**New York City water supply system**

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**New York City's water supply system** is one of the most extensive [municipal water systems](http://en.wikipedia.org/wiki/Municipal_water_system) in the world. This complex system relies on a combination of [tunnels](http://en.wikipedia.org/wiki/Tunnel), [aqueducts](http://en.wikipedia.org/wiki/Aqueduct) and [reservoirs](http://en.wikipedia.org/wiki/Reservoir_%28water%29) to meet the daily needs of 8 million residents and many visitors. Thanks to well-protected wilderness [watersheds](http://en.wikipedia.org/wiki/Drainage_basin), New York's [water treatment process](http://en.wikipedia.org/wiki/Water_purification) is simpler than in other American cities. One advantage of the system is that 95% of the total water supply is supplied by gravity. The other 5% needs to be pumped to maintain pressure, but this is sometimes increased in times of drought when the reservoirs are at lower than normal levels.

The system is divided into three separate sub-systems:

* The [New Croton Reservoir](http://en.wikipedia.org/wiki/New_Croton_Reservoir), the oldest and smallest, sits in [Westchester](http://en.wikipedia.org/wiki/Westchester_County%2C_New_York) and [Putnam](http://en.wikipedia.org/wiki/Putnam_County%2C_New_York) counties.
* The [Catskill aqueduct](http://en.wikipedia.org/wiki/Catskill_aqueduct), built decades later, is significantly larger than the Croton. In the early years of the 20th century, the [city](http://en.wikipedia.org/wiki/Government_of_New_York_City) and [state](http://en.wikipedia.org/wiki/Government_of_New_York) designated thousands of acres of land in the eastern [Catskill Mountains](http://en.wikipedia.org/wiki/Catskill_Mountains) to build two reservoirs that more than doubled the city's capacity.
* In the 1950s and 1960s, the city expanded its water system again, tapping the east and west branches of the [Delaware River](http://en.wikipedia.org/wiki/Delaware_River), as well as other tributaries of the Delaware and [Hudson](http://en.wikipedia.org/wiki/Hudson_River) rivers to create the newest and largest of its three systems, the [Delaware system](http://en.wikipedia.org/wiki/Delaware_Aqueduct), which provides around half of the city's water supply.

The city has sought to restrict [development](http://en.wikipedia.org/wiki/Land_development) throughout its watershed. One of its largest watershed protection programs is the Land Acquisition Program, under which the [New York City Department of Environmental Protection](http://en.wikipedia.org/wiki/New_York_City_Department_of_Environmental_Protection) has purchased or protected through [conservation easement](http://en.wikipedia.org/wiki/Conservation_easement) over 70,000 acres (280 km²) since 1997.

**Responsibility for water supply, sewerage and wastewater treatment**

Responsibility for water supply, sewerage and [wastewater treatment](http://en.wikipedia.org/wiki/Sewage_treatment) of New York City is shared between three institutions: The [Department of Environmental Protection](http://en.wikipedia.org/wiki/New_York_City_Department_of_Environmental_Protection) operates and maintains the system; the Municipal Water Finance Authority raises debt in the market to finance the system; and the Water Board sets rates and collects user payments.

The **New York City Department of Environmental Protection** has a workforce of over 5,600. It includes three bureaus in charge of, respectively, the upstate water supply system, the city's water and sewer operations, and wastewater treatment:

* The Bureau of Water Supply manages, operates and protects New York City's upstate water supply system to ensure the delivery of a sufficient quantity of high quality [drinking water](http://en.wikipedia.org/wiki/Drinking_water). The Bureau is also responsible for the overall management and implementation of the provisions of the city's $1.5 billion Watershed Protection Program.
* In addition to operating and maintaining the water supply and sewerage system, the Bureau of Water and Sewer Operations is also responsible for the operation of the [Staten Island Bluebelt](http://en.wikipedia.org/wiki/Staten_Island_Bluebelt), an ecologically sound, cost-effective natural alternative to storm sewers, which occupies approximately 15 square miles (39 km2) of land in the South Richmond area of [Staten Island](http://en.wikipedia.org/wiki/Staten_Island). This project preserves streams, ponds and other wetland ("bluebelt") areas, allowing them to perform their natural function of conveying, storing and filtering [storm water](http://en.wikipedia.org/wiki/Storm_water).
* The Bureau of Wastewater Treatment operates 14 water pollution control plants treating an average of 1.5 billion gallons of wastewater a day; 89 wastewater pump stations; eight dewatering facilities; 490 sewer regulators; and 6,000 miles (9,700 km) of intercepting sewers.

The **New York City Municipal Water Finance Authority** (“NYW”) finances the [capital](http://en.wikipedia.org/wiki/Financial_capital) needs of the water and sewer system of the city through the issuance of [bonds](http://en.wikipedia.org/wiki/Municipal_bond), [commercial paper](http://en.wikipedia.org/wiki/Commercial_paper) and other obligations. It is a [public-benefit corporation](http://en.wikipedia.org/wiki/Public-benefit_corporation) created in 1985 pursuant to the New York City Municipal Water Finance Authority Act. The Authority is administered by a seven-member Board of Directors. Four of the members are ex officio members: the Commissioner of Environmental Protection of the City, the Director of Management and Budget of the City, the Commissioner of Finance of the City and the Commissioner of Environmental Conservation of the State. The remaining three members are public appointments: two by the Mayor, and one by the Governor.

The **New York City Water Board** sets water and sewer rates for New York City sufficient to pay the costs of operating and financing the system, and collects user payments from customers for services provided by the water and wastewater utility systems of the City of New York. The five Board members are appointed to two-year terms by the Mayor.

**Overview of infrastructure**

The NYC water system has storage capacity of 550 billion gallons and provides over 1.2 billion gallons per day of high quality drinking water to more than eight million city residents and another one million users in four upstate counties bordering on the water supply system. The distribution system is made up of an extensive grid of water mains stretching approximately 6,500 miles (10,500 km).

The city's wastewater is collected through an equally extensive grid of sewer pipes of various sizes and stretching over 6,600 miles (10,600 km). Virtually all of the city's dry-weather wastewater is collected through this system and processed by one of 14 wastewater treatment plants located throughout the city's five boroughs. The plants currently treat about 1.3 billion gallons of wastewater per day. The operation of these plants ensures that New York City's surrounding waterways are clean and safe.

**Water tunnels**

1. New York City Water Tunnel No. 1 was completed in 1917. It runs from the [Hillview Reservoir](http://en.wikipedia.org/wiki/Hillview_Reservoir) under the central [Bronx](http://en.wikipedia.org/wiki/Bronx), [Harlem River](http://en.wikipedia.org/wiki/Harlem_River), West Side, Midtown and Lower East Side of [Manhattan](http://en.wikipedia.org/wiki/Manhattan), and under the [East River](http://en.wikipedia.org/wiki/East_River) to [Brooklyn](http://en.wikipedia.org/wiki/Brooklyn) where it connects to Tunnel 2. It is expected to undergo extensive repairs upon completion of Tunnel No. 3 in 2012
2. New York City Water Tunnel No. 2 was completed in 1935. It runs from Hillview Reservoir under the central Bronx, East River, and western [Queens](http://en.wikipedia.org/wiki/Queens) to Brooklyn where it connects to Tunnel 1 and the Richmond Tunnel to [Staten Island](http://en.wikipedia.org/wiki/Staten_Island).
3. [New York City Water Tunnel No. 3](http://en.wikipedia.org/wiki/New_York_City_Water_Tunnel_No._3) is the largest capital construction project in New York City's history. It is intended to provide the city with a critical third connection to its Upstate New York water supply system. The tunnel will eventually be more than 60 miles (97 km) long. Construction on the tunnel began in 1970 but is not expected to be completed until at least 2020.

**The Croton Water Filtration Plant Project**

In order to comply with federal and state laws regarding the filtration and disinfection of drinking water, the [U.S. Environmental Protection Agency](http://en.wikipedia.org/wiki/U.S._Environmental_Protection_Agency) (EPA) and the New York State Department of Health called on the city to create a treatment plan to serve the Croton System. The underground filtration plant is under construction in [Van Cortlandt Park](http://en.wikipedia.org/wiki/Van_Cortlandt_Park). While the Bloomberg administration originally budgeted the project at $992 million in 2003, an audit by the city's comptroller placed the actual costs at $2.1 billion in August of 2009.

**2008-2013 Underwater Reconstruction Project**

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In recent years, the New York City water supply system has been leaking water at a very rapid rate of up to 36 million gallons per day. A complex five-year project with an estimated $22 million construction cost was initiated in November 2008 to correct some of this leakage. The work includes underwater [diving teams](http://en.wikipedia.org/wiki/Saturation_diving) of six divers who live in a 24-foot (7.3 m) pressurized tube that includes "showers, a television and a Nerf basketball hoop" in conditions designed to replicate those of their underwater work site. The divers breathe air that is [97.5% helium and 2.5% oxygen](http://en.wikipedia.org/wiki/Heliox#Diving_uses). The six divers descend 700 feet (210 m) to the work site where they work 12-hour shifts at a time. "When the divers aren't squeaking at one another in helium-speak, three of them use a diving bell to go 70 stories down, where they do things like strip out 4,000 lb. (1,800 kg). bronze pipe fittings [in twelve-hour shifts divided up into four-hour demolition sessions and eight hours of rest].

**See also**

* [Environmental issues in New York City](http://en.wikipedia.org/wiki/Environmental_issues_in_New_York_City)
* [Integrated urban water management](http://en.wikipedia.org/wiki/Integrated_urban_water_management)
* [NYC DEP Police](http://en.wikipedia.org/wiki/NYC_DEP_Police)
* [Water supply and sanitation in the United States](http://en.wikipedia.org/wiki/Water_supply_and_sanitation_in_the_United_States)

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