

THE LATEST FAD IN NEW YORK CITY'S DRINKING WATER SUPPLY

E. Mark Pires

Earth & Environmental Science Department
Long Island University – C.W. Post Campus
Brookville, New York 11548

ABSTRACT: *The New York City water supply system provides approximately 1.3 billion gallons (5 billion liters) of high quality drinking water daily to over nine million people from unfiltered surface sources. Since the early 1990s, the city has managed to avoid expensive federally mandated filtration of its vulnerable surface water supply. It has done so by satisfying the necessary criteria to obtain a Filtration Avoidance Determination (FAD) under provisions of the Safe Drinking Water Act as administered by the U.S. Environmental Protection Agency. The recent renewal of filtration avoidance status granted in 2002 is due in part to New York City's aggressive watershed management program. This paper examines the challenges New York City faces in satisfying filtration avoidance criteria and the strategies employed to meet them.*

INTRODUCTION

The New York City water supply system is a fascinating subject for geographers and urban and regional planners. In historical, technological, social, and political terms, the establishment and evolution of the system is a testament to successful urban development planning on a massive scale. Without an abundant and reliable source of pure, clean water, the city would not have been able to attain such phenomenal growth over the last two centuries.

A complex and far-flung network of reservoirs, aqueducts, tunnels, and pipes supplies water to over nine million consumers in the City of New York and several nearby suburban counties. For the most part, the system functions remarkably well, delivering the lifeblood of water on a daily basis to about one-half of the population of New York State. However, the system has its problems. Much of the infrastructure is aged, over 100 years in some instances, and in need of maintenance and repair. Although the sustained yield of potable water meets the needs of such a large population, concerns have been raised over the last 10-15 years about the ability of the city to maintain the exceptionally high quality of water reaching the tap. Threats to water quality, both present and projected, have provoked a spate of

activity to renovate and reorganize the system's physical infrastructure and managerial operations.

One remarkable aspect of New York's water supply is the fact that it is one of the few systems of its size in the United States to provide water from an unfiltered surface source. Surface water is generally considered more vulnerable to pollution and contamination than groundwater. Although federal regulations require most municipal water suppliers to filter drinking water in order to protect public health, the City of New York has so far been able to avoid the costly prospect of filtering its water supply. The city has done so by convincing the federal Environmental Protection Agency (EPA) that it has put in place a watershed management program that can safeguard public health from waterborne disease. This paper examines the strategies employed by New York City to protect the quality of its water supply, and to avoid investment in filtration technology, through what is widely regarded as an experiment in watershed protection of unprecedented scope and size. I begin with a brief historical sketch of the development of New York's water supply infrastructure. I then outline relevant water quality concerns and the regulatory environment in which they are now being addressed. Finally, in the last section of the paper, I highlight the progress to date and the future challenges regarding the city's experiment in watershed protection.

NEW YORK CITY'S WATER SUPPLY

The historical geography of New York's water supply can be divided into three major periods (New York City Department of Environmental Protection (NYCDEP), 1999). The first is a lengthy early-settlement period from the 1600s to the early 1800s. During this time of relatively low population density, people obtained their potable water supply from local wells, ponds, and springs. Toward the end of this period, slow but steady growth in demand eventually outstripped supply from these sources. In the early nineteenth century, Manhattan experienced serious water supply problems including salt water intrusion into the wells, an inadequate supply of water to fight fires, and contamination due to poor sanitation that on occasion, such as in 1832, led to deadly outbreaks of cholera (Koeppel, 2000).

As New York struggled to meet the growing demand for water, it was clear that the city would have to search for a more abundant, reliable, and clean supply from somewhere beyond the island of Manhattan. Thus began the second major period in the water supply system, an initial expansion that took place from the 1830s to the early 1900s. The city set its sights on developing the Croton River watershed in what is today the northern part of Westchester County, New York, some 40 miles (65 km) north of the city (see Figure 1). The jewels of the early expansion included the Croton Dam and its impressive aqueduct that brought water to Manhattan, by gravity alone, for the first time in 1842 (Tobin, 2001). Intended to meet demand for at least a century, the Croton system in fact helped spur the city's growth and development. This led to even greater demand for water, which in turn necessitated plans to expand the system much sooner than expected. By the late 1880s, the city was busy constructing a bigger dam, a larger aqueduct, and a series of additional reservoirs that together constitute what is now known as the "East-of-Hudson" watershed.

Shortly after its completion, even the enlarged East-of-Hudson system was deemed inadequate to meet the burgeoning demands of the metropolis. By the early twentieth century, the city was again looking for suitable watershed lands to develop. During a third period of expansion that

extended into the second half of the twentieth century, the city gradually developed an extensive "West-of-Hudson" Catskill/Delaware system that today delivers approximately 90% of daily water supply. The Catskill/Delaware system, completed in 1965, includes six reservoirs and two aqueducts that supply the metropolitan area from the Catskill Mountains and the headwaters of the Delaware River some 125 miles (200 km) away. Today, the overall system serves up some 1.3 billion gallons (5 billion liters) per day of high quality water to almost one-half of New York State's population, and leads some New Yorkers to boast of having the "champagne of drinking water."

WATER QUALITY CONCERNS IN THE NEW YORK CITY SYSTEM

New York City's impressive water supply system notwithstanding, Gotham's residents have reason to be concerned that one day they could wake up to find their glasses filled with vinegar rather than champagne. The surface sources from which New York derives its drinking water are considered at risk from pollution associated with increased development, urban sprawl, and agricultural land use (Platt et al., 2000). Unlike most other public water supplies in the United States that come from surface sources, New York City's water is not currently subjected to treatment with filtration technology to remove microbial contaminants. Given recent concerns about drinking water quality throughout the nation, the federal Environmental Protection Agency has tightened regulations intended to protect public health from waterborne disease. The more stringent regulations stem from amendments to the Safe Drinking Water Act (SDWA) and the EPA's 1989 Surface Water Treatment Rule (SWTR) and its 1998 Interim Enhanced Surface Water Treatment Rule (IESWTR). The treatment rules stipulate that public water suppliers must employ filtration technology unless they can show that adequate source protection measures are in place to safeguard public health (United States Environmental Protection Agency (USEPA), 2002a). If such assurance is given, the EPA can issue a waiver known as a "Filtration Avoidance Determination" (FAD) that relieves the

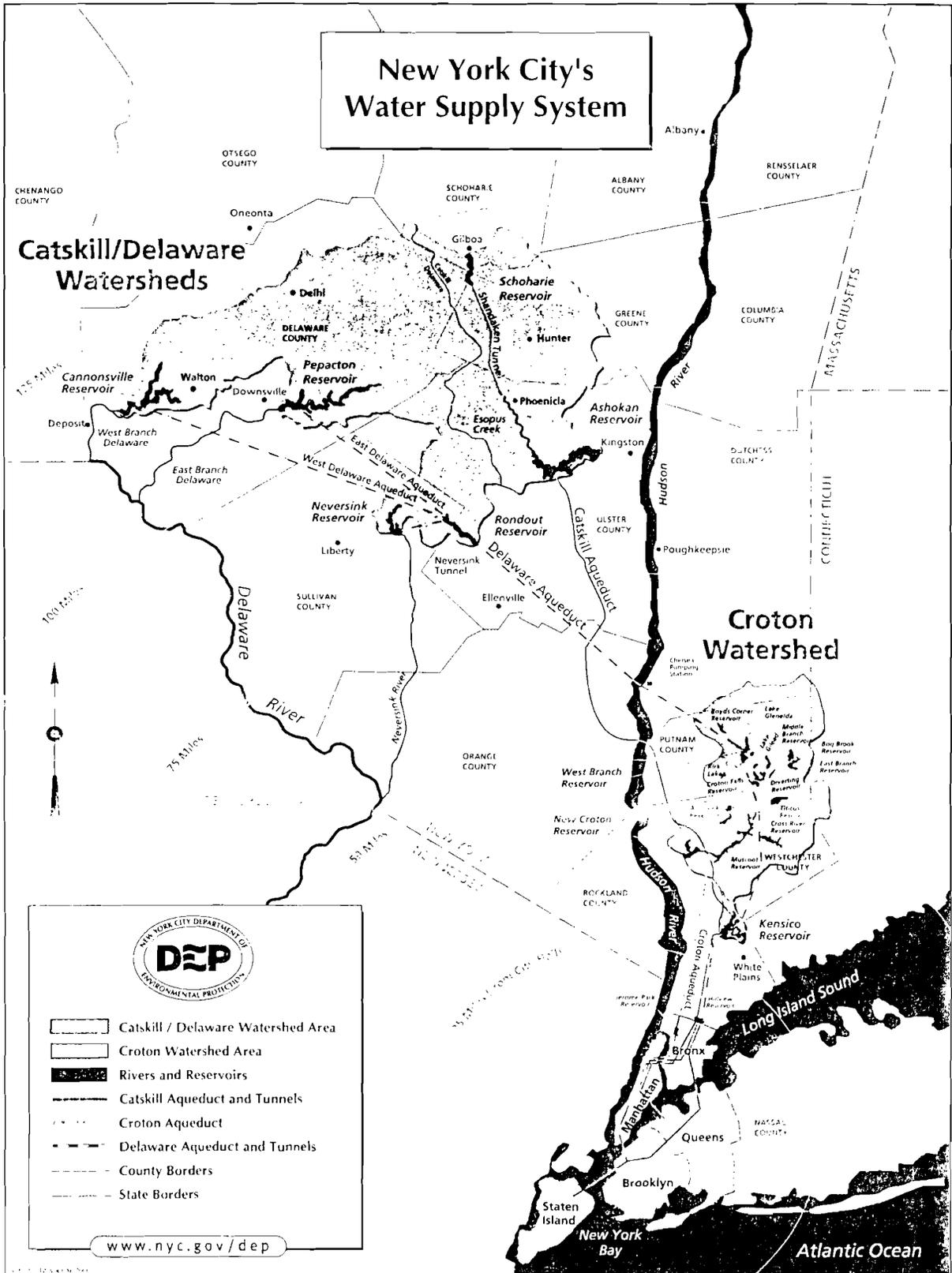


Figure 1. New York City Water Supply Watersheds. Source: NYC Department of Environmental Protection.

supplier from having to install filtration technology. FADs are temporary, revocable measures subject to strict oversight and timetables for meeting all water quality protection criteria.

To date, New York City has managed to avoid the costly prospect of filtering the larger Catskill/Delaware portion of its water supply where estimates for the design and construction of a suitable filtration plant range from \$4-8 billion. Of note, the city is currently under federal court order to build a \$1 billion plant for the more threatened East-of-Hudson Croton system. In 1997, the EPA issued a five-year FAD for the Catskill/Delaware system that coincided with the signing of a landmark watershed protection pact known as the New York City Watershed Memorandum of Agreement (MOA) that was entered into by the City of New York (through its Department of Environmental Protection (DEP), the lead agency responsible for water supply), the State of New York, the EPA, upstate municipalities, and several private environmental groups (Platt et al., 2000). The MOA establishes a framework for long-term watershed management, with major provisions for land acquisition, new watershed rules and regulations, and a range of watershed protection and partnership programs financed by a more modest \$1.5 billion commitment over an initial ten-year period (National Research Council, 2000). The MOA is significant in that it has so far proved successful in establishing workable partnerships among disparate watershed interests and stakeholders including government, environmental, agricultural, industrial, commercial, residential, and recreation sectors. In late 2002, the EPA renewed the expired FAD for another five years until 2007 due in large part to the progress made under the provisions of the MOA and future commitments outlined in New York City's long-term watershed protection program (USEPA, 2002b; NYCDEP, 2001a).

WATERSHED PROTECTION UNDER THE 1997 MOA & FAD

Renewal of the EPA's filtration avoidance determination is granted with the stipulation that watershed protection measures now in place will be expanded and enhanced. Although much has been

accomplished over the past years to help protect New York's water supply from degradation at the source, much still needs to be done in order to consolidate these gains and assure that improvements continue into the future. Noted below are some highlights of the progress made so far as well as some of the challenges that still lie ahead.

Progress to Date

Land acquisition

Compared with other major urban water supply systems, the City of New York owns a relatively small proportion of the land within its watershed. Prior to the signing of the 1997 MOA, the city owned only about 6% of the land in the West-of-Hudson watershed, with nearly one-half of the total attributed to land submerged under the reservoirs. Of the remaining West-of-Hudson lands, 74% is in private ownership and 20% is owned by the State of New York (National Research Council, 2000; USEPA, 2000). The MOA stipulates that the city will actively seek to increase its landholdings within the watershed by soliciting the purchase of undeveloped land deemed hydrologically sensitive. This designation applies to land where there is a significant pollution threat defined by various measures of linear distance between certain land uses (e.g. agriculture) or installations (e.g. fuel storage tanks, septic systems, etc.) and nearby watercourses or reservoirs, or by estimated pollutant travel time through the watershed to the distribution system. The acquisition of such land, to be held undeveloped in perpetuity, is seen as one of the most effective strategies the city can employ to protect the water supply from the threat of future degradation. Under the MOA, the city agreed to solicit the purchase of 355,050 acres (143,745 ha) of land over ten years in the West-of-Hudson watershed, committing \$250 million to do so (National Research Council, 2000). The city is also interested in acquiring land in the more developed, and hence more vulnerable East-of-Hudson watershed and has committed \$7.5 million for this purpose (National Research Council, 2000).

The EPA closely monitors progress on land acquisition in the West-of-Hudson watershed which, given the interconnected design of the system, includes two high priority areas – the Kensico and West Branch reservoirs – that are physically located

on the east side of the Hudson River (see Figure 1). In its mid-term evaluation of compliance with the recently expired 1997-2002 FAD, the EPA noted that the city had solicited over 150,000 acres (60,730 ha) of land (42% of the total ten-year solicitation goal), and actually acquired, or had under contract to acquire, approximately 18,000 acres (7,290 ha), or about 12% of the total acres solicited (USEPA, 2000). Generally speaking, the EPA is satisfied with the DEP's progress to date. However, it has recommended that the city move more aggressively to acquire land in the hydrologically sensitive Kensico reservoir area. Recently, the DEP reports having signed a purchase contract to acquire 120 acres (50 ha) in the Kensico basin to add to the 35 acres (14 ha) it already acquired or has placed under contract, which indicates some progress toward the nearly 1000-acre (405 ha) acquisition target (NYCDEP, 2001b).

Watershed rules and regulations

Prior to the 1997 MOA, New York City relied on a regulatory apparatus that dated from 1953 to protect and police its important water supply watershed. A completely updated and revised code of Watershed Rules and Regulations was promulgated at the same time that the 1997 Memorandum of Agreement and the 1997-2002 EPA Filtration Avoidance Determination were concluded. In accordance with applicable federal and state regulations, the new watershed rules and regulations govern and control a wide variety of activities and sources of pollution in the watershed. Among the important considerations are standards for the siting of any hazardous materials facility, for wastewater and sewage discharges and effluent controls, and for any development on hydrologically sensitive lands. The updated rules and regulations are considered an important management tool for water quality protection.

Watershed protection and partnership programs

The creation of a number of programs under the rubric of watershed protection and partnerships is perhaps the most significant outcome of the 1997 MOA. These programs are designed to protect and enhance water quality while at the same time preserve and promote socioeconomic development in

the upstate watershed communities. A number of institutional arrangements – largely funded by the City of New York through its Department of Environmental Protection – have been established to implement and manage these programs, most notable among these being the nonprofit Catskill Watershed Corporation (CWC) and the Watershed Agricultural Council (WAC). Since their inception, these agencies have been involved in the development of a number of both structural (i.e. physical) and nonstructural (i.e. managerial) Best Management Practices (BMPs) to promote healthy watersheds and prosperous communities. Examples of these include new construction and upgrades of existing wastewater treatment facilities, a septic system rehabilitation and replacement program in the “West-of-Hudson” watersheds, a “Whole Farm Planning” program to minimize agricultural nonpoint source pollution, streambank stabilization and stormwater control programs, and improved watershed education and community outreach. Examples of successful BMP implementation to date include the replacement of more than 1,500 failed residential septic systems since 1997 (this \$15 million program was recently reauthorized for another five-year period with similar funding), construction of 39 road salt storage sheds at a cost of over \$7 million, 58 separate stormwater control projects with an investment of approximately \$5 million, and the start of construction on two of seven planned new municipal wastewater treatment facilities – all to be completed by 2007 – at a total investment of over \$87 million (Catskill Watershed Corporation, 2003; NYCDEP, 2003). In addition, nonstructural BMP accomplishments supported by the Watershed Agricultural Council include the registration of over 2,700 acres of conservation easements, over 46,000 acres registered in forest management plans, and nearly 140 participating watershed farm operations with completed Whole Farm Plans (Watershed Agricultural Council, 2003).

Challenges ahead

Much remains to be done with regard to New York City's efforts to acquire land in the watershed. Although actual acquisition is not stipulated in the letter of the MOA or the FAD – in fact only solicitation to purchase is required – the spirit of the agreements suggests that all attempts will be made to carry out a very complicated process that

involves a number of stages from solicitation, negotiation, and purchase contract, to contract closing, ownership and, ultimately, protection. Indeed the EPA considers progress in concluding purchase contracts to be an important indicator of the city's overall performance in protecting the watershed. A more detailed analysis indicates that more needs to be done to actually acquire land and bring it under protection. For example, as of early November, 2001, DEP data indicated that a total of 270,244 acres (109,410 ha) of land had been solicited through Year 5 of the 1997 MOA/FAD, representing 100% of the solicitation target by that time (NYCDEP, 2001a). Of this total, 33,746 acres (13,662 ha), 12.5% of the solicitation total, were either acquired or placed under purchase contract. In its report, DEP refers to this 12.5% as its "success rate" in land acquisition. However, the report goes on to mention that of these 33,746 acres, only 17,815 (7,212 ha) were acquired after closing the purchase contracts. Thus, the acreage acquired represents 6.6% of the Year 5 solicitation total and 5% of the ten-year overall solicitation goal of 355,050 acres (143,745 ha), respectively. The city's progress to date thus raises the question of what should constitute "success" in land acquisition: the amount of land under contract and/or closed, or the amount actually closed and under ownership and protection. In its draft FAD renewal document, the EPA stated that the city needed to: (1) continue with its solicitation program as stipulated by the FAD and MOA, (2) reduce the lag time between contracts and closing, and (3) continue its efforts to acquire lands in the most sensitive basins such as the Kensico reservoir (USEPA, 2002c).

Revision of the antiquated code of watershed rules and regulations is heralded as an important achievement in the negotiations that led to the 1997 Memorandum of Agreement. The challenge now before the New York City DEP and other agencies is to enhance and strengthen the implementation and enforcement of the new code. According to the EPA, this effort must include a greater degree of coordination and collaboration between DEP and the New York State Departments of Environmental Conservation (DEC) and Health (DOH), important partners in watershed protection. EPA also recommends that the DEP be more actively engaged in the State Environmental Quality Review Act (SEQRA) process - New York's primary

environmental impact assessment and planning tool. Such engagement should include holding regular workshops and trainings for municipal planning board members, building inspectors, and other pertinent stakeholders on DEP's role in the SEQRA process.

The landmark 1997 Memorandum of Agreement is often described as an experiment in cooperative natural resource management and socioeconomic development planning. So far, it would seem that this experiment has been successful as evidenced by the EPA's decision in 2002 to extend its Filtration Avoidance Determination for another five years. Many effective and popular programs have been put in place in a relatively short period of time. The current challenge is to sustain and enhance the level of both human and financial commitments to the already established watershed protection and partnership programs, and to expand these to as yet underserved regions of the watershed. Efforts are also needed to increase awareness and involvement in watershed protection on the part of a broader spectrum of community-based stakeholders from county governments, non-governmental organizations, and environmental groups, to municipal agencies, business interests, corporations, and other local community organizations. Such efforts must include enhanced dissemination of information and increased public information and education on watershed issues to encourage effective stewardship at both public and private levels.

CONCLUSION

Working together with numerous partners, the City of New York and its Department of Environmental Protection have fashioned an impressive long-term plan for managing and protecting an already high quality water supply enjoyed by millions of people in the nation's largest city. The city has very strong incentives to assure that this plan succeeds: compliance with state and federal water quality regulations, and the desire to avoid having to build and maintain an exceedingly expensive filtration plant should its long-term watershed protection plan fail to live up to expectations. Given the recent downturn in the city's

financial situation in the last couple of years, the importance of this strategy has become all the more apparent.

The recent five-year renewal of the Environmental Protection Agency's filtration avoidance determination for the New York City water supply system as allowed under the Safe Drinking Water Act demonstrates that the city is taking watershed protection seriously. The latest FAD is both a testament to the innovative and cooperative efforts of a wide variety of watershed stakeholders, and a reminder of what is possible when committed individuals and agencies strive to achieve effective, preventive, forward-looking environmental stewardship. While significant strides have been made in watershed protection over the last several years, New York City and its partners still have their work cut out for them in order to consolidate and enhance their hard-won achievements.

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