Pace Environmental Law Review

Volume 23
Issue 2 *Summer 2006*

Article 4

June 2006

Fixing Our Drinking Water: From Field and Forest to Faucet

Keith S. Porter

Fixing Our Drinking Water: From Field and Forest to Faucet

KEITH S. PORTER*

SUMMARY

The protection of water supplies predates Earth Day by more than 150 years, yet modern environmental law has tended to overlook this concern for water supply protection. Rules and regulations aimed at protecting water supplies from pollution date from the early eighteen hundreds. As the nineteenth century progressed, considerable reliance was placed on safeguarding water supply catchments, or as they are now more commonly termed, watersheds. This safeguarding relied, in part, upon controlling human activity in the catchment area by means of state and local government initiatives. It also invoked the assistance of police powers to ensure the continuance of the safety and welfare of society. In the early twentieth century, however, preference for catchment management retreated as water engineers developed increasingly effective methods of water treatment and as water treatment was increasingly relied upon to provide protective barriers against waterborne diseases. Unfortunately, in more recent years, increased awareness of new threats to water supplies has undermined confidence in primary reliance on water treatment.

The existence of the New York City watershed demonstrates a renewed reliance on rules and regulations to protect water supply. However, the New York City watershed differs from the nineteenth century concept of the ideal catchment area sought for water supplies. Unlike many nineteenth century watersheds, the New York City watershed hosts multiple land uses and associated nonpoint sources. Traditionally, police powers administered through watershed rules and regulations had limited reach in controlling such sources of contamination. Therefore, assumption of local responsibility in managing land to protect water quality

* Director, New York State Water Resources Institute, Adjunct Professor of Law, Cornell Law School. The author acknowledges the very helpful assistance of Jery Stedinger, Professor of Environmental Engineering, Cornell University, for his review of an earlier version of this article.

seems essential. In this regard, the New York City watershed program is an experiment that is attempting to determine what should be managed—and how and by whom—to best ensure the continued integrity of the water supply.

Delaware County is seeking and testing answers to these questions. This article reviews the fluctuating history and need for protecting water supplies at their source—at the watershed level—and outlines how Delaware County, as a partner in the New York City watershed, is fostering such protection through local comprehensive planning.

I. INTRODUCTION

Compared to the Clean Water Act (CWA),[1] the Safe Drinking Water Act (SDWA)[2] is relatively overlooked. This lesser attention may seem remarkable given that SDWA's subject matter is fundamental for public health. The fact that drinking water is a commodity provided as a service that has been thoroughly tested is likely the reason SDWA is so often overlooked. In fact, the safety of our public water supplies has long been assumed with confidence. However, recently recognized threats to public health conveyed by drinking water have disturbed complacency about its purity. Methods of water treatment traditionally relied upon for 100 years now appear insufficient to protect against the protozoan parasite, *Cryptosporidium parvum*.[3] In addition, suspected carcinogens that result when chlorination reacts with organic material in the raw water during water treatment,[4] known collectively as disinfection byproducts, have also become a concern. Such concerns have reawakened interest in the nineteenth century practice of protecting drinking water supplies at their source to provide a first line of defense against waterborne diseases.

Protection of drinking water at the watershed level, or source water protection, is now an enhanced objective of the Safe Drinking Water Act.[5] The New York City watershed is a nationally significant demonstration of protection of a major water supply at its source. This watershed, encompassing nearly 2000 square miles,

1. 33 U.S.C. §§ 1251-1387 (2000).

2. 42 U.S.C. §§ 300f-300j-26 (2000).

3. Greg Hannahs, Cryptosporidium parvum: An Emerging Pathogen, http://biology.kenyon.edu/slonc/bio38/hannahs/crypto.htm (last visited Mar. 13, 2006).

4. G.L. Gilbert, *From Broad St. to Prospect via Milwaukee: Water Contamination and Human Disease*, 8 INOCULUM 1 (1999).

5. 42 U.S.C. §§ 300j-13, 300j-14.

is inhabited and will remain so.[6] Farming, other land uses, and human activities create nonpoint sources of potential pollution. Thus, to securely protect the integrity of water necessitates high standards of land management and comprehensive planning. Protecting water supplies is a primary objective in comprehensive watershed management with significantly wider environmental benefits. Hence, comprehensive watershed management yields environmental benefits beyond water quality alone. Safe drinking water is essential for human health, but also, as Professor William Cox has observed, human health is fundamentally related to environmental quality.[7]

Not only does comprehensive watershed management yield a variety of environmental benefits, it also generally incorporates multiple jurisdictions and levels of government. It is impossible, however, to regulate and monitor multiple nonpoint sources through police powers alone. Therefore, to securely protect a water supply and provide other environmental benefits in an inhabited watershed such as New York City's, it is essential to engage farmers and other landowners, businesspersons, community leaders, and residents so they willingly manage the nonpoint sources over which they individually have control. Management of nonpoint sources is local management, and therefore ownership of the management program is also local.

Delaware County, which accounts for about 50 percent of the New York City watershed, is demonstrating the acceptance of responsibility at the local level for watershed protection.[8] The county represents confirmation of the evolution, noted by Professor John Nolon, "toward environmental sensitivity in local land use controls."[9] This acceptance of responsibility is integrated with the responsibilities of other watershed partners, including New York City. Thus, the Delaware County Action Plan and its local management procedures are a paradigm for inclusive protection of

6. EPA, WATERSHED PROGRESS: NEW YORK CITY WATERSHED AGREEMENT, EPA 849-F-005 (1996) [hereinafter WATERSHED PROGRESS], http://www.epa.gov/owow/watershed/ny/nycityfi.html.

7. William E. Cox, *Evolution of the Safe Drinking Water Act: A Search for Effective Quality Assurance Strategies and Workable Concepts of Federalism*, 21 WM. & MARY ENVTL. L. & POL'Y REV, 69, 91 (1997).

8. Michael A. Principe, William N. Stasiuk, & Ira A. Stern, *Protecting New York City's Drinking Water Sources* (2000 APA Nat'l Planning Conference, Apr. 19, 2000), http://www.asu.edu/caed/proceedings00/PRINCIP/princip.htm.

9. JOHN R. NOLON, OPEN GROUND 9 (2003).

a water supply at its watershed source through cooperation and partnership.

II. SHARING AUTHORITIES TO PROTECT A "NECESSITY OF LIFE"

Watershed partnership requires a sharing of authorities between equal or different levels of jurisdictions. Disputes have frequently arisen between authorities of equal dignity over sharing of the water resource itself in "equitable apportionment suits."[10] Resolving such a dispute was critical for the New York City water supply. In 1931, the United States Supreme Court decided what has become known as the Delaware Diversion Case.[11] This case, *New Jersey v. New York*,[12] has been described as one of the "most famous in the history of interstate stream litigation."[13] In it, New Jersey sued to enjoin New York City and New York State from transferring waters from the Delaware River to New York City.[14] New Jersey insisted that the common law riparian rule be strictly applied.[15] In its 1931 decision, the Supreme Court decreed that New York City could divert up to 440 million gallons per day (mgd) from the Delaware River.[16] In a further decree issued on June 7, 1954, the Court increased this amount to 800 mgd.[17] As a result of these two decisions, a dam was constructed on the West Branch of the Delaware River in Delaware County, thus creating the Cannonsville Reservoir. Completed in 1963 and with a volume of nearly 100 billion gallons, this reservoir became the third largest of the twenty reservoirs in the New York City water supply system.[18] With the substantial addition of the catchment created by the Cannonsville Reservoir, the combined water supply area of the New York City watershed grew to nearly 2000 square miles.[19]

In delivering the Supreme Court's 1931 decision, Justice Holmes stated his well-known maxim: "A river is more than an

10. 4 ROBERT E. BECK, WATERS AND WATER RIGHTS § 45.01 (1991 ed., Replacement Vol. 2004).

11. ROSCOE C. MARTIN, WATER FOR NEW YORK 128 (1960).

12. New Jersey v. New York, 283 U.S. 336 (1931).

13. MARTIN, *supra* note 11, at 128.

14. 283 U.S. at 341.

15. *Id.* at 342.

16. *Id.* at 336.

17. New Jersey v. New York, 347 U.S. 995, 997 (1954).

18. New York City Water Supply Watershed, Overview [hereinafter Overview], http://www.nyc.gov/html/dep/watershed/html/cannonsvilleinfo.html (last visited Mar. 13, 2006).

19. WATERSHED PROGRESS, supra note 6.

amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it."[20] The current governance of the New York City watershed inverts Holmes' maxim: How are powers of the various jurisdictions governing the New York City watershed to be rationed to protect the necessity of life that its reservoirs supply? Indeed, the sharing of authorities in order to safeguard "New York's downstate water supply is one of the most critical environmental missions facing city, state and federal decision-makers in the [twenty-first] century."[21] This article describes Delaware County's Action Plan, a sharing of powers through the initiative of local government in what is heralded as a prototype watershed program of the utmost importance to all water supply managers.[22]

III. WATERSHEDS: THE FUNDAMENTAL HYDROLOGICAL UNIT

Although watersheds usually constitute far from optimal political or jurisdictional units, they constitute ideal geographic units for managing water.[23] River basins, or watersheds, are a natural hydrological unit for water supplies. "As the receiver, collector, and conveyer of precipitation, the watershed is a logical central component of management efforts to provide adequate water supplies to users."[24]

While watersheds are fundamental for water supplies, the history of watershed management demonstrates that it has had multi-faceted purpose and has made variable progress. Even the term "watershed" emerges from a definitional potpourri. According to the *Oxford English Dictionary*, the term "watershed" first appeared around the year 1800.[25] It was perhaps derived from the older German word, *wasserscheide*, meaning the "parting-line of the waters."[26] Watershed, as an English derivative, thus origi-

20. 283 U.S. at 342-44.

21. Eric A. Goldstein & Robin Marx, *A New York Watershed Protection Program for the 21st Century*, 14 ENVTL. L. IN N.Y. 1, 1 (2003).

22. COMMITTEE TO REVIEW THE NEW YORK CITY WATERSHED MANAGEMENT STRATEGY, WATERSHED MANAGEMENT FOR POTABLE WATER SUPPLY: ASSESSING THE NEW YORK CITY STRATEGY 20 (2000) [hereinafter WATERSHED MANAGEMENT STRATEGY].

23. COMMITTEE ON WATERSHED MANAGEMENT, NEW STRATEGIES FOR AMERICA'S WATERSHEDS 5 (1999) [hereinafter COMMITTEE ON WATERSHED MANAGEMENT].

24. *Id.* at 17.

25. OXFORD ENGLISH DICTIONARY (2000).

26. H. BAUMANN, MURET-SANDERS ENCYCLOPAEDIC ENGLISH-GERMAN AND GERMAN-ENGLISH DICTIONARY 1098 (Sixteenth ed. 1910).

nally meant a line dividing adjacent river basins. As Archibald Geikie stated in a popular nineteenth century geography textbook, a line traced around the sources of all streams feeding a river represented the watershed, water-parting, or divide for that basin.[27] Regrettably, this useful meaning has blurred with "watershed," drifting into duplicative synonymity with "drainage basin."

Accepting current parlance, a watershed may be defined as "an area in which surface runoff collects and from which it is carried by a drainage system, as a river and its tributaries."[28] Such an area "is also known as a catchment area, drainage area, feeding ground, gathering ground, or hydrographic basin."[29] To these terms, the study conducted under the auspices of the National Research Council added yet another: "waterscape."[30] It may be noted that "watershed" connotes surface waters. However, the wellhead area for a drinking water well is, in effect, the watershed for that well.[31]

This profuse lexicon mirrors the many species of watershed management. Regardless, all watershed management involves some use of water, and water use is fundamental for human society. The watershed as a legal and administrative entity predates its original dictionary definition. In addition to drinking water, the necessity for irrigation and drainage arrangements produced the so-called "fluvial" civilizations "in the basins of the Nile, Tigris-Euphrates, Indus, Yellow, Yangtze, and lesser rivers of the Old World."[32] River basin, or watershed management, therefore has well-founded historical credentials as the fundamental hydrological unit for water uses.

In the United States, legislation to protect water supplies dates back almost to the country's formation. For example, in 1808 the state of Maryland passed an early legislative act establishing rules and regulations to protect a water supply.[33] This act, in establishing the Baltimore Water Company, stated:

---

27. ARCHIBALD GEIKE, ELEMENTARY LESSONS IN PHYSICAL GEOGRAPHY 250 (1894).

28. MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS 2049 (Sybil Parker ed., 3d ed. 1984).

29. *Id.*

30. COMMITTEE ON WATERSHED MANAGEMENT, *supra* note 23, at 2.

31. JOSEPH A. SALVATO, ENVIRONMENTAL ENGINEERING AND SANITATION 244 (4th ed. 1992) (defining "wellhead" as "the surface and subsurface area surrounding a water well or wellfield supplying a public water system through which contaminants are reasonably likely to move toward and reach such well or wellfield").

32. LUDWIK A. TECLAFF, THE RIVER BASIN IN HISTORY AND LAW 15 (1967).

33. 1808 Md. Laws 44-45.

> That if any person shall willfully pollute the said water, between the pumping-house of the said company and the mill on Jones Falls, now owned and occupied by John Stricker and William Patterson, by throwing any dead animals, or other impure substances, into the same, or by swimming, bathing or washing themselves, or by washing clothes or the skins of any dead animals or other things therein, or by erecting any necessary or other nuisance so near the said water as to pollute the same, the person or persons so offending shall forfeit and pay to the said company a sum not exceeding twenty dollars for every such offence, to be recovered by warrant, before any magistrate of the county or city of Baltimore, and shall be obliged to remove the said nuisance, or forfeit and pay the sum of ten dollars for every day the same shall continue, to the use of Baltimore county, to be recovered by action of debt at the suit of the state.[34]

The Philadelphia City Council used very similar language in rules and regulations it adopted five years earlier, in 1803, to protect Philadelphia's water supply.[35]

New York lagged behind these other states by many decades. However, in 1885, New York passed legislation to protect public water supplies, authorizing the state board of health "to make rules and regulations for protecting from contamination any and all public supplies of potable waters and their sources within this state."[36] The phrase "and their sources" anticipated such a provision in the federal Safe Drinking Water Act by more than 100 years.

By a remarkable coincidence, an American and a British geologist separately published seminal proposals concerning watersheds one year apart during the nineteenth century. In 1878, John Wesley Powell published his "extremely important"[37] *Report on the Lands of the Arid Region of the United States*.[38] Powell further developed his ideas in later articles published in the popular quarterly, *The Century*.[39] For Powell, scarce water resources required

34. *Id.*

35. NELSON MANFRED BLAKE, WATER FOR THE CITIES: A HISTORY OF THE URBAN WATER SUPPLY PROBLEM IN THE UNITED STATES 255 (1956).

36. 1885 N.Y. Laws 920.

37. CHARLES COULSTON GILLISPIE, DICTIONARY OF SCIENTIFIC BIOGRAPHY 119 (1981).

38. JOHN WESLEY POWELL, REPORT ON THE LANDS OF THE ARID REGION OF THE UNITED STATES (1878).

39. John Wesley Powell, *Institutions for the Arid Lands*, 40 THE CENTURY 111 (1890).

rational recognition of the watershed, or hydrographic basin, as he defined it:[40]

> Thus it is that there is a body of interdependent and unified interests and values, all collected in one hydrographic basin, and all segregated by well-defined boundary lines from the rest of the world. The people in such a district have common interests, common rights, and common duties, and must necessarily work together for common purposes. Let such a people organize, under national and state laws, a great irrigation district, including an entire hydrographic basin, and let them make their own laws for the division of the waters, for the protection and use of the waters, for the protection and use of the forests, for the protection of the pasturage on the hills . . . . The plan is to establish local self-government by hydrographic basins.[41]

Unfortunately, Powell's suggestions were "years ahead of the public and governmental acceptances of their times."[42]

Powell's British peer, the eminent geologist Frederick Toplis, shared a similar fate. In 1879 Toplis suggested dividing the whole of England and Wales into twelve watershed districts.[43] His purpose was to establish a system of wholesome water supplies throughout the country by integrated management of the watersheds.[44] The Society of Arts awarded Toplis a Silver Medal for his article, but the United Kingdom failed to adopt his suggestions until more than a century later, when it enacted the Water Act of 1973, thereby allocating responsibilities "for the entire water cycle" to ten Regional Water Authorities.[45]

Wholesome water is indispensable for the public health, safety, and welfare. Because of its importance, courts have traditionally upheld legislation to protect water supplies as a legitimate application of police powers.[46] Police power is "the power of the state to make all manner of reasonable laws for the welfare of the commonwealth and the good people thereof."[47] For example, in

---

40. *Id.*

41. *Id.* at 114.

42. GILLISPIE, *supra* note 37, at 119.

43. Frederick Toplis, *Suggestions for Dividing England and Wales into Watershed Districts*, XXVII J. SOC'Y ARTS 696, 696 (1879).

44. *Id.*

45. JOHN HASSAN, A HISTORY OF WATER IN MODERN ENGLAND AND WALES 124 (1998).

46. *See generally* WILLIS REED BIERLY, POLICE POWER: STATE AND FEDERAL DEFINITIONS AND DISTINCTIONS (1907).

47. *Id.* at 9.

State v. Wheeler, the court, while referring to police powers expressed in an act passed by the New Jersey Legislature,[48] stated that the act prohibited the pollution of waters used to supply any reservoir for distribution for public use and was "intended to restrain and regulate the use of private property so as to protect the common right of all citizens of the state." The court went on to say that "Such acts are plainly within the police power of the legislature, which power is the mere application to the whole community of the maxim, '*sic utere tuo ut alienum non loedus*' [use property without injury to that of others]."[49]

The need to restrain and regulate land use within a watershed was dramatically demonstrated in April of 1885. During that time, residents of the city of Plymouth, Pennsylvania were suddenly afflicted by an outbreak of typhoid fever.[50] More than 1000 persons became ill and more than 100 died.[51] When physicians from Pennsylvania and New York conducted an immediate epidemiological inquiry to determine the cause of the outbreak, they discovered that all afflicted households had obtained their water from a stream called Mountain Brook.[52] Although this brook drained a small watershed with few inhabitants, the physicians learned that a man who had contracted typhoid fever while staying in Philadelphia had come to live in a house within the watershed in January 1885.[53] During his care, the man's nurse threw his "dejecta" onto snow outside the house.[54] Because of a sudden thaw in late March, snowmelt carried the fecal material into Mountain Brook.[55] The brook then conveyed the contamination into Plymouth's water supply.[56] It was thus determined that one man caused the virulent illness of 1104 persons and the death of 114.[57] This single inadvertent cause of a deadly outbreak was a dramatic demonstration of the vulnerability of water supplies and the need for their vigilant protection.

48. State v. Wheeler, 44 N.J.L. 88, 89 (N.J. 1882).
49. *Id.* at 91.
50. WILLIAM P. MASON, WATER SUPPLY 32 (4th ed. 1918).
51. *Id.*
52. *Id.*
53. *Id.* at 33.
54. *Id.* at 34.
55. *Id.*
56. *Id.*
57. *Id.* at 32-34.

IV. PURITY—BETTER THAN PURIFICATION?

Such demonstration of the vulnerability of a water supply strongly reinforced the conviction that water supply catchments should be highly protected. Cities sought to escape the calamitous horrors of cholera and typhoid fever by seeking purer sources of water supplies by impounding and protecting water in rural or remote upland areas.[58] In fact, during the nineteenth century, this option became widely preferred in the water industry. The development of the Croton water supply for New York City is an especially well-known example.[59] At the time, there was agreement that once a watershed has been selected for a supply, "it should be protected with the greatest care which science suggests, and with the utmost vigor which the law allows."[60] Or, as Allen Hazen stated, "The ideal catchment area is free from human habitation and is covered with forest."[61]

However, during the nineteenth century engineers were also making impressively effective gains in improving treatment for water supplies, and, between 1849 and 1893, fifty-one filters were installed for water treatment in North America.[62] In 1872, the city of Poughkeepsie, New York placed into operation the first use in the United States of a slow sand filter to treat water obtained from the Hudson River.[63] Such use of "run-of-the river" sources provided impetus for water engineers to develop treatment methods such as filtration and chlorination.

Engineering success induced growing confidence in engineering alternatives to watershed protection to produce wholesome water for human consumption. For example, in 1907, the distinguished American engineer George W. Fuller asked, "Is it better policy to purchase and control water-sheds, thereby preventing the pollution of impounding reservoir supplies, or to suffer a certain amount of pollution of such supplies, relying upon filtration to correct the effects thereof?"[64] Fuller asserted that "a pure water

58. Daniel A. Okun, *Drinking Water Quality Through Enhancement of Source Protection*, *in* DRINKING WATER QUALITY ENHANCEMENT THROUGH SOURCE PROTECTION 319, 319 (Robert B. Pojasek ed., 1997).

59. *See* GERARD T. KOEPPEL, WATER FOR GOTHAM: A HISTORY (2000).

60. MASON, *supra* note 50, at 300-02

61. ALLEN HAZEN, CLEAN WATER AND HOW TO GET IT 12 (2d ed. 1914).

62. M.N. BAKER, 1 THE QUEST FOR PURE WATER 141 (2d ed. 1981).

63. *See id.* at 148.

64. George W. Fuller, *Water Supply: An Informal Discussion of the Annual Convention* (Am. Soc. Civ. Engrs., Paper No. 1059, 1907), *reprinted in* PURE AND WHOLE-

is better than a purified water."[65] However, he also concluded that "The purchase and control of watersheds is a less efficient procedure than filtration, as regards both the sanitary character of the water and its physical condition as to appearance, tastes, and odors."[66]

New York City was a conspicuous exception to this precept. For the water industry generally, as the century progressed, the trend was "away from dependence upon preventive measures on the watershed . . . [and towards] purification processes at the intake."[67] Such treatment relies upon a sequence of treatment barriers to impurities, including storage, screening, sedimentation, clarification, filtration, removal of micro-pollutants, and disinfection.[68] Water engineers trained later in the century were convinced that all microbiological contamination could be eliminated by water treatment[69] and, as Daniel A. Okun states, "engineers became sanguine about the dangers of using polluted sources because [they believed such sources] . . . could be rendered safe by appropriate treatment."[70]

V. LOSS OF CONFIDENCE IN SUFFICIENCY OF TREATMENT

At least until recently, water treatment maintained general professional and public confidence in the quality of drinking water it provided.[71] As one commentator stated in the early 1980s:

> Americans generally assume that the water from their faucets is healthful, and free of bacterial or chemical contaminants that can bring disease. Usually, the assumption is correct. The drinking water supplies in cities and towns of the United States rank in quality, on the average, among the best in the world.[72]

SOME 39, 39 (1982) (papers selected by the Committee on History and Heritage, American Society of Civil Engineers).

65. PURE AND WHOLESOME, *supra* note 64, at 44.

66. *Id.* at 47.

67. AMERICAN WATER WORKS ASSOCIATION, WATER WORKS PRACTICE: A MANUAL 73 (1926).

68. *See* ALAN C. TWORT, DON D. RATNAYAKA & MALCOLM J. BRANDT, WATER SUPPLY 267-463 (5th ed. 2000).

69. Thomas J. Lane, *The Challenge of Water Treatment Plant Design*, *in* WATER TREATMENT PLANT DESIGN 1.1, 1.1 (Edward E. Baruth ed., 4th ed. 2004).

70. Okun, *supra* note 58, at 319.

71. Cox, *supra* note 7, at 74-75.

72. *Community Water Supply Study: Significance of National Findings, reprinted in* A LEGISLATIVE HISTORY OF THE SAFE DRINKING WATER ACT 1069, 1073 (1982) (statement of James H. McDermott, P.E., Director, Bureau of Water Hygiene).

The Safe Drinking Water Act of 1974 (SDWA) reflected this confidence in water treatment.[73] The first version of the SDWA relied on enforcement of water quality standards specified for the water delivered to consumers.[74] Compliance with standards thus became a matter of applying treatment technologies combined with monitoring.[75]

Unfortunately, new difficulties became increasingly apparent. One such difficulty is the production, distribution, and use of chemicals. Prompted by industrial and consumer demand, the creativity of chemists has produced about six million new chemical compounds.[76] There are now between 60,000 and 95,000 chemicals in commercial use, and about 1000 new products are synthesized annually.[77] During their production, distribution, and use, many of these chemicals or their residuals contaminate water supplies; yet conventional water treatment is incapable of fully removing all these chemicals from the water supply.[78] Because of these emerging risks, twenty-five years ago, Daniel Okun argued for the development and protection of water sources for existing and future public water supplies.[79]

Waterborne microbes present another difficulty for water treatment. In the last three decades microbiologists have detected waterborne microbes, which previously had not been recognized as seriously threatening public health.[80] These microbes include *Cryptosporidium parvum,* and the cousin of the bacterium that causes tuberculosis, *Mycobacterium avium*.[81] Conventional treatment is not secure against these organisms. For example, the 1993 outbreak of *Cryptosporidiosis* in Milwaukee, Wisconsin originated from a water supply that employed filtration.[82] As reported by the *Milwaukee Journal Sentinel*, as a result of the out-

73. Safe Drinking Water Act of 1974, Pub. L. No. 93-525, 88 Stat. 1660 (codified as amended at 42 U.S.C. §§ 300f-300j (2000)).

74. Cox, *supra* note 7, at 77.

75. SALVATO, *supra* note 31, at 332.

76. B.J. ALLOWAY & D.C. AYRES, CHEMICAL PRINCIPLES OF ENVIRONMENTAL POLLUTION 4 (2d ed. 1997).

77. *Id.*

78. Okun, *supra* note 58, at 320.

79. *Id.* at 326.

80. PAUL R. HUNTER, WATERBORNE DISEASE: EPIDEMIOLOGY AND ECOLOGY 80 (1997).

81. *Id.* at 193.

82. Marilynn Marchione, *10 Years Ago, Crypto Gripped the City: Water Contamination Lessons Lead to Safer System 10 Years Later*, MILWAUKEE J. SENTINEL, Apr. 7, 2003, *available at* http://www.jsonline.com/news/metro/apr03/131542.asp.

break, 403,000 persons were sickened, 44,000 persons received medical attention, 4400 people were hospitalized, and more than 100 people died.[83]

Unfortunately, the pathogens are resistant to chlorination at conventional levels of disinfection,[84] and this resistance cannot be overcome by raising the concentrations of disinfectants because of the risk of disinfection byproducts. Thus, the chronic risk posed by organic chemicals must be balanced with the acute risk presented by microbes.[85] These considerations raise doubts about primary reliance on water treatment to purify water. As Professor William Cox states, "The emphasis placed on source protection is inversely related to the confidence given to treatment technology."[86] Consequently, today there is reawakened interest in protecting water prior to treatment as the first barrier to contamination. Although

> '[a]fter the event' mechanisms to punish polluters for wrongful behavior have traditionally tended to predominate as a legal strategy for securing satisfactory water quality[,] . . . regulatory law has developed from being a retrospective and punitive mechanism to 'bring polluters to book', to a proactive mechanism for preventing contamination of waters and protecting or restoring the aquatic environment.[87]

VI. CONGRESS RESPONDS: AMENDMENTS TO THE SAFE DRINKING WATER ACT

In response to apprehensions about the safety of water supplies, in 1986 the ninety-ninth Congress enacted substantial amendments to the Safe Drinking Water Act.[88] Congress was concerned with contamination of drinking water supplies and inadequate federal standards.[89] Its main purposes in amending SDWA

83. *Id.*

84. Jennifer L. Clancy, Zia Bukhari, Thomas M. Hargy, James R. Bolton, Bertrand W. Dussert, & Marilyn M. Marshall, *Using UV to Inactivate Cryptosporidium*, 92 J. AM. WATER WORKS ASS'N 97, 97 (2000).

85. J. Alan Roberson, John E. Cromwell III, Stuart W. Krasner, Michael J. McGuire, Douglas M. Owen, Stig Regli, & R. Scott Summers, *The D/DBP Rule: Where Did the Numbers Come From?*, 87 J. AM. WATER WORKS ASS'N 46, 46 (1995).

86. Cox, *supra* note 7, at 115.

87. WILLIAM HOWARTH & DONALD MCGILLIVARY, WATER POLLUTION AND WATER QUALITY LAW 717 (2001).

88. Safe Drinking Water Act Amendments of 1986, Pub. L. No. 99-339, 100 Stat. 642 (codified as amended at 42 U.S.C. §§ 300f-300j (2000)).

89. WILLIAM J. KELLY, THE SAFE DRINKING WATER ACT AMENDMENTS OF 1986 (BNA SPECIAL REPORT) 1 (1986).

were to strengthen the procedures for setting drinking water standards and enforcement and to provide groundwater protection. The Act specifically provides for the protection of drinking water supplies at their source.[90] Remarkably, however, in the 1986 Amendments, this provision was only for sole-source aquifers and wellhead areas.[91] Surface waters were not accorded such explicit protection.

Enhanced measures to promote the protection of water supplies at their source were adopted in 1996.[92] These measures included a source water quality assessment program[93] and a source water petition program.[94] The latter program has the objective of "facilitat[ing] the local development of voluntary, incentive-based partnerships among owners and operators of community water systems, governments, and other persons in source water areas."[95]

VII. FILTRATION AVOIDANCE THROUGH SOURCE WATER PROTECTION

In a critical clause for unfiltered water supply systems such as that of New York City, the Safe Drinking Water Act Amendments of 1986 mandated that

> Not later than [eighteen] months after the enactment of the Safe Drinking Water Act Amendments of 1986, the Administrator shall propose and promulgate national primary drinking water regulations specifying criteria under which filtration (including coagulation and sedimentation, as appropriate) is required as a treatment technique for public water systems supplied by surface water sources. In promulgating such rules, the Administrator shall consider the quality of source waters, protection afforded by watershed management, treatment practices (such as disinfection and length of water storage) and other factors relevant to health.[96]

---

90. 42 U.S.C. §§ 300h-6, 300h-7 (2000 & Supp. 2005).

91. Safe Drinking Water Act Amendments of 1986, Pub. L. No. 99-339, §§ 203, 205, 100 Stat. 642, 660 (codified as amended at 42 U.S.C. §§ 300h-6, 300h-7 (2000)).

92. Safe Drinking Water Act Amendments of 1996, Pub. L. No. 104-182, 110 Stat. 1613 (codified as amended at 42 U.S.C. §§ 300f-300j (2000)).

93. *Id.* § 132(a), 110 Stat. 1613, 1673 (codified at 42 U.S.C. § 300j-13 (2000)).

94. *See id.* § 133, 110 Stat. at 1675 (codified at 42 U.S.C. § 300j-14 (2000)).

95. *See id.* § 133(a)(2)(A), 110 Stat. at 1676 (codified at 42 U.S.C. § 300j-14(a)(2)(A) (2000)).

96. Safe Drinking Water Act Amendments of 1986, Pub. L. No. 99-339, § 101(b)(7)(C)(i), 100 Stat. 642, 645 (codified as amended at 42 U.S.C. § 300g-1(b)(7)(C)(i) (2000)).

In 1989, EPA issued the Surface Water Treatment Rule (SWTR) as required by the 1986 Amendments to SDWA.[97] The criteria specified for a water supply to avoid filtration included limits for fecal coliform and turbidity, and disinfection and monitoring requirements.[98] In addition, a principal criterion by which filtration might be avoided was adequate watershed protection by requiring that "The public water system must maintain a watershed control program which minimizes the potential for contamination by *Giardia lamblia* cysts and viruses in the source water."[99] In addition, "the watershed control program must: (i) characterize the watershed hydrology and land ownership; (ii) identify watershed characteristics and activities which may have an adverse effect on source water quality; and (iii) monitor the occurrence of activities which may have an adverse effect on source water quality."[100] The regulations further stipulated that "The public water system must demonstrate through ownership and/or written agreements with landowners within the watershed that it can control all human activities which may have an adverse impact on the microbiological quality of the source water."[101]

Because New York City originally estimated the capital costs of filters at $8 billion,[102] watershed protection appeared a substantially less expensive alternative. Therefore, in order to comply with the criteria of the SDWA and its regulations the city chose to apply for "Filtration Avoidance."[103] The case for avoidance was founded on the high quality of the water obtained from the Catskill-Delaware watershed system.[104] As one commentator has noted, "New York City has some of the best water in the world, and the reason is trees."[105] The Catskill-Delaware region has a high proportion of forested lands and a very low population density. Thus, the water New York City supplies to its nine million consumers complies with all requirements for drinking water and

97. 54 Fed. Reg. 27,486 (June 29, 1989).

98. 40 C.F.R. §§ 141.71-141.75 (2005).

99. *Id.* at § 141.71(b)(2).

100. *Id.*

101. *Id.*

102. DIANE GALUSHA, LIQUID ASSETS: A HISTORY OF NEW YORK'S WATER SYSTEM 255 (1999).

103. WATERSHED MANAGEMENT STRATEGY, *supra* note 22, at 18.

104. *Id.* at 17.

105. Mike Dombeck, *From the Forest to the Faucet, in* WHOSE WATER IS IT? 125, 125 (Bernadette McDonald & Douglas Jehl eds., 2003).

maintains a high quality.[106] In fact, "New York City's water supply is world renowned for purity and excellent taste."[107]

To institute watershed protection, in September 1990, New York City proposed new Watershed Rules and Regulations for the watershed region.[108] This document provoked immediate anger among farmers and watershed communities.[109] They saw the proposed regulations as a threat to their livelihood and way of life.[110] In fact, providing filters for water supplied from a farmed watershed has been a question contended since the early use of filters.[111] Thus, many argued initially that the city ought to be compelled to build filters. These advocates even included engineers in the New York City Department of Environmental Protection (DEP),[112] as well as an expert panel convened by EPA to review the city's application.[113] Five members of the EPA panel felt so opposed to filtration avoidance that they published an article four years after the panel delivered its final report to EPA.[114] The panel members argued that filtration avoidance failed to provide adequate protection from waterborne pathogens and disinfection byproducts.[115] In the article, the panel stated that, "Without filtration, given the degree of development that already exists on New York City's watersheds and the city's limited capacity to restrict further development, the people of the city, particularly

106. Arthur Ashendorff, Michael A. Principe, Anne Seeley, John LaDuca, Larry Beckhardt, Walter Faber, Jr. & Jeff Mantus, *Watershed Protection for New York City's Supply*, 89 J. AM. WATER WORKS ASS'N 75-88 (1997).

107. Comm. on Pub. Health, *Statement on Preservation of New York City's Drinking Water Quality*, 65 BULL. N.Y. ACAD. MED. 898, 898 (1989).

108. *Id.*

109. *Id.* at 255-56.

110. *See id.* at 256.

111. Attorney-General v. Rhymney & Aber Valley Gas & Water Company, (1907) 71 J.P. 435 (Eng.) (holding that a water company supplying water obtained from unfenced reservoirs fed by streams receiving drainage from farmyards without filtration was not supplying pure and wholesome water as required by the Waterworks Clauses Act, 1847).

112. Robert F. Kennedy, Jr., *A Culture of Mismanagement: Environmental Protection and Enforcement at the New York City Department of Environmental Protection*, 15 PACE ENVTL. L. REV. 233, 254 (1997).

113. D.A. OKUN, G.F. CRAUN, J.K. EDZWALD, J.R. GILBERT, E. PANNETIER & J.B. ROSE, REPORT OF THE EXPERT PANEL ON NEW YORK CITY'S WATER SUPPLY (1993).

114. Daniel A. Okun, Gunther F. Craun, James K. Edzwald, Jerome B. Gilbert & Joan B. Rose, *New York City: To Filter or Not to Filter?*, 89 J. AMER. WATER WORKS ASS'N 62-74 (1997) (Eileen Pannetier, a water quality specialist with Comprehensive Environmental Inc., located in Dedham, Massachusetts, was the sixth member of the panel. She declined to coauthor the article because she regarded it as inappropriate for panel members to comment on events after the panel was dissolved. *Id.* at 63 n.*).

115. *Id.* at 73.

those who are immunocompromised, are potentially at risk."[116] These views mirrored those of EPA in its response to the application for avoidance submitted by the Massachusetts Water Resources Authority on behalf of the Boston water supply system.[117] Indeed, influential opposition to filtration avoidance existed at a national level.

However, the characteristics of the New York City water supply do support a case for filtration avoidance, as persuasively argued in an article written in response to the objections of the five EPA panel members.[118] A critical implicit assumption of those arguing for comprehensive watershed management is that the New York City Watershed Program is a safer alternative to filtration. On June 14, 1989, the Council of the New York Academy of Medicine approved the following statement:

> The New York Academy of Medicine cautions against relying solely on filtration to protect the public. Many examples exist of waterborne disease epidemics caused by failures of filtration systems. The advent of filtration also will serve as a disincentive to source water protection, causing increasing pollution loadings that in turn pose greater health risks and necessitate expensive modifications to filtration systems.[119]

Gerald R. Iwan, then-chief of the Drinking Water Quality Control Division of the New York City Department of Environmental Protection, suggested in an article following the passage of the SDWA Amendments of 1986 that New York City could take one of two directions in sustaining its high quality water supplies.[120] First, it could become completely dependent on water treatment technology with its "associated economic and technical responsibilities of unimaginable magnitude."[121] This direction would almost inevitably result in a decline in the quality of the source waters.

Iwan stated the alternative as follows:

---

116. *Id.*

117. James Kavanaugh, *To Filter or Not to Filter: A Discussion and Analysis of the Massachusetts Filtration Conflict in the Context of the Safe Drinking Water Act*, 26 ENVTL. AFF. 809, 829 (1999).

118. Ashendorff et al., *supra* note 106, at 89.

119. Comm. on Pub. Health, *supra* note 107, at 900.

120. Gerald R. Iwan, *Drinking Water Quality Concerns of New York City, Past and Present*, 502 ANNALS N.Y. ACAD. SCI. 183, 203 (1987).

121. *Id.*

> The alternative direction, characterized by a policy of resource protection and scientific surveillance, affords advantages in maintaining a cost-effective, high-quality drinking water without the complexities of superfluous treatment technology and source quality degradation. New York, because of its unique high-quality surface supply, again has the opportunity to lead in establishing principles for drinking water preservation that are consistent with the lessons of its historical supply development. The principles of surface water preference, a remote supply, sanitary protection, maximum utilization of natural quality, disinfection, scientific surveillance, and selective application of technology can be synthesized into a policy of reservoir protection that has utility for filtered and non-filtered sources alike.[122]

New York City persisted in pursuing the second direction.

After six years of demanding discussions and negotiations, the principal parties reached and ratified an agreement.[123] In early 1997, the governor of New York, the mayor of New York City, and other parties to the agreement, including the Coalition of Watershed Towns, twelve villages in the watershed, and a consortium of environmental groups, signed the New York City Watershed Memorandum of Agreement (MOA).[124] This groundbreaking agreement requires New York City to invest about $1.5 billion in upgrading wastewater treatment, stormwater management, and environmentally benign development.[125] Most significantly, the MOA requires the city to purchase land in the watershed, thus forcing it "to assume the role of country squire" as it becomes "one of the largest landowners in upstate New York."[126]

On May 6, 1997, EPA announced a five-year Filtration Avoidance Determination (FAD) for the Catskill and Delaware part of the watershed.[127] As George Rodenhausen states, "EPA had to 'rewrite the book' to provide a filtration avoidance determination to

122. *Id.*

123. NEW YORK CITY WATERSHED MEMORANDUM OF AGREEMENT (1997) [hereinafter MOA], *available at* http://www.nysefc.org/tas/MOA/MOAPg1.htm.

124. *Id.*

125. *Id.*

126. Winnie Hu, *Striving to Protect the Watershed, the City Assumes the Role of Country Land Baron*, N.Y. TIMES, Aug. 9, 2004, at B1.

127. *Id.*

New York City.[128] Simultaneously, the New York City Watershed Rules and Regulations were promulgated as New York State regulations.[129] The MOA includes these regulations.[130] Effectively, the MOA extends the concept of "Public Water System" to include the entire catchment of the reservoirs.

VIII. AN OLD FOE FOR WATER SUPPLIES: PHOSPHORUS

The Surface Water Treatment Rule is a response to microbial threats to water supplies.[131] However, undesirable levels of algae in reservoirs are perhaps an even greater threat to the New York City water supply, and phosphorus is a primary culprit. Undesirable levels of phosphorus enrich reservoirs in the Croton system and in the Cannonsville Reservoir in the Catskill-Delaware system.[132] The resultant algal growth increases risk of undesirable chlorine disinfection byproducts.[133] Such eutrophication may also produce disagreeable odors, tastes, and colors; low dissolved oxygen levels; and elevated metals concentrations in the water supplied to consumers.[134] Most importantly, when water is chlorinated, chlorine reacts with organic material such as algal cells and detritus in the water to form disinfection byproducts such as trihalomethanes.[135] These byproducts are a carcinogenic risk.[136]

Under the MOA, all reservoirs must meet New York State Water Quality Standards and Guidance Values.[137] Article VI, paragraph 162 of the MOA also states the "New York State guidance value for phosphorus will be used for [Total Maximum Daily Load] TMDL development [for the reservoirs]."[138] New York State has a

128. George A. Rodenhausen, *Water Supply and Stream Protection*, *in* ENVIRONMENTAL LAW AND REGULATION IN NEW YORK 317, 327 (William R. Ginsberg & Philip Weinberg eds., 2001).

129. N.Y. COMP. CODES R. & REGS. tit. 10, pt.128 (2005).

130. Rodenhausen, *supra* note 128.

131. HARRY VON HUBEN, SURFACE WATER TREATMENT: THE NEW RULES 1 (1991)

132. S.W. Effler & A.P. Bader, *A Limnological Analysis of Cannonsville Reservoir, NY*, 14 LAKE & RESERVOIR MGMT. 125 (1998).

133. *Drinking Water: Chlorine Disinfection Byproducts*, 33 ENV'T REP. 561-63 (2002) [hereinafter *Drinking Water*].

134. SALOME FREUD, WHY NEW YORK CITY NEEDS A FILTERED CROTON SUPPLY 1 (2003).

135. DRINKING WATER HEALTH EFFECTS TASK FORCE, HEALTH EFFECTS OF DRINKING WATER TREATMENT TECHNOLOGIES 62-63 (1989).

136. *Drinking Water*, *supra* note 133, at 561.

137. MOA, *supra* note 123.

138. *Id.* art. VI, ¶ 162.

guidance value of 20 micrograms per liter (μg/L) for phosphorus.[139] This value is derived from statewide surveys of lakeshore residents and other interested parties. It should be noted that the derivation of this value was based on aesthetic considerations, rather than on considerations of public health.[140] Under the MOA, this value was adopted as the designated standard for phosphorus in the New York City reservoirs.[141]

The drainage basins of reservoirs that fail to meet the guidance value are designated as "phosphorus restricted."[142] A phosphorus-restricted basin is the drainage area in which the phosphorus load to the reservoir or controlled lake produces concentrations exceeding the guidance value.[143] In such basins, the regulations do not permit new wastewater treatment plants or expansions of existing wastewater treatment plants that discharge to surface waters.[144] The designation of a restriction is determined using a five-year running arithmetic mean of the annual geometric mean phosphorus concentrations in the reservoir.[145] However, the regulations allow a variance from this prohibition.[146] A variance may be granted if the increase in phosphorus is offset by a twofold reduction in phosphorus loading from another source elsewhere in the basin.[147] The regulations also provided a pilot program under which new or expanded wastewater treatment for surface discharges might be permitted if phosphorus were reduced three times the proposed discharge in the basin.[148] In other words, the regulations provide for trading between discharges in individual basins. To satisfy the terms of the pilot program, the regulations require the preparation of a County Comprehensive Strategy.[149] A comprehensive strategy is not required for a vari-

139. NYDEC, NEW YORK CITY'S 2001 WATERSHED PROTECTION PROGRAM SUMMARY, ASSESSMENT AND LONG-TERM PLAN 266 (2001).

140. NYDEC, NEW YORK STATE FACT SHEET: AMBIENT WATER QUALITY VALUE FOR PROTECTION OF RECREATIONAL USES (1993).

141. MOA, *supra* note 123, art. VI, ¶ 162.

142. N.Y. COMP. CODES R. & REGS. tit. 10, § 128-1.6 (2005).

143. *Id.*

144. *Id.* § 128-3.6(b).

145. NYDEC, METHODOLOGY FOR DETERMINING PHOSPHORUS RESTRICTED BASINS 4 (1997).

146. N.Y. COMP. CODES R. & REGS. tit. 10, § 128-3.6(b).

147. *Id.* § 128-6.1.

148. *Id.* § 128-8.3(a)(3).

149. *Id.* § 128-8.3(a)(1).

ance to be granted, but it would support the request for the variance.[150]

Of all the reservoirs in the New York City watershed system that fail to meet the guideline for phosphorus, the most important is the Cannonsville Reservoir. This reservoir is the third largest in storage volume.[151] With a drainage basin extending over 116,000 hectares (ha) of hilly terrain and river valleys, it also has the largest catchment of all the reservoirs in the New York City watershed.[152] However, a population of less than 20,000 persons and a very low density of about nineteen persons per square kilometer has remained static for more than a century.[153] The watershed is 70 percent forest, 25 percent farmland, and 2 percent urban.[154] There are only four villages and seven hamlets in the entire area.[155] Accordingly, the predominant land uses in the region are forest, and abandoned farmland reverting to forest. Farming is in sharp decline, but of the remaining farm uses, dairy production is foremost with between 7000 and 8000 animals on 125 farms owned and operated by family farmers.[156]

Despite the rural landscape, the water in the Cannonsville Reservoir is enriched by phosphorus.[157] Phosphorus loads from point and nonpoint sources in the Cannonsville Reservoir basin have been measured since 1975, and have been intensively monitored since 1991.[158] Loads have varied since 1991 from an observed low of 20,000 kilograms to a peak of 166,000 kilograms.[159] The average annual load is about 50,000 kilograms.[160] Unfortunately, this amount of phosphorus maintains concentrations of phosphorus in the reservoir at about 20 micrograms per liter.[161]

---

150. *Id.* § 128-6.1(d)(2).

151. Effler & Bader, *supra* note 132, at 126.

152. Overview, *supra* note 18.

153. Ashendorff et al., *supra* note 106, at 79.

154. NEW YORK CITY WATERSHED: SECTION 319: NATIONAL MONITORING PROGRAM PROJECT 4 (1999), *available at* http://www.bae.ncsu.edu/programs/wqg/99rept319/index_files/newyork.pdf.

155. Patricia Longabucco & M. Rafferty, *Analysis of Material Loading to Cannonsville Reservoir: Advantages of Event-Based Sampling*, 14 LAKE & RESERVOIR MGMT. 197, 198 (1998).

156. P. E. Cerosaletti, D.G. Fox, L.E. Chase, *Phosphorus Reduction Through Precision Feeding of Diary Cattle*, 87 J. DAIRY SCI. 2314, 2314 (2004).

157. Effler & Bader, *supra* note 132, at 125.

158. Longabucco & Rafferty, *supra* note 155, at 197-212.

159. *Id.* at 211.

160. KIMBERLEE KANE, NEW YORK CITY DEPT. OF ENVTL. PROT., PROPOSED PHASE II PHOSPHORUS TMDL CALCULATIONS FOR CANNONSVILLE RESERVOIR 17 (1999).

161. *Id.*

Until 2000, the reservoir generally had concentrations of phosphorus that approximately met the guidance value of 20 micrograms per liter for phosphorus.[162] Thus, under the watershed regulations the Cannonsville Reservoir basin was designated as "phosphorus-restricted."[163] This need for restriction is significant because the reservoir, with a capacity of nearly 100 billion gallons, is one of the three largest in the New York water supply system.[164]

As business leaders became aware of the prohibition on new or expanded wastewater surface discharges, the phosphorus restriction was increasingly perceived as a serious economic constraint on the communities in the basin. Delaware County is one of the least affluent counties in New York State. The median household income in 1999 was $32,461, ranking Delaware County the eighth lowest of sixty-two counties in the state.[165] Since the promulgation of the regulations, the business community has argued that bureaucratic uncertainties about limits on wastewater discharges deter planning and investment.

A critical point was reached in 1998 when a request to increase the discharge from a wastewater treatment point was denied, pending the county's preparation of a comprehensive strategy,[166] as required in a phosphorus-restricted basin under New York regulations.[167] This posed a challenge for county leaders because Delaware County is a rural area with a conservative, self-reliant culture, and its needs for planning and governmental services have been modest. Currently, the county legislature consists of only a board comprised of the supervisors of the county's nineteen towns.[168] Leaders share with other New York State local governments a traditional disaffection for central government. Under the New York State Constitution, New York is a "home rule" state.[169] Home rule may be defined "as local control over

162. NEW YORK CITY DEPT. OF ENVTL. PROT., 2001 WATERSHED WATER QUALITY ANNUAL REPORT 26 (2002) [hereinafter WATER QUALITY REPORT].

163. N.Y. COMP. CODES R. & REGS. tit. 10, § 128-1.6(a)(80) (2005).

164. Effler & Bader, *supra* note 132, at 126.

165. U.S. Census Bureau, Fact Sheet, Delaware County, New York, http://factfinder.census.gov/servlet/SAFFFacts?_event=Search&geo_id&_geoContext=&_street=&_county=delaware+county&_cityTown=delaware+county&_state=04000US36&_zip=&_lang=en&_sse=on&pctxt=fph&pgsl=010 (last visited May 30, 2006).

166. N.Y. COMP. CODES R. & REGS. tit. 10, § 128-8.3.

167. *Id.*

168. DIRECTORY OF COUNTY, TOWN AND VILLAGE OFFICIALS, COUNTY OF DELAWARE STATE OF NEW YORK (2001).

169. N.Y. CONST. art. IX.

matters of local concern."[170] Municipal independence, or home rule, embodies the "*Imperium in Imperio*" doctrine in a division of powers between the state and local governments.[171] Local government leaders in Delaware County keenly defend their prerogatives under home rule. They hold strongly the conviction that the decisions of landowners, businesspersons, local government, and residents are local matters. Accordingly, a key issue for the success of the MOA is its ability to incorporate local prerogatives.

In March 1998, the Delaware County Board of Supervisors invited the New York State Water Resources Institute (WRI)[172] to assist in understanding the MOA's phosphorus restriction and its constraints. In particular, the board asked for assistance in creating a comprehensive strategy for the county, as prescribed by the regulations. The chairman of the board, Ray Christensen, specified two conditions for the strategy: First, it should be founded on sound scientific credentials to ensure credibility and acceptance; and second the strategy should be co-developed through institutional partnerships at local, state, and federal levels.[173]

From the spring of 1998, there were multiple meetings, discussion papers, and drafts of a prospective comprehensive strategy. Leaders in the county were unfamiliar with guidance values, monitoring programs, mathematical models, phosphorus loading, and Total Maximum Daily Loads (TMDLs). Initially, it was difficult to identify and understand possible and acceptable options. There were disagreements about what needed to be done, and about how and by whom it should be done (and paid for). County leaders recognized that action was necessary, although they were initially strongly opposed to any hint that additional county staff might be required. The business community was reservedly skep-

170. Lewis A. Millenbach, *Municipal Home Rule in New York*, 22 SYRACUSE L. REV. 736, 736 (1970-1971). Home rule is another phrase for what Tocqueville termed "municipal independence." As Tocqueville observed, in the United States, the principle of the sovereignty of the people is universally admitted. "Municipal independence is therefore a natural consequence of the principle of the sovereignty of the people in the United States." ALEXIS DE TOCQUEVILLE, THE REPUBLIC OF THE UNITED STATES OF AMERICA, AND ITS POLITICAL INSTITUTIONS 66 (Henry Reeves trans., 1862).

171. JOSEPH F. ZIMMERMAN, THE GOVERNMENT AND POLITICS OF NEW YORK STATE 34-35 (1981).

172. The New York State Water Resources Institute (WRI) addresses water resource problems by engaging research, educational, and outreach resources of the New York State academic community as mandated by federal and state laws, which established WRI.

173. Interview by author with Ray Christensen, Chairman of the Delaware County Board of Supervisors, on file with author.

tical, and watershed partners outside the county gave varied amounts of support. For example, the deputy commissioner of the New York City Department of Environmental Protection (DEP), Bill Stasuik, disapproved on the grounds the proposed strategy went substantially beyond what was required under the watershed regulations. Aggressive opposition to the county was evident elsewhere in the DEP.[174] In balancing opposition to the county's emerging strategy, the firm support of senior staff in the New York State Department of Environmental Conservation, Division of Water, became crucial.

The problem of phosphorus originating from farms presented a particularly sensitive issue. Many farmers were initially unconvinced that phosphorus posed an important problem. Also, as recognized in EPA's Filtration Avoidance Determination (FAD), the Watershed Agricultural Council is the lead agency for farming in the watershed. However, the chairman of the Watershed Agricultural Council, Richard Coombe, took the position that the Watershed Agriculture Program was focused on pathogens, and not phosphorus. Delaware County was therefore obliged to include phosphorus management on farms as a central part of its own operational plan.

Despite varied levels of support for the comprehensive strategy, a consensus nevertheless developed. Confidence also grew in the county's ability to assume and carry out the local management program to protect the Cannonsville Reservoir. The Delaware County Soil and Water Conservation District, Cooperative Extension, Departments of Public Works, and Planning and Economic Development were crucial in fostering confidence and agreement in the county and among its watershed partners.

In July 1999, the WRI, together with the County Planning Department, submitted to the county a strategy designated as the Delaware County Action Plan (DCAP).[175] The strategy met the two conditions required by the chairman of the board. First, to foster scientific credentials, the WRI created an inter-disciplinary team to conduct research to support decisions made under DCAP. Second, to meet the condition that there be institutional support, the Delaware County Board of Supervisors established two inter-

174. For example, a senior DEP scientist deliberately sabotaged a key inter-agency meeting intended to develop a shared scientific agenda with the watershed partners.

175. DELAWARE COUNTY DEPT. OF WATERSHED AFFAIRS, DELAWARE COUNTY ACTION PLAN (DCAP II) FOR WATERSHED PROTECTION AND ECONOMIC VITALITY (2002) [hereinafter DCAP II].

agency committees: an overall inter-agency review body called the Delaware County Phosphorus Study Committee, and a Scientific Support Group, to which the scientific team reported. Agencies at local, state, and federal levels are represented on both bodies.[176] The Board of Supervisors of Delaware County approved this strategy in September 1999.

Because the DCAP satisfies the MOA requirements for a Delaware County Comprehensive Strategy as required under the New York City Watershed Rules and Regulations,[177] state and federal partners to the MOA subsequently accepted the strategy after their joint review. The DCAP was implemented on October 1, 1999, when the board of supervisors of Delaware County established a new agency designated as the Delaware County Department of Watershed Affairs, and created a new position of commissioner to direct the department.[178]

IX. THE DELAWARE COUNTY ACTION PLAN

DCAP's goal is to assist the county's residents, farmers, businesses, and communities in meeting water quality objectives while retaining economic vitality.[179] The four specific objectives are: (1) fostering contaminant reductions from individual sources of the contaminants within the basin; (2) meeting overall reservoir basin-level aims of contaminant load reductions, such as the operational goal of reducing phosphorus by 10,000 kilograms per year; (3) sustaining water quality protection with a sound scientific and economic basis; and (4) fostering and sustaining local technical capacities.[180]

DCAP is a local instrument[181] and a voluntary initiative.[182] Its primary agents are county departments and inter-agency partners coordinated by the Delaware County Department of Watershed Affairs,[183] and Cornell University provides scientific support through the WRI.[184] Although DCAP is a local response to the

176. *Id.* at 39-40.
177. N.Y. COMP. CODES R. & REGS. tit. 10, § 128-8.3 (2005).
178. DELAWARE COUNTY BOARD OF SUPERVISORS RESOLUTION NO. 229: PURSUANT TO THE AUTHORITY GRANTED BY SECTION 204 OF THE COUNTY LAW. This is the only such County Watershed Department of which the author is aware.
179. DCAP II, *supra* note 175, at 4.
180. *Id.* at 4-5.
181. *Id.* at 4.
182. *Id.* at 5.
183. *Id.*
184. *Id.* at 42.

phosphorus restriction, watershed partners insist that the program address all significant potential contaminants,[185] including pathogens and organic chemicals.[186] Because these contaminants are most likely to be found in runoff from farms, highways, and urban areas, measures to deal with phosphorus from such sources will commonly be effective against the other contaminants as well.[187]

As mentioned above, the average load of phosphorus in the Cannonsville Reservoir basin maintains concentrations of phosphorus of about 20 micrograms per liter, and the reservoir has been labeled "phosphorus-restricted." Simple calculations suggest that if the overall average loading of phosphorus were 40,000 kilograms per year, then the corresponding concentration of phosphorus in the reservoir would be about 16 micrograms per liter.[188] Such a concentration would be below the threshold of 20 micrograms per liter, with a good margin of safety. Accordingly, DCAP has adopted the target reduction of 10,000 kilograms per year or about 20 percent of the load existing prior to the creation of DCAP.[189]

To meet this target, DCAP allocates reductions to individual sources of phosphorus in the basin.[190] Approximately two-thirds of the phosphorus reaching the reservoir is estimated to originate from farming, or more specifically, from animal manure.[191] On-site wastewater (septic systems) and urban areas are estimated to contribute only about 6 percent of the total.[192] Accordingly, Delaware County has specified target reductions from farms, and septic systems and urban areas combined, as 8000 kilograms, and 2000 kilograms, respectively.[193] Options for achieving significant reductions in phosphorus from septic systems and urban areas are limited. Therefore, reducing the phosphorus conveyed by manure is critical to reducing overall loading of phosphorus sufficiently to

185. *See id.* at 39.

186. *Id.* at 5.

187. *Id.* at 27.

188. If it is assumed that 50,000 kilograms per year produces a concentration of 20 micrograms per liter, then by simple proportionality, 40,000 kilograms per year will produce a concentration of 16 micrograms per liter.

189. DCAP II, *supra* note 175, at 6.

190. *Id.*

191. *Id.* at 34.

192. *Id.* at 36.

193. MARY JANE PORTER, KEITH S. PORTER & DEAN FRAZIER, DCAP: DELAWARE COUNTY ACTION PLAN PROGRESS REPORT (2006).

securely restore the Cannonsville Reservoir.[194] The following sections describe the specific components of DCAP designed to meet the target goals.

A. Animal Manure and Farm Nutrient Management

Scientists representing Cornell University and County Cooperative Extension have created quantified nutrient management methods for animal producers.[195] As much as two-thirds of the nutrients imported onto dairy farms remain as surplus on those farms.[196] Consequently, there is a build up of phosphorus on and in the soil.[197] These accumulations increase concentrations of phosphorus in runoff.[198] Research and field demonstrations show that significant reductions can be achieved.[199] In usual farm practice, purchased feeds account for 65 to 85 percent of the nutrients imported. Precision feeding can reduce the phosphorus inputs by more than 30 percent.[200] Further reductions can be achieved by improving the quality of on-farm forage that takes up a larger fraction of the soil phosphorus.[201] These reductions can be achieved while sustaining or increasing farm production.[202] Farmers therefore have an economic incentive to adopt these practices. Other practical methods to improve the use of manure on fields and crops while protecting water quality are being investigated.[203] The solution is to develop options by which the surplus may safely be used or disposed of elsewhere.

B. County-wide Planning

Delaware County and its towns and villages apply planning procedures and authorities that take into account water quality aims. These procedures include: comprehensive planning, envi-

194. Cerosaletti et al., *supra* note 156, at 2320-22.
195. *Id.*
196. *Id.*
197. *Id.*
198. Andrew N. Sharpley, *Concluding Remarks: Future Strategies to Meet the Agricultural and Environmental Challenges of the 21st Century*, *in* AGRIC. AND PHOSPHORUS MGMT. 199, 199-202 (Andrew N. Sharpley ed., 2000).
199. Cerosaletti et al., *supra* note 156, at 2322.
200. Precision feeding is achieved by careful regulation of the amounts of nutrients fed to the animals to precisely and quantifiably match their nutrient requirements.
201. PORTER ET AL., *supra* note 193, at 21.
202. *Id.*
203. P.J.A. Kleinman, R.B. Bryant & W.S. Reid, *Development of Pedotransfer Functions to Quantify Phosphorus Saturation of Agricultural Soils*, 28 J. ENVTL. QUALITY 2026-30 (1999).

ronmental review, zoning, subdivision regulations, site plan reviews, and planning to protect local water supplies.[204] Delaware County Planning Department staff assists communities in the county through its Town Planning Advisory Service (TPAS). Also of particular importance for protecting water quality is the Delaware County Highway Management Plan, instituted in conjunction with the County Department of Public Works. This highway program involves comprehensive assessment and management of all drainage aspects of highways at the county and town levels.[205]

C. On-site Wastewater Treatment

Staff of the Delaware County Soil and Water Conservation District have inventoried, mapped, and assessed the on-site wastewater treatment systems in the Cannonsville basin according to soil and hydrological conditions.[206] The survey indicates that there are about 6770 on-site septic systems in the basin.[207] Given their average age of thirty years, their outdated designs, and the poor soils in which they were placed, rehabilitation or replacement of these septic systems is desirable.[208] A comprehensive rehabilitation and maintenance program is now being implemented through the Catskill Watershed Corporation, with funding provided by New York City.[209]

D. Community Stormwater and Highway Drainage

Villages have a significant impact on water quality through stormwater. Rural highways and back roads are conduits for water from land uses draining into roadside ditches or to the highways, and thence to watercourses.[210] Impervious areas and roads are therefore significant sources of potential contaminants.[211] The County Department of Planning is assisting villages and hamlets in planning and implementing their stormwater projects.[212] The

204. PORTER ET AL., *supra* note 193, at 15.

205. *Id.* at 17.

206. LAURENCE D. DAY, DELAWARE COUNTY SOIL AND WATER CONSERVATION DIST., PHOSPHORUS IMPACTS FROM ONSITE SEPTIC SYSTEMS TO SURFACE WATERS IN THE CANNONSVILLE RESERVOIR BASIN, NY (2001).

207. *Id.* at 55.

208. Laurence Day, *Septic Systems as Potential Pollution Sources in the Cannonsville Reservoir Watershed, New York*, 33 J. ENVTL. QUALITY 1989, 1996 (2004).

209. The Catskill Watershed Corp., *Septic Maintenance, Stormwater Planning Program Launched*, WATERSHED ADVOC., Autumn 2003, at 1.

210. DCAP II, *supra* note 175, at 10.

211. *Id.*

212. *Id.*

County Department of Public Works has inventoried, mapped, and assessed key drainage features, such as catch basins, culverts, ditches, and bridges.[213] A maintenance and repair program has been implemented, which includes sediment removal from the culverts, catch basins, and ditches; culvert repairs; and deicing improvements.[214]

E. Stream Corridor Protection and Rehabilitation

There are 662 miles of stream in the Cannonsville Reservoir basin, much of which drains agricultural land.[215] Stream corridors are the last barriers to contaminants from nonpoint sources entering watercourses. Working with the New York City Department of Environmental Protection, the County Soil and Water Conservation District has assessed and mapped stream corridors as the basis for the protection measures that are underway.[216] The objective is to enhance stewardship of the West Branch of the Delaware River and its tributaries through a Stream Corridor Management Plan.[217] Apart from accomplishing benefits for water quality, the management plan will assist in mitigating floods.[218] It will also enhance the appearance of streams, adding amenity and economic benefits.[219]

F. Composted Municipal Waste and Manure

The Department of Public Works is responsible for a county-funded composting facility.[220] When completed at an estimated cost of about $17 million, the facility will allow about 70 percent of the total waste stream in the county to be composted and recycled.[221] The facility will also have capacity to compost surplus manure produced in the county.[222] It may be noted that Delaware County also reduces the waste stream by an annual comprehensive "Clean Sweep" program to collect wastes, including pesticides, corrosives, and solvents.[223]

213. *Id.*
214. *Id.* at 10-11.
215. *Id.* at 26.
216. *Id.* at 27.
217. *Id.* at 26.
218. *Id.*
219. *Id.*
220. PORTER ET AL., *supra* note 193, at 45.
221. *See* DCAP II, *supra* note 175, at 34.
222. *See id.* at 21-22.
223. PORTER ET AL., *supra* note 193, at 46

G. Ongoing Evaluation and Monitoring Supported by Modeling and Research

As required by the Delaware County Board of Supervisors, DCAP is founded on credible scientific research. However, two research needs include (1) the identification and achievement of desired contaminant reductions by individual management options; and (2) meeting overall basin-level goals of contaminant load reductions.[224] Quantifying the impact of nonpoint sources on water quality and the benefits of management measures is difficult.[225] There are six major full-time monitoring stations in the Cannonsville Reservoir basin.[226] The data from these stations support exhaustive mathematical and statistical analyses of the basin combined with the results of scientific field studies.[227] Mathematical modeling by Cornell scientists provides a basis for management decision-making and evaluation of those decisions in the watershed.[228]

H. Economic Development

DCAP fundamentally assumes that protection of water quality and economic development are compatible. Since its creation, the Delaware County Department of Economic Development has sought to encourage traditional economic and industrial development in the county outside the New York City watershed and to pursue environmentally compatible initiatives in watershed communities and businesses.[229] The department provides funds through grants, business counseling, and informational services.[230] These components are closely coordinated through the Department of Watershed Affairs, and they account for all significant nonpoint sources.[231] Management options are scientifically determined and evaluated.[232] Monitoring results, supported by the mathematical models, confirm that the combined effect of managing the nonpoint sources is significantly contributing to a

224. DCAP II, *supra* note 175, at 5.

225. For a comprehensive description of methods by which nonpoint sources can be evaluated, see VLADIMIR NOVOTNY, WATER QUALITY: DIFFUSE POLLUTION AND WATERSHED MANAGEMENT (2d ed. 2003).

226. *See* DCAP II, *supra* note 175, at 34.

227. *Id.* at 34-35.

228. *Id.*

229. *Id.* at 5, 7.

230. *See id.* at 24.

231. *See id.* at 39.

232. *Id.* at 12, 27, 42.

reduction in phosphorus loading to the reservoir.[233] In fact, the guidance value for phosphorus in the Cannonsville Reservoir has now been met sufficiently for the restriction to be lifted.[234] All DCAP components substantially involve local, New York City, New York State, and federal partners.[235] An inter-agency institutional framework supports and assists the management through the inter-agency Scientific Support Group and the Phosphorus Study Committee.[236] A Water Quality Committee comprised of town supervisors reviews and decides policies.[237] Over the last five years, the committees have established partnerships with shared understandings and purposes. During those five years about $5 million has been raised through external funding for planning and implementing the program.[238]

X. ECONOMIC DEVELOPMENT WITH SOURCE WATER PROTECTION: A SHARED PURPOSE

"Local planning is a key tool for ensuring adequate source water."[239] For DCAP to be embraced and sustained as such a key tool, it must also advance the economic interests of the constituencies it serves. This necessity raises the difficult question of how to encourage economic development while maintaining source water protection. The environmental community tends to express one view: That is, it argues, "When land use controls become necessary to protect the environment, frequently nothing less than a complete ban on further development can ensure preservation. The legal issues then posed do not involve how much development is permissible, but whether development is permissible at all."[240]

The degree of permissible development is a major point of contention in the New York City watershed. Economic objectives of the MOA are aspired rather than specified.[241] In a critique of the New York City Agreement, Eric Goldstein argues that government agencies need to be guided by the recognition that "Mother

233. *Id.* at 34.

234. WATER QUALITY REPORT, *supra* note 162, at 26.

235. DCAP II, *supra* note 175, at 11.

236. *Id.* at 39-40.

237. *Id.* at 39.

238. *Id.* at 46.

239. INST. OF MED. OF THE NAT'L ACADS., FROM SOURCE WATER TO DRINKING WATER: WORKSHOP SUMMARY 25 (Lawrence Reiter et al. eds., 2004).

240. LINDA MALONE, ENVIRONMENTAL REGULATION OF LAND USE xi (2001).

241. MOA, *supra* note 123, at art. V.

Nature knows best."[242] Goldstein makes clear that, in his view, watershed protection is best accomplished by curtailing human activities.[243] This position implies that Mother Nature must orphan her children by denying them a place in her home; and that, logically, ultimate protection means preserving a wilderness.[244]

Graciela Chichilnisky and Geoffrey Heal represent the efforts of New York City as a restoration of "the integrity of the Catskill ecosystems."[245] These authors conveniently overlook the fact that faithful restoration of the natural system of the Catskills would require the removal of the New York City dams that have flooded about 22,600 acres, or 35.3 square miles, of the watershed.[246] Their position seems to maintain that one can injure the environment for one's own use but forbid others to damage it for their use.[247]

Yet, economic development is integral to DCAP as part of comprehensive planning.[248] Economic development must therefore be consistent with the protection of water quality. To sustain that protection, DCAP is an attempt by local leaders, on behalf of the communities they represent, to systematically manage land and nonpoint sources.[249] It is a comprehensive plan through which the leaders seek to sustain the economic viability of their communities with environmentally benign development.[250] DCAP is a positive expression of home rule authority for watershed management that voluntarily anticipates needs, rather than reacting to externally imposed "top-down" police powers. DCAP is also a proactive mechanism. This requires that it defeat what Robert Adler terms the most difficult issue for watershed management posed by respective roles and aims of government at different levels.[251]

---

242. Eric Goldstein, *Mother Nature Knows Best: Fundamentals for Ensuring a Safe Water Supply*, 12 FORDHAM ENVTL. L.J. 455, 459 (2001).

243. *Id.*

244. *See* MAX OELSHLAEGER, THE IDEA OF WILDERNESS (1991) (thoroughly discussing the influential conviction that protection means preserving "the Wilderness").

245. Graciela Chichilnisky & Geoffrey Heal, *Economic Returns from the Biosphere*, 391 NATURE 629, 629 (1998).

246. *Id.*

247. *See id.*

248. DCAP II, *supra* note 175, at 5-7.

249. *Id.* at 9.

250. *Id.* at 7.

251. Robert W. Adler & Michele Straube, *Watersheds and the Integration of U.S. Water Law and Policy: Bridging the Great Divides*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 1, 22 (2000).

So far, the operational partnerships fostered by DCAP demonstrate that such difficulty can be defeated. John Nolon has noted the adoption by local governments throughout the country of an impressive number of local environmental laws.[252] Delaware County, through DCAP, seeks a partnership that assimilates the different levels of authority and responsibility.[253] It seeks to bridge the gap between federal and state law, as well as local law related to land and water uses. Therefore, DCAP qualifies as an important example of the "American system of environmental and land use law that simultaneously relies on local discretion while attempting management of that discretion from the top."[254] For such assimilation of bottom-up with top-down law to prevail, there must be shared aims for economic development, integrated with water quality protection.

XI. CONCLUSION

DCAP is a successful example of county-based comprehensive planning with quantified objectives to reduce loadings from nonpoint sources so that water quality targets are quantifiably sustained. The New York City Watershed Agreement is a nationally significant demonstration of such protection at the source of a water supply for nine million people. Ensuring the fullest safety of water supplies prescribes comprehensive protection at their sources. Source water protection means watershed management. This judicious policy, now fostered through the Safe Drinking Water Act, encourages a return to local and state responsibilities as originally adopted in the nineteenth century. Local and state rules and regulations, and then the creation and protection of upland water supplies, were the earliest measures to prevent water pollution in the United States. The New York City Watershed Agreement echoes those measures, now representing a most rigorous attempt to protect the city's water supply at its source through watershed rules and regulations. This protection provides an alternative to very expensive filters that would otherwise be required under federal law. A high proportion of forested areas in the watershed maintains a yield of high-quality water.[255] How-

252. John R. Nolon, *In Praise of Parochialism: The Advent of Local Environmental Law*, *in* NEW GROUND 3, 8 (John R. Nolon ed., 2003).

253. Keith S. Porter, *Should Governmental Water Responsibilities Flow Downwards?* 16 WATER L. 49, 56 (2005).

254. Nolon, *supra* note 252, at 38.

255. Dombeck, *supra* note 105, at 125.

ever, there are also farms, commercial, residential, and other land uses in the watershed. Robert F. Kennedy, Jr. has stated that "It remains clear to all those who participated in the Watershed negotiations that the Agreement will only protect water quality if the DEP is vigilant in enforcing compliance with the new regulations."[256] In an inhabited watershed, watershed police powers imposed on communities by an external agency are arguably insufficient. Land management upon which the quality of water critically depends is also a local matter for landowners and their local communities. Sustaining water quality by watershed management therefore requires local acceptance of responsibility in addition to regulations. Comprehensive planning, with its panoply of legal measures available to local governments, is a potentially viable local action.

The New York City watershed is now a "protected area." This protected area is inhabited and not restricted to one exclusionary use. Rather, it is a "living landscape" that depends upon maintenance of "a vigorous economy and social structure, and a population that is sympathetic to the objectives of conservation. It means working with people at all levels, and especially with those living and working in the area—the people most intimately affected by what happens to it."[257] The New York City Watershed Agreement offers the challenge to safeguard the water supply at its source through protection achieved by effective sanitary standards. Such safeguarding requires the communities, landowners, and residents in the watershed to willingly accept local responsibilities. A particularly effective and readily available instrument by which those local responsibilities may be advanced is comprehensive planning. Such assumption of local authorities is a sharing of powers with city, state, and federal partners. As a recent report of the Institute of Medicine states, an essential component in a holistic approach to planning for source water protection is widespread community involvement. "Local planning is a key tool for ensuring adequate source water."[258] This is a challenge Delaware County, with its watershed partners, is meeting through its locally driven Delaware County Action Plan.

256. Kennedy, *supra* note 112, at 237.

257. P.H.C. LUCAS, PROTECTED LANDSCAPES: A GUIDE FOR POLICY-MAKERS AND PLANNERS xvi (1992).

258. INST. OF MED. OF THE NAT'L ACADS., FROM SOURCE WATER TO DRINKING WATER: WORKSHOP SUMMARY 25 (Lawrence Reiter et al. eds., 2004).