Water Supply in the Northeast: A Study in Regulatory Failure

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INTRODUCTION

Water is a plentiful resource in the Northeastern United States. Water supply management in the region is complicated, however, by droughts and the fact that water sources are not always within the convenient reach of population centers. These climatic and geographical conditions should not present Northeastern water management institutions with any insurmountable problems. Nevertheless, residents of the region have periodically suffered severe water shortages. These shortages are man-made. They occur because the states of the region lack the insti-

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1. This article will use the terms “Northeastern” and “Northeast” as defined in the 1977 Army Corps of Engineers study entitled NORTHEASTERN UNITED STATES WATER SUPPLY STUDY SUMMARY REPORT. The Corps included the following twelve states within its definition: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. U.S. ARMY CORPS OF ENGINEERS, NORTHEASTERN UNITED STATES WATER SUPPLY STUDY SUMMARY REPORT 1 (1977) [hereinafter cited as NEWS STUDY].


3. The Northeast's most severe drought in the last hundred years occurred between 1961 and 1966, when the region suffered a precipitation deficit of over 50 inches. 1981 Hearings, supra note 2, at 110.
tutional arrangements necessary to provide a sufficient supply of water to all their residents in times of drought.

In the Northeast during the fall and winter of 1980-81, a combination of hydrological factors, including subnormal rainfall, left little runoff to fill the region's reservoirs. The most recent drought showed that the water supply institutions of the Northeastern states have serious shortcomings. Among the problems are wide variations in storage capacities among local water supply systems, a lack of adequate infrastructure (such as interconnecting pipelines), and a lack of cooperation and coordination between state, municipal, and private water supply institutions. Because of these impediments to rational and efficient distribution, neighboring communities that experienced the same amount of rainfall often faced dramatically different water supply conditions during the drought. Some communities had more than enough water, while others had too little.

The legal structure determining the supply of water for public use can be divided into two parts. The first part, an outgrowth of property law, governs the allocation of rights to water resources. The second part, growing out of laws concerning the relationship between state and local governments and the regulation of public utilities, governs the diversion, storage, and distribution of water once public water supply systems have acquired water rights.

During the last century our society shifted from one in which most citizens depended on their own private water supply to one in which most citizens are served by public water supply systems. This shift has generated the development of new laws regulating the organization and operation of public water supply systems. In the Northeast, where water is relatively plentiful, these regulatory laws have become more important in determining the adequacy and cost of water supply than the laws relating to the initial allocation of water rights.

Most legislative efforts to solve the Northeast's water supply shortages have addressed the problem primarily as one of allocation. A

4. A significant portion of precipitation is lost to potential human use by evaporation and by transpiration from the Earth's vegetation. The national average annual precipitation is 30 inches, of which 70% is lost through evapotranspiration. The remaining 30% is runoff which flows into streams and rivers. U.S. WATER RESOURCES COUNCIL, THE NATION'S WATER RESOURCES, SUMMARY REPORT 1-3 (1968) [hereinafter cited as FIRST NATIONAL WATER ASSESSMENT]; NATIONAL WATER COMMISSION, WATER POLICIES FOR THE FUTURE xxv, xxvii (1973). From June 1980 through January 1981, the Northeast received only 70% of its normal rainfall for this period. 1981 Hearings, supra note 2, at 7. In addition, during the summer of 1980, evapotranspiration averaged from 15 to 20 inches, an abnormally high amount for the Northeast. Id. at 114.

5. See infra text accompanying notes 117-25 for a discussion of the problems that occurred during the 1980-81 drought.

broader perspective, which includes the laws and legal institutions determining how water supplies are distributed, reveals in each state a complex web involving many different actors. A legal structure has evolved with no central conception of how the parts of the whole should work together rationally to develop a water supply system that satisfies the public's needs and preferences.

This Article offers ideas on how a state can manage its water resources to assure a sufficient supply of water for all its citizens, regardless of their location. While water supply problems do not respect state borders any more than they do local jurisdictional lines, this Article focuses only on intrastate decisional structures. Section I describes the Northeast's water resources, the nature of demand, the historical development of public water supply systems, and the organization of those systems today. Section II examines the existing legal structures which determine public water supply in the Northeastern states. Because the best way to understand how these complex structures work is to study them in action, Section II includes case studies of three representative states that were particularly hard hit in the 1980-81 drought: Connecticut, New Jersey, and New York. Sections I and II show that water distribution in the Northeast is highly fragmented with respect to the number of systems and the legal environments in which they operate. Section III considers the two main consequences of this fragmentation. First, fragmentation produces inefficient resource use due to a duplication of facilities and higher operational costs. Second, the Northeastern states are unable to assure all their citizens adequate water supplies during droughts. Section III concludes that, given the absence of pressures on existing institutions, state-mandated regionalization is required to ensure the consolidations necessary for a dependable water supply both in times of plenty and times of drought.

I
 WATER AVAILABILITY, DEMAND, AND SUPPLY SYSTEMS

A. Natural Availability

All of the Earth's water resources come from precipitation, two-thirds of which returns to the atmosphere through direct evaporation or is consumed by vegetation through transpiration (the combination of the two processes being referred to as "evapotranspiration"). The remaining third, which either flows into streams and rivers or seeps into the

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7. Furthermore, this Article emphasizes issues regarding the quantity, not the quality, of water, although many of the factors that lead to an inadequate quantity of water also adversely affect water quality. For example, groundwater overdraft in coastal areas can lead to saltwater intrusion.

ground, constitutes runoff and is available for human use. The extent of an area's runoff, and hence its potential water supply, depends on how much precipitation the area receives and the amount of evapotranspiration that occurs. These factors may vary from watershed to watershed and from one time period to another. A major goal of water resources management is to protect the public against flood and drought conditions which result from wide fluctuations in runoff.

Most parts of the Northeast have an average annual runoff that is twice the national average, as well as a lower rate of evapotranspiration. In addition, the amount of runoff is more consistent from year to year than in other regions of the United States.

B. Demand: Trends and Projections

Throughout this century the nation's demand for water has steadily increased, while the natural supply has remained inevitably fixed. In 1900 the total national withdrawal was forty billion gallons per day (bgd); by 1975 it had grown tenfold, to 398 bgd. This increased demand was due to population growth, higher standards of living, and technological advances. Per capita consumption of water increased as the level of urbanization and industrial development increased. From

9. A “watershed” is “a geographic area which drains into a particular water body.” NATIONAL WATER COMMISSION, supra note 4, at xxvii.
10. FIRST NATIONAL WATER ASSESSMENT, supra note 4, at 1-4. See supra note 4 and accompanying text.
11. NATIONAL WATER COMMISSION, supra note 4, at 7.
12. SECOND NATIONAL WATER ASSESSMENT, supra note 2, at III-2. Of the total water withdrawal, 85% is fresh water and 15% is salt water, used primarily for industrial purposes. Id. at III-15.
14. In general, the more industrialized an area, the greater its per capita use of water due to increased manufacturing, greater population densities, and higher income levels. As income levels increase, people can afford to buy more water-consuming devices, such as dishwashers, air conditioners, and garbage disposals, and generally own larger homes with larger and thirstier lawns. Wolman, Water Resources, A Report to the National Academy of Sciences, in WATER, HEALTH, AND SOCIETY 8-9 (G. White ed. 1969); M. GREENBERG & R. HORDON, supra note 13, at 25-26; SECOND NATIONAL WATER ASSESSMENT, supra note 2, at III-15. See also Foster & Beattie, Urban Residential Demand for Water in the United States, 55 LAND ECON. 47 (1979), for a review of the studies which have found high correlations between use and per capita income.

The Second National Water Assessment projected that by the year 2000, total water withdrawals in the Northeast will decrease an estimated 10% from 1975 levels, due mainly to manufacturers' conservation efforts. SECOND NATIONAL WATER ASSESSMENT, supra note 2, at III-19 to III-20. Recently the Army Corps of Engineers conducted a study of the Housatonic River Basin, which extends over parts of western Connecticut, southwestern Massachusetts, and eastern New York. The study predicts increases in domestic and commercial demand, although at a rate slower than that which occurred from 1965-1975 (0.5 gallons per capita per day (gpcd), compared with one gpcd during the earlier period). The projections assume that price increases and conservation efforts will combine to reduce demand. U.S.
1900 to 1970, the per capita water withdrawal increased three and one-half times while the population increased two and one-half times.\textsuperscript{15}

In 1977 the Army Corps of Engineers completed a study of water supply in the Northeast (the \textit{NEWS Study}).\textsuperscript{16} Undertaken in response to a severe drought in the Northeast during the 1960's, the study discusses trends in water use and supply. Its projections pose real challenges for the Northeastern states. The study found that sixty percent of the Northeast's population of fifty million people live in five major metropolitan areas: Baltimore, Boston, New York, Philadelphia, and Washington.\textsuperscript{17} The study projects that by the year 2000, the region's population will increase by thirty million, and that most people will continue to live in these five metropolitan areas.\textsuperscript{18} The study concludes that three of these metropolitan areas—Boston, New York and Washington—already have "immediate near term need (prior to 1990) for increased supply capacity."\textsuperscript{19}

The \textit{NEWS Study} found that in these three metropolitan areas, the demand for water after the mid-1960's drought exceeded the pre-drought demand, thus widening existing deficits between "safe yields"\textsuperscript{20} and actual consumption.\textsuperscript{21} The study warned that the deficits would continue to grow unless water supplies increased or, due to conservation and increased prices, demand diminished.\textsuperscript{22}

The planning and implementation of major water supply projects entail many years\textsuperscript{23} and large amounts of capital, as two examples from New York City show. The first example is a project to divert enough

\begin{itemize}
\item Army Corps of Engineers, Housatonic River Basin Urban Study A-56 (1982) [hereinafter cited as Housatonic Study].
\item National Water Commission, supra note 4, at 6.
\item News Study, supra note 1.
\item Id. at 1.
\item Id.
\item Id. All of Rhode Island and almost all of Massachusetts have "immediate near term need" for water. Within these two states, the Boston and Providence metropolitan areas have the most urgent need. Id. at 63.
\item The "safe yield" is the maximum amount of water that could be withdrawn from a water system daily over the course of a year, if the year's runoff feeding such a system were equal to the amount of runoff in the lowest historically recorded year. M. Greenberg & R. Hordon, supra note 13, at 69-71; News Study, supra note 1, at 14. After the sixties' drought, the safe yields of most systems in the Northeast, which had been based on the drought of 1929-32, were reduced, some significantly. For example, New York City's safe yield was reduced 29%. M. Greenberg & R. Hordon, supra note 13, at 70-71.
\item News Study, supra note 1, at 6-7.
\item Id. at 7, 9.
\item The average lead time for a new reservoir is between eight and ten years. Army Corps of Engineers projects require an average of about 18 years from inception to completion. M. Greenberg & R. Hordon, supra note 13, at 74; 1981 Hearings, supra note 2, at 273. The News Study estimates that the various projects proposed in the study would require 10 to 15 years for implementation. See News Study, supra note 1, at 25, 70, for discussions of project timing for both the Washington and Boston metropolitan areas.
\end{itemize}
water from the Hudson River during high flows to add 360 million gallons per day (mgd) annually to New York City's water supply system. The need for an increase in the City's supply was first perceived during the drought of the mid-1960's. The project proposal came out of the NEWS Study, which was issued in 1977. The project is still awaiting various federal approvals and final congressional authorization. It is estimated that once the project is authorized, there will be six years of preconstruction design and engineering planning, with construction commencing two years thereafter and taking another six to eight years to complete. Thus, thirty years may elapse between the initial identification of a problem and a finished project. The second example is the construction of a third water tunnel as a backup to the City's existing tunnels. Phase I of construction, which began in 1970, is expected to be completed by 1988-90, while the completion dates for Phases II and III have not been determined. Initial discussions for the third tunnel began in 1954. The estimated total cost for the Hudson River project and Phase I of the tunnel, in 1980 dollars, is $5.4 billion.

The New Jersey Statewide Water Supply Master Plan, (New Jersey Master Plan) provides additional cost figures for typical water supply facilities. The New Jersey Master Plan estimates that it will cost $65 million to build a pipeline that can move forty mgd twenty-six miles from the Raritan River basin, in the state's central region, to the Passaic River basin, in northeastern New Jersey. Two reservoirs with a combined yield of thirty-five mgd will cost an additional $40 million, and another $65 million will be needed for "high priority rehabilitation and consolidation of inadequate water supply systems." New Jersey voters recently approved a $350 million bond issue, of which $128.5 million is slated just for various feasibility studies regarding projects commencing after 1985.

24. The Corps of Engineers has not been involved with any water supply projects for New Jersey or Connecticut. 1981 Hearings, supra note 2, at 8. In New York, the state and affected local governments decided to work with the Corps on the Hudson River project to increase New York City's safe yield.
25. 1981 Hearings, supra note 2, at 9, 16-17.
27. 1979 Hearings, supra note 26, at 250.
30. Id. at 72.
31. Id.
32. Id.
33. See infra note 214 and accompanying text.
C. Water Supply Systems

1. Development of Public Water Supply Systems: The Sources of Fragmentation

Today only seventeen percent of all Americans rely for their home uses on individual water supply systems, such as individual wells or direct diversions of surface waters. Public water supply systems satisfy the remaining eighty-three percent of residential demand and most of the demand for water by nonindustrial commercial businesses and public uses, such as fire protection. Public water supply systems also supply approximately twelve percent of the water needed by industrial businesses.

Public water supply systems are a product of urbanization. In the nineteenth century, most of the population living outside of the cities depended on individual water systems. In cities, however, the need for clean and adequate water supplies for growing populations, coupled with the need to provide greater community fire protection services, made reliance on individual systems unviable. This led to the development, in the first half of the nineteenth century, of more extensive water supply systems.

In the early part of the nineteenth century, most cities relied on private water companies. In 1801, Philadelphia developed the first municip-

34. Second National Water Assessment, supra note 2, at 24. By the year 2000, individual water systems will serve only about 10% of the population.
35. The term "public water supply systems" refers to all community water supply systems and includes systems owned by private companies as well as those owned by government entities. Privately owned water supply systems are called "investor-owned systems."
36. Water withdrawals fall into four principle uses: agriculture, industrial, steam-electric generation, and domestic (i.e., municipal, individual, and commercial withdrawals). Withdrawals for domestic use have traditionally been less than for the other three uses and have represented about 8.5% of total freshwater withdrawals. Domestic use grew, however, as a result of population growth and increased per capita income, from five billion gallons per day (bgd) in 1900 to 29 bgd in 1975. Of the 29 bgd, 23 bgd were for municipal and individual uses, and 5.5 bgd were for commercial uses. Wolman, The Metabolism of Cities, in Water, Health, and Society 281 (G. White ed. 1969); Second National Water Assessment, supra note 2, at 20-21.
37. In 1975, manufacturing received 7.3 bgd, or 11.8% of its total water withdrawals, from public water supply systems. Second National Water Assessment, supra note 2, at 37.
38. "At the close of the eighteenth century, only seventeen utilities were in operation. The number did not pass the hundred mark until 1850 and the thousand mark until 1895. By 1895 the number had reached about 3,000." Wolman & Bosch, U.S. Water Supply Lessons Applicable to Developing Countries, in Water, Health and Society 219-20 (G. White ed. 1969). By 1900 public water supply systems served 39% of the population, a figure which corresponds with the percentage of the population then living in urban areas. M. Greenberg & R. Hordon, supra note 13, at 25.
40. Id. at 63.
ipally-owned water supply system. By the mid-nineteenth century, reliance on private water companies gave way, in the larger cities, to municipally-owned systems. As noted by Nicholas Blake, a historian of water supply in the United States, "[e]verywhere the high rates and inadequate service of the private companies were contrasted with the lower rates and larger supply provided by Philadelphia's pioneer venture in municipal water works." Today, almost three-fourths of all urban water systems (those servicing 50,000 or more customers) are municipally-owned.43

Rapid development of public water supply systems occurred in the first two decades of the twentieth century as a part of the process of suburbanization of the areas surrounding cities. By 1976, some 35,000 public water supply systems operated in the United States. Of these, eighty percent served less than 10,000 customers each, supplying a total of only nine percent of public system users. Twenty percent of the systems served the remaining ninety-one percent of public users.45

The most telling feature of water supply systems throughout the United States is the fragmentation along local political boundaries. Provision of water has always been a function of local government that has been performed either by municipalities themselves or by private companies operating under direct or indirect municipal franchises.46

41. Id. at 35.
42. Id. at 77.
43. THE PRESIDENT'S INTERGOVERNMENTAL WATER POLICY TASK FORCE, REPORT OF THE SUBCOMMITTEE ON URBAN WATER SUPPLY II-1 (1980) [hereinafter cited as PRESIDENT'S TASK FORCE REPORT].
44. Three thousand public water supply systems existed in 1895; by 1924, that number had tripled to 9000 systems serving 10,000 communities. Wolman & Bosch, supra note 38, at 220. See also J. TEAFORD, CITY AND SUBURB: THE POLITICAL FRAGMENTATION OF METROPOLITAN AMERICA, 1850-1970 76-104 (1979), for a discussion of the development of public services such as water supply in suburban areas. In describing the trend toward suburban self-reliance, Teaford cites the example of Cook County, Illinois, where in 1880 only "29% of the outlying municipalities ... enjoyed a piped supply of water, whereas by 1915 45% of the suburban cities and villages could claim this advantage. And by 1934 83% of the municipalities within a fifty mile radius of Chicago enjoyed a public water supply." Id. at 78.

The widespread delivery of public services by private companies during this period, and the failure of municipal regulation to ensure reasonable rates for customers and stockholders alike, generated a demand for state regulation of investor-owned utilities. 1 H. SPURR, GUIDING PRINCIPLES OF PUBLIC SERVICE REGULATION 2-7 (1924); P. GARFIELD & W. LOVEJOY, PUBLIC UTILITY ECONOMICS 28-31 (1964). The decade between 1907 and 1917 witnessed the creation, in "all but a minority" of states, of public utility commissions to issue franchises and regulate water rates. 1 A. PRIEST, PRINCIPLES OF PUBLIC UTILITY REGULATION 27 (1969).
45. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF WATER SUPPLY, SURVEY OF OPERATING AND FINANCIAL CHARACTERISTICS OF COMMUNITY WATER SYSTEMS II-3 to II-4 (1977) [hereinafter cited as EPA SURVEY].
46. Although they are issued by the state, franchises for investor-owned systems generally require formal or informal approval by the municipalities to be served. Under New York law, for example, affected municipalities must consent to the incorporation of any private waterworks corporation. N.Y. TRANSP. LAW § 41 (McKinney Supp. 1983).
WATER SUPPLY IN THE NORTHEAST

In the Northeast, most public water supply systems initially have used water from within local borders. Typically, they use groundwater, which generally is less expensive and easier to provide than surface water. The natural inclination to look first to water sources close at hand, however, cannot explain why most communities have chosen to create their own water systems. The development and endurance of fragmented water systems reflect a strong tradition of local autonomy. Municipalities generally try to avoid becoming dependent for direct service on neighboring supply systems. Instead, each municipality almost always either establishes its own system or franchises an investor-owned system. This pattern persists even where the local water system must purchase water from other, nonlocal water systems.

When municipalities outgrow their indigenous natural supply, they are more likely to buy groundwater may also reflect the more relaxed rules that govern the allocation of groundwater rights, compared with those that govern the use of surface water.

In his study of northern New Jersey, Professor Miri found a "strong attachment to local autonomy." J. MIRI, THE POLITICS OF WATER SUPPLY IN NORTHERN NEW JERSEY 17 (1971). Similarly, the Corps of Engineers notes that the strength of home rule in Connecticut and Massachusetts limited the potential alternatives with respect to planned regional water supply projects. HOUSATONIC STUDY, supra note 14, at B-35.

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additional water from other sources than to merge or consolidate with other nearby municipal systems.\textsuperscript{51}

Suburban communities, even when aware of a water supply problem, have been more reluctant than their city counterparts to seek metropolitan or regional solutions. This reluctance reflects a continuing distrust of cities that have larger and more centralized systems.\textsuperscript{52} Fragmentation is also explained in part by general public apathy. Except during times of drought, most voters take little interest in water supply problems. Thus local officials, who have a natural preference for autonomy, feel little pressure to join in cooperative intergovernmental programs.\textsuperscript{53}

2. The Different Legal and Political Environments in Which the Different Forms of Water Systems Operate

The effects of the fragmentation of water supply distribution systems are often accentuated by the co-existence within a single state of three types of systems: municipally-owned systems, investor-owned systems, and special districts and authorities (which have characteristics of each of the other two forms of ownership). These three types of institutions operate in different legal and political environments. This results in differences in their decisionmaking patterns concerning the development and operation of supply facilities, which in turn makes cooperation among them more difficult.

a. Municipal Water Systems

Municipally-owned water supply systems are more common than investor-owned water companies.\textsuperscript{54} Two possible reasons for this are the capital-intensive nature of water supply systems\textsuperscript{55} and the general per-


\textsuperscript{53} The Springfield, Massachusetts study found that even among involved local officials and citizens there was little interest in "large scale water resource plans and programs." E. Kaynor & I. Howards, supra note 49, at 91. "When asked to rank local issues, most respondents placed water resources near the bottom." Id. at 43.

\textsuperscript{54} Investor-owned systems predominate in only two of the twelve Northeastern states: Connecticut has 61 municipally-owned systems and 524 investor-owned systems; Virginia has 365 municipally-owned systems and 3306 investor-owned systems. Data from the Connecticut Dep't of Envtl. Protection, Natural Resources Center, supplied to the author (July 1982); letter from Evans H. Massic, Enforcement Chief, Bureau of Water Supply Engineering, Commonwealth of Virginia Dep't of Health, to the author (Nov. 12, 1982).

\textsuperscript{55} According to Professor Blake, the early development of municipally-owned systems was due in part to the inability of private companies to raise sufficient capital to maintain and expand their systems. N. Blake, supra note 39, at 77. This may have been the case in the late-eighteenth and early-nineteenth centuries, when financial markets had not developed adequately. The capital intensive nature of the water supply industry does not explain the small role played by investor-owned systems formed in the late-nineteenth and twentieth centuries,
ception of water as a public resource intimately tied to the public health and the economic well-being of a community. Property tax advantages also favor municipal over private ownership, especially with larger systems whose surface water diversions require substantial land holdings.

Most states exempt municipally-owned water supply systems from state regulation. Six of the twelve Northeastern states do not regulate either the rates or the services of municipally-owned systems. Four states regulate only the rates charged to extraterritorial customers (people living outside municipal borders). The other two states, Maine and Rhode Island, provide for some degree of intramunicipal rate regulation. Until 1981, Maine regulated the rates of municipally-owned systems as a matter of course. Maine now permits municipally-owned systems to set their own rates, with review by the state Public Utility Commission available only upon petition. In 1980, Rhode Island amended its statutes to provide for the regulation of intramunicipal rates; however, the law covers only those systems that also provide extraterritorial service.

however, when other more capital intensive utilities (e.g., telephone and electric) were dominated by private companies.

56. Each state, however, does regulate the purity of water supplies. Both municipally-owned systems and investor-owned systems must report to the state agency (typically the Department of Health) charged with insuring the quality of drinking water, a regulatory task which requires the enforcement of federal standards under the Safe Drinking Water Act, 42 U.S.C. §§ 300f-300j-10 (1982). The information that municipalities provide generally pertains to the quality, not the quantity, of water supplies. In some instances, though, the two issues may overlap, as where a system's financial inability to maintain quality standards affects its ability to provide water at all.

57. These states are Connecticut, Delaware, Massachusetts, New York, Vermont, and Virginia.
60. Under the amended law, municipalities may request the Maine Public Utility Commission to hold hearings on the proposed changes. Alternatively, the municipality may hold local hearings that are subject to Commission review upon the petition of either 15% of the system's customers or 1000 customers, whichever is less. 1981 Me. Laws 438, §§ 3-5. Connecticut and Maryland require municipalities to conduct public hearings on proposed rate changes, but do not provide for state review. Conn. Gen. Stat. Ann. § 7-239 (West 1972); Md. Health-Envtl. Code Ann. § 9-727 (1982).
61. 1980 R.I. Pub. Laws 335, § 6 (codified at R.I. Gen. Laws § 39-1-2 (1983)). Since 1967, Rhode Island has regulated the extraterritorial rates of municipally-owned systems, as well as their intramunicipal rates, when the systems received either water or loans from the Rhode Island Water Resources Board. In 1980, the state legislature amended the provisions affecting extraterritorial rates. The amendments came in response to a judicial decision involving the state's largest municipally-owned system, the City of Providence Water Supply Board, which serves 13 communities where 55% of the state's population reside. In City of Providence v. Public Util. Comm'n, 414 A.2d 465 (R.I. 1980), the Rhode Island Supreme Court held that the Providence system could set extraterritorial rates without state review. The court relied on the fact that the statute that enabled the municipal system to fix rates was enacted subsequent to the passage of the statute that empowered the state to review extraterritorial
A few Northeastern states involve their public utility commissions in the affairs of municipally-owned systems in ways other than rate regulation. In Connecticut, New York, and Pennsylvania, municipally-owned systems are subject to the reporting requirements of each state's public utility commission, although neither Connecticut nor New York regulate any municipal water rates, and Pennsylvania only regulates extraterritorial rates. In New Jersey, New York, and Rhode Island, proposed municipal system contracts to buy or sell water must be approved by the state agency in charge of water resources management.

A number of states regulate competition between municipally-owned and investor-owned systems by prohibiting municipal service in areas where other systems exist or by requiring the acquisition of any private systems before extending service into such areas. Similarly, two municipal rates. The court's decision prompted the legislature to amend the latter statute explicitly to grant the state the power to review all extraterritorial municipal rates, including those of the Providence system.

The statewide regulatory approach has presented some new challenges. An official at the Rhode Island Water Resources Board reported that the agency encountered problems in developing uniform and fair rate regulation principles applicable to both municipally-owned and investor-owned systems. One area of contention has been the question of how to treat the municipal practice of borrowing from general funds to pay for utility deficits. The state favors an approach that would disallow municipally-owned systems, calculating their expenses for ratemaking purposes, from including the costs of repaying such loans. This policy would force municipally-owned systems to become self-supporting. Telephone interview with Peter Calise, Staff Director, Rhode Island Water Resources Board (Aug. 3, 1983).

In New York, municipally-owned systems must file copies of their annual reports with the Public Service Commission. Most municipalities, however, do not comply with this requirement. Keig, Fristoe & Goddard, State Regulation of Water Utilities, PUB. UTIL. FORT., Aug. 13, 1970, at 21; telephone interviews with officials at the New York Public Service Comm’n (Aug. 3, 1983). Pennsylvania requires all municipally-owned systems to maintain depreciation accounts and reports as prescribed by the Public Utilities Commission, and to make their facilities and records available for inspection. Connecticut and Pennsylvania also prescribe uniform accounting principles to be used by all systems.


For example, Massachusetts requires a municipality seeking to set up its own waterworks system to acquire, by purchase or condemnation, any existing system already serving...
Northeastern states prevent competition between municipally-owned systems by prohibiting one municipality from serving customers in another municipality without the other municipality’s prior consent. In no state can municipalities be ordered to provide extraterritorial service. With the recent exception of New Jersey, no state can order municipalities to interconnect with other systems, except during declared emergencies.


66. Since they are public utilities, municipally-owned water systems have a duty to serve the public. Consequently, the case law has qualified the general prohibition against state-ordered extraterritorial service so that it accords with principles applicable to public utilities. Thus, if a municipally-owned system chooses to extend service to nonresidents, it cannot discriminate among similarly situated nonresidents. In addition, a municipally-owned system, upon acquiring an investor-owned system, cannot cut off service to any of the company’s extramunicipal customers.


68. Many of these systems, however, do make payments in lieu of taxes. The EPA Survey revealed a direct correlation between the size of a municipally-owned system and the likelihood that such a system makes payments in lieu of taxes:
rical property;\textsuperscript{69} in another five Northeastern states, such entities pay real property taxes on land, but not on improvements.\textsuperscript{70} In addition, the favorable federal tax treatment of interest earned on municipal bonds allows municipally-owned systems to finance capital improvements at lower rates than private systems.\textsuperscript{71}

States generally exempt water supply projects from state limits on municipal debt,\textsuperscript{72} although two states, New Jersey and Virginia, offer exemptions only for “self-liquidating” debt.\textsuperscript{73} On the other hand, certain

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EPA Survey, supra note 45, at VII-14.

\textsuperscript{69} Del. Code Ann. tit. 9, § 4262 (1975); Me. Rev. Stat. Ann. tit. 30, § 4262 (1978); Md. Code Ann. art. 81, § 9(h) (1980); Pa. Stat. Ann. tit. 72, § 5020-204(a)(7) (Purdon Supp. 1984); Va. Code § 58.1-3663 (1984). In Delaware, Maryland, Pennsylvania, and Virginia, tax exemptions on extraterritorial property derive from general real property tax exemptions granted to public property used for public purposes. The Maine statute specifically exempts “revenue producing municipal facilities” located “within or without the corporate limits.” In Virginia, a municipal system’s facilities that are located outside its borders are exempt from real property taxes as long as the system provides no extramunicipal service. (The use of waterworks to generate revenue outside municipal borders is not deemed a public use of municipal property.)


\textsuperscript{71} The water supply industry relies more heavily on long-term debt financing than other capital-intensive industries. EPA Survey, supra note 45, at VII-20; Garfield, Earnings Required to Finance Water Company Expansion, Pub. Util. Fort., Aug. 15, 1968, at 27-29. Interest expense generally constitutes approximately 20% of total revenues for all public water systems. EPA Survey, supra note 45, at VII-20. For larger systems (serving 100,000 persons or more), the lower interest rates can save municipally-owned systems as much as two to three cents per thousand gallons of water. Id. at VII-21.


\textsuperscript{73} “Self-liquidating” debt is analogous to “revenue bonds” because the cash revenues from the project to which the debt applies are intended to cover operating and maintenance costs, interest expense and principal repayments. In New Jersey, for the purpose of calculating its municipal debt limit, any revenue deficits for the payments of interest and principal on a “self-liquidating” debt is included in the municipality’s gross debt. N.J. Stat. Ann. §§ 40A:2-6, -44, -45, -48 (West 1980). Virginia’s Constitution provides that if, after a period
aspects of state regulation of municipal bond financing, such as the need in many cases for bond referenda and public issuance of bonds, and limitations on the use of revenue bonds, serve to restrict the financing options available to municipal systems in comparison to other institutions.

Municipalities generally are able to use revenues from water sales for other municipal purposes. Some observers suggest that even where the law requires municipalities to keep the revenues of their water supply systems separate from general funds, in practice surplus water revenues are often “siphoned off” into the general treasury.

The water rates of municipally-owned systems are generally lower than those of investor-owned systems. Many factors contribute to this price differential. First, municipalities enjoy both lower borrowing costs and lesser tax burdens. In addition, the opposition of consumers to rate

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74. Only four Northeastern states limit the use of revenues derived from water sales. Connecticut prohibits any use of waterworks revenues for other municipal purposes. CONN. GEN. STAT. ANN. § 7-204 (West 1972). Vermont prohibits use of waterworks revenues for other municipal purposes whenever water supply bonds are outstanding. VT. STAT. ANN. tit. 24, § 3311 (1975). Massachusetts allows four uses of revenues from water sales: operating expenses, interest and principal payments, reimbursements to towns for money spent on their water departments, and new construction. Any remaining surplus must be used to reduce rates. MASS. GEN. LAWS ANN. ch. 41, § 69B (West Supp. 1984). The rates set by Maine’s municipalities must cover the following expenses: payments for operating and maintaining the system, payments for interest, principal, and sinking fund requirements of not less than two percent nor more than 10% of outstanding indebtedness, and payment of up to five percent of yearly revenues into a contingency reserve fund. 1981 Me. Laws 438, §5.

75. Interview with Peter Kosak, supra note 62. In a 1968 survey of 252 municipally-owned water utilities serving 10,000 customers or more, officials expressed dissatisfaction over the “provision of free water service to other departments, the contributions to general revenue funds and the failure of the city council to permit the water department to operate as a utility.” Keig, Fristoe, & Goddard, Structure of Publicly-Owned Water Utilities, J. OF AM. WATERWORKS, Apr. 1970, at 215, 218 [hereinafter cited as Keig].

A statistical analysis of 337 municipally-owned systems (using 1964 data), conducted to “examine the linkage between utility prices and variables in municipal finance,” revealed “clear evidence of a trade-off between [municipally-owned utility] prices and local taxes . . . . Overall, the evidence indicates that water consumers subsidize municipal operations in more cases than those in which the municipality subsidizes water uses.” P. Mann, The Interlocking of Municipalities and Publicly Owned Utilities, in LOCAL SERVICE PRICING POLICIES AND THEIR EFFECT ON URBAN SPATIAL STRUCTURE 300-01 (P. Downing ed. 1974). See infra note 78 for further discussion of the effects that local political pressures have on the financial operations of municipally-owned water supply systems.

76. Compared with investor-owned systems, municipal systems “in all size categories” consistently sold water at lower rates per thousand gallons of water. EPA SURVEY, supra note 45, at VI-12. An earlier study also found that the “prices charged by privately owned systems [were] . . . systematically higher” than the prices charged by municipal systems. J. Hirshleifer, J. DeHaven & J. Milliman, WATER SUPPLY-ECONOMICS, TECHNOLOGY, AND POLICY 107 (1960) [hereinafter cited as J. Hirshleifer].

77. See supra notes 65-71 and accompanying text.
increases\textsuperscript{78} often motivates municipalities to subsidize water system deficits with property tax revenues. The tendency in such situations is to provide just enough money to permit continued operation, but not enough to cover the costs of new investments.

Municipally-owned systems often suffer from inadequate water supplies because they typically neither reinvest surplus funds, when rates are high enough to yield surpluses, nor raise additional capital through rate increases when deficits occur. For these same reasons, municipally-owned systems also tend to maintain their infrastructure inadequately. This is particularly true in the older municipal systems where leakage in some instances wastes thirty percent or more of the daily water supply, making shortfalls during droughts even more likely.\textsuperscript{79}

In 1980, a presidential task force estimated that "municipally-owned and operated urban water systems are four times as likely as privately-owned systems to experience shortfalls" in supply.\textsuperscript{80} Yet despite the urgency of the situation faced by many systems, the popular notion that water should be free, or as nearly free as possible, is pervasive and difficult to overcome. Many observers suggest that the public's lack of interest in water supply problems is a principal reason why municipalities have made capital investments in water supply a relatively low priority.\textsuperscript{81}

\textsuperscript{78} A 1980 survey found that "local officials have argued that raising water prices to the levels needed . . . is not feasible politically." \textit{President's Task Force Report}, supra note 43, at III-2. The report cites a number of possible explanations for voter resistance to increased rates: (1) the "desire of some voters to have others pay a portion of their costs;" (2) voter skepticism of "bureaucratic proposals;" (3) the lack of visibility of capital improvements to water supply systems; and (4) a fear that higher rates might overburden low-income families, and might cause businesses and high income residents to leave the area. \textit{Id.} at III-3.

Water supply officials usually emphasize the last two explanations. \textit{See, e.g., 1979 Hearings}, supra note 26, at 122-28, in which Buffalo city officials testified that $500 million was needed to "bring [the] system to a decent operating level," but that the city could not raise water rates for fear of losing more residents, given New York's already high tax structure. The officials also expressed concern about increasing the burden on people with fixed incomes. The officials added that the then current rates, which averaged $75-$80 per year for a single family home, had not been raised in four years. \textit{Id.} at 125-26.

\textsuperscript{79} The Commissioner of the New York State Department of Environmental Conservation, Robert Flacke, has testified that several cities in New York, such as Albany, Rochester, and Poughkeepsie, lose between 30-60\% of their daily water supplies to leakage. \textit{1979 Hearings}, supra note 26, at 174; \textit{1981 Hearings}, supra note 2, at 405. New York City estimates that it loses 100 million gallons per day, which is seven percent of its daily supply. \textit{Id.} On an average day in 1980, Philadelphia could not account for 118 million gallons of water (about 33\% of the system's daily supply); 66 million of these gallons were lost to leakage. \textit{Id.} at 775.

During the 1980-81 water shortage, the Connecticut-American Water Company, serving the Town of Greenwich, could not account for about 19\% of its daily water supply. State of Connecticut Dept of Public of Utility Control, Decision with Respect to Application of the Connecticut-American Water Company to Increase its Rates to All Customers, docket no. 81-10-03, at 16 (May 20, 1982).


\textsuperscript{81} \textit{Id.} at III-3; \textit{Keig}, supra note 75, at 219.
b. Investor-Owned Systems

Investor-owned systems are subject to rate regulation and to income and property taxation. In addition, they borrow money at higher rates than municipal systems. Privately-owned systems, however, are unhampered by bond referendum requirements, debt limits, and other similar restrictions. Thus, when they need capital for improvements, private systems can be more flexible than municipal systems, with respect to timing and loan size.

The way in which public utility commissions set water rates significantly affects the investment decisions of private systems. Commissions typically set the water rate at the level necessary to meet a target rate of return on the system's equity, which is related to the value of its capital assets. This method of setting rates creates an incentive for private systems to plow earnings back into new investments. In contrast, ratepayers pressure municipal water systems either to divert their surpluses to other non-water-related uses or to reduce water rates.

To protect ratepayers against unnecessary investments, state laws generally restrict the ability of private systems to include in their rate bases the cost of investments for future use. Limitations on the ability of investor-owned utilities to recoup these costs may skew investment toward smaller storage capacity units which take less time to complete. In contrast, for municipal systems which are not restricted in this manner, once a decision has been made to proceed with a bond referendum and public offering, there may be pressure to overbuild to avoid having to return to voters for additional bond issues.

When examining the role of investor-owned systems in the water supply distribution network, a clear distinction emerges between large and small systems. Although the number of investor-owned water supply systems is roughly equivalent to the number of municipally-owned systems, investor-owned systems serve only sixteen percent of the na-

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83. See 2 A. PRIEST, PRINCIPLES OF PUBLIC UTILITY REGULATION 756-69 (1969) for a discussion of the conflict between the regulatory practice of excluding investments for future use from the rate base and the need for water companies to purchase land and construct reservoirs to meet future demand.
84. It has been suggested that the pursuit of power and glory by bureaucrats and politicians, as well as their failure to properly calculate the cost of investments, substantially contribute to the tendency of governments to over-invest in water supply facilities. J. HIRSHLEIFER, supra note 76, at 369-71. The political hurdles associated with making new capital investments may also contribute to this bias.
85. In 1975, it was reported that investor-owned systems constituted 52% of all public water systems. SECOND NATIONAL WATER ASSESSMENT, supra note 2, at 22-23. The term "public water system" is defined in the Safe Drinking Water Act to include all systems which serve 25 or more people or which have 15 or more service connections. 42 U.S.C. § 300f(4) (1982). Using data supplied pursuant to the Act, EPA found that 44% of the nation's public water systems were investor-owned. EPA SURVEY, supra note 45, at II-5.
Most investor-owned systems are small and serve only single communities. In Pennsylvania, for example, seventy-three percent of the investor-owned systems serve less than 500 customers each. Such small operations generally lack access to the capital necessary to upgrade their facilities to meet increasing consumer demand and to comply with the standards of the Safe Drinking Water Act. In contrast, larger investor-owned systems have been more successful in raising the capital necessary to maintain adequate supplies and services.

There have been increasing failures among small water companies in New York, with the affected municipalities taking over the failed systems.

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86. EPA Survey, supra note 45, at II-5.
87. Sample data show that a majority of systems serving fewer than 500 people are investor-owned, whereas 80% of the systems serving greater than 500 people are municipally-owned. EPA Survey, supra note 45, at IV-3.
88. 1981 Hearings, supra note 2, at 682.
89. 42 U.S.C. §§ 300f-300j-10 (1982). In 1981, while commenting on the fact that 70% of the 1250 water supply systems in Pennsylvania served less than 1000 customers, the Associate Deputy Secretary for Resources Management and Drought Coordination for the State of Pennsylvania testified that:

Most small suppliers lack the technical personnel and fiscal and organizational resources to meet basic standards. Their small rate base does not bode well for their ability to raise needed funds through traditional financing mechanisms, including bank loans and sales of bonds on the open market. Faced with small numbers of customers, unrealistically low rates, and inadequate cash flow, many systems are barely able to meet current expenses; no reserves are available for maintenance and replacement of the basic system. Insolvency and bankruptcy of small suppliers is no longer unknown. If a water supply company goes bankrupt, quite often the only available option is the formation of a municipal authority to take over the system. Unfortunately, such authorities may not be in financial position to solve the underlying problems.

1981 Hearings, supra note 2, at 721. See also New Jersey Master Plan, supra note 29, at 25:

Investor-owned utilities fall into two groups: one representing the larger, established, well-managed and well-financed utilities; and the other representing the small utilities, many of which are under-managed, under-operated and under-financed. The larger investor-owned utility represents a major contribution to good water service in New Jersey. These utilities are among the best operated and maintained in the State. Small investor-owned utilities, however, are a serious concern in many rural and suburban communities. Most of the small investor-owned utilities are a fall-out of land development where franchises were granted by a community and the system recognized by the State. Without borrowing capacity for improvements, or the organization and funds to cope with the rate-making process, these small systems have been a trial for regulatory agencies and a frustration to their customers and local governments.

In 1977, to facilitate local compliance with the Safe Drinking Water Act, Connecticut instituted a program that offered financial help to local water supply systems. The program provided $4 million in loans to investor-owned systems serving between 25 and 10,000 persons. It also made $3 million in grants available to municipally-owned systems. 1977 Conn. Acts 614, § 587 (Reg. Sess.). The state subsequently increased funding to a total of $9 million: $5 million for loans to investor-owned systems, and $4 million for grants to municipally-owned systems. 1981 Conn. Acts 370, § 7 (Reg. Sess.). In 1982 the state expanded the program, making loans and grants available to systems that had been ordered by the Department of Health Services to remedy problems of inadequate supply. 1982 Conn. Acts 735, § 1 (Reg. Sess.).

tems.\textsuperscript{91} There is evidence that this phenomenon may be occurring in other states as well.\textsuperscript{92} Not all municipal takeovers, however, involve small or failing systems. In August 1980, for example, the profitable New Haven Water Company, which served Connecticut's New Haven metropolitan area, sold its system to a public authority. The reasons for the sale were related primarily to the lower financing costs\textsuperscript{93} enjoyed by a quasi-municipal entity and the desire of the shareholders to maximize their profits on the sale of large land holdings no longer needed by the utility. Without the sale of the company as a whole, most of the profits from individual sales of land would have been returned to the ratepayers rather than the shareholders.\textsuperscript{94}

c. Special Districts and Public Authorities

Special districts and public authorities\textsuperscript{95} theoretically enjoy the best of two worlds. As quasi-municipal entities, they receive favorable tax treatment. Almost all states exempt these systems' property, wherever located, from taxation.\textsuperscript{96} As semi-autonomous public bodies, they can

\textsuperscript{91} Interview with Stuart M. Dean, Chief Permit Administrator for Water Supply, Bureau of Water Resources, New York State Dep't of Env'l Conservation (Oct. 18, 1982).

\textsuperscript{92} A recent survey of the 45 state commissions that regulate water supply utilities found a "pervasive belief that many [such utilities] are simply too small to function efficiently as public utilities." \textit{National Regulatory Research Inst., Commission Regulation of Small Water Utilities: Some Issues and Solutions} 26 (1983).

\textsuperscript{93} The public authority's lower financing costs reflect both its lower borrowing rate and its ability to debt finance the entire cost of improvements. The latter advantage allows the public authority to avoid having to use costly equity financing as a means of maintaining acceptable debt to equity ratios. Telephone interview with Robert McGugh, Executive Director, South Central Regional Water Authority (successor to the New Haven Water Company) (Aug. 1, 1983).

\textsuperscript{94} The New Haven Water Company faced large costs to construct facilities to satisfy the Safe Drinking Water Act's standards. At the same time, the company sought to sell some of its large holdings of watershed land no longer needed with the construction and operation of the treatment plants. The company, however, was uncertain whether all or any of the sale proceeds would go to shareholders as opposed to ratepayers. The municipalities served by the New Haven Water Company, on the other hand, feared that the company's sale of these lands could lead to unwanted development. This combination of factors created a willing seller and a willing buyer of the company's assets. \textit{Id.}

\textsuperscript{95} Special districts are governmental units formed to perform either a single or a limited number of governmental functions for a particular geographical area. They are the most numerous form of local government. \textit{U.S. Bureau of the Census, 1982 Census of Governments, Preliminary Report No. 1, Governmental Units in 1982} 1 (1982). The Bureau of the Census classifies "public authorities" as "special districts."

As a general matter, public authorities tend to rely solely on user fees rather than tax revenues to pay operating costs. Members of the governing boards of public authorities are usually appointed rather than elected, and their jurisdiction and constituencies tend to be flexible. In contrast, special districts may have the power to tax, their governing boards are often elected, and they serve specific geographical areas. D. Mandelker, D. Netsch & P. Saltsich, Jr., \textit{State and Local Government in a Federal System} 26 (2d ed. 1983); O. Reynolds, Jr., \textit{Handbook of Local Government Law} \S\S\ 11, 13 (1982).

manage their affairs more efficiently and with less red tape than most government agencies. Each state surveyed here has authorized the creation of either water supply districts, water supply authorities, or, in many cases, both.97

Quasi-municipal entities also offer the advantage of structural flexibility, since jurisdictional lines can be drawn to reflect regional, rather than local, needs.98 Most of the quasi-municipal water supply systems, however, have been limited to serving areas no larger than individual counties99 or metropolitan areas.100

II

CASE STUDIES

The array of decisions that in the aggregate ultimately determine the supply of water to each resident of a state occurs within a complex legal structure involving the mandates of several regulatory agencies as well as traditional property rights relating to the allocation of water. This section contains case studies of how, in three representative states, Connecticut, New Jersey and New York, these legal structures led to the 1980-81 crisis and how these structures have been altered in response to that crisis. To provide background, this section begins with a brief history of the allocation of water rights in the Northeastern states and a description of the 1980-81 crisis in the three states.


98. In six states, Delaware, Maine, Maryland, New Jersey, Pennsylvania, and Virginia, any municipality may establish its own water supply authority (or a “district,” in Maine and New Jersey) or may join with others to form a joint water supply authority (or district). DEL. CODE ANN. tit. 16, §§ 1401-1402 (1983); ME. REV. STAT. ANN. tit. 30, § 5103 (1964); MD. HEALTH-ENVT'L. CODE ANN. § 9-902 (1982); N.J. STAT. ANN. § 40:62-96 (West 1967); PA. CONS. STAT. ANN. § 306 (Purdon 1974); VA. CODE § 15.1-1241 (1981). In Delaware, Maryland, New Jersey, and Pennsylvania, the term “municipality” is used broadly to include local government units such as counties, towns, and boroughs, in addition to incorporated cities and villages.

A majority of Maine’s water supply systems are run by water supply districts, whose customers number from as few as 24 persons to as many as 40,370. Letter from the State of Maine Public Utility Commission to the author (Oct. 1982). Maine law blurs the line between municipalities and their water districts: where the two entities’ boundaries coincide, municipalities can appropriate money for the districts. ME. REV. STAT. ANN. tit. 30, § 5103(b) (1964).

99. Counties, unlike municipalities, tend not to own their own water supply systems. If water is to be provided on a county-wide basis, it will be through a special district or an authority.

100. The New Jersey District Water Supply Commission is an exception to this pattern; serving twelve counties, it is a large supplier of water to Northeastern New Jersey. Municipal membership in the District is voluntary; thus far only six governmental entities have joined—Bloomfield, Glen Ridge, Kearny, Montclair, Newark, and the Passaic Valley Water Commission, a quasi-municipal entity which serves three municipalities. M. GREENBERG & R. HORDON, supra note 13, at app. B, 162.
A. Allocation of Water Rights: Historical Background

1. Surface Water

In the Northeastern states, the allocation of surface water is based on riparian rights law, the doctrine generally in effect throughout the eastern half of the nation. Under riparian principles, an owner of land adjacent to a river or stream enjoys a usufructuary property right in that water course. This right allows him to divert surface water for use on riparian lands. A riparian owner's right is not unlimited, however, and depends on whether the state recognizes the "English rule" or the "American rule." Under the English rule, each riparian owner is entitled to have the "natural flow of the stream reach his land materially unaltered except for the domestic uses of upper riparians." Use of the water on nonriparian lands is not permitted and may be enjoined by another riparian owner whether or not actual injury results from the nonriparian use.

The restrictiveness of the English rule led the courts of many Northeastern states to adopt a rule of reasonable use (the "American rule") with respect to nondomestic uses and, to a lesser extent, nonriparian uses. Under the American rule, a riparian owner's reasonable use of water is subject to the equal right of other riparian owners to make a reasonable use of the water. Conflicts as to what constitutes reasonable use are resolved by the courts.

The riparian rights system of water allocation, with conflicts resolved through the courts rather than by administrative procedures, suited an area with abundant water resources. During the 1950's, however, a movement developed in the eastern states to shift to the prior appropriation doctrine, generally applicable in the arid western states, as a better means of allocating water to the highest beneficial uses in the public interest. Although only one eastern state, Mississippi, adopted...
a prior appropriation scheme,\textsuperscript{107} many states began thinking in terms of statewide water resource management. Several states enacted statutes that modified the common law by requiring permits or licenses for certain types of water diversion.\textsuperscript{108} In most Northeastern states, though, state involvement in water resource management remained limited to long-term planning and data collection.

2. Groundwater

Groundwater is subject to common law riparian rules only when it constitutes an underground stream. To qualify as such, a subterranean watercourse must possess "a channel, consisting of well-defined beds and banks, and a current of water"\textsuperscript{109} whose existence and location are "known or ascertainable."\textsuperscript{110} Little groundwater falls within this definition; rather, most groundwater is classified as "percolating."\textsuperscript{111} Three different rules of allocation apply to percolating groundwater: the English or absolute rule, the American or reasonable use rule, and the correlative rights rule.

The English rule entitles a landowner to capture all of the percolating water beneath his property, regardless of the intended use or the ef-
fect such use may have on neighboring groundwater levels.\textsuperscript{112} Under the American rule, a landowner can only use groundwater for beneficial purposes "with a reasonable relationship to the use of his overlying land."\textsuperscript{113} Thus, unlike the English rule, the American rule prohibits the use of percolating water on non-overlying lands. Most of the Northeastern states have adopted the American rule, particularly as applied to municipalities.\textsuperscript{114} Under the rule of correlative rights, courts apportion percolating water among overlying landowners when there is insufficient supply. This last rule is similar to the riparian rule of reasonable use, reflecting the notion that water rights are usufructuary, rather than corporeal.\textsuperscript{115}

The traditional legal distinctions between surface water and groundwater ignore the principles of hydrology, which demonstrate the interrelationship of all water within a watershed basin. Thus commentators have criticized the common law of water allocation because important resource decisions are based on inadequate and artificial legal concepts.\textsuperscript{116}

\textbf{B. The 1980-81 Drought’s Severity and Impact on Water Distribution}

The drought of 1980-81 imposed severe strains on the water supply systems of many communities in New York, New Jersey and Connecticut. Consider, for example, New York City’s system, which normally supplies 1.5 bgd. By February 1981, the city’s reservoirs were reduced to one-quarter of their capacity.\textsuperscript{117} In addition, the Delaware River Basin Commission had cut the city’s entitlement to Delaware River water by more than one-third, from 800 mgd to 520 mgd.\textsuperscript{118} Faced with these supply limitations, both the city and Westchester County, which is supplied in part by the New York City water system, imposed restrictions on residential and nonresidential water use.\textsuperscript{119}

In response to water shortages in New Jersey’s populous seven

\begin{itemize}
  \item \textsuperscript{112} S. Clarcy-Wantrup, W. Hutchins, C. Martz, S. Sato & A. Stone, Waters and Water Rights §§ 17.1, 52.2(B) (R. Clark ed. 1967).
  \item \textsuperscript{113} Ausness, supra note 108, at 551.
  \item \textsuperscript{114} See generally Waters and Water Rights, supra note 101, at 157-59; Hanks & Hanks, supra note 111, at 630-50.
  \item \textsuperscript{115} Hanks & Hanks, supra note 111, at 640-48.
  \item \textsuperscript{116} "Ground water [sic] is often naturally interrelated with surface water: ground water feeds springs and surface streams, and surface water charges ground water reservoirs. Nevertheless, there persists [sic] in the laws of many States myths (long ago abandoned by hydrologists) that ground water is separate from and unrelated to surface water." National Water Commission, supra note 4, at 233. The Commission recommended an integrated management approach to both surface water and groundwater. \textit{Id.}
  \item \textsuperscript{117} 1981 Hearings, supra note 2, at 104.
  \item \textsuperscript{118} Id. at 927.
  \item \textsuperscript{119} N.Y. Times, Jan. 20, 1981, at A1, col. 1; N.Y. Times, Apr. 1, 1981, at B-3, col. 6. New York City supplies approximately 100,000 gallons of water per day to surrounding communities, most of them in Westchester County. 1979 Hearings, supra note 26, at 223.
\end{itemize}
northern counties, the Governor declared a state of emergency. He ordered a twenty-five percent reduction in the area's industrial consumption and limited residential consumption to fifty gallons per person per day, approximately seventy-five percent of the typical daily in-home use.

Many communities in Connecticut also restricted residential water use. For example, when its total water supply dwindled to a level that could only last for twenty days, the Town of Greenwich limited individual residents to forty-five gallons per day, about forty percent of the typical daily in-home use for the area.

Not every locality in the Northeast, however, faced water supply problems. Communities within ten miles of Greenwich, for example, did not have a shortage requiring restrictions on water use. The largest water company in Connecticut, Bridgeport Hydraulic Company, had a surplus of water, but no interconnecting pipelines to deliver water to Greenwich. The same pattern was evident in New Jersey. Not only were there significant differences among neighboring communities, depending upon the storage capacity of their water suppliers, but two state-owned reservoirs, Spruce Run and Round Valley, with a combined storage capacity of sixty-six billion gallons, were near capacity; only a pipeline to transfer the water from the reservoirs to the suffering communities was missing.

The question raised is why the water supply systems in these states were unable to provide a more rational distribution of water in a time of shortage.

120. About 3.5 million people, 48% of the state's population, reside in these seven northern counties. New Jersey Master Plan, supra note 29, at 2.
121. Exec. Order No. 98, New Jersey (1980); 1981 Hearings, supra note 2, at 221.
123. Id.; Engineering Task Force, supra note 122, at 1.
124. Id.; Engineering Task Force, supra note 122, at 1.
125. N.Y. Times, Sept. 21, 1980, § IV, at 6, col. 3; N.Y. Times, Sept. 28, 1980, at 40, col. 3. The Round Valley and Spruce Run Reservoirs, with a combined yield of 160 mgd, are approximately 26 miles west of the drought area. N.Y. Times, Oct. 1, 1980, at B2, col. 1. When New Jersey's Governor imposed water rationing, reservoirs owned by the Hackensack Water Company, serving 800,000 northeastern New Jersey residents, were filled to only 28% of capacity, while Round Valley Reservoir, the larger of the two state-owned reservoirs, was filled to 84% of capacity.
C. Legal Structures in the Three States: 
Influence on Response to Crisis

1. Connecticut

The regulation of water resources in Connecticut is carried on by 
three state agencies: the Department of Environmental Protection, the 
Department of Health Services, and the Public Utilities Commission. 
The Department of Environmental Protection, the Department of Health 
Services, and the state's planning agency, the Office of Policy and Man-
agement, are responsible for developing long term plans for water re-
source management.126

The Department of Environmental Protection regulates the allocation 
of water. At the time of the 1980-81 drought, all Connecticut water 
systems needed Department of Environmental Protection approval to di-
vert water from rivers,127 and investor-owned systems needed approval 
to sell surplus water.128 Since the enactment of the Connecticut Water 
Diversion Policy Act in 1982, the Department of Environmental Protec-
tion has administered a permit system of allocation.129

The Department of Health Services has jurisdiction over “all mat-
ters concerning the purity and adequacy of any source of water or ice 
supply used by any municipality.”130 Like health agencies in other 
states, the role of the Department of Health Services is primarily limited 
to questions of drinking water quality.131 All water supply systems in 
Connecticut must report annually to the Department of Health Services,
132 and all proposed construction or expansion of water sources re-
quires Department of Health Services approval.133 In addition, no water 
supply system, whether investor-owned or municipally-owned, can sell 
watershed lands without Department of Health Services approval.134

The Public Utilities Commission regulates Connecticut's investor-
owned water supply systems. The Department of Public Utility Control, 
which serves as a staff for the Public Utilities Commission, is the state 
agency most actively involved in the daily operations of such systems.

126. CONN. GEN. STAT. ANN. §§ 22a-352 to -353 (West Supp. 1983). Despite the 
Department of Health Services' statutory role in water resources planning, none of its Water 
Supply Section's 11 members (seven full-time professional engineers and four part-time em-
ployees) is directly responsible for water resources planning. Telephone interview with Ray 
Jarema, Chief, Water Supply Section, Connecticut Dep't of Health Services (Aug. 1, 1983).

127. CONN. GEN. STAT. ANN. § 25-8(a) (West 1975).


129. Id. §§ 22a-365 to -378. See infra notes 172-77 and accompanying text for a dis-
cussion of the new permit system.


131. Telephone interview with Ray Jarema, supra note 126.


134. Id. § 25-32(b).
Although municipally-owned systems must file annual reports with the Public Utilities Commission, the Commission has no jurisdiction over those systems or over systems owned by homeowner or condominium associations.

The Public Utilities Commission monitors the adequacy of service provided by investor-owned systems. The Commission reviews not only financial matters, but also the adequacy of each company’s supply. Since 1982, the Public Utilities Commission has been authorized to petition the courts for a receiver to take over any water company that it finds is not providing adequate service. In practice, however, the power of the Public Utilities Commission to require the maintenance of a particular safe yield or to insist on capital improvements or changes in operations continues to depend on the Commission’s power to withhold approval for rate increases.

Connecticut has 585 public water systems, which serve about eighty-two percent of the state’s population. Investor-owned systems predominate in Connecticut; however, the majority of these systems serve areas with populations of less than 1000. Only one investor-owned system, Bridgeport Hydraulic Company, provides water to more than 100,000 persons. Only 61 of Connecticut’s public water supply systems are government owned. Public authorities serve the large metropolitan areas of Hartford and New Haven, both of which have populations of more than 100,000.

During the 1980-81 drought, no Connecticut agency had the power

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135. Id. § 16-29.
136. Id. § 16-1.
137. Id. § 16-6b.
138. In monitoring the adequacy of supply, the Commission has required each investor-owned system to maintain a safe yield that is 10% above the system’s average daily demand. Interview with Peter Kosak, supra note 62.
140. Rate hearings for water companies comprise about 80% of the Commission’s caseload. Data from the Connecticut Dep’t of Public Utilities Control supplied to the author (June 1983). For a number of reasons, however, the issues of adequate supply and service by smaller investor-owned systems may not be receiving the necessary level of attention. The aggregate revenue for all regulated water supply systems in Connecticut was $74 million in 1982, as compared with $3.4 billion for other regulated utilities. In addition, the support staff at the Department of Public Utility Control includes only three engineers specializing in water supply. Telephone interview with Peter Kosak, Assoc. Utilities Engineer, Engineering Div., Dep’t of Public Utilities Control (Aug. 2, 1983).
141. Data from the Natural Resources Center, Connecticut Dep’t of Envtl. Protection, supplied to the author (July 1982) (containing preliminary data regarding Connecticut water resources and supply systems) [hereinafter cited as Connecticut Preliminary Data].
142. Id.
143. See supra note 54.
144. Connecticut Preliminary Data, supra note 141. Among the government-owned systems are nine state-owned systems which serve an airport, two jails, three hospitals, and three schools. The other 52 government-owned systems are owned by municipalities.
145. Id.
to order water systems to interconnect pipelines absent a state declaration of emergency.\textsuperscript{146} The state never declared a state of emergency, apparently because officials feared potential liability to firms forced to curtail operations as a result of a reduction in water supply.\textsuperscript{147} The Department of Environmental Protection, the Public Utilities Commission, and the Department of Health Services, however, participated in negotiations among local communities in southwest Connecticut concerning the possibility of establishing emergency interconnections.

When the negotiations began, the Connecticut-American Water Company, serving the Town of Greenwich, was in danger of running out of water.\textsuperscript{148} The Stamford Water Company, serving the nearby City of Stamford, was in a position to help because, although it had a smaller water basin than the Greenwich system, it had greater storage capacity.\textsuperscript{149} Interconnections capable of carrying up to ten mgd already linked the two systems.\textsuperscript{150} As a result of the negotiations, Stamford shipped one mgd to Greenwich from the end of December 1980 through mid-February 1981.\textsuperscript{151} Greenwich also negotiated with two other nearby water supply systems: Norwalk Taxing District No. 2, a quasi-municipal system east of Stamford which had ample water for its own needs, and Bridgeport Hydraulic Company, still further east, which enjoyed a surplus.\textsuperscript{152} Although Norwalk was initially reluctant to part with any water,\textsuperscript{153} the system eventually agreed to supply needed water to Green-

\textsuperscript{146} N.Y. Times, Feb. 1, 1981, § 23, at 1, col. 5.
\textsuperscript{147} Id.
\textsuperscript{148} N.Y. Times, Jan. 25, 1981, § 23, at 1, col. 3.
\textsuperscript{151} Although the interconnections were capable of transferring more than one mgd, Stamford was unwilling to sell more than that amount because of its own customers' needs. N.Y. Times, Jan. 22, 1981, at B1, col. 5. Stamford transferred a total of 38 million gallons of water to Connecticut-American, which paid $400 per million gallons. In addition, the latter company was obligated to, and did, return all 38 million gallons to the Stamford system at no charge. Thus, Connecticut-American paid Stamford a total of $30,400 (using $400 as the market value). Telephone interview with Joseph Yates, supra note 150. The supervising engineer at the Department of Public Utility Control reported that some persons considered the "total package" to be over-priced. He added, however, that time pressures and the lack of other sources left no other alternative. Telephone interview with Peter Kosak, supra note 140.
\textsuperscript{152} N.Y. Times, Jan. 25, 1981, § 23, at 1, col. 3.
\textsuperscript{153} According to a Connecticut-American Water Company official, Norwalk's reluctance to sell water was connected to its attempts to pressure the Department of Environmental Protection into approving Norwalk's diversion of water from a nearby river to substitute for any water supplied to Greenwich. Under Connecticut law, the river could not be used for drinking water without a waiver from the Department. The Norwalk water system had unsuccessfully sought a general waiver from the Department prior to the drought. Telephone interview with Joseph Yates, supra note 150. Officials at Norwalk, however, attributed the reluctance to sell water to the lack of assurance that any costs incurred by the Norwalk system to purchase additional water from Bridgeport Hydraulic, to make up for water delivered out of the Norwalk system to Greenwich, would be repaid. In essence, the Norwalk system was afraid to
wich. Unfortunately, the agreement could not be implemented without construction of an emergency pipeline. Given the length of the negotiations and the physical difficulties posed by the geography of the area, it was not feasible to construct a pipeline within the necessary time.\textsuperscript{154}

For several years preceding the drought of 1980-81, the water supply systems of southwestern Connecticut had considered the concept of a permanent regional pipeline, but they failed to act on the idea. Officials at Connecticut-American and Bridgeport Hydraulic attributed this inaction to questions about financing and a lack of agreement regarding the need for a pipeline.\textsuperscript{155} A recent Army Corps of Engineers study recommends the construction of such a project and estimates that a six-mile pipeline from Norwalk to Stamford, capable of carrying 8.5 mgd, would cost $5.2 million.\textsuperscript{156}

The recent shortages have given new impetus to negotiations that may lead to the construction of a pipeline connecting Bridgeport Hydraulic with Greenwich. Under the current proposal, Bridgeport Hydraulic would construct and operate the pipeline, and would receive financial support from investor-owned companies connecting to the new line.\textsuperscript{157} The Stamford Water Company has been cautious about participating in the project.\textsuperscript{158} Bridgeport Hydraulic and Stamford Water Company, however, are presently negotiating an agreement whereby Bridgeport Hydraulic will acquire Stamford.\textsuperscript{159} The acquisition of Stamford Water Company would eliminate a major obstacle to plans for the pipeline.\textsuperscript{160}

Another obstacle to the proposed pipeline is the opposition expressed by the two quasi-municipally-owned systems that serve the town of Norwalk: Norwalk Taxing District No. 1 and Norwalk Taxing District No. 2.\textsuperscript{161} Officials from the area’s investor-owned systems suggest that the Norwalk systems oppose the pipeline project because it threatens their hopes to draw drinking water from the Norwalk River,\textsuperscript{162} which

\textsuperscript{154} Telephone interview with John Hiscock, Chief Engineer, Norwalk Taxing District No. 2 (Sept. 29, 1983).
\textsuperscript{155} Interview with Carolyn Gimbrone, Senior Environmental Analyst, Natural Resources Center, Connecticut Dep’t of Envt’l Protection (July 23, 1982).
\textsuperscript{156} Telephone interview with Robert H. Reinert, Executive Vice President, Bridgeport Hydraulic Co. (Aug. 2, 1983).
\textsuperscript{157} Id.; telephone interview with Joseph Yates, \textit{supra} note 150.
\textsuperscript{158} Telephone interview with Robert H. Reinert, \textit{supra} note 157.
\textsuperscript{159} Id.
\textsuperscript{160} As of August 2, 1983, Bridgeport and Stamford had reached an agreement, and were awaiting the Public Utility Commission’s expected approval. \textit{Id.}
\textsuperscript{161} \textit{Id.}
\textsuperscript{162} See \textit{supra} note 153.
WATER SUPPLY IN THE NORTHEAST

fails to meet Department of Environmental Protection quality standards. Although the Department of Environmental Protection has the power to waive its standards, the Norwalk systems thus far have not persuaded the agency to do so. Should a new pipeline make water available to Norwalk from the Bridgeport system, Norwalk's case for receiving the waiver would be greatly weakened.\(^{163}\)

An official from Norwalk Taxing District No. 2 described a different reason for the district's "violent" opposition to the project. He argued that the pipeline will cost more if owned and financed by Bridgeport Hydraulic, an investor-owned system, than if owned and financed by a governmental entity.\(^{164}\) The official acknowledged that his system was seeking legislative approval to withdraw water from the Norwalk River, which would allow the town to satisfy its water needs at minimal costs for the next fifty years.\(^{165}\) Despite significant cost differences between obtaining water from the Norwalk River and participating in a regional pipeline, there seems to be some willingness on the part of Norwalk Taxing District No. 2 to support a regional pipeline if it is owned by a government authority. Norwalk's objection to the current proposal apparently derives primarily from a distrust of investor-owned systems and from a perception that the interests of private shareholders and the Public Utilities Commission are inconsistent with those of ratepayers.

Had a regional pipeline existed in 1980, Greenwich could have received needed water from other water companies that possessed surpluses. The question still remains as to why Greenwich's water system was so much more vulnerable than neighboring systems. The answer reveals certain other failings in the regulatory scheme existing at the time. A review of the Public Utilities Commission's decision regarding a rate increase requested by Connecticut-American after the water crisis, as well as discussions with various persons involved in the 1980-81 drought, indicates that there was a failure by the water company to increase its water supply in order to meet increasing demand in a community with high water consumption patterns and increasing commercial and industrial use.\(^{166}\) There was also a failure to reduce water leakage, which the Public Utilities Commission calculated to be over eighteen percent.\(^{167}\) These factors made the Greenwich system more vulnerable dur-

\(^{163}\) Telephone interview with Robert H. Reinert, supra note 155; telephone interview with Joseph Yates, supra note 150.

\(^{164}\) Telephone interview with John Hiscock, supra note 153.

\(^{165}\) Id.

\(^{166}\) State of Connecticut, Dep't of Public Utility Control, Decision in the Application of the Connecticut-American Water Company to Increase its Rates to All Customers, No. 81-10-03 (May 20, 1982), at 16-17 [hereinafter cited as 1982 PUC Decision].

\(^{167}\) The Commission rejected rate increases to cover the company's cost of dealing with the emergency on the ground that the additional costs were due to management failures to deal with the need for increased supply and reduced leakage. Id.
ing a drought than other communities. The 1982 decision of the Public Utilities Commission also shows that an earlier warning by the Commission concerning the inadequacy of the system's water supply had failed to forestall the crisis.\footnote{166. A 1976 Public Utility Commission decision on Connecticut-American's request for a rate increase noted the narrow margin between Connecticut-American's safe yield and its average daily demand, and warned the company of the consequences of delaying the development of new sources. State of Connecticut, Dep't of Public Utility Control, Decision in the Application of the Connecticut-American Water Company to Increase its Rates to All Customers, No. 76-01-04 (June 21, 1976), at 7-8 [hereinafter cited as 1976 PUC Decision]. In 1976 and in 1980, the Connecticut-American system's safe yield was 17.0 mgd. By Commission standards, which use 10\% as an adequate margin of safety between safe yield and average daily demand, Connecticut-American's average daily demand should have been "no more than 15.30 mgd." 1982 PUC Decision, supra note 166, at 16. In 1976, the system's average daily demand was 15.2 mgd, while in 1980 it was 16.78 mgd. 1976 PUC Decision, supra, at 7; 1982 PUC Decision, supra note 166, at 16.}

Attempts by the Public Utilities Commission to condition rate increases on improvement of services thus far have not yielded results.\footnote{169. 1982 PUC Decision, supra note 166, at 22.} For example, in 1982 the Commission ordered Connecticut-American's parent company, the American Waterworks Company, a large holding company of investor-owned systems, to devise a plan for increasing its equity position in Connecticut-American.\footnote{170. Id.} This would reduce Connecticut-American's heavy reliance on debt. According to newspaper reports, American Waterworks has refused to pursue future equity investment unless the Commission increases its equity rate of return.\footnote{171. N.Y. Times, Dec. 5, 1982, § 23, at 1, col. 1.}

In Connecticut, at the time of the 1980-81 drought, there was little state involvement in the allocation of water rights. In particular, information regarding existing water rights and supply was not centralized. Some of the failings in state regulation revealed by the 1980-81 drought have since been corrected by legislation.

The Connecticut Water Diversion Policy Act\footnote{172. CONN. GEN. STAT. ANN. §§ 22a-365 to -378 (West Supp. 1984).} establishes a permit system, administered by the Department of Environmental Protection, for future diversions of surface water and groundwater by any person, including municipalities.\footnote{173. Id. § 22a-365.} Existing diversions were to be registered by July 1, 1983, or become subject to the permit provisions of the Act.\footnote{174. Id. § 22a-377(a)(1), (2). The Act exempts diversions of less than 50,000 gallons in a 24-hour period. Id. § 22a-368.} The Act sets no specific duration for permits, but empowers the agency to temporarily suspend or place additional conditions upon permits during water supply emergencies.\footnote{175. Id. § 22a-378(a)(1).} In addition, no permit can be transferred without the Department of Environmental Protection's...
Ironically, the Water Diversion Policy Act was not passed in response to the 1980-81 drought, but was a reaction by rural Connecticut communities to the Hartford Metropolitan Authority's attempt to acquire water rights from outside its watershed basin.177

More direct outgrowths of the 1980-81 drought are Public Acts 81-358178 and 81-427.179 The first of these acts empowers the Public Utilities Commission to require an investor-owned water company to interconnect with another investor-owned company or with a municipal system desiring an interconnection, if the Commission finds that such action "would be an effective means of relieving site-specific water shortages."180 Consistent with its jurisdictional limits,181 the Public Utilities Commission has no power to order a municipally-owned system to interconnect with another system, regardless of whether the municipally-owned system has a water surplus or deficit. Under the second statute, Public Act 81-427, any construction or expansion of a water source must be approved by the Public Utilities Commission.182 In making its decisions, the Public Utilities Commission must consider whether the applicant system will operate the new facility "in a reliable and efficient manner" and whether unnecessary "duplication of water service" might result.183 This statute gives the Commission broad power to control the number of new systems created in the state and to encourage the merger of existing systems.

In reaction to the drought, the Connecticut legislature also amended the statute that empowers the Department of Health Services to approve or deny proposals for new water supply sources.184 Prior to the drought, Department of Health Services based its decisions on criteria relating to the "purity and adequacy" of prospective supply sources.185 Now the agency must also consider the possible effects of the proposed system on other nearby systems, including private wells.186

While the Water Diversion Policy Act seems to designate the Department of Environmental Protection as the lead agency in water resource management, the other two state agencies continue to exercise overlapping jurisdiction. A task force has been created to examine

176. Id. § 22a-368(c).
177. Interview with Carolyn Gimbrone, supra note 154.
181. See supra note 137 and accompanying text.
183. Id.
184. Id. § 25-33(b).
agency responsibilities as well as the much broader issue of water supply distribution.\textsuperscript{187}

2. New Jersey

New Jersey has a far longer history of state regulation of water rights than Connecticut. New Jersey’s first statutory modification of common law water rights occurred in 1905, when the state legislature passed a law requiring state approval for all interstate water diversions.\textsuperscript{188} In 1907, the state established a permit system governing all water diversions for public water supply use. In 1947, the permit system was extended to large private groundwater diversions in designated areas.\textsuperscript{189} The 1963 permit system,\textsuperscript{190} applicable to private surface water diversions in designated areas, placed New Jersey at the forefront of the eastern states in enlightened water resource management.\textsuperscript{191}

At the time of the recent drought, the Department of Environmental Protection was New Jersey’s primary water resource management agency. The Department regulated both allocation and water quality, except that diversion permits required the approval of the Water Policy and Supply Council, a lay board appointed by the Governor.\textsuperscript{192}

Public water supply systems in New Jersey rely heavily on both surface water and groundwater. The southern region depends mainly on groundwater, while the state’s more urbanized northern region uses mostly surface water.\textsuperscript{193} New Jersey has 622 water supply systems, 397 of which serve less than 1000 customers each.\textsuperscript{194} Municipally-owned systems account for about one-half of the water supply systems.\textsuperscript{195} New Jersey’s largest supplier is the investor-owned Elizabethtown Water Company.\textsuperscript{196} Two other major systems in northern New Jersey are operated by regional authorities. These two entities, the North New Jersey District Water Supply Commission and the Passaic Valley Water Commission, were formed, pursuant to state statute,\textsuperscript{197} through the voluntary

\begin{footnotesize}
\begin{enumerate}
\item 187. 1982 Conn. Acts 8228 (Spec. Sess.).
\item 188. 1905 N.J. Laws 238, § 1 (repealed by 1965 N.J. Laws 70, § 2).
\item 189. Permits are required for groundwater diversions exceeding 100,000 gallons per day. N.J. STAT. ANN. § 58:1A-7 (West 1982).
\item 190. 1963 N.J. Laws 181 (codified at N.J. STAT. ANN. § 58:1A-3(g) (West 1982)).
\item 193. NEW JERSEY MASTER PLAN, \emph{supra} note 29, at 1.
\item 195. \emph{Id.}
\item 196. M. GREENBERG & R. HORDON, \emph{supra} note 13, at 5; telephone interview with Stephen Nieswan, \emph{supra} note 194.
\end{enumerate}
\end{footnotesize}
association of member municipalities. 198

New Jersey's Board of Public Utilities regulates the water rates charged by investor-owned water companies. 199 The Board also regulates the rates charged by municipal water companies for extraterritorial sales if the extra-territorial service is to more than 1000 customers, or if outside sales are more than twenty-five percent of the system's total revenues. 200 Eighteen of the approximately 300 municipally-owned systems are subject to Board of Public Utilities regulation. 201

Contracting between water supply systems is a common practice. The New Jersey Master Plan identifies 590 interconnections between water supply systems, although only 150 are used for regular water transfers. 202 The twenty-five largest systems in the state are the ultimate source for seventy-five percent of the water distributed by public water supply systems. 203 All contracts by municipalities for the purchase of water require Department of Environmental Protection approval; contracts are limited to fifteen years if the other party is a municipality and thirty years if the other party is a private entity. 204

Long before the 1980-81 drought, it was recognized that the densely populated and highly industrialized northeastern part of New Jersey, located in the Passaic and Hackensack water basins, did not have sufficient water to meet demand. 205 In the 1950's, protracted debate over how to increase the water supply culminated in the construction of two large state-owned reservoirs, Spruce Run and Round Valley, using the Raritan River in central New Jersey. 206 The original proposal for the reservoirs contemplated that the state would build filtration facilities and the necessary pipelines to bring water to the northeast section of the state. 207 These aspects of the plan were eliminated as a result of strong opposition by the major water supply systems, which feared competition from the state. 208 One opponent, the North New Jersey District Water Supply

198. Neither regional authority has taxing power. The Passaic Valley Water Commission has no bonding authority, while the North New Jersey Water Supply Commission has limited authority to issue bonds for transmission facilities, but not for impounding facilities. N.J. STAT. ANN. §§ 58:5-33, -43 (West 1982). Capital investments are financed by the individual members. N.J. STAT. ANN. §§ 40:62-132, 58:5-22 (West 1967 and 1982).
201. Telephone interview with Douglas Ziemba, Supervising Engineer, New Jersey Board of Public Utilities (Aug. 3, 1983). In addition, all municipally-owned systems must report their rates directly to the Department of Consumer Affairs, although that agency has no regulatory power over the systems. N.J. STAT. ANN. § 52:27BB-26 (West 1967).
202. NEW JERSEY MASTER PLAN, supra note 29, at 15.
203. Id. at 1.
206. See 1. MIRI, supra note 49, at 120-212.
207. Id. at 156-57.
208. Id.
Commission, proposed to construct a pipeline to bring water to the northeastern communities, but was unable to obtain sufficient support from its member communities to fund construction.\textsuperscript{209} Today, some of the water reaches northeastern New Jersey indirectly, through purchase and resale by the Elizabethtown Water Company. Almost half the reservoirs' capacity, however, has never been contracted for.\textsuperscript{210}

The failure of these reservoirs to remedy the water supply problems of northern New Jersey, coupled with increasing concerns about the quantity and quality of groundwater in southern New Jersey, led the state to commission the New Jersey Master Plan,\textsuperscript{211} which was completed in 1981. To meet the state's near-term\textsuperscript{212} water needs, the New Jersey Master Plan recommends that the state fund four water supply projects between 1981 and 1985, including a pipeline to connect the Round Valley and Spruce Run reservoirs with the northeastern part of the state.\textsuperscript{213} The drought of 1980-81 and a major water main break in Newark in July 1981 were fortuitously timed to promote public support for a $350 million general obligation state bond issue for water supply projects, which was approved in a November 1981 referendum.\textsuperscript{214} Pursuant to the referendum, however, each specific appropriation for a project must be approved by the legislature.\textsuperscript{215} Thus, the major battles over interbasin transfers from the Raritan basin to the northeastern communities in the Passaic basin are yet to come, with the outcome far from certain. For example, in response to political pressures, feasibility studies are currently being conducted to consider alternatives to a pipeline.\textsuperscript{216}

The crisis of 1980-81 prompted the New Jersey legislature to grant the Department of Environmental Protection broader regulatory powers. The state adopted a more extensive permit system by giving the Department of Environmental Protection authority to modify existing uses previously exempted from regulation.\textsuperscript{217} The legislation transferred all functions of the Water Policy and Supply Council to the Department of Environmental Protection and created a new Water Supply Advisory

\begin{itemize}
\item \textsuperscript{209} Id. at 156-59.
\item \textsuperscript{210} Id. at 199-204.
\item \textsuperscript{211} See supra note 29.
\item \textsuperscript{212} "Near-term" is defined as water supply needs for the period 1985-2000. 1981 Hearings, supra note 2, at 149.
\item \textsuperscript{213} NEW JERSEY MASTER PLAN, supra note 29, at 72.
\item \textsuperscript{214} Water Supply Bond Act, 1981 N.J. Laws 261.
\item \textsuperscript{215} Id. § 15(a).
\item \textsuperscript{216} Telephone interview with Stephen Neiswan, supra note 194.
\item \textsuperscript{217} Water Supply Management Act, 1981 N.J. Laws 262 (codified at N.J. STAT. ANN. §§ 58:1A-1 to -17 (West 1982)). The New Jersey Master Plan strongly recommended that the Department of Environmental Protection be given the ability to regulate existing uses. This power was considered particularly important in connection with groundwater, because prior law had excluded diversions of over 740 mgd from both reporting and permitting requirements. NEW JERSEY MASTER PLAN, supra note 29, at 13.
\end{itemize}
Council, which has a purely advisory role in permitting and in other water supply matters. The legislature also strengthened the Department of Environmental Protection’s powers to order both municipally-owned and investor-owned systems to interconnect and to upgrade their facilities.

In addition, the legislature adopted the Small Water Company Act of 1981, which jointly vests the Department of Environmental Protection and the Board of Public Utilities with the power to order the merger of water systems, regardless of their form of ownership. There is some doubt, however, over the extent to which these agencies will use their new powers under this Act. The New Jersey Master Plan, which is intended to guide these agencies in the exercise of their authority, pays homage to the role of local governments with the following principle:

Responsibility for the development of water resources and the operation of water supply systems should be commensurate with the lowest level of government capable of being financially responsible for the particular water supply project.

Furthermore, the Administrator of the Water Supply and Watershed Management Section of the Department of Environmental Protection has indicated a general reluctance to interfere with the prerogatives of local governments.

Currently, the Department of Environmental Protection is concentrating on obtaining the necessary feasibility studies for the projects specified in the New Jersey Master Plan, and on administering a $15 million revolving loan program, funded out of bonds issued pursuant to the 1981 referendum, for the construction of interconnections among the state’s water systems. Under the terms of the referendum, only municipally-owned systems are eligible to participate in the program, but they are free to interconnect with investor-owned systems. The purpose of the program is to enable systems to move water to areas where it is needed in times of emergency. The goal set out in the proposed regulations is to

219. The Water Supply Management Act provides that the Department may “order the interconnection of public water supply systems whether in public or private ownership, whenever the department determines that the public interest requires that the interconnection be made...” 1981 N.J. Laws 262, § 15(e) (codified at N.J. Stat. Ann. § 58:1A-15(e) (West 1982)).
221. Id.
223. Interview with William Whipple, Administrator, Water Supply and Watershed Management Section, New Jersey Dep’t of Envtl. Protection (Oct. 25, 1982).
224. Id.
225. The funds generated by the referendum can only be used for water supply facilities (defined to include interconnections) which are owned by the state or its political subdivisions. Water Supply Bond Act, 1981 N.J. Laws 261, § 3(i).
enable all water supply systems in New Jersey to be interconnected with other systems so that any system can obtain a minimum of fifty percent of its "average water supply usage" from other systems, with no more than thirty-five percent coming from any one adjacent system.\textsuperscript{226} Priority will be given to small systems that are responding to an order or recommendation of the Department of Environmental Protection to repair or construct interconnections.\textsuperscript{227} Given the relatively limited amount of funds available, it is uncertain whether the program will attain its goals.

As another response to the 1980-81 drought, the legislature created the New Jersey Water Supply Authority.\textsuperscript{228} The Authority was given title to all existing state water facilities, including the Round Valley and Spruce Run reservoirs, and will be the owner of any new state funded water projects.\textsuperscript{229} The legislation specifically denies the Authority the power to "plan, initiate, acquire, construct, maintain or operate any retail water system or project."\textsuperscript{230} An earlier draft of the legislation would have authorized the Authority to distribute water, and to construct and operate water supply facilities.\textsuperscript{231} (Under this draft, the Authority would have been termed the "New Jersey Water Supply Utility."\textsuperscript{232}) As was the case with the legislation for the Round Valley and Spruce Run Reservoirs, the power to engage in the distribution of water was deleted from the final bill.

The 1981 bond referendum instructs the Authority and the Department of Environmental Protection to work with the Board of Public Utilities to develop a program that, "to the maximum extent practicable and feasible," will charge each water supply system that benefits from any state water project for "the full cost of planning, designing, acquiring, constructing and operating" the project.\textsuperscript{233} These provisions reflect the state's experience with Round Valley and Spruce Run. Much of the capacity of these reservoirs has remained uncommitted, and consequently the revenues received by the state have not been sufficient to retire the bonds issued to finance their construction.\textsuperscript{234}

\textsuperscript{226} N.J. ADMIN. CODE tit. 7, § 1G-2:12(f) (proposed Oct. 1982).
\textsuperscript{227} Id. § 1G-2:12(h), (a).
\textsuperscript{228} New Jersey Water Supply Authority Act, 1981 N.J. Laws 293 (codified at N.J. STAT. ANN. §§ 58:1B-1 to -25 (West 1982)).
\textsuperscript{229} N.J. STAT. ANN. § 58:1B-5 (West 1982).
\textsuperscript{230} Id. § 58:1B-17.
\textsuperscript{231} The Senate bill would have empowered the Authority to "plan, . . . construct, . . . [and] operate 'projects.'" A "project" was defined as a "water system or any part thereof," which in turn was defined to include "water distribution systems." N.J. Senate Bill No. 1612 §§ 6a, 30, 3(m) (1980).
\textsuperscript{232} Id. § 1.
The Water Supply Authority Act adopted, by implication, the New Jersey Master Plan's recommendation that the capital costs of any new state-financed "drought insurance" facility, such as the Raritan-Passaic pipeline, be paid by the water supply systems served by the project in proportion to each system's safe yield deficits. Systems with the largest deficits would pay the highest proportion of the costs. Deficits would be recalculated every five years. If a system reduced its safe yield deficit by developing its own supplies or purchasing water from other systems, its payment to the state would be reduced, and the state would have to pay the shortfall. Thus, the recommended method of financing runs the risk of leaving the state with more white elephants, should suppliers find cheaper sources of water. A water supply official from the Department of Environmental Protection indicated, however, that the Department would be able to prevent competing projects from being developed through its power to approve new diversions. It remains to be seen whether the New Jersey Master Plan's method of financing will be used, and if so, whether New Jersey water politics will allow the Department of Environmental Protection to exercise its powers as the official contemplated.

In summary, with its new legislation, New Jersey continues its tradition of strong state regulation and direct state involvement in the provision of water. Despite this strong involvement, earlier legislation to allocate water failed to protect New Jersey residents from periodic water shortages because the shortages derived largely from problems of distribution. The recent legislation, combined with the passage of the 1981 bond referendum, has given New Jersey some of the tools that it needs to restructure water distribution. The state's program to promote construction of interconnections is an important first step. The state's history of deference to local government, however, raises doubts about its willingness and ability to use these new tools.

3. New York

New York State has approximately 1900 public water supply systems. Of these, 1400 are municipally-owned, consisting primarily of

235. See N.J. STAT. ANN. § 58:1B-6(a) (West 1982); NEW JERSEY MASTER PLAN, supra note 29, at 61.
236. NEW JERSEY MASTER PLAN, supra note 29, at 61.
237. Id.
238. Id.
239. Interview with William Whipple, supra note 223.
240. This number does not include private systems such as those that serve mobile home parks and private institutions. When such systems qualify as public water systems, as defined by the Safe Water Drinking Act, 42 U.S.C. § 300f(4) (1982), they are regulated by the Department of Health. Letter from Stuart Dean, Chief Permit Administrator for Water Supply, Bureau of Water Resources, New York Dep't of Envtl. Conservation, to the author (Aug. 3, 1982).
city and village water departments and town and county water districts.\footnote{241} The largest water supply system, that of New York City, generally operates independently of state regulation.\footnote{242} The New York City Department of Environmental Protection operates and regulates the quantity and quality of the city’s water supply system.\footnote{243} All of the city’s water is surface water, piped from upstate New York.\footnote{244} New York City essentially operates a regional water system in the sense that communities in the eight counties through which the city’s aqueducts pass are entitled to water from the city’s system at the same rate that city residents pay.\footnote{245} For example, seventy-two percent of Westchester County is supplied by the New York City system;\footnote{246} total use of New York City water outside of the city is 100 mgd, about seven percent of the water supplied by the system.\footnote{247}

The New York Department of Environmental Conservation is the lead agency for the regulation of other public water systems in the state. The Department administers a permit system which regulates all uses of water for both public consumption and irrigation.\footnote{248} The agency must approve all proposals to create, or add to, sources of water supply for these uses.\footnote{249} Individual systems, moreover, need Department of Environmental Conservation approval before they can extend service to areas not included in their original permits.\footnote{250} The agency must approve all sales of water between individual systems.\footnote{251} Permits are also required for any interstate water transfers\footnote{252} and for digging wells with a pumping capacity in excess of forty-five gallons per minute on Long Island.\footnote{253}


\footnote{242} New York City’s water supply system is subject, however, to the state permit system. N.Y. ENVTL. CONSERV. LAW § 15-0111 (McKinney 1984).

\footnote{243} ADMIN. CODE CITY OF NEW YORK § K51-42.0 (1975).

\footnote{244} 1981 Hearings, supra note 2, at 475; Buck, Drought City: The Real Scenario, New York Mag., Feb. 23, 1981, at 21-22.

\footnote{245} ADMIN. CODE CITY OF NEW YORK § K51-42.0 (1975).

\footnote{246} 1979 Hearings, supra note 26, at 249.

\footnote{247} 1981 Hearings, supra note 2, at 636.


\footnote{249} Id. § 15-1501(1).

\footnote{250} Id. § 15-1501.

\footnote{251} The regulations issued by the Department of Environmental Conservation, pursuant to N.Y. ENVTL. CONSERV. LAW § 15-1501 (McKinney 1977), enumerate the actions that require a permit; among these are “entering into contract or other agreement for supply of water.” N.Y. ADMIN. CODE tit. 6, Part 601 (1972).

\footnote{252} N.Y. ENVTL. CONSERV. LAW § 15-1505 (McKinney 1984).

\footnote{253} Id. § 15-1527. This requirement was enacted to prevent overdrafting and the intrusion of salt water into the groundwater. Conservation Law of 1911, 1911 N.Y. Laws 647, § 476.
The Department of Environmental Conservation does not have the power to order interconnections between systems, although municipalities have broad powers to work with other municipalities and investor-owned systems to provide emergency interconnections.\textsuperscript{254} The Department can, however, order a system that requests approval of a new source of supply to serve communities that the Department determines should be supplied from the new source.\textsuperscript{255}

The Department of Environmental Conservation has seldom been forced to choose between two or more competing proposed public supply uses. Water supply permits are rarely denied or conditioned. The Department has, however, exerted pressure on applicants in some instances to alter their plans to obtain a more rational use of water. For example, the Department has sometimes urged a system to connect with another system rather than develop separate supplies.\textsuperscript{256}

In October 1982, the permit section at the Department of Environmental Conservation consisted of one person for the entire state, excluding Long Island.\textsuperscript{257} Without its own staff to review and investigate permit applications, the Department of Environmental Conservation relied heavily on the Department of Health, which has a staff of approximately thirty at the state level. As a matter of administrative practice, the Department of Health reviews all permit applications to the Department of Environmental Conservation,\textsuperscript{258} and no permit will be given without the Department of Health's written approval.\textsuperscript{259}

The Department of Health's statutory jurisdiction with respect to water matters concerns the quality of drinking water delivered to the customer.\textsuperscript{260} In addition to setting scientific standards for water purity, the agency determines proper construction standards for all new public supply systems, and approves specific construction plans submitted by individual systems.\textsuperscript{261} Although the Department of Environmental Conservation has overall responsibility for managing New York's water resources, the Department of Health is responsible for developing

\begin{footnotes}
\textsuperscript{255} N.Y. ENVTL. CONSERV. LAW § 15-1501 (McKinney 1984).
\textsuperscript{256} Interview with Stuart Dean, Chief Permit Administrator for Water Supply, Bureau of Water Resources, New York Dep't of Env'tl. Conservation (Oct. 18, 1982).
\textsuperscript{257} The Department, however, was in the process of increasing its staff by regionalizing the issuance of permits. The regionalization was completed by August 1983. New York now has nine regions, seven upstate and two downstate. The latter two represent the areas of New York City and Long Island. Telephone interview with Stuart Dean, Chief Permit Administrator for Water Supply, Bureau of Water Resources, New York Dep't of Env'tl. Conservation (Aug. 3, 1983).
\textsuperscript{258} Telephone interview with John Orndorfs, Director, Bureau of Public Water Supply, Division of Env'tl. Protection, New York Dep't of Health (Aug. 3, 1983).
\textsuperscript{259} Interview with Stuart Dean, supra note 256.
\textsuperscript{261} N.Y. ADMIN. CODE tit. 10, § 5-1.22 (1981).
\end{footnotes}
comprehensive area-wide water supply plans that include provisions for emergencies.\textsuperscript{262}

The New York Public Service Commission also has a role in the regulation of public water supply. The Commission regulates the rates charged to customers of investor-owned systems. A copy of any permit application filed with the Department of Environmental Conservation by an investor-owned system is sent to the Public Service Commission for review. The Commission, however, does not have any standard procedures for monitoring the safe yields of these systems.\textsuperscript{263} The Commission's involvement with municipally-owned systems is limited to receiving copies of their annual reports.\textsuperscript{264} Thus, as in Connecticut and, to a lesser extent today with the new legislation, in New Jersey, once a municipally-owned system receives an operating permit, no agency monitors its performance on an on-going basis.

Southeastern New York is the region of the state most prone to water supply shortages. This problem has been recognized for many years, but there has been a history of state inaction. For example, the Temporary Commission on the Water Supply Needs of Southeastern New York issued a report in 1973 recommending the regionalization of water supply distribution in southeastern New York under a new public benefit corporation.\textsuperscript{265} No action was ever taken on this recommendation. During the drought of 1980-81, twenty-one communities in the region, including New York City, suffered water supply emergencies.\textsuperscript{266} At the time of the shortages, the Department of Environmental Conservation and the Task Force on Institutional Arrangements for Southeastern New York Water Supply were involved in working out emergency measures. Unfortunately, there is no evidence that this cooperation produced anything more than planning advice.\textsuperscript{267}

The 1980-81 water emergencies did not result in any legislation or other institutional changes in New York, as happened in New Jersey and Connecticut. Thus far, the only significant state-level response to the drought in New York has been the Department of Health's request that affected communities work with the agency's county-level officials to

\textsuperscript{262} N.Y. ENVTL. CONSERV. LAW §§ 15-1301, -1303, -1305 (McKinney 1984).
\textsuperscript{263} Telephone interview with Paul Roberts, Assistant Utility Engineer, Water Division, New York Public Service Comm'n (Aug. 5, 1983).
\textsuperscript{264} N.Y. PUB. SERV. LAW § 89(1) (McKinney 1955).
\textsuperscript{265} TEMPORARY COMM'N ON THE WATER SUPPLY NEEDS OF SOUTHEASTERN NEW YORK, INSTITUTIONAL ARRANGEMENTS AND ALTERNATIVE FUTURES 247 (1973). When this report was issued, the state's southeastern region had 481 public water supply systems (280 investor-owned, 201 municipally-owned), and 138 small private systems serving institutions, trailer parks, and apartments. \textit{Id.} at Table 23.
\textsuperscript{266} 1981 Hearings, supra note 2, at 432. New York City's demand for water at that time was 1560 mgd; the system's safe yield was 1295 mgd. \textit{Id.} at 436.
\textsuperscript{267} \textit{Id.} at 432.
draw up emergency plans for future droughts.\textsuperscript{268}

III

ANALYSIS AND RECOMMENDATIONS

The historical response of the Northeastern states to periodic water shortages, such as the recent one, has been to increase state-level regulation of the water rights allocation process by establishing and refining a permit system. This response has had positive effects. Permit systems encourage states to develop long-term plans for water use, to manage water resources in accordance with those plans, and to curtail wasteful uses.

Despite these benefits, however, the case studies suggest that changes in the method of allocating water rights have not and will not correct the main cause of water shortages, fragmentation in the distribution of supply. Fragmentation exists in all the states of the Northeast, in those that have instituted some form of permitting system and in those that rely solely on the riparian rights doctrine of allocation. Fragmentation impedes capital investments to increase water supplies and interconnect water systems. The recurring problem of water shortages will not be cured until there is a significant integration of water supply systems.

A. Goals for Reforming the Legal Structure

While all states recognize private property rights in water, these rights have been historically limited and have been increasingly subjected to state regulation. The principle that a state's water resources should be used in the interest of the public as a whole reflects a policy judgment that there is no inherent reason why water resources should be allocated to private parties in a pattern related to the ownership of real property. The riparian rights theory was never a truly private system of allocation in the sense that ownership of particular real property was accompanied by an inalienable right to a certain percentage of adjacent waters. The reasonable use doctrine reflected a judicial socialization of water rights. Ultimately, the legal regime for water rights allocation shifted from common law rules to regulation by administrative agencies.

Today, most of the United States is served by public water supply systems. For the Northeast, with its abundant water resources, the primary dependence on public systems means that the laws that govern and regulate public water supply systems play a far greater role in determining the adequacy and cost of a water supply than the laws relating to the initial allocation of water rights. The goals that the regulation of water supply systems should serve, however, have not been well thought out.

The goal that water resources should be used to benefit the state's

\textsuperscript{268} Telephone interview with John Orndorfs, \textit{supra} note 258.
population as a whole, rather than particular well-located individuals or municipalities, suggests two principles by which to evaluate the legal structure that determines the adequacy and cost of the water supply for each citizen. The first principle is that every citizen should have the same assurance of freedom from water shortages. This means that each water supply system in the state should have at least the minimum safe yield ratio (the ratio of what the system would yield faced with the lowest amount of runoff experienced in the prior hundred years to the current average demand for the system) necessary to deliver a normal amount of water, even in times of drought. The second principle is that, at least in the long run, the price of water should be the same for all citizens whether they live near or far from water sources, except for price differentials related to the cost of transportation.

It might be argued that a regulatory policy based on these two principles would be insensitive to local preferences with respect to an adequate safe yield ratio. Everything else being equal, a higher safe yield ratio (i.e., a greater degree of assurance of normal water supply in time of drought) costs more money, and some localities might wish to buy less water supply insurance than others. No practical institutional means exist, however, to measure how much water supply insurance localities really want. Experience shows that when shortages occur, localities look to the state for relief, whatever their previous decisions may indicate about their preferred trade-off between cost and supply in time of drought. Certainly in 1980 and 1981, many communities sought state relief when their water supplies dwindled to levels that could last only a few weeks. Given the demand for state relief, and the large personal and economic disruptions that water shortages can cause, it seems safe to assume that most persons, if forced to make an informed decision, would prefer the extra expenditures necessary to assure normal or near-normal supplies of water in times of drought.

B. The Need for Increased Integration of Water Supply Systems

The existing legal structure governing water supply distribution fails to adequately promote the two principles set out above. As a result of this legal structure water is distributed by numerous municipally-owned and investor-owned systems, each of which operates relatively independently of the others. These public systems have not made the investments necessary to assure adequate water supplies during droughts. Small investor-owned companies lack the access to financial markets needed to make capital investments. The larger municipally-owned systems tend not to make capital investments in order to avoid having to raise rates and taxes.

At present, many public supply systems have inadequate safe yield ratios. They are capable of providing water only under favorable condi-
tions: average or above-average rainfall, plus the good luck not to have a water main break, equipment malfunction, or other system disruption. They are unable to provide normal water supplies when conditions are not optimal. Furthermore, there do not appear to be any internal forces at work within the current legal structure that will lead to the formation of larger water supply systems better able to provide adequate water supplies during droughts.

To achieve the goal of guaranteeing all citizens sufficient water during droughts, systems with inadequate safe yield ratios, as determined by state water resources officials, must increase their supplies. This will require the diversion and storage of additional water, as well as the physical integration, where possible, of currently separate systems into larger networks. Larger networks would help eliminate the safe yield deficits of individual systems by providing access to any excess capacity within the network, and would diversify the risks of highly localized drought conditions and individual system failures.

C. The Improbability of Increased Integration Absent State-Mandated Regionalization of Water Supply Systems

The integration of water supply systems into larger networks could be achieved by mergers of systems or contracts among systems. Unfortunately given the existing legal structure, there are insufficient forces at work to effect further integration through either of these methods. To understand why this is so it is necessary to examine the characteristics of organizations currently operating water supply systems in the Northeast.

1. Mergers

Only a few investor-owned water companies are large publicly-held entities. Most investor-owned systems are either small privately-held companies or small operating companies owned by large holding companies. A holding company may offer its operating subsidiaries some economies of scale with respect to technical and administrative services, but these arrangements generally do not solve the inherent problems associated with operating companies that serve small geographical areas and few customers.

Apparently, there has not been any significant movement toward mergers of investor-owned systems. One reason for this may be that in some cases a municipally-owned system lies between two investor-owned systems thereby preventing the investor-owned systems from intercon-

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A second reason for the absence of mergers may be that investor-owned systems are regulated industries. An official from Bridgeport Hydraulic Company, a company which has engaged in limited merger activity, indicated that the existing rate regulation procedures create disincentives for takeovers of systems that need capital improvements. If the assets of the acquired company have been depreciated, the merger, whatever it costs, adds little to the acquiring firm's rate base. In addition, due to regulatory lag, the costs of improvements cannot be added to the rate base until well after they have been incurred. A third possible explanation for the lack of mergers is politics. The possibility of public objection to any rate increases which ultimately would result from capital improvements following a merger may deter potential mergers. A proposed merger also might bring objections from each affected municipality because, given the larger service area of the merged system, each municipality's ability to exercise control over the water rates paid by its residents would be weakened.

Mergers between municipally-owned systems occur even less frequently than mergers between investor-owned systems. Apparently this is because local governments are suspicious of one another.

2. Contracting

Contracting is frequently used by both investor-owned and municipally-owned systems. Contracting is particularly attractive to a municipally-owned system because it offers a flexible way to deal with short-
term needs and poses a lesser threat than mergers to the municipality's ability to retain control over the distribution of water. The limited scope and duration of water supply contracts involving both municipally-owned and investor-owned systems, however, leads to a level of integration that falls well short of what mergers could accomplish.

One major drawback of contracting is that it addresses problems in a piecemeal fashion, substituting short-term solutions for long-term planning. Contracting is also subject to over-pricing by the supplier of water. Furthermore, negotiating water supply contracts is often complicated by the need to obtain the approval of a government agency.

In Connecticut, for example, investor-owned systems seeking to sell excess water must obtain a permit, which is limited to a ten-year period, from the Department of Environmental Protection. Similarly, in New Jersey, municipalities seeking to purchase water must limit the duration of the contract and obtain approval from the Department of Environmental Protection. The short time limits placed on water contracts, whether imposed politically or by statute, prevent the formation of water supply networks that are secure enough to encourage the capital investments needed to improve water supply.

276. ACIR Report, supra note 49, at 34-35; Beckman & Dworsky, New Views on Public Responsibility for Resources Development—Jurisdictions, Consequences and Remedies, in NEW HORIZONS FOR RESOURCES RESEARCH: ISSUES AND METHODOLOGY 114 (1965) (proceedings of the 1964 Western Resources Conference). The EPA found that purchased water costs were higher than either groundwater or surface water in almost every instance, except for populations of 100,000 to one million customers. EPA Survey, supra note 45, at VII-7; see also M. Greenberg & R. Hordon, supra note 13, at 7.

277. CONN. GEN. STAT. ANN. § 22a-358 (West Supp. 1976-1983). Permits may be renewed after ten years; however, this provision effectively limits the duration of contracts for the sale of water.

The difficulties associated with contracting are illustrated by a situation in southeastern Connecticut where the Town of Noroton, served by the Connecticut-American Water Company, needs to purchase 1.2 mgd of water. Noroton's neighbor, the Town of Norwalk, has two quasi-municipal water supply systems, one of which, Norwalk Taxing District No. 2, has sufficient supplies of water to allow a sale to Noroton. Norwalk, however, refused to contract with Noroton until another nearby water supply system, Bridgeport Hydraulic, assured Norwalk that it could obtain water if necessary in time of shortage. The contracting process has involved two separate sets of negotiations—one between Norwalk and Bridgeport Hydraulic, the other between Norwalk and Noroton. In addition, the parties have needed approvals from the Department of Environmental Protection and from the Department of Public Utility Control.

Norwalk and Bridgeport have entered into a five year contract, which may be renewed for another five years. Telephone interview with Robert H. Reinert, supra note 157. For the past two years, however, Norwalk and Noroton have failed to reach a contractual agreement. Norwalk currently is supplying Noroton with 1.2 mgd on a noncontractual basis. Telephone interview with John Hiscock, supra note 153.


279. There is significant literature concerning the question of when resources are more efficiently allocated pursuant to market contracts than by authoritative decision within an organization. See, e.g., Coase, The Nature of the Firm, 4 ECONOMICA N.S. 386 (1937); O. Williamson, Markets and Hierarchies: Analysis and Antitrust Implications 1-81 (1975). An important advantage of contracting is that, under appropriate circumstances, re-
3. State-Mandated Regionalization

The foregoing discussion suggests that further integration of supply systems can only be accomplished through state-mandated regionalization of water distribution. The current legal structure is so protective of local government interests that, without change, continued fragmentation and vulnerability to periodic shortages are inevitable.

D. The Empirical Case for Larger Networks

Studies of the water supply industry in the Northeast support the view that larger public water supply networks would promote optimal allocation of water. A 1976 analysis of water supply systems in northeastern New Jersey found that major intersystem transfers of water from the Raritan basin, using existing interconnections, could have eliminated all safe yield deficits in the Hackensack and Passaic basins. The contemplated transfers, however, were not then and are not now possible due to institutional impediments. The study also concludes that, while additional interconnections would be necessary, absent institutional barriers to interbasin transfers, projected increases in demand for 1980 and 1985 could be met without construction of new sources of supply.

A recent study concludes that use of an "optimal water allocation plan" by southwestern Connecticut's water supply systems would have reduced the costs of transporting water from source to demand areas in

source use is guided by a price that aggregates in an optimal way the diverse knowledge of many different individuals. Hayek, The Use of Knowledge in Society, 35 AM. ECON. REV. 519 (1945). On the other hand, authoritative decisions within organizations eliminate the costs associated with negotiating contracts and adapt more easily to changing circumstances. Coase, supra, at 336-37. Williamson argues that certain human and environmental conditions increase the relative attractiveness of the organizational mode compared to long-term (or repeated short-term) market contracting: (1) uncertainty combined with "bounded rationality" (the inability to accurately assess the probability of future events and act accordingly because of limitations in knowledge and in the capacity of the human mind to make complex calculations), and (2) a small number of potential parties to an exchange, combined with the possibility of "opportunism" (the ability of a party to gain an advantage through misrepresentation or lack of candor). O. Williamson, supra, at 8-10. The case studies suggest that these factors are present in the case of water supply distribution. This does not prove, however, that water systems rely too heavily on contracting, because it is difficult in the abstract to know how intense these factors need to be before the resulting disadvantages of market contracting outweigh the inherent advantages of this method. Water supply is not like many areas of the economy where market pressures push firms to make the optimal choices between integration and contracting. On the contrary, there are serious political and legal obstacles to integration which may make contracting the only viable option even if integration would be more efficient.

281. The transfers actually could not be made due to the lack of agreements for water transfers among the various water supply systems and local communities. Similarly, the model ignored existing contracts where such contracts impeded optimal distribution. Id.
282. Id. at 140.
1979 by 5.5%.

Projections for 1985 and 2000 show similar cost reductions. When Bridgeport Hydraulic, which serves thirteen communities, is removed from the model the potential for further cost reductions is even greater. This indicates that Bridgeport Hydraulic is already “minimizing its cost . . . [and] . . . operating as a regional water authority.”

Empirical data from studies of the water supply industry as a whole also support the view that consolidating water supply systems increases day-to-day operating efficiency. Basing its conclusions on a random sample of 984 public water systems serving from twenty-five to 100,000 persons, a 1977 EPA survey found that in “virtually every expense category” the smaller systems had “significantly higher costs” than the larger systems.

Some form of metropolitan or regional approach to water supply distribution has been urged by organizations as disparate as the American Commission on Intergovernmental Relations and the American Water Works Association, a trade association of investor-owned water companies. The National Regulatory Research Institute recently cited with approval attempts by Illinois and Florida to limit the creation of small inefficient water supply units by actively “promoting regional water systems, since regional service enhances the prospects for quality control, reduces the unit cost of quality maintenance and improvement, and induces economies of scale with larger treatment plants.” The Research Institute also noted that regional systems offer “potentially enhanced access to capital markets and increased ability to acquire additional sources of supply.”

E. Models of Regionalization

A state’s water supply could be regionalized by using either a public or a private sector approach. A private sector approach would license private firms to manage regional systems. The firms could either sell water directly to customers or to existing utilities on a wholesale basis. Under a public sector approach, the state would create regional authorities, but would retain authority, as a central manager, to insure comprehensive planning and proper financial management.

Although most Northeastern states would need to enact legislation

284. Id. at 9.
285. Id. at 11.
286. Id. at 14.
290. Id.
to create either of these organizational frameworks, the primary obstacles to regionalizing water distribution are not legal, but political and financial. For example, home rule provisions in state constitutions should not present barriers to regionalization efforts in light of the overwhelming state concerns in the area of water resource management. Home rule, as a broadly held doctrine suggesting the proper political relationship between local governments and the state, however, will impose a heavy burden of proof on state government in making its case for a regional structure.

Another difficult issue raised by water supply regionalization relates to the compensation of individual system members for property incorporated into the new networks. Any regional system that incorporates an investor-owned system must pay just compensation for the property acquired. In addition, fairness considerations, as well as political necessity, may dictate that municipally-owned systems also receive some sort of compensation.

Whether a public or a private sector approach should be used to regionalize a state's water supply is a complex question involving a range of political and economic issues. Although this question is beyond the scope of this Article, it is helpful to examine some existing regionalized water systems.

Of particular interest is the regionalization of water supply distribution in Great Britain. At the end of World War II, Great Britain's water distribution structure, like that in the Northeast United States today, was highly fragmented, with 1186 systems serving England and Wales. The first step toward regionalization was the Water Act of 1945 which authorized the Minister of Health to consolidate water supply systems to

291. While empowering municipalities to legislate with regard to matters of local concern, all forms of constitutional home rule provisions recognize the state's power to preempt municipal activity in matters of statewide concern. D. MANDELKER, D. NETSCH, & P. SALSICH, JR., STATE AND LOCAL GOVERNMENT IN A FEDERAL SYSTEM 104, 131 (2d ed. 1983).

292. The pattern of fragmentation, in which each municipality has its own water supply facility, reflects the tradition of local autonomy in the Northeast, particularly in New England and the mideastern states. This tradition of local autonomy dates back to the colonial development of the town as a unit of government in this region, at the expense of the power of county government. See J. MIRI, supra note 49, for a discussion of the "strong attachment to local autonomy" which affected New Jersey's pattern of development. See also ADVISORY COMMISSION ON INTERGOVERNMENTAL RELATIONS, STATE AND LOCAL ROLES IN THE FEDERAL SYSTEM 245-48, 258-261 (1982) (discussing the role of the town unit of government in the different patterns of local government structure).

Despite the Northeast's tradition of local autonomy, counties in the region recently have increased their roles in providing governmental services. Id. at 19. Between 1967 and 1977, the services provided by counties in New England increased by about 38%, while counties in the mideastern states increased services by about 21%. Id. at 22. The growing role of counties in providing government services may be attributed to a recognition that smaller units often are unable to respond adequately to needs for urban services. Id. at 238-39. This may indicate more willingness on the part of citizens in the Northeast to consider regional alternatives than in the past.
distribute water more efficiently. By 1974, the number of systems had been reduced to 187 serving a population of almost 50 million. The successful efforts of the British government in consolidating water supply systems capable of providing water to more than ninety-nine percent of the population “accounted in large measure for an appreciation of what might be accomplished by further consolidation.”

The regulation of water rights allocation in England began with the Water Resources Act of 1963, which created a permit system administered by twenty-nine river authorities. Thus, with passage of the 1963 Act, the government regulated both water allocation and distribution. The new regulatory scheme, however, was bifurcated: the national government regulated distribution, while the river authorities regulated allocation.

This problem was solved with the Water Act of 1973. The 1973 Act divided England and Wales into ten regions and created for each region an authority with overall responsibility for matters of both distribution and allocation. Water rates are set by the water authorities subject to the requirement that all costs, “including operation and maintenance, interest on outstanding debts, depreciation or debt redemption and a contribution toward a reserve for future capital expenditure” be paid for out of revenues from water rates. The elimination of bifurcated responsibility and the further consolidation of water distribution has created a legal structure that should avoid most of the supply problems that continue to plague the Northeastern United States.

In the United States, there have been some legislative attempts in the area of comprehensive water supply management. For example, in response to perceived institutional failures during a 1976 drought in

294. Id. at 20.
296. In examining the regulatory system created by the 1963 Water Resources Act, Professor Craine notes that separating the power “for consolidating water distribution” from the “water management activities of the River Authorities” made it “difficult if not impossible, to design regional distribution and disposal systems hydrologically integrated with river management plans and actions.” L. Craine, supra note 293, at 108-09. In addition, the 1963 Water Resources Act’s grant of exclusive power over source development to the river authorities frustrated the water undertakers, who were responsible for supply distribution. This division of responsibility was a major weakness of the water management system under the 1963 Act. D. Okun, supra note 293, at 27; Purdue, The Implications of the Constitution and Functions of Regional Water Authorities, 1979 Pub. L. 119.
298. D. Okun, supra note 293, at 244.
northern California, the state created a water management district for the Monterey Peninsula. The District has the power to allocate the region’s water, particularly groundwater, to construct new facilities, subject to electoral approval, and to consolidate distribution by acquiring both public and private systems. Despite these statutory powers, however, the district thus far has confined itself to planning activities. Similarly, Rhode Island’s Water Resources Board has broad, but as yet unexercised, powers to effectuate regional distribution. The Board is authorized to divide “the state into areas for the purpose of providing water supply facilities” and to designate “municipal water departments or agencies, special districts or private firms to perform area-wide water supply operations within each area.”

These untested state models may provide limited guidance on how to structure a regional water supply network. More useful guidance on issues of local governmental participation in, and management of, regional authorities may be found in the various existing metropolitan water systems and regional authorities in other areas of utility service.

CONCLUSION

The Northeastern states have no shortage of water resources. Problems of inadequate supply stem more from an abundance of independent public water supply systems, which are poorly regulated by the states. It is time for states to recognize that water supply can no longer be left to individual local governments. Reliance on voluntary mergers and contracting among systems has left the Northeast vulnerable to periodic water shortages similar to those experienced in 1980-81.

301. Id. §§ 118-341 to -366. The District can establish charges for the withdrawal of groundwater from within specified zones; monies raised must be used primarily to import water into the zone to prevent the groundwater from being overdrafted.
302. Id. § 118-452.
303. Id. § 118-328(a).
305. R.I. Gen. Laws § 46-15-6(f)(1), (2) (Supp. 1980). The City of Providence water supply system presently serves 55% of the state’s population and has the capacity to expand its service in the future. Therefore, it provides substantial regionalization of distribution, making it unlikely that the Water Resources Board will need to use its power. Telephone interview with Peter Calise, Staff Director, Rhode Island Water Resources Board (Aug. 2, 1982).
306. For example, the Metropolitan District of California sells water at wholesale prices to member municipalities, whose systems in turn deliver the water to customers in southern California.
307. For example, the New York State Power Authority supplies one-quarter of the state’s electric power at wholesale prices. In Nebraska, regional power districts provide all of the state’s electricity, some of which is acquired from the jointly operated Nebraska Public Power District.
Attention to water rights allocation will not, absent changes in the structural arrangements for the diversion and ultimate distribution of water supply, prevent future shortages. Regionalization is necessary. A regional network for public water supply would have the legal and financial capability to insure adequate water supply during droughts. At the same time, it would minimize the current inequities in the amount of water available to citizens based on their location within the state.