

[Print](#)**WEEK FOUR: WHAT ARE THE CHALLENGES OF MANAGING EARTH'S FRESH WATER? | ESSAY ONE****Thirsty Metropolis: A Case Study of New York City's Drinking Water, Part One****by Eleanor Sterling, Nora Bynum, and Erin Vintinner**

It's 1995, and New York City has to bring its immense water supply system into compliance with strict new Environmental Protection Agency criteria. With billions of dollars at stake, tension between the many stakeholders is building, and years of progress toward the safety of upstate watersheds is threatened. The Governor convenes a meeting that will determine the future of the system...

**NYC's Water Supply System**

The system encompasses more than 5,000 square kilometers across eight counties, and supplies 4.2 billion liters (1.1 billion gallons) of safe drinking water per day to millions of downstate residents, businesses, commuters, and tourists. ©NYC DEP

[Enlarge image »](#)**The History**

Arriving in the early 17th century, Manhattan's first European settlers drew their drinking water from private wells. Over the next three centuries, a series of local reservoirs developed into an extensive system of reservoirs and aqueducts to meet growing demand. In the process, watersheds in upstate New York became the primary source of drinking water for New York City, which is home to nearly half the population of the state.

With the exception of some parts of Queens that rely on groundwater, New York City draws upon surface water far north of the metropolitan area. This network consists of three watersheds: the Catskill and Delaware watersheds, about 160 kilometers (100 miles) north of the city in the Catskill Mountains, and the Croton watershed, about 80 kilometers (50 miles) north of the city and east of the Hudson River. Excess water is released to the Delaware River. The system that delivers this water to the taps of 9 million customers is an engineering marvel. It consists of 19 reservoirs and more than 9,700 kilometers (6,000 miles) of pipes, aqueducts and tunnels, including the Delaware Aqueduct, the longest continuous tunnel in the world. Even more impressive, the system is almost entirely gravity-driven. The reliability and safety of this water is absolutely essential to the metropolis.

This water supply is under pressure from increasing human population and development at both ends: in the watershed communities and downstate, in New York City. Both populations are tightly linked, with conflicts dating back to the 1950's, when the City claimed eminent domain (taking private property for public use with compensating payment to the owner) and flooded whole villages to build its upstate reservoirs.



## Water in High Demand

New York City uses more than 1.1 billion gallons of water every day. ©Flickr / Stacie Brew

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While the drinking water coming down to New York City is disinfected, it's not filtered. The quality, therefore, depends in many ways upon ecosystem services: the water purification provided by the watershed. For an unfiltered drinking water supply, the most critical quality issues relate directly to point- and non-point-source pollution from upstate watershed lands. Some of the prime sources of New York City drinking water degradation are runoff from treated lawns and numerous farms (primarily dairy farms), effluent from wastewater treatment plants and septic systems, and stormwater runoff. Upstate population growth has contributed to sprawl: low-density, automobile-centered development on suburban fringes. Sprawl increases the amount of impenetrable surfaces like roads that prevent soil from absorbing water, consumes open space, and impinges on the services provided by the watershed. Downstate residents have also been acquiring second homes in watershed communities, generating a new wave of development pressure. As these upstate watersheds develop and potential pollution sources multiply, so do threats to the quality of the water collected in reservoirs and carried south to city-dwellers.

## New York: City of Waterways and Aquatic Life

The coastline that greeted Henry Hudson as he sailed into the river that now bears his name has changed drastically. As European settlers poured into the New World, they modified vast portions of shoreline, dredging channels, deforesting wooded coasts, and filling in wetlands. These changes accommodated trade and population growth by creating more usable land and disposing of waste. La Guardia, Newark, and John F. Kennedy Airports, and the now-closed Fresh Kills landfill, were all built on top of former marshlands, a pattern typical of the evolution and development of large cities.

The New York metropolitan area still boasts approximately 2,400 kilometers (1,500 miles) of coastline. Four of its five boroughs are located on islands, and a complex network of waterways connects the metropolitan area to New Jersey and Connecticut. Just beyond the NY/NJ Harbor Estuary lies the New York Bight, a 39,000-square-kilometer (15,000-square-mile) gulf on the Atlantic Ocean.

These waterways support remarkable biodiversity, including marine deepwater, subtidal, and intertidal ecosystems. Even the most developed areas contain pockets of high aquatic biodiversity, whether in marine, coastal, or freshwater ecosystems. For example, the wetlands of the NY/NJ Harbor Estuary, which is located along the Atlantic flyway, provide critical habitat for resident and migratory birds. The marshes of Jamaica Bay support more than one-fifth of all North American bird species, and even shelter the endangered Kemp's Ridley sea turtle. Many fish species occupy New York City estuaries for at least some portion of the year, including migratory species such as sturgeon and resident species such as white perch. Habitats in these estuaries also support shellfish, crustaceans and nematodes, and blue-green algae.

## The Scenario

In the 1980s, outbreaks of water-borne illnesses across the country raised public health concerns. After Congress passed the Safe Drinking Water Act Amendments of 1986, the United States Environmental Protection Agency (EPA) issued the Surface Water Treatment Rule (SWTR) to prevent microbial contaminations that can cause illness. The SWTR required that any public water supply system either filter its source water or meet a series of objective water quality, operational, and watershed control criteria. New York City had to choose between the two.

Since the cost of constructing a filtration facility approached an estimated \$6 billion to \$8 billion, the city took initiatives in the early 1990's to meet the SWTR requirements. In recognition of these efforts, the EPA issued a conditional Filtration Avoidance Determination (FAD) in 1993. The FAD centered around a land-acquisition program that would restrict activities on water-sensitive lands and **buffer zones** (areas adjacent to water bodies on which activities that may affect water quality are regulated or restricted). The impact of the necessary land acquisition upon upstate residents and businesses created the potential for conflict with the City of New York. The EPA also required the city to begin designing a filtration facility for the Catskill/Delaware supply, in order to minimize delay if filtration were to become necessary.

Uncertainty regarding the City's follow-up and the possible use of eminent domain for land acquisition caused relations between upstate and downstate stakeholders to deteriorate. A coalition of upstate stakeholders filed suit against the City, bringing matters to an impasse. Over a year later, New York State Governor George E. Pataki convened a meeting to mediate the controversy. The resulting negotiations involved four primary stakeholder groups: government entities, upstate stakeholders, downstate stakeholders, and environmental groups. The background and primary concerns of each group are described below:

## Upstate Stakeholders

In 1995, the City of New York owned less than 10 percent of the watershed upon which it depends, which covers roughly 5,000 square kilometers. The watershed's year-round population was around 78,000, in addition to a significant number of summer residents. Most Westchester County residents, who depend on the NYC water supply system for their drinking water, supported the prospect of land acquisition in their county. However, many towns west of the Hudson River opposed any plans that might devalue private property, such as the acquisition of buffer zones around water bodies or restrictions on sewerage and service connections that could make land unavailable for development.

Represented by the Coalition of Watershed Towns and spokespersons for eight upstate counties, watershed residents claimed that efforts to protect surface water quality would unduly reduce economic growth and opportunities, and that environmental measures would benefit New York City almost exclusively.



## Upstate New York

The waterfront communities in the Hudson River Valley are home to productive agriculture enterprises, including dairies, orchards, and vineyards. ©Flickr / Patsy Wooters

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## Government Agencies

Compliance with the Surface Water Treatment Rule, involved many government agencies, including the EPA, the NYS Department of Health, and the State and City Departments of Environmental Conservation. The New York City Department of Environmental Protection held primary responsibility for the public's continued access to safe drinking water, as it does now, while the EPA had authority over state and local agencies.

According to the STWR, in order to remain unfiltered, the water supply system needed to meet stringent criteria. Levels of specified contaminants (including **coliforms** and **turbidity**) could not be exceeded, and the system (including the watershed) had to comply with certain disinfection requirements.

Agency objectives varied. If the system ceased to meet the EPA criteria, the EPA could mandate the construction of a filtration plant. While the EPA was solely concerned with water quality, local agencies such as the NYCDEP favored the most cost-effective solution—in this case, a compromise that allowed water to flow unfiltered from upstate communities.

## Downstate stakeholders

The New York City metropolitan area was and remains one of the most populous and heavily industrialized coastal areas on earth. In 1995, almost 17 million people lived in the city, Long Island, northern New Jersey, and northeastern Pennsylvania, including the more than 7.3 million residents of the city's five boroughs. They were represented by spokespersons from New York City, Putnam County, and Westchester County. (Putnam and Westchester County residents receive water from upstate and so were considered downstate stakeholders, along with commuters and tourists.)

Long renowned for its safety and quality, New York City's tap water has been described as the "champagne of drinking waters" and is considered a secret ingredient in the famous local bagels and pizza. If a filtration plant were mandated for the Catskill/Delaware water supply, NYC residents and businesses would face upfront costs of many billions of dollars. This cost could double water rates. Lower-income residents and owners of rent-controlled housing would be particularly adversely affected, as well as small business owners. Alternatively, the city would have to bear the costs of complying with any future FADs.



### City Water Tunnel No. 3

Since 1970, New York City has been extending its connection to the water supply upstate with the largest construction project in the city's history. When completed in 2020, the new tunnel will provide a critical supplement to two existing tunnels. ©NYC DEP

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## Environmental Groups

The principal environmental groups involved with NYC's water supply were Riverkeeper, the Catskill Center for Conservation and Development, the Trust for Public Land, the Open Space Institute, and the New York Public Interest Group. These groups advocated for environmental measures that would protect both New York City's water supply and the resilience and diversity of upstate ecosystems. Since biodiversity and riparian corridors may be protected under the umbrella of water purification, some of this agenda was shared with government agencies. Rural upstate watersheds contained wetlands and waterways that provide ecosystem services such as nutrient cycling and drought and flood mitigation.

Watershed lands also provide key habitat for regionally rare large mammal species, including black bears, bobcats, and fishers. The waters that supply the reservoirs support healthy populations of trout, and the reservoirs themselves are important fisheries. Watershed lands also supported numerous endangered and threatened species such as the bald eagle, the timber rattlesnake, the red-shouldered hawk, the spotted salamander, the eastern hognose snake, the spotted turtle, and the eastern bluebird. Rare regional plant species include the northern wild monkshood, shoreline sedge, the roseroot stonecrop, the fragrant cliff fern, and Appalachian Jacob's ladder.

## Decision Time

Now In 1995, various options are on the table. One is to create a program to meet the EPA's stringent water quality and control criteria, which would cost between \$1 billion and \$1.5 billion over ten years to implement. Another is to construct a facility that would filter all of the water coming from the Catskill and Delaware watersheds, at an estimated cost of at least \$6 billion to \$8 billion dollars, with annual operating costs of \$500 million. Possible compromises include a land-acquisition agreement, devising watershed rules and regulations, establishing partnerships, or exploring filtration options. All the stakeholder groups, who have a year to come up with a plan, have agreed to a roundtable meeting.

### Related Links

[EPA: Ground Water and Drinking Water »](#)

The national standards for water quality, source protection, and water systems, as outlined by the Environmental Protection Agency.

[NYC DEP: Drinking Water »](#)

Learn about New York City's water supply system, its history, and current reservoir levels.

[NYC Tunnel Number 3 »](#)

Explore the intricate engineering details of New York City's newest water tunnel, currently under construction.

[CBS: NYC Way Down Underground »](#)

10/7/2016

Watch this video tour of City Water Tunnel Number 3 and the sandhogs who are building it.