

1-1-1982

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Recommended Citation

Charles Stephenson, *INTERSTATE WATER RIGHTS IN THE CONNECTICUT RIVER: ISSUES RAISED BY THE PROPOSED NORTHFIELD DIVERSION*, 4 W. New Eng. L. Rev. 641 (1982), <http://digitalcommons.law.wne.edu/lawreview/vol4/iss4/4>

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INTERSTATE RIGHTS TO THE WATERS OF THE CONNECTICUT RIVER: ISSUES RAISED BY THE PROPOSED NORTHFIELD DIVERSION

CHARLES STEPHENSON*

I. INTRODUCTION

The Metropolitan District Commission (MDC), an agency of the Commonwealth of Massachusetts,¹ is currently preparing an environmental impact report on its proposed diversion of water from the Connecticut River² into the water supplies of Boston and forty-three other Massachusetts communities.³ The proposal, generally called the Northfield diversion, would employ the pumping capacity of an existing hydroelectric power station to withdraw up to 375 million gallons of water daily from the river during periods of relatively high flow.⁴ The water would be channeled from the power station reservoir through an aqueduct to Quabbin Reservoir (Quabbin), the

* Clerk to Hon. Kent B. Smith, Massachusetts Appeals Court; Member of the Massachusetts Bar; B.A., Brown University, 1972; M.A., Tufts University, 1973; J.D., Western New England College School of Law, 1982.

1. The MDC is an agency of the Commonwealth providing recreation, sanitation, and water supply facilities to its member communities. The MDC was first organized as a water supplier in 1895. Act of June 5, 1895, ch. 488, 1895 Mass. Acts 565.

2. The Connecticut River has its headwaters in the Connecticut Lakes of northern New Hampshire; the river drains portions of four states (New Hampshire, Vermont, Massachusetts, and Connecticut) and Canada. The Connecticut River basin has an area of 11,136 square miles, and the river is 280 miles in length.

3. Presently, the MDC water district includes 34 communities within 15 miles of the State House in downtown Boston. Several central and western Massachusetts towns also receive MDC water. METROPOLITAN DISTRICT COMMISSION, METROPOLITAN WATER SYSTEM (1976) (pamphlet).

4. See Act of Aug. 25, 1970, ch. 766, 1970 Mass. Acts 631. The power station is the Northfield Mountain plant operated by Northeast Utilities. The power plant and its operating procedures are discussed more fully at notes 23-38 *infra* and accompanying text. See also Appendix A (diagram).

As originally approved, the diversion could only be accomplished when the flow of the Connecticut River was greater than 15,000 cubic feet per second (cfs). Act of Oct. 13, 1967, ch. 669, 1967 Mass. Acts 565. The figure presently authorized is 17,000 cfs, as measured at a United States Geological Survey monitoring station in Montague, Massachusetts. Act of Aug. 25, 1970, ch. 767, 1970 Mass. Acts 631. See Appendix B (map) and notes 50-57 *infra* and accompanying text.

MDC's major collection and storage facility.⁵

The Massachusetts legislature approved the Northfield diversion in principle during the late 1960's⁶ when, in the aftermath of a sustained drought, the MDC's supply capability appeared to be imperiled.⁷ At that time, there was little focused opposition to the Northfield diversion or to a companion diversion project involving a nearby Connecticut River tributary.⁸ During the 1970's, however, substantial opposition emerged. Criticism of the plan came from sources as diverse as political leaders, environmental groups,⁹ and municipal and state governments.¹⁰ The opposition succeeded in delaying the Northfield diversion and caused the Massachusetts legislature to modify its approval to the extent that the plan is now termed an alternative of last resort.¹¹

Despite the delays and criticism, the MDC has continued to fund study of the plan and MDC officials remain confident that the Northfield diversion eventually will be authorized and funded by the

5. The capacity of Quabbin Reservoir is 1,235,000 acre feet of water (an acre foot is the volume of water required to flood an acre to the depth of one foot and is equivalent to 325,851 gallons). METROPOLITAN DISTRICT COMMISSION, METROPOLITAN WATER SYSTEM (1976) (pamphlet).

6. Act of Aug. 25, 1970, ch. 767, 1970 Mass. Acts 631; Act of Oct. 13, 1967, ch. 669, 1967 Mass. Acts 565.

7. In 1970, Quabbin was filled to only 57 percent of capacity. SPECIAL STUDY COMMISSION, REPORT OF SPECIAL STUDY COMMISSION RELATIVE TO PROVIDING FUNDS FOR EXTENSION AND DEVELOPMENT OF WATER SUPPLY SOURCES AND DIVERSIONS FROM THE CONNECTICUT RIVER TO QUABBIN RESERVOIR, MASS. H.R. REP. NO. 5543 (1970) [hereinafter cited as SPECIAL STUDY COMMISSION, REPORT].

8. The companion plan was to divert water from the Millers River in Erving, Massachusetts. M. DeFalco, A History of the Proposed Northfield Diversion Project 10 (1979) (available at Connecticut River Watershed Council library, Easthampton, Massachusetts). Although the plan has not been officially terminated, it has been given a low priority by the MDC because of the poor quality of the Millers River water and because the cost of accomplishing the diversion would be disproportionately high.

9. *E.g.*, the Connecticut River Watershed Council, Inc., and Massachusetts Public Interest Research Group (Mass PIRG). One citizen group, the Water Supply Citizens Advisory Committee, has undertaken a significant role in the drafting of the environmental impact report on the diversion.

10. The following communities, for example, have all passed resolutions expressing opposition to the diversion, at least until all viable alternatives have been exhausted: Springfield, Massachusetts, Apr. 22, 1975; Northampton, Massachusetts, Dec. 18, 1975; Longmeadow, Massachusetts, Mar. 7, 1977; Hartford, Connecticut, Mar. 28, 1977; Middletown, Connecticut, Apr. 7, 1977 (copies of the resolutions are available at the Connecticut River Watershed Council library, Easthampton, Massachusetts).

11. Statement by Evelyn Murphy, Massachusetts Secretary of Environmental Affairs (Aug. 5, 1977) (available at Connecticut River Watershed Council library, Easthampton, Massachusetts). *See also* MASS. J. RES., Resolutions on Major Water Supply Augmentation Projects (June 2, 1978).

legislature.¹² Should that authorization be forthcoming, the State of Connecticut likely will seek to enjoin the diversion. Connecticut's largest water district also is contemplating a major diversion of the Connecticut River to meet future supply requirements of greater Hartford.¹³ Moreover, the Connecticut General Assembly has instructed the state attorney general to oppose any upstream diversions that might harm any interests of Connecticut or its citizens.¹⁴

The Constitution grants the Supreme Court of the United States original jurisdiction over controversies between the states.¹⁵ During the twentieth century, the Court has apportioned water rights between states in six river basins.¹⁶ Significantly, one suit brought before the Supreme Court was *Connecticut v. Massachusetts*,¹⁷ in which Connecticut sought an injunction to block construction of Quabbin and to prevent the MDC's diversion of a Connecticut River tributary.¹⁸ The Supreme Court denied relief on the ground that Connecticut had failed to prove the requisite injury to its interests, but the Court left open to Connecticut the right to bring suit again should its rights to be jeopardized by future upstream diversions.¹⁹

This comment will explore, in the context of a potential suit to enjoin the Northfield diversion, the procedural, evidentiary, and le-

12. Holyoke Transcript-Telegram, Apr. 1, 1980, at 7, col. 1. Officially, the MDC also refers to the project as a last resort, but MDC administrators continue to regard the Northfield diversion as a high priority.

13. Based on our water demand projections, our present water supply sources [surface reservoirs] will probably be fully utilized in about three decades, following which the in-stream or ground-water aquifer flows of the Connecticut River or its tributaries will likely be the source of our future needs [sic].

Both quality and quantity of flow will affect the District's beneficial utilization of the Connecticut River.

Statement by Gilbert Gustafson, Manager, Metropolitan District Commission of Hartford (Jan. 10, 1972) (available at the Connecticut River Watershed Council library, Easthampton, Massachusetts).

14. CONN. GEN. STAT. § 3-126 (1969). Section 3-126 provides in its entirety:

The attorney general is authorized to investigate and, with the approval of the governor, to take such action as is deemed necessary to protect the state from damage by diversion or other interference with water from streams without the state which enter or are tributary to streams flowing within the state. Any expenses incurred by the attorney general in instituting or maintaining proceedings incident to such action shall be paid from the treasury on the approval of the comptroller.

Id.; See also CONN. SEN. J. RES. NO. 33 (Apr. 22, 1979); CONN. SEN. J. RES. NO. 4 (Apr. 6, 1976).

15. U.S. CONST. art. III, § 2, cl. 1.

16. See note 66 *infra* and accompanying text.

17. 282 U.S. 660 (1931).

18. *Id.* at 662.

19. *Id.* at 674.

gal principles involved in adjudication of an interstate water dispute. Residents of southern New England will be directly affected by the outcome of the Northfield controversy. But the potential conflict between Connecticut and Massachusetts has broader implications as well. In the absence of congressional apportionment of an interstate stream,²⁰ states with conflicting interests have only two avenues available through which to achieve a permanent resolution of their disagreement: Interstate compact²¹ and litigation. Both are burdensome, time-consuming, and costly.

Because natural resources, like the water of a flowing river, are of finite capacity, one state's exploitation of an interstate resource necessarily entails infringement upon the interests of another. In this context, interstate agreements may be impossible and litigation inevitable, at least when the infringement upon a state's interests is substantial. Connecticut and Massachusetts may resolve their differences over the Northfield diversion without resorting to litigation, but similar disputes will arise as potential sources of water are exhausted, while population and industrial growth increases demand. For that reason, although the Supreme Court has not been active in apportioning water rights to interstate streams since 1945,²² suits between competing states may become more frequent in the future.

II. THE NORTHFIELD DIVERSION AND ITS POTENTIAL IMPACTS

The origins of the Northfield diversion can be traced to the engineering department of Northeast Utilities (NU), a holding com-

20. The waters of the lower Colorado River basin were apportioned by the Boulder Canyon Project Act, 43 U.S.C. §§ 617-617v (1976 and Supp. IV 1980). The Supreme Court sanctioned Congressional apportionment of the Colorado River in *Arizona v. California*, 373 U.S. 546 (1963). The Boulder Canyon legislation and *Arizona v. California* have been the subject of extensive discussion. See 2 WATERS AND WATER RIGHTS § 134 (R. Clark ed. 1967) [hereinafter cited as R. CLARK].

21. An agreement between two states is not permitted by the Constitution of the United States unless approved by Congress. U.S. CONST. art. I, § 10, cl. 1. The benefits of interstate water use compacts are explored in Muys, *Interstate Compacts and Regional Water Resources Planning and Management*, 6 NAT. RES. LAW. 153 (1973); Stone, *Interstate Water Compacts*, 24 ROCKY MTN. L. REV. 141 (1952).

22. Since the Supreme Court decided *Nebraska v. Wyoming*, 325 U.S. 589 (1945), there has been no judicial allocation of water rights between competing states. The Supreme Court, during the last 35 years, has entertained several suits involving other aspects of interstate water rights, and has amended several prior decrees. See, e.g., *Arizona v. California*, 373 U.S. 546 (1963). Cases decided prior to 1945 are discussed at notes 87-186 *infra* and accompanying text.

pany for several southern New England power companies.²³ At the suggestion of top executives of Western Massachusetts Electric Company,²⁴ an NU member utility, the engineers designing the Northfield Mountain hydroelectric power station (Northfield) in Erving, Massachusetts developed a site plan that would permit an economically feasible diversion of Connecticut River water into nearby Quabbin.²⁵ Because of favorable public response²⁶ and legislative action,²⁷ NU incorporated the engineers' design for water diversion capability into the Northfield Mountain project.²⁸ The Northfield power station was constructed and, in 1973, began generating electricity.

Northfield operates by siphoning Connecticut River water into a tailrace and employing electrically driven pumps to direct that water through a tunnel to a mountaintop holding reservoir.²⁹ The reservoir is approximately 800 feet above river level,³⁰ so that when the system's operation is reversed, water returns through the tunnel

23. N.U.'s member firms are The Connecticut Light and Power Company, The Hartford Electric Light Company, Western Massachusetts Electric Company, Holyoke Water Power Company, and Northeast Utilities Service Company.

24. See CONNECTICUT RIVER WATERSHED COUNCIL, INC., QUABBIN FACTS 17 (1967) [hereinafter cited as QUABBIN FACTS].

25. It can be argued that Northeast Utilities proposed the diversion as well as a series of public parks in the Northfield Mountain area less as a matter of largesse than as a political expedient, to enhance its bargaining posture as it sought licenses for construction and operation.

26. A statement in a pamphlet printed by the Connecticut River Watershed Council is perhaps indicative of much of the public response:

Hailed by public officials and the press as the most dramatic water resource development in Massachusetts in recent years is the Northeast Utilities proposal to utilize the project's pumping facilities to provide 26 billion gallons annually of excess Connecticut River water to Quabbin Reservoir during the period of high freshet flow, primarily in the spring.

QUABBIN FACTS, *supra* note 24, at 15-16. The Watershed Council now has an entirely new administration and has become a leading opponent of the diversion plan. See, e.g., R. Hubley, Some Effects of the Proposed Diversion to Quabbin Through the Northfield Pump and Storage Facility (Apr. 30, 1977) (available at the Connecticut River Watershed Council library, Easthampton, Massachusetts).

27. See Act of Oct. 13, 1967, ch. 669, 1967 Mass. Acts 565; MASS. J. RES., ch. 46, 1967 Mass. Acts 888.

28. N.U. constructed its reservoir with dikes four feet higher than necessary to impound water for generating purposes, adding 375 million gallons of water storage capacity, and included in the wall of the reservoir the necessary headworks for the Quabbin aqueduct. NORTHEAST UTILITIES, NORTHFIELD MOUNTAIN PUMPED STORAGE HYDRO-ELECTRIC PROJECT AND RECREATION AREAS 20 (1967) [hereinafter cited as N.U., NORTHFIELD PAMPHLET].

29. See Appendix A (diagram).

30. The elevation of the Connecticut River at Northfield Mountain is approximately 180 feet above sea level. The mountain top reservoir has a maximum elevation of

by force of gravity. The tunnel system directs the kinetic energy of the falling water over turbines at the foot of the mountain, thereby generating an average of one million kilowatts of electricity per hour.³¹ From the turbines, the falling water is directed back into the Connecticut River.³²

The philosophy of Northfield's operation is to systematically exploit fluctuations in wholesale electric rates, thereby minimizing NU's overall cost of meeting demand for electrical energy.³³ When consumer demand is low, which is generally late at night, during weekends, and on holidays, the wholesale price of electricity declines.³⁴ During those periods, Northfield purchases the electricity necessary to pump water up to the storage reservoir.³⁵ Conversely, when the wholesale price electricity commands is high, Northfield releases stored water and generates electricity.³⁶ The system is ingenious, and permits NU to meet peak consumer demand with less frequent reliance on electricity purchased from other suppliers. Additionally, any surplus energy generated at Northfield may be sold to other utilities at elevated peak demand prices. Northfield carries another benefit: It generates electricity without the onsite use of nuclear or fossil fuels.³⁷ Nonetheless, Northfield has a significant impact on the Connecticut River, for although the plant imposes no net loss on the river's flow, the periodic diversions and discharges of water create an unnatural rhythm of ebb and flood in the Northfield reach of the river.³⁸

approximately 1,000 feet above sea level. N.U., NORTHFIELD PAMPHLET, *supra* note 28, at 5.

31. *Id.* at 6.

32. *Id.*

33. *Id.* at 2.

34. *Id.*

35. *Id.* Two nuclear-fueled power facilities, in Vernon, Vermont and Rowe, Massachusetts, are within twenty miles of the Northfield plant and provide a ready source of off-peak supply.

36. *See id.*

37. N.U. appropriately notes that the electricity to power the Northfield Mountain pumps comes from other steam and nuclear powered facilities. *Id.* at 2. In effect, most of the environmental burdens of the Northfield operation are felt elsewhere in New England.

38. L. Brower & P. Walford, Model Zeta: Potential Effects of Diverting Connecticut River Flood Waters to Boston (Nov. 1979) [hereinafter cited as Brower & Walford, Model Zeta]; P. Walford, The Yield of the Proposed Connecticut River Diversion (Sept. 1980) [hereinafter cited as Walford, Yield Study] (both available at the Connecticut River Watershed Council library, Easthampton, Massachusetts). N.U. euphemistically refers to its "lower reservoir" as having a length of twenty miles and a surface area of 2,000 acres. N.U., NORTHFIELD PAMPHLET, *supra* note 28, at 5. The "lower reservoir" is in fact the main stem of the Connecticut River between two major dams. The studies by

The MDC plan for diversion would utilize the existing pumping and storage capacities of Northfield through the simple expedient of connecting the mountaintop reservoir to Quabbin by aqueduct.³⁹ Because the elevation of Quabbin is 450 feet below the power station reservoir,⁴⁰ and because the aqueduct would be less than ten miles in length,⁴¹ that segment of the diversion could be accomplished by force of gravity. The aqueduct would terminate at the head of the east branch of Quabbin.⁴² Connecticut River water would then mingle with Quabbin water, and join the gradual flow of the east branch toward the MDC intake at the southern end of the Quabbin.⁴³

Theoretically, the diversion would be limited only by the capacity of the pumps at Northfield, which can divert water from the river at a staggering rate of 90,000 gallons per second.⁴⁴ As a practical matter, however, the diversion would be limited by economic considerations. Northfield could be expected to pump some additional water during periods of low demand for electricity. Brief intervals of additional pumping would not create any substantial interference with the operation of the power station's generating cycle.⁴⁵ But un-

Brower and Walford focus on the possible impacts of periodic ebb and flood on river ecology. Arguably, many of the impacts projected by the studies already occur as a by-product of the power station's present pumping regimen; presumably Brower and Walford simply suggest those impacts would be exacerbated by a diversion.

39. QUABBIN FACTS, *supra* note 24, at 16-17. As presently envisioned, the aqueduct would have an inside diameter of ten feet. DEP'T OF THE ARMY, ADDENDUM: NORTHFIELD MOUNTAIN WATER SUPPLY PROJECT NORTHEASTERN UNITED STATES WATER SUPPLY STUDY 6 (1974) (available from Corps of Engineers Regional Planning Office, Waltham, Massachusetts) [hereinafter cited as DEP'T OF THE ARMY, NORTHFIELD STUDY].

40. The maximum elevation of Quabbin Reservoir is 530 feet above mean low tide. QUABBIN FACTS, *supra* note 24, at 10.

41. Estimates of the aqueduct's probable length vary from 8.5 to 9.8 miles. E. KAYNOR, CONNECTICUT RIVER DIVERSION: A CASE STUDY IN WATER ALLOCATION POLICY 46 (1978) [hereinafter cited as KAYNOR, WATER ALLOCATION STUDY].

42. QUABBIN FACTS, *supra* note 24, at 16. See Appendix B (map). There also has been some consideration given to building a longer aqueduct to the West Branch of Quabbin, thus insuring that the MDC intake would be more fully buffered from the lower quality Connecticut River water.

43. At present, the MDC's plan for pretreatment and purification of the water introduced into Quabbin is unclear. Williams, *River Tapping: Would it Ruin our Drinking Water?*, Boston Globe, June 8, 1980, (Magazine), at 7 [hereinafter cited as Williams, *Boston Water*].

44. N.U., NORTHFIELD PAMPHLET, *supra* note 28, at 5. The intake and discharge processes use the same tunnels; the only separate facilities are the pumps and turbines themselves. See Appendix A (diagram).

45. Northfield station operates on a flexible schedule, with most pumping occurring during the night and on weekends. These periods would also be the times during which pumping to facilitate the MDC diversion would occur. In fact, actual release of water to the MDC could occur at any time that N.U. felt that water could be spared and the

less the MDC were willing to pay more for water than that water's value in power generation, no extra pumping would occur during any but these brief slack periods.⁴⁶ NU proposed 375 million gallons per day (mgd) as a diversion volume acceptable to its interests.⁴⁷ That figure is based on the reservoir's excess storage capacity⁴⁸ and is unrelated to the efficiency equation that would govern the daily diversion volume from Northfield. For that reason, in the absence of legal limitations the figure could be readily modified by agreement between NU and the MDC.⁴⁹

Albeit through the use of very obscure language, the Massachusetts legislature's 1970 authorization for Northfield apparently adopted NU's suggested diversion volume of 375 mgd as a statutory limit.⁵⁰ With a nod toward the interests of Connecticut River basin residents, the legislature also prohibited diversion "on any day when the flow of water in the Connecticut river . . . in the town of Montague [several miles downstream of the power station] is less than seventeen thousand cubic feet per second [17,000 cfs]."⁵¹

storage reservoir had sufficient depth to permit release through the Quabbin aqueduct headworks in the reservoir wall.

46. Presumably, in addition to the economic considerations that would limit diversion volume to that which could be pumped in a relatively short period of time, an additional limitation would result from the technological requirements of time for maintenance and flow reversal procedures. Furthermore, discharge through the turbines can proceed at approximately 1.5 times the rate of pumping. N.U., NORTHFIELD PAMPHLET, *supra* note 28, at 5. As a result, most of the available nighttime and weekend hours are already used for the pumping necessary to maintain the sustained capacity to release water and generate electricity during the weekday hours of peak demand.

47. *Id.* at 20.

48. *Id.* At the rate of 90,000 gallons per second, approximately 1.2 hours is required to pump 375 million gallons.

49. The mountain top reservoir is regularly filled to capacity once a week at the end of the sustained low-demand weekend period when pumping generally proceeds uninterrupted. As has been noted, diversion from the reservoir is not effectively limited by the reservoir's capacity, the time of day, season of the year, or the rate of river flow. The only effective limit, short of the technological capacity of the pumping system, is economic. *See* notes 33-37 *supra* and accompanying text.

50. The Act states: "The amount of water diverted over a three consecutive year period shall not exceed three hundred and [sic] seventy-five million gallons per day for each day that the flow of the Connecticut river . . . exceeds seventeen thousand cubic feet per second." Act of Aug. 25, 1970, ch. 766, 1970 Mass. Acts 631.

The language of the enactment may be fairly construed as authorizing diversion of titanic proportions of water on any given date, as long as the three year gallonage (permissible diversion days multiplied by 375 million gallons) is not exceeded. Professor Walford noted this possibility, but rejected it as inconsistent with the legislature's apparent intent to maintain a reasonably stable stream flow in the Connecticut River. Walford, Yield Study, *supra* note 38, at 3.

51. Act of Aug. 25, 1970, ch. 766, 1970 Mass. Acts 631.

Several interpretations of the 17,000 cfs limit are possible.⁵² The most logical construction is that no diversion would be permitted at any time when the preceding twenty-four hours' average river flow did not exceed 17,000 cfs. The average figure is appropriate because even during periods of peak spring flow, the Connecticut River is subject to large fluctuations in instantaneous flow,⁵³ caused by both natural forces and the effects of periodic storage and discharge from flood control and hydroelectric power facilities.⁵⁴ One study indicates that diversions authorized on the basis of the 17,000 cfs-average calculation could occur on ninety-one days in a typical year.⁵⁵ Under that regimen, the Northfield diversion would theoretically enhance MDC supplies by an average of ninety-nine mgd,⁵⁶ and would deplete the yearly flow of the river by thirty-four billion gallons. The MDC, from an unclear statistical basis, has projected seventy diversions per year, an average yield of seventy-two mgd, and a yearly river depletion of twenty-six billion gallons.⁵⁷

External forces, especially regional weather patterns, suggest that no projection is absolutely reliable in predicting the actual function of the proposed diversion. As recently as the spring of 1980, Quabbin was filled to capacity and overflowing its spillway.⁵⁸ Predictably, the spring months are also when the Connecticut River peaks and its average flow most frequently exceeds 17,000 cfs at Montague.⁵⁹ In many years, then, the Northfield diversion might

52. See Walford, Yield Study, *supra* note 38, at 3-6.

53. Instantaneous flow is the rate of stream flow at any given moment. Instantaneous flow can be monitored at any regular interval. The Montague gauge records flow bihourly. Brower & Walford, Model Zeta, *supra* note 38.

54. Nearby hydropower facilities are the Turners Falls Dam, Vernon Dam (Vermont), and the Northfield Mountain station. In his first study, Walford suggested that the appropriate construction of the Act, see note 50 *supra*, would be that diversion would only be permissible when flow exceeded 17,000 cfs at every monitoring interval during the preceding 24 hours. Walford, Yield Study, *supra* note 38, at 4. This interpretation seems unlikely given the history of the diversion proposal (the legislature had authorized diversion whenever the river flow exceeded 15,000 cfs) and the apparent intent of the legislature. Walford's strict construction would also have the probable effect of blocking diversion on any two consecutive days when the river was at any stage less than a raging flood, because the effect of one day's diversion could possibly cause a fluctuation below 17,000 cfs at the downstream monitoring station. It seems unlikely the legislature intended such a result. Walford subsequently adopted the average-flow interpretation in his second study. Brower & Walford, Model Zeta, *supra* note 38.

55. Walford, Yield Study, *supra* note 38, at 5.

56. The computation is: Permissible diversion days (91) multiplied by the probable daily yield (375 mgd) divided by the number of days in a year (365).

57. See KAYNOR, WATER ALLOCATION STUDY, *supra* note 41, at 58.

58. Williams, *Boston Water*, *supra* note 43, at 7,11 (photograph).

59. See Walford, Yield Study, *supra* note 38, at figure 2. During the past 75 years,

prove to be impractical during the season in which it could be expected to operate most safely and efficiently,⁶⁰ simply because the MDC would not have storage capacity for additional supplies.⁶¹

Conversely, during periods of drought, when the MDC's need would be greatest, the volume of river flow would be restricted and would less frequently exceed the 17,000 cfs flow requirement. Any diversions that might be accomplished during such periods of scarcity would have more significant downstream impacts⁶² and would cause introduction of relatively poor quality water into the MDC system.⁶³

The vagueness of the enabling legislation, the inconsistent diversion projections, and the imponderables of future demand and weather conditions make difficult an accurate projection of the Northfield diversion's impacts. Given the complexities involved, even the comprehensive Environmental Impact Report⁶⁴ will be speculative in its projections. Apparently, some impacts would be substantial while others would be less so; any impact, of course, would vary in its harshness depending on the volume of diversion and the rate of river flow. For purposes of clarity, the likely impacts of diversion are presented in tabular form. Those impacts potentially significant to interstate litigation will be discussed more fully in a subsequent section.

the months of April and May have supplied over 50 percent of the days upon which diversion would be permissible under the present statutory formula. *Id.*

60. Spring flood waters, per cubic foot, can be expected to carry lesser burdens of sewage and other organic contaminants than do waters flowing at a more restrained volume and pace. Thus, water introduced into Quabbin would be purer during the spring. Similarly, a diversion of 375 mgd, were the river flowing at 30,000 cfs, would likely have only a fraction of the downstream impact of a similar diversion accomplished were the river flowing at 17,000 cfs.

61. On the other hand, when the spring freshet follows a dry year, or if MDC member community demand increases substantially, Quabbin will not be full during the spring or any other season.

62. *See* note 60 *supra*; *see also* TABLES I-III *infra* and accompanying notes.

63. The amount of pollution discharged into the river is relatively constant throughout the year. Only flow varies markedly; thus, during periods of low rate of flow, much higher concentrations of pollutants would be present in a given volume of water. If the quality of water in the Connecticut River were sufficiently poor, the MDC could be expected to forego an otherwise permissible diversion.

64. The Environmental Impact Report will be the product of research by several consulting firms and a citizens advisory group. As of this writing, the report remains in its early stages of preparation.

TABLE I. *Impacts Resulting From Restriction of River Flow*

Impact	Effect	Impacted Populations and Activities
Reduced flood cleansing	Increase in riverbed sludge ^a	Fisheries ^b Recreation ^c Water Supply
Increased salinity in estuary	Alteration of estuarine habitat ^d	Riverbed mussels ^e Water supply
Reduced inundation of floodplain	Alteration of floodplain habitat ^f	Riverbed life ^g Floodplain vegetation Agriculture ^h
Reduced flow during an average of ninety days per year	Increase in river water temperature, enhancing organic contamination ⁱ	Fisheries Recreation Waste disposal Water supply
	Decrease in available suspended oxygen, enhancing organic contamination ^j	Fisheries Recreation Waste disposal Water supply
	Decrease in available flow ^k	Water supply Hydroelectric power generation Waste disposal Fisheries Recreation Navigation

^a Without strong flood currents to periodically flush the river and to scour the riverbed of accumulated sludge, sludge buildup will increase with the probable effect of reducing oxygen levels in the river and increasing water temperatures, thereby creating reverberations throughout the riverine food chain. See CONNECTICUT BASIN CO-ORDINATING COMM. COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION, D-71 (1970) [hereinafter cited as BASIN COMM. COMPREHENSIVE INVESTIGATION].

^b "Fisheries" connotes impact on commercial fisheries.

^c "Recreation" connotes impact on sport fishing, boating, swimming, and related shoreline activities.

^d The primary effect of reduced flow on the Connecticut River estuary would be to move upstream the point at which river water is entirely fresh, and to cause, downstream of that point, an adjustment in the fresh to salt water gradient. At any given point below the furthest upstream influence of salt water, the river would be saltier than it would be were it not for the diversion. It is not clear whether the proposed Northfield diversion would have any perceptible effect on the estuary, which by the nature of tidal action, is a dynamic and changing zone under any circumstance.

- ^e One study prepared for the Northfield Citizens Advisory Committee suggests a diversion might threaten an estuarine mussel, *Alasmidonta heterodon*. D. Smith, Report to Northfield Citizens Comm. (NCAC) (available at Connecticut River Watershed Council library, Easthampton, Massachusetts).
- ^f [P]ointbar and ox-bow lake formation, rejuvenation of coarse streambed breeding habitats, and the maintenance of the unique floodplain forests, swamps and marshes, depend on the extreme of flooding. Due to the very flat topography of the floodplain, a vertical change of very small magnitude in the level of flooding can make a much greater change in the area flooded. Even an inch (measured vertically), extended over the whole area of the floodplain, may reduce the area of inundation by hundreds of acres. R. Hubley, *supra* note 26.
- ^g A slug, *Cragonex pseudogracilis*, whose breeding habitat is in floodplain backwaters, might be destroyed by any substantial alteration in annual floodplain inundation. D. Smith, *supra* note *e*.
- ^h The Connecticut valley has historically been an extremely fertile agricultural area, largely because of the alluvial deposits left by the Connecticut River. In recent years, valley agriculture has become largely dependent on the use of chemical fertilizers, and, because of flood control damming, little tillable land has been inundated in recent decades.
- ⁱ Reduced flow increases the concentration of organic contaminants in any stream. In the absence of sufficient oxygen, organic compounds decay anaerobically, generating both heat and odor. See BASIN COMM., COMPREHENSIVE INVESTIGATION *supra* note *a*, at D-71.
- ^j As flow decreases and organic contaminants become more concentrated, available oxygen supplies are depleted, anaerobic decomposition occurs, and water quality decreases. *Id.* Decreased flow also lowers the turbulence of a stream, inhibiting its capacity to capture airborne oxygen. *Id.*
- ^k It has been suggested that the Northfield diversion, operating at the levels predicted by the MDC, would subtract only one percent of the Connecticut River's annual average flow. But it can be shown that reduced flow, reduced levels of oxygen, increased waste load, and increased anaerobic decomposition all are closely interrelated, and that disruption of the balance of these forces can substantially affect the quality of water in a stream. See notes *a, i-j supra*.

TABLE II. *Impacts Resulting From Cyclical Rapid Reductions In River Flow*

Impact	Effect	Impacted Populations and Activities
Increased turbulence and possible reverse river flow ^l	Riverbed-floodplain erosion and increased water turbidity ^m	Recreation Fisheries Navigation
	Disruption of sensory orientation and spawning activity of sport and commercial fish ⁿ	Fisheries Recreation

^l The discussion of ebb and flood impacts is based on the computer projections generated in the *Model Zeta* study, Brower & Walford, *Model Zeta, supra* note 38.

^m Periodic rapid reductions in natural flow which "would occur during flood periods when the kinetic energy of the river is high, [might result in] erratic erosion patterns

- . . . particularly along the banks of the river." *Id.* Erosion and erratic patterns of flow would also probably increase the level of solids suspended in, and later precipitating from, the waters of the Connecticut River.
- ⁿ Brower and Walford also speculate that an unnatural ebb and flood cycle on an upstream reach of the river could seriously impair the direction-sensing processes of certain fish, most notably the shad and Atlantic salmon. *Id.*

TABLE III. *Impacts Resulting From Introductions of Connecticut River Water Into Quabbin Reservoir*

Impact	Effect	Impacted Populations and Activities
Introduction of river species into Quabbin	Disruption of reservoir ecology ^o	Recreation Water supply
Introduction of impure water in Quabbin	Reduction in reservoir water quality ^p	Water supply
	Increase in lake bed silting at mouth of aqueduct	Water supply
	Possibly radioactive contamination of MDC water supply ^q	Water supply

^o Quabbin Reservoir is renowned for excellent trout fishing. METROPOLITAN DISTRICT COMMISSION, METROPOLITAN WATER SYSTEM (1976) (pamphlet). The sea lamprey, a parasitic eel-like fish, could enter Quabbin from its present habitat in the Connecticut River and rapidly throw the reservoir's carefully developed and delicate ecosystem into chaos by depleting the trout population. *See Williams, Boston Water, supra* note 43, at 7, 9. Another potential pest in the reservoir is the carp, which stirs up bottom sediments, causing turbidity and the destruction of fish eggs. T. CONVEL, QUABBIN: THE ACCIDENTAL WILDERNESS 57 (1981).

^p Quabbin water is rated class A+, the highest purity classification. The Connecticut River is rated class C+, *Williams, Boston Water, supra* note 43, at 7, and carries high levels of organic contaminants from upstream sewage disposal and wood pulp processing. Water quality ratings in the New England states are based on a scale of class A to class D, class A being suitable for any use, class D being suitable only for navigation and some industrial uses. Ratings for the Connecticut River are based on an analysis of the following factors: level of dissolved oxygen, burden of sludge, color, turbidity, taste, odor, pH, coliform bacteria contamination, radioactivity, and levels of phosphates, ammonia, and phenols. BASIN COMM., COMPREHENSIVE INVESTIGATION, *supra* TABLE I, note a, at D-75 to 76.

^q The Vermont Yankee power plant, nine miles north of the Northfield Mountain intake point, has had a checkered career as a nuclear facility. Its troubled history includes several incidents of radioactive discharge into the Connecticut River. *Williams, Boston Water, supra* note 43, at 9. Predictably, scientists and engineers have widely varying opinions concerning the risks of significant radioactive contamination of the MDC supply, but most concur that there is some danger. *Id.*

III. INTERSTATE WATER DIVERSION LITIGATION

Under the constitutional grant of original jurisdiction,⁶⁵ the Supreme Court has entertained six major lawsuits brought by downstream states requesting relief from upstream diversions.⁶⁶ In four of those cases the Supreme Court issued decrees apportioning rights to water from interstate streams;⁶⁷ in the others, the Court placed no restrictions on the challenged diversions.⁶⁸ The cases are few and propound no firmly settled body of law that could be invoked to resolve an interstate suit joined over the Northfield diversion.⁶⁹ The cases, however, do illustrate the broad principles of evidence and legal analysis that should govern future interstate water rights litigation.

A recurrent theme in the cases is the problem of choice of law: Whether intrastate law, considerations of equity, or elements of both should govern the Supreme Court's decisions. Each of the fifty states has developed its own unique body of law apportioning rights to flowing water among competing users;⁷⁰ thus, from the outset, the Court has rejected application of purely intrastate law.⁷¹ The Court,

65. U.S. CONST., art. III, § 2, cl. 1 & 2.

66. *Nebraska v. Wyoming*, 325 U.S. 589 (1945) (apportioning the North Platte River); *Washington v. Oregon*, 297 U.S. 517 (1936) (declining to apportion the Walla Walla River); *New Jersey v. New York*, 283 U.S. 336 (1931) (apportioning the Delaware River); *Connecticut v. Massachusetts*, 282 U.S. 660 (1931) (apportioning the Connecticut River); *Wyoming v. Colorado*, 259 U.S. 419 (1922) (apportioning the Laramie River); *Kansas v. Colorado*, 206 U.S. 46 (1907) (declining to apportion the Arkansas River). The Supreme Court has also decided one case brought by several Great Lakes states to protest a diversion from Lake Michigan. *See Wisconsin v. Illinois*, 278 U.S. 367 (1929). Two other decisions considered diversions *into* interstate rivers. *See North Dakota v. Minnesota*, 263 U.S. 365 (1923); *Missouri v. Illinois*, 200 U.S. 496 (1906).

67. *Nebraska v. Wyoming*, 325 U.S. 589 (1945); *New Jersey v. New York*, 283 U.S. 336 (1931); *Connecticut v. Massachusetts*, 282 U.S. 660 (1931); *Wyoming v. Colorado*, 259 U.S. 419 (1922).

68. *Washington v. Oregon*, 297 U.S. 517 (1936); *Kansas v. Colorado*, 206 U.S. 46 (1907).

69. The Supreme Court has recurrently used two shorthand phrases to characterize the principles it has applied: "[E]quality of right," *Kansas v. Colorado*, 206 U.S. 46, 97 (1907) and "equitable apportionment," *Id.* at 118. *See also Nebraska v. Wyoming*, 325 U.S. 589, 617 (1945); *New Jersey v. New York*, 283 U.S. 336, 343 (1931); *Wyoming v. Colorado*, 259 U.S. 419, 464 (1922). The principle of equitable apportionment is explored in 2 R. CLARK, *supra* note 20, § 132.1.

70. *See* 1 R. CLARK, *supra* note 20, § 51.

71. *See Kansas v. Colorado*, 185 U.S. 125 (1902). The Court said, "[s]itting, as it were, as an international, as well as a domestic tribunal, we apply Federal law, state law, and international law, as the exigencies of the particular case may demand. . . ." *Id.* at 146-47. *See also Kansas v. Colorado*, 206 U.S. 46, 98 (1907). "[T]hrough these successive disputes and decisions this court is practically building up what may not improperly be called interstate common law." *Id.*

however, has accorded weight to general principles of water law shared by competing states.⁷²

The two major doctrines of water law are riparianism, common to the eastern and Mississippi Valley states, and priority of appropriation, common to the western states.⁷³ Riparianism, a common law principle, historically gave downstream abutters rights to the undisturbed natural flow of a stream.⁷⁴ Common law riparianism is now subject to numerous exceptions, including a rule common to most riparian states that upstream abutters are entitled to a reasonable use of a stream's flow for normal consumption and waste discharge.⁷⁵ But even under the modern doctrine of riparianism, rights to reasonable use are limited to landowners abutting a body of water, so that distant consumers are restricted in their right to divert water from a stream.⁷⁶

In the western states, the doctrine of priority of appropriation developed as better suited to encouraging the large-scale irrigation and storage of spring runoff necessary for effective agricultural development of arid land.⁷⁷ By contrast to riparianism, priority of appropriation attaches no significance to a user's proximity to a watercourse. Ownership of land abutting a stream carries no special rights of access to streamflow; a distant consumer is in theory entitled to as much water as he can put to beneficial use.⁷⁸ The governing rule of appropriation law is priority in time: During periods of water shortage, more recent (junior) appropriators must curtail, or, if necessary, cease their use of a stream so that prior (senior) appropriators' demands can be satisfied.⁷⁹

The Supreme Court, in the interstate water diversion cases, has developed another principle of water rights to govern disputes between competing states: Equitable apportionment.⁸⁰ Equitable apportionment "is a label, not an analysis,"⁸¹ but functionally, it is a

72. See notes 168-86 *infra* and accompanying text.

73. For a more complete definition of the two doctrines see J. SAX, *WATER LAW, PLANNING & POLICY* 1-3 (1968). The importance of the doctrines in interstate water rights litigation is discussed in 2 R. CLARK, *supra* note 20, §§ 131.3 -4.

74. See 1 R. CLARK, *supra* note 21, §§ 17.1, 51.2.

75. Reasonable use is discussed in 7 *id.*, § 611. See also RESTATEMENT (SECOND) OF TORTS §§ 850, 850A (1977).

76. See, e.g., *Stratton v. Mount Hermon Boys' School*, 216 Mass. 83, 103 N.E. 87 (1913).

77. See 1 R. CLARK, *supra* note 20, § 18.

78. See *id.*, §§ 51.5 -9.

79. See *id.*, § 51.9.

80. See, e.g., *Kansas v. Colorado*, 206 U.S. 46, 97-98 (1907).

81. R. CLARK, *supra* note 20, § 132.1.

judgment based on "a consideration of the pertinent laws of the contending States and all other relevant facts . . ." ⁸² Equitable apportionment softens the harsh consequences of both riparian and appropriation doctrine, which, if applied to interstate disputes, would have the effect of vesting absolute rights in certain states. ⁸³

Approached chronologically, the Supreme Court decisions show a marked evolution in the Court's approach toward interstate water disputes and its willingness to rely on principles of intrastate water law. The early cases, couched in sweeping language, established the rule of equitable apportionment and alternately accepted or rejected state law principles in an inconsistent pattern. ⁸⁴ The later decisions gave fuller content to the term equitable apportionment, and the Court engaged in a more sophisticated examination of the benefits and burdens resulting from large-scale diversions and of the expectations, born of state law, of the competing consumers. ⁸⁵ The Court drafted increasingly complex decrees of apportionment in an effort to fairly balance those considerations. ⁸⁶ The body of law that emerged may be settled in its general framework but, as a rule of equity, is *ad hoc* in its application, wholly dependent upon the quality of the evidence adduced in any given controversy.

Kansas was the first state to sue another over rights to the consumption of the waters of an interstate stream. In 1901, Kansas brought suit against Colorado, alleging that Colorado was diverting an excessive volume of water from the Arkansas River. ⁸⁷ In *Kansas v. Colorado*, ⁸⁸ Chief Justice Fuller traced the Court's role in interstate dispute resolution and determined that water rights controversies were a proper matter for the Court's original jurisdiction. ⁸⁹ A

82. *Connecticut v. Massachusetts*, 282 U.S. at 670-71 (1931).

83. If, for instance, a strict common law riparian rule were applied, an upstream state would be effectively foreclosed from any significant diversions of water unless water of equal quantity and quality were returned to the stream. Similarly, as between competing appropriation states, strict application of appropriation law would give the state that first exploited a stream rights superior to a more recently developing state, without regard for equity or the regional implications of such an allocation.

84. *Compare Kansas v. Colorado*, 206 U.S. 46 (1907) with *Wyoming v. Colorado*, 259 U.S. 419 (1922).

85. *See, e.g., Nebraska v. Wyoming*, 325 U.S. 589 (1945).

86. *See, e.g., id.* at 665-72 (decree); *New Jersey v. New York*, 283 U.S. 805 (1931).

87. *Kansas v. Colorado*, 185 U.S. 125, 132-39 (1902).

88. 185 U.S. 125 (1902).

89. *Id.* at 139-47. Article III of the Constitution of the United States grants the federal judiciary jurisdiction over "[c]ontroversies between two or more states; . . ." and

demurrer by Colorado was overruled.⁹⁰

After a lengthy period of factfinding by a Court appointed master,⁹¹ the merits of Kansas' claim were reached in 1907.⁹² In an opinion by Justice Brewer, the Supreme Court's jurisdiction was reconfirmed, and the immense volume of evidence presented⁹³ was condensed into several general findings: That the diversions practiced by Colorado irrigators had diminished the flow of the Arkansas River;⁹⁴ that the Arkansas River region in Colorado was entirely dependent on irrigation;⁹⁵ that the Kansas counties bordering the river had recently lost population,⁹⁶ and; that the crop yield in Kansas had not been clearly diminished because of upstream diversions.⁹⁷

Canvassing prior decisions on water rights, Justice Brewer concluded that the Supreme Court's judgment was not bound by either state's internal rules of water law,⁹⁸ but, rather, was governed by

provides that the Supreme Court shall have original jurisdiction over cases to which a state is a party. U.S. CONST., art. III, § 2, cl. 1 & 2. The United States Judicial Code is more explicit, granting exclusive jurisdiction to the Supreme Court in "[a]ll controversies between two or more states. . . ." 28 U.S.C. § 1251 (1976).

Since a demurrer was overruled in *Missouri v. Illinois*, 180 U.S. 208 (1901), there has been no serious dispute about the propriety of litigating interstate water controversies before the Supreme Court. The principles of original jurisdiction are discussed in Note, *The Original Jurisdiction of the United States Supreme Court*, 11 STAN. L. REV. 665 (1959).

90. *Kansas v. Colorado*, 185 U.S. at 147.

91. The Supreme Court has appointed a master in each of the interstate water rights cases. The master's responsibilities include collecting evidence, presiding over hearings, taking expert testimony, and reporting his or her findings to the Court. See FED. R. CIV. P. 53.

92. *Kansas v. Colorado*, 206 U.S. 46 (1907). *Kansas v. Colorado* is discussed in Friedrich, *The Settlement of Disputes Between States Concerning Rights to the Waters of Interstate Streams*, 32 IOWA L. REV. 244 (1947).

93. *Kansas v. Colorado*, 206 U.S. 46, 105 (1907). Justice Brewer noted both the volume of evidence (8,559 pages, 122 exhibits, 347 witnesses) and its apparent unreliability: "[T]here is no little contradiction and a good deal of confusion [in the evidence]. . . ." *Id.* at 105-06.

94. *Id.* at 106-08, 117.

95. *Id.* at 109-10, 117. Justice Brewer observed that many of the Colorado diversions had been undertaken over ten years before Kansas first brought suit. *Id.* at 107-08. There was no suggestion in his opinion that the principle of laches should be invoked against the Kansas claim, although the Court was very solicitous of the needs of the Colorado irrigators who had become dependent on the diversions. "[The irrigators had] transform[ed] thousands of acres into fertile fields and render[ed] possible their occupation and cultivation where otherwise they would have continued barren and unoccupied. . . ." *Id.* at 117. See note 127 *infra*.

96. *Kansas v. Colorado*, 206 U.S. at 110, 112-13.

97. *Id.* at 111, 113.

98. *Id.* at 98-105. Justice Brewer noted that Colorado was governed by the rule of prior appropriation while Kansas applied the eastern riparian rule. He neatly undermined Kansas' argument that the Court should apply strict riparian principles of unabated

rules of equity and a balancing of the interests of the competing states.⁹⁹ Justice Brewer interpreted the evidence as demonstrating that while great benefits accrued to Colorado through irrigation, the diversions by which that irrigation was accomplished had worked only minimal injury on Kansas,¹⁰⁰ and held that no relief should be granted.¹⁰¹ Justice Brewer characterized the then existing division of Arkansas River waters as an "equitable apportionment of benefits"¹⁰² among the two states, despite some evidence that the riverbed in Kansas had been on occasion left dry.¹⁰³

Disputes between rival water users in the two states continued long after 1907, and in 1943, the Court again adjudicated the conflicting claims of Kansas and Colorado in *Colorado v. Kansas*.¹⁰⁴ The Court found that the flow of the Arkansas had actually increased during the years intervening since its prior decision,¹⁰⁵ and that while the State of Colorado and private Colorado users had instituted sensible conservation procedures, Kansas users were using primitive techniques and making inefficient use of the flow of water available to them.¹⁰⁶ Again, no discernible injury to the interests of Kansas or its citizens had been proven.¹⁰⁷ Again, no substantive restrictions were placed on Colorado's use of the river.¹⁰⁸

ed flow by citing *Clark v. Allaman*, 71 Kan. 206, 80 P. 571 (1905), which had adopted a test of reasonableness in adjudicating riparian rights within Kansas. *Kansas v. Colorado*, 206 U.S. at 102-03.

99. See note 71 *supra*.

100. *Kansas v. Colorado*, 206 U.S. at 109-113, 117.

101. *Id.* at 117.

102. *Id.* at 118. Kansas was granted the right to again bring suit should the volume of diversions "material[ly] increase." *Id.*

103. *Id.* at 115.

104. 320 U.S. 383 (1943). Colorado had complained that a series of lawsuits filed by Kansas water users were disrupting Colorado's distribution planning, and that adjudication of the suits would result in a fixed interstate allocation system. Colorado argued such a result was in contravention of the Supreme Court's decision in *Kansas v. Colorado*, 206 U.S. 46 (1907). Kansas in turn counterclaimed that Colorado had authorized diversions in excess of those approved by the earlier case. *Colorado v. Kansas*, 320 U.S. at 386-88 (1943). The 1943 decision is discussed in 44 COLUM. L. REV. 437 (1944).

105. *Colorado v. Kansas*, 320 U.S. at 396-98 (1943).

106. *Id.* at 397. The principle of discouraging waste is central to water law, and could be a critical factor in any litigation over the proposed Northfield diversion. See notes 252-59 *infra* and accompanying text.

107. *Colorado v. Kansas*, 320 U.S. at 400 (1943).

108. *Colorado v. Kansas*, 322 U.S. 708 (1944) (decree). The individual Kansas water users were enjoined from further prosecuting their claims. *Id.* The Court, possibly tiring of this conflict, had been blunt in advising states facing similar disputes in the future to attempt reaching agreement under the Compact Clause, rather than invoking the jurisdiction of the Supreme Court. *Colorado v. Kansas*, 320 U.S. at 392 (1943).

In 1922, the Supreme Court, in *Wyoming v. Colorado*,¹⁰⁹ entered its first decree¹¹⁰ apportioning the waters of an interstate river. Wyoming brought suit to enjoin a Colorado irrigation project that would have removed a significant portion of the Laramie River's flow to irrigate lands outside the river's watershed.¹¹¹ Wyoming's first ground for objection, that no out of basin diversion from an interstate river should be permitted, was summarily dismissed as an insufficient basis for the grant of an injunction.¹¹² Similarly rejected was Colorado's contention that it should be permitted to consume all the river water regardless of any injury to the interests of a downstream state.¹¹³ Noting that both states recognized the doctrine of priority of appropriation,¹¹⁴ Justice Van Devanter held that the principle of priority, applied without regard for state lines, was the most equitable basis for apportioning the waters of the Laramie River.¹¹⁵ Justice Van Devanter then determined the dependable flow of the Laramie River¹¹⁶ and ordered the priorities of the competing appropriators in both states.¹¹⁷ Because the volume of the appropriations recognized by both states exceeded the dependable flow,¹¹⁸ the Court's decree enjoined Colorado from permitting a planned diversion by the most junior appropriator in that state from exceeding a fixed annual volume.¹¹⁹

The decree proved ineffective in circumscribing the conduct of Colorado and its appropriators, and Wyoming continued to press its claims.¹²⁰ In 1936, the Court held that certain appropriations in Col-

109. 259 U.S. 419 (1922). *Wyoming v. Colorado* is discussed in Bannister, *Interstate Rights in Interstate Streams in the Arid West*, 36 HARV. L. REV. 960 (1923).

110. 259 U.S. at 496 (1922) (decree).

111. *Id.* at 456.

112. *Id.* at 466-67. The Court's opinion noted that similar diversions were permitted under the laws of both states. *Id.*

113. *Id.* at 466. Such a rule would be totally alien to the rules of equitable apportionment laid down in *Kansas v. Colorado*, 206 U.S. 46 (1907), and in several other Supreme Court decisions. *Wyoming v. Colorado*, 259 U.S. at 466.

114. *Wyoming v. Colorado*, 259 U.S. at 467, 470-71. See notes 73-76 *supra* and accompanying text.

115. *Wyoming v. Colorado*, 259 U.S. at 470.

116. *Id.* at 471-89.

117. *Id.* at 489-95.

118. *Id.* at 489.

119. *Id.* at 496. The decree was modified shortly thereafter. *Wyoming v. Colorado*, 260 U.S. 1 (1922). The limits placed by the decree on the most junior appropriator is entirely consistent with the rules of prior appropriation. See notes 73-79 *supra* and accompanying text.

120. The individual appropriators were explicitly held bound by an interim decree, *Wyoming v. Colorado*, 286 U.S. 494 (1932).

orado should be terminated.¹²¹ Otherwise, Colorado was free to vary the volume of diversions allocated to individual appropriators,¹²² as long as the aggregate limits imposed by the earlier decree were observed.¹²³ Evidently, despite its references to individual appropriators, the prior decision had not been intended to fix the rights of the individual appropriators, but only to establish their priorities as a tool in fairly apportioning the Laramie River among the competing states.¹²⁴ Rules of priority, on the facts of *Wyoming v. Colorado*,¹²⁵ simply had provided a convenient formula to apply in attaining that goal.¹²⁶

The Supreme Court in 1931 first addressed the problems of apportioning water rights to interstate rivers among contending riparian states.¹²⁷ In *Connecticut v. Massachusetts*¹²⁸ and *New Jersey v.*

121. *Wyoming v. Colorado*, 298 U.S. 573, 579, 581-82, 586 (1936). Justice Van Devanter found that Colorado had excusably violated several unclear provisions of the earlier decree, and because Colorado had promised to abide by any clarification of its rights, no injunction was issued to correct those violations. *Id.* at 579. Another diversion that had been carried on beyond the limitations placed by the decree, with "distinctly wasteful" results, was placed under a specific injunction. *Id.* at 581-82, 586. This second major opinion in the Laramie River controversy is discussed in Simsarian, *The Diversion of Interstate Waters in the United States*, 32 AM. POL. SCI. REV. 907 (1938).

122. The appropriators were those recognized in the 1922 decision. See note 119 *supra* and accompanying text.

123. *Wyoming v. Colorado*, 298 U.S. 573, 584-85 (1936).

124. *Id.* at 583-85. Justice Van Devanter found that the rights of individual appropriators were governed by state law and not properly before the Court:

It was not the purpose of that suit or of the decree to withdraw water claims dealt with therein from the operation of local laws relating to their transfer or to restrict their utilization in ways not affecting the rights of one state and her claimants as against the other state and her claimants.

Id. at 584.

125. 259 U.S. 419 (1922).

126. Justice Van Devanter's opinion noted that appropriation law, in addition to providing a fair basis for the decision, placed mutual responsibilities on both states to make fair and reasonable use of the Laramie River. *Wyoming v. Colorado*, 259 U.S. at 484. The 1936 decision was further clarified in *Wyoming v. Colorado*, 309 U.S. 572 (1940) and amended by consent of both states in *Wyoming v. Colorado*, 353 U.S. 953 (1957).

127. In 1929, the Supreme Court had adjudicated another major water dispute in *Wisconsin v. Illinois*, 278 U.S. 367 (1929), which focused on the rights of states bordering on the Great Lakes. Wisconsin, together with Michigan, Ohio, Pennsylvania, and New York, had brought suit to have the Court enjoin the novel waste disposal practices of Chicago, hinging on the diversion of huge volumes of water from Lake Michigan into the Mississippi River system. By the early 1920's that diversion had caused the level of the lower Great Lakes to decrease by six inches. The states opposing the diversion succeeded in obtaining a decree which imposed major, step-by-step reductions in the volume of water Chicago was permitted to siphon from Lake Michigan. *Id.* at 420. *Wisconsin v.*

New York,¹²⁹ the Court permitted major diversions from tributaries of the Connecticut and Delaware Rivers.

*Connecticut v. Massachusetts*¹³⁰ grew out of the expanding water supply requirements of Boston and, as would any litigation over the proposed Northfield diversion, pitted the interests of the Connecticut Valley against those of eastern Massachusetts. As the Boston metropolitan area grew in the early twentieth century, water demand rapidly overtaxed the supply available from the MDC's existing sources.¹³¹ By 1927, the Massachusetts General Court had settled on the construction of Quabbin to relieve the supply crisis, and the necessary legislation was enacted.¹³² In 1928, Connecticut filed suit, alleging that the Quabbin plan would violate Connecticut's riparian rights in the Connecticut River in several respects.¹³³ Connecticut sought an injunction forbidding the impoundment of the Swift River and diversions to Quabbin from the Ware River.¹³⁴ Both rivers are tributaries of the Connecticut.

After a period of factfinding, the Supreme Court ruled on the merits of Connecticut's claim, denying requests for injunctions against both the Quabbin plan and any future diversions.¹³⁵ Connecticut had attempted to prove injury to its shad fishery, hydroelec-

Illinois has substantial importance in the related field of interstate river rights litigation, for the case demonstrates the significance the Court may attach to objectively proven harm. The Supreme Court was clearly impressed by the substantial long term damage to Great Lakes shipping interests. *Id.* at 408-09. Collecting such evidence, which is the product of observing the effect of an accomplished diversion, is not without its drawbacks. As was noted in *Kansas v. Colorado*, 206 U.S. 46 (1907), the Supreme Court showed great solicitude for the reliance a region may come to place on an accomplished diversion. *See* note 95 *supra* and accompanying text.

128. 282 U.S. 660 (1931). *Connecticut v. Massachusetts* is discussed in Kelly, *Rationing the Rivers: A Decade of Interstate Waters and Interstate Commerce in the Supreme Court*, 14 ROCKY MT. L. REV. 12 (1941); Burch, *Conflicting Interests of States over Interstate Waters*, 10 TENN. L. REV. 267 (1932).

129. 283 U.S. 336 (1931). *New Jersey v. New York* is discussed in Simsarian, *The Diversion of Interstate Waters in the United States*, 32 AM. POL. SCI. REV. 907 (1938); Burch, *Conflicting Interests of States over Interstate Waters*, 10 TENN. L. REV. 267 (1932) (Judge Burch was the Master who had collected evidence and made recommendations to the Supreme Court in *New Jersey v. New York*).

130. 282 U.S. 660 (1931).

131. *Id.* at 664-65.

132. *See* Act of April 26, 1927, ch. 321, 1927 Mass. Acts 384; Act of May 28, 1926, ch. 375, 1926 Mass. Acts 441. As constructed, Quabbin Reservoir flooded approximately 39 square miles of the Swift River basin and wiped out four Massachusetts towns: Prescott, Dana, Enfield, and Greenwich. Approximately 2,500 people were resettled. QUABBIN FACTS, *supra* note 24, at 3, 10-11.

133. 282 U.S. at 662-63.

134. *Id.* at 662, 665-66.

135. *Id.* at 673-74.

tric power facilities, floodplains, and to the navigability of the river.¹³⁶ Connecticut also argued a classical riparian right to an unabated flow of the river.¹³⁷ Justice Butler found the evidence presented unpersuasive,¹³⁸ and held that earlier cases compelled a complaining state to prove that "the threatened invasion of rights is of serious magnitude and established by clear and convincing evidence,"¹³⁹ a burden he found Connecticut had not met.¹⁴⁰ Similarly, Justice Butler rejected any suggestion that an out-of-basin diversion was inherently objectionable,¹⁴¹ as it would be under pure riparianism.¹⁴² Justice Butler refused to allow other elements of riparianism to govern the Supreme Court's reasoning.¹⁴³ Rather, he held that given Boston's need for a dependable source of drinking water, the absence of any proven alternative sources, and the inadequacy of Connecticut's proof of injury, no injunction should be issued.¹⁴⁴ Significantly, however, the Court's final decree¹⁴⁵ placed an affirmative obligation on Massachusetts to abide by limits placed on the operation of Quabbin,¹⁴⁶ and granted Connecticut the right to renew its objections if its "substantial interests" were threatened by violation of those limits through a "material increase"¹⁴⁷ in the Massachusetts diversions from the Ware and Swift Rivers.¹⁴⁸

136. *Id.* at 666-67.

137. *Id.* at 669-70.

138. *Id.* at 666-67, 672-73.

139. *Id.* at 669. Justice Butler cited *New York v. New Jersey*, 256 U.S. at 309 and *Missouri v. Illinois*, 200 U.S. 496, 521 (1906). Both those cases pertained to claims of nuisance arising from the sewage disposal practices of the defendant states, rather than the disruption of an interstate river's flow caused by a diversion. Justice Holmes had defended the imposition of these burdens in interstate litigation in *Missouri v. Illinois*, 200 U.S. 496, 519-21 (1906).

140. 282 U.S. at 669.

141. *Id.* at 672.

142. See note 76 *supra* and accompanying text.

143. 282 U.S. at 670-72. See notes 73-76 *supra* and accompanying text.

144. 282 U.S. at 672-74. Justice Butler said, "Drinking and other domestic purposes are the highest uses of water." *Id.* at 673.

145. *Connecticut v. Massachusetts*, 283 U.S. 789 (1931) (decree).

146. The limits were incorporated from Massachusetts legislation and an agreement between Massachusetts and the Army Corps of Engineers. See *Connecticut v. Massachusetts*, 282 U.S. at 665, 672, 674.

147. *Connecticut v. Massachusetts*, 283 U.S. 789, 790 (1931).

148. Neither the Swift nor Ware Rivers enter Connecticut before discharging into the main stem of the Connecticut River, thus Connecticut has never had any legally cognizable interest in the flow of either river except as each contributes to the flow of the main stem. In *Wyoming v. Colorado*, 298 U.S. 573 (1936), the Supreme Court made clear that it did not intend that its decree be read as circumscribing the internal water allocation rules of the party states. See note 126 *supra*. Thus, the decree in *Connecticut v. Massachusetts*, 283 U.S. 789 (1931), which limited the diversion volume from two *in-*

A resolution similar to that in *Connecticut v. Massachusetts*¹⁴⁹ was reached by Justice Holmes in *New Jersey v. New York*.¹⁵⁰ New Jersey alleged that a New York plan to impound and divert to New York City the waters of several Delaware River tributaries would violate New Jersey's general riparian rights and cause certain specific injuries.¹⁵¹ In line with the rule stated in *Connecticut v. Massachusetts*,¹⁵² Justice Holmes rejected application of strict riparianism, stating:

[A] more liberal answer may be given [in resolving interstate disputes] than in a controversy between neighbors members of a single State. Different considerations come in when we are dealing with independent sovereigns having to regard the welfare of the whole population and when the alternative to settlement is war. In a less[er] degree, perhaps, the same is true of the quasi-sovereignities bound together in the Union. *A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it. . . .* Both States have real and substantial interests in the River that must be reconciled as best they may be. The different traditions and practices in different parts of the country may lead to varying results, but *the effort is always to secure an equitable apportionment without quibbling over formulas* [sic].¹⁵³

Although Justice Holmes cited no evidence to support such a conclusion, New Jersey's allegations that the diversion would impair recreation and oystering in the river were deemed proven.¹⁵⁴ The decree¹⁵⁵ therefore placed a ceiling, well below that requested by

trastate rivers, may be read as a limit on Massachusetts' right to divert from the main stem or any tributary, if the combined effect of that and the existing Quabbin diversion would cause an injury to Connecticut's interests. The Court implicitly made this suggestion, holding that a prospective injunction was unnecessary because "Massachusetts declares that she intends to and must obey these findings of the War Department. *Her statements . . . clearly negative any threat, intention or purpose to make any diversion of water in excess of that specified . . .*" *Connecticut v. Massachusetts*, 282 U.S. at 674 (emphasis added).

149. 282 U.S. 660 (1931).

150. 283 U.S. 336 (1931).

151. *Id.* at 338-39, 343-45. The injuries alleged were to fisheries, water quality, industry, property values, water supply, agriculture, and recreation. *Id.* Pennsylvania had intervened, not in direct opposition to the New York plan, but to request that the diversion be charged against New York's equitable share of the Delaware River's flow. *Id.* at 340-41.

152. 282 U.S. 660 (1931).

153. 283 U.S. at 342-43 (emphasis added).

154. *Id.* at 345.

155. *New Jersey v. New York*, 283 U.S. 805 (1931) (decree).

New York, on the volume of permissible diversions.¹⁵⁶ Although the master found that the diversion did not seriously threaten the water quality in the main stem of the Delaware River,¹⁵⁷ the decree also obligated New York, before it could effect the diversion, to construct a sewage treatment plant to purify wastes entering the river at Port Jervis, New York.¹⁵⁸ In line with the decree entered in *Connecticut v. Massachusetts*,¹⁵⁹ New York also was required to release a limited volume of the impounded waters during periods of low flow in the main stem.¹⁶⁰

Washington v. Oregon,¹⁶¹ decided in 1936, was perhaps the most easily resolved of the interstate water diversion cases. Washington alleged that Oregon irrigators were appropriating an excessive volume of water from a branch of the Walla Walla River and requested a decree of equitable apportionment.¹⁶² Based largely on the master's findings, Justice Cardozo dismissed the claim on several grounds.¹⁶³

Justice Cardozo found elements of laches in the conduct of Washington and of the key Washington consumer, Gardena Farms, who had permitted the Oregon diversions to go unchallenged for almost fifty years.¹⁶⁴ He also found that the Washington appropriator

156. The limit, 440 mgd, was considerably less than New York's planned diversion volume of 600 mgd. *New Jersey v. New York*, 283 U.S. at 339-40.

157. *Id.* at 345.

158. *Id.* at 346.

159. 282 U.S. 660 (1931).

160. 283 U.S. at 346-47. The decree was made subject to the paramount interest of the United States in protecting the navigability of the Delaware River. *Id.* at 348. The decree was modified in 1954, with the consent of Delaware, Pennsylvania, and New Jersey, to permit New York to increase the volume of its diversions on completion of a new dam. *New Jersey v. New York*, 347 U.S. 995 (1954). The use of the Delaware River as a water supply is now governed by the Delaware River Basin Compact, Pub. L. No. 87-328, 75 Stat. 688 (1961).

161. 297 U.S. 517 (1936). *Washington v. Oregon* is discussed in Kelly, *Rationing the Rivers: A Decade of Interstate Waters and Interstate Commerce in the Supreme Court*, 14 ROCKY MT. L. REV. 12 (1941).

162. 297 U.S. at 518-19. The Walla Walla actually divides into several branches in northeastern Oregon. Oregon farmers had been in the practice of diverting most of the water from the largest branch into the smaller ones, from which irrigation channels had been dug. *Id.* at 519-22. Washington also had alleged that the Oregon farmers were improperly taking and applying the region's groundwater. Those allegations were rejected on several grounds. *Id.* at 524-26.

163. *Id.* at 530.

164. *Id.* at 529-30. Justice Cardozo offered a stinging rebuke to Washington in the course of his opinion.

undertook its irrigation project knowing of the preexisting Oregon diversions¹⁶⁵ and had failed to complete its project diligently.¹⁶⁶ Based on those findings, relevant to both considerations of equity and of appropriation law, Justice Cardozo held that the Oregon irrigators were not taking more than their rightful share of the Walla Walla River's flow.¹⁶⁷

In 1945, *Nebraska v. Wyoming*,¹⁶⁸ the most recent and most complex interstate diversion case was decided. Justice Douglas, writing for five members of the Court,¹⁶⁹ adjudicated the rights of three competing states to the waters of the North Platte River. The North Platte originates in Colorado and flows through Wyoming and Nebraska before entering the Missouri River. The North Platte had long been subject to extensive diversions for the purpose of irri-

The case comes down to this: the court is asked upon uncertain evidence of prior right and still more uncertain evidence of damage to destroy possessory interests enjoyed without challenge for over half a century. In such circumstances an injunction would not issue if the contest were between private parties, at odds about a boundary. Still less will it issue here in a contest between states, a contest to be dealt with in the large and ample way that alone becomes the dignity of the litigants concerned.

Id. at 529.

165. *Id.* at 527.

166. *Id.* at 528-29.

167. *Id.* at 526-27. Justice Cardozo gave great weight to the principles of priority of appropriation in his decision. That same concept was central to the decision in *Wyoming v. Colorado*, though in both cases the Court emphasized that considerations of equity dictated a similar result. See notes 114-15 *supra* and accompanying text.

Washington v. Oregon was also grounded on a very practical finding. Because of the porous qualities of the Walla Walla riverbed, even were the Oregon diversions to be enjoined, little or none of the water flowing past the site of those diversions would reach Washington during the dry season. Justice Cardozo observed:

To restrain the diversion . . . would bring distress and even ruin to a long established settlement of tillers of the soil for no other or better purpose than to vindicate a barren right. This is not the high equity that moves the conscience of the court in giving judgment between the states.

Washington v. Oregon, 297 U.S. at 523 (citations omitted).

168. 325 U.S. 589 (1945). See *Arizona v. California*, 373 U.S. 546 (1963) in which the Court confirmed the paramount authority of Congress to allocate the water of a navigable interstate river (the Colorado) under its Article I power to regulate interstate commerce. Although the *Arizona v. California* Court considered the proper allocation of water from certain Colorado River tributaries, its decision was based on statutory construction, not principles of equitable apportionment.

169. Justice Jackson took no part in the decision. Justice Roberts, joined by Justices Rutledge and Frankfurter, dissented on the grounds that the case was not properly justiciable, as Nebraska had not carried its burden of proof. 325 U.S. at 657-64 (Roberts, J., dissenting).

gating arid lands and was impounded behind a series of dams in Wyoming and Nebraska to maximize a reliable water supply.¹⁷⁰ The controversy arose in part because of the construction of another dam in Wyoming, the Kendrick Project,¹⁷¹ and in part because of the effects of a series of droughts beginning in 1930 and persisting for some thirteen years.¹⁷² Nebraska alleged that the new dam threatened the future water supply to western Nebraska, and that the drought, in concert with upstream diversions, had caused an insufficient flow of water to even satisfy Nebraska's then existing needs.¹⁷³

Justice Douglas, adopted the master's findings, and by denying Colorado's motion to dismiss, held that the North Platte River had been over-appropriated by Colorado and Wyoming and that a justiciable controversy existed.¹⁷⁴ Justice Douglas applied the locally adopted principles of priority of appropriation as a general guide, but stated:

[I]f an allocation between appropriation States is to be just and equitable, strict adherence to the priority rule may not be possible. For example, the economy of a region may have been established on the basis of junior appropriations. So far as possible those established uses should be protected though strict application of the priority rule might jeopardize them. *Apportionment calls for the exercise of an informed judgment on a consideration of many factors.*¹⁷⁵

Justice Douglas divided the river into six segments.¹⁷⁶ Based on

170. *Id.* at 594-97.

171. The dam was constructed by the federal government, and had not been put into operation before *Nebraska v. Wyoming* was decided. *Id.* at 597.

172. *Id.* at 598-99.

173. *Id.* at 599.

174. *Id.* at 608-11. Justice Douglas found that all three states were governed by appropriation law, although eastern sections of Nebraska follow principles of riparianism. *Id.* at 599-600.

175. *Id.* at 618. (emphasis added). Justice Douglas continued:

Priority of appropriation is the guiding principle. But physical and climatic conditions, the consumptive use of water in the several sections of the river, the character and rate of return flows, the extent of established uses, the availability of storage water, the practical effect of wasteful uses on downstream areas, the damage to upstream areas as compared to the benefits to downstream areas if a limitation is imposed on the former—these are all relevant factors. They are merely an illustrative, not an exhaustive catalogue. They indicate the nature of the problem of apportionment and the delicate adjustment of interests which must be made.

Id.

176. *Id.* at 593. One segment was in Colorado, three in Wyoming, and two in Nebraska. The two Nebraska segments were essentially ignored because the critical

a balancing of priority rights, practical considerations, and equities, appropriators in four of the segments were granted rights to a share of the dependable flow of the river.¹⁷⁷ Domestic uses in all three states were exempted from any of these limitations.¹⁷⁸ Rights to the water in the most fiercely contested segment of the river were allocated between Wyoming and Nebraska on a percentage formula derived from appropriation volumes during periods of high river flow.¹⁷⁹ Such a determination was alien to the actual priorities that were recognized in that region¹⁸⁰ but was seen by Justice Douglas as the most sensible and equitable basis for allocating rights, particularly during periods of drought when reliance on the river would be at its height.¹⁸¹

Justice Douglas' opinion drew substantially upon the soundest elements of the Court's analysis of prior interstate water diversion controversies. The decision in *Nebraska v. Wyoming*¹⁸² accorded considerable weight to state law governing water rights to the source in dispute, but state law clearly was made secondary to the principles of equitable apportionment.¹⁸³

Equitable apportionment was explicitly recognized as the product of a balancing of three factors beyond the consideration of rights vested under state law. One of the factors was the practical consideration of avoiding regulation of an upstream use when that regulation would create no downstream benefits.¹⁸⁴ A second factor was the consideration, common to equity, of the reliance interests of those who had become dependent on established diversions.¹⁸⁵ A third factor accorded substantial weight was the character of various uses;

reach of the North Platte was the easternmost segment in Wyoming. It was from that segment that virtually all of the Nebraska appropriators who depended on the North Platte drew their water. *Id.* at 595-96, 654-55.

177. *Id.* at 621-55. Colorado users were, for instance, limited to their present levels of consumption. *Id.* at 621-23. See note 176 *supra* for treatment accorded the two most downstream segments.

178. 325 U.S. at 656.

179. *Id.* at 637-43.

180. *Id.* at 641 (table listing priorities).

181. *Id.* at 643. There were also considerations of efficiency and economic fairness supporting this determination. *Id.* at 640.

182. 325 U.S. 589 (1945).

183. *Id.* at 618, 646. This holding, together with Justice Douglas' interpretation of *Washington v. Oregon* and *Wyoming v. Colorado*, brought the western appropriation cases more in line with the decisions in *New Jersey v. New York* and *Connecticut v. Massachusetts*, which had rejected application of strict riparian principles.

184. 325 U.S. at 619.

185. *Id.* at 618, 621, 643.

whether wasteful or efficient, whether domestic or agricultural.¹⁸⁶ Clearly, Justice Douglas intended that all the relevant burdens created by a diversion from an interstate stream be considered and weighed against a similar consideration of the diversion's benefits. That analysis should apply to future litigation as well. Those factors explored by Justice Douglas, as well as several other contemporary factors, would be central to the development of evidence and arguments to be presented should Connecticut seek an injunction to bar the proposed diversion at Northfield.

IV. ISSUES IN A POSSIBLE INTERSTATE LAWSUIT OVER THE NORTHFIELD DIVERSION

The rule established in the interstate water diversion cases is that a state opposing diversion of water must allege substantial injury to sustain a suit¹⁸⁷ and must prove that injury by clear and convincing evidence in order to obtain an injunction.¹⁸⁸ Further, a state bringing suit must confront two unattractive options in the timing of its objections. A state may seek an injunction before a diversion is accomplished, shouldering the burden of demonstrating injury based only on projections of impact.¹⁸⁹ Alternatively, it may allow the diversion to occur and collect hard evidence of impact, then shouldering the burden of opposing an established use.¹⁹⁰

The Supreme Court has embraced several principles that may mitigate a complaining state's burdens in certain factual settings. The Court has considered the totality of downstream impacts imposed by a diversion: Thus, where no single injury was of sufficient magnitude, several lesser injuries, when considered together, were found substantial enough to justify at least a partial injunction.¹⁹¹ Similarly, a state has not been permitted to accomplish through a series of minor diversions, each with minimal impacts, that which would not have been permissible to accomplish through a single, major diversion.¹⁹²

The Supreme Court also has accorded weight to the nature of

186. *Id.* at 618, 656.

187. *See, e.g.*, *Connecticut v. Massachusetts*, 282 U.S. at 669.

188. *Id.* at 669.

189. *See, e.g.*, *Connecticut v. Massachusetts*, 282 U.S. 660 (1931).

190. *See, e.g.*, *Kansas v. Colorado*, 206 U.S. 46 (1907); *see also* note 127 *supra*.

191. *See, e.g.*, *New Jersey v. New York*, 283 U.S. at 345; *see* notes 154-58 *supra* and accompanying text.

192. While this rule has never been explicitly stated, it is implicit in several of the interstate water diversion cases, in which the cumulative downstream impact of all of a state's diversions were considered. *See, e.g.*, *New Jersey v. New York*, 283 U.S. 336

water use in the contending states, thereby establishing a rough hierarchy of values for differing uses.¹⁹³ Consumptive use has been valued over nonconsumptive.¹⁹⁴ Domestic consumption has been valued over agricultural consumption.¹⁹⁵ Efficient use has been valued over inefficient use.¹⁹⁶ Thus, should a downstream state successfully demonstrate its use would be more valuable than the diverting state's use, the downstream state's chances of obtaining an injunction would be greatly enhanced.¹⁹⁷ By the same logic, if a diversion were wasteful, or were effected to supplement a wasteful use, there would be a good possibility that the diversion would be enjoined.

Finally, the Court has applied the principles of use hierarchy and the consideration of overall downstream impact in a more generalized balancing of the burdens and benefits occasioned by a water diversion.¹⁹⁸ In *Connecticut v. Massachusetts*,¹⁹⁹ for example, in addition to surveying all the injuries Connecticut alleged, Justice Butler examined Boston's need for drinking water, the paramount value of that use, and the lack of viable alternatives to the proposed construction of Quabbin.²⁰⁰ Justice Butler's decision favorable to Massachusetts was premised not merely on Connecticut's failure to prove substantial injury: Consistent with the general concept of equitable allocation, his implicit finding was that the benefits of the diversion outweighed its burdens.²⁰¹

As has been shown, however, in controversies in which the balance of burdens and benefits has been reversed, diversions have been enjoined.²⁰² Should the Northfield diversion plan near fruition, and

(1931) (considering the overall impacts of several planned diversions by the State of New York).

193. See, e.g., *Connecticut v. Massachusetts*, 282 U.S. at 673; see notes 144, 178, 186 *supra* and accompanying text.

194. See, e.g., *Kansas v. Colorado*, 206 U.S. 46 (1907); see notes 102-05 *supra* and accompanying text.

195. See, e.g., *Nebraska v. Wyoming*, 325 U.S. 589 (1945); see note 174 *supra* and accompanying text.

196. See, e.g., *Colorado v. Kansas*, 281 U.S. 179 (1930); see notes 107-10 *supra* and accompanying text.

197. This rule is implicit in *Wisconsin v. Illinois*, 248 U.S. 367 (1929); see note 127 *supra*. On the other hand, where similar uses of water are made in the contending states, the Court has not required that each use be equally productive. *Wyoming v. Colorado*, 259 U.S. at 468-69.

198. See notes 94-97, 144, 154-60, 175 *supra* and accompanying text.

199. 282 U.S. 660 (1931).

200. See note 144 *supra* and accompanying text.

201. *Connecticut v. Massachusetts*, 282 U.S. at 673.

202. See, e.g., *Wisconsin v. Illinois*, 281 U.S. 179 (1930); see note 127 *supra*; see also *Nebraska v. Wyoming*, 325 U.S. 589 (1945); note 177 *supra*.

should Connecticut seek to enjoin the diversion, the principles of overall downstream impact, hierarchy of uses, and burden-benefit analysis likely would be central to the Supreme Court's analysis of the controversy. Those principles therefore provide the framework for discussion of the positive and negative attributes of the Northfield diversion. Because detailed, reliable evidence is unavailable, discussion will be general. Not coincidentally, the Supreme Court has adopted a similarly general approach. In adjudicating interstate water suits, the Court has looked to the overall tenor of the evidence and arguments presented:

It is difficult for a court to decide issues of fact upon which experts equal in number and standing differ flatly and when their conclusions rest on estimates upon the correctness of which the court, without technical knowledge, can not undertake to pass. *In such cases, the court looks about for outstanding facts from which the lay mind can safely draw inferences.* . . .²⁰³

A. *Possible Downstream Impacts of the Northfield Diversion*

The Swift River diversion that created Quabbin subtracts approximately two percent from the average flow of the Connecticut River.²⁰⁴ That fact was noted by the Supreme Court, whose approval of Quabbin was at least partially predicated on Massachusetts' declaration that it would adhere to the provisions of a project permit issued by the Army Corps of Engineers. That permit required Massachusetts to release water from Quabbin during periods of low river flow, thereby protecting the navigability and water quality of the lower Connecticut River.²⁰⁵ Significantly, the Court refrained from enjoining any future diversions in part because Massachusetts' "statements . . . clearly negative any threat, intention or purpose to make any diversion in excess of that specified or otherwise than as set forth in the determinations of the War Department."²⁰⁶

The Northfield diversion would subtract an additional one percent from the river's annual flow.²⁰⁷ The combined effect of the established and proposed diversions would result in a cumulative downstream flow reduction of approximately three percent. Thus,

203. *North Dakota v. Minnesota*, 263 U.S. 365, 385-86 (1923) (emphasis added).

204. *Connecticut v. Massachusetts*, 282 U.S. at 666.

205. *Id.* at 665.

206. *Id.* at 674.

207. KAYNOR, WATER ALLOCATION STUDY, *supra* note 41, at 58.

the Northfield diversion, if accomplished, apparently would violate the Supreme Court's 1931 decree by materially increasing the volume of diversion.²⁰⁸ Although the Court likely would find a suit premised solely on that contention to be without merit,²⁰⁹ that Connecticut opposed the creation of Quabbin could provide an important foundation for Connecticut's claim in any litigation to block the proposed diversion. Certainly, Connecticut has not slept on its equitable rights²¹⁰ and thus should be permitted to adduce evidence of the cumulative impacts on Connecticut's interests of both past and impending diversions.²¹¹

Preservation of the navigability of the Connecticut River is of substantial interest to Connecticut, particularly along the reach of the river below the fall line.²¹² As one illustration of that interest, several oil storage facilities south of Hartford are supplied chiefly by tankers that navigate the river for a distance greater than thirty miles. Any impairment to the navigability of the river could have two effects: Restriction of tanker access to the terminals and enhancement of the risks of collision and grounding. Correspondingly, those risks could enhance the danger of an oil spill in the river.

There is other commercial use of the river for transportation in the reach south of Hartford, but available evidence suggests that the Massachusetts diversions, present and proposed, would create their most significant impacts during the spring, when river level is high and channel depth is not a major concern.²¹³ Should Connecticut, however, be able to demonstrate that risks are created, however, that proof would be significant, for impairment of navigability has been a pivotal issue in several of the interstate diversion cases.²¹⁴

When Connecticut brought suit against the Swift River diversion in 1931, there was a hydroelectric power station on the Connecticut River, north of Hartford.²¹⁵ Although the Supreme Court

208. See notes 147-48 *supra* and accompanying text.

209. Were Connecticut to advocate an injunction based solely on the somewhat obscure language of the 1931 decree, the Court might find that advocacy to be merely an exercise "to vindicate a barren right." *Washington v. Oregon*, 297 U.S. at 53.

210. For the importance of laches in interstate water cases, see note 164 *supra* and accompanying text.

211. See note 192 *supra* and accompanying text.

212. The fall line of the Connecticut River is at Windsor Locks, Connecticut. See map, Appendix B.

213. A similar discussion can be found in *Connecticut v. Massachusetts*, 282 U.S. at 666.

214. *Id.*; see note 127 *supra*.

215. *Connecticut v. Massachusetts*, 282 U.S. at 667.

denied an injunction, the possible impact of a diversion upon the facility was accorded consideration.²¹⁶ That facility no longer is in operation, but a smaller hydroelectric power station presently operates on the same reach of the river, at Windsor Locks.²¹⁷ Two municipal electric cooperatives²¹⁸ are undertaking an expansion of that power station;²¹⁹ when completed, the project would require an available river flow of 1900 cfs.²²⁰ But because the present average flow of the Connecticut River, as it enters Connecticut, is 15,900 cfs,²²¹ it is unlikely that an upstream diversion of the magnitude authorized at Northfield would have any perceptible impact on the expanded Windsor Locks hydroelectric power plant.²²²

At the present time, only industrial consumers in Connecticut use the river as a water supply.²²³ Because those users are few and because the cumulative flow restriction caused by both present and planned diversions would be slight, no discernible impact will be imposed on these current industrial users. Although several studies indicate that Connecticut communities will become dependent on the river as a municipal water source in the future,²²⁴ Connecticut would be unable to forcefully argue for protection of this substantial interest. Even in the aftermath of the Federal Declaratory Judgment Act,²²⁵ the Supreme Court has held that protection of such indefinite future rights is beyond the proper scope of its adjudicatory power in interstate water diversion suits.²²⁶

Connecticut has a more immediate interest in protecting the volume and quality of Connecticut River water, as those measures affect the river's ecological balance, recreational opportunities, and

216. *Id.*

217. STATE OF CONNECTICUT OFFICE OF POLICY AND MANAGEMENT, ENERGY: HYDROPOWER POLICY AND REPORT (1981).

218. Massachusetts Municipal Electric Energy Co-operative and Connecticut Wholesale Electric Co-operative.

219. Letter from J. Horne, State of Connecticut Office of Policy and Management, to Charles Stephenson (Sept. 28, 1981).

220. *Id.*

221. BASIN COMM. COMPREHENSIVE INVESTIGATION, *supra* note 63, at D-2.

222. Economic injury to commerce, and indirectly to consumers, was accorded substantial weight in *Wisconsin v. Illinois*, 278 U.S. 367, 408-09 (1929).

223. The most significant industrial consumer is the Connecticut Yankee nuclear power facility in Haddam, which draws water from the river to cool its reactor core.

224. *See* note 14 *supra* and accompanying text. *See generally* BASIN COMM. COMPREHENSIVE INVESTIGATION, *supra* note 63.

225. 28 U.S.C. § 2201 (1976).

226. *Nebraska v. Wyoming*, 325 U.S. at 608; *Connecticut v. Massachusetts*, 282 U.S. at 674. This premise is perhaps open to dispute. *See* 2 R. CLARK, *supra* note 20 § 130.2; notes 8-10 *supra* and accompanying text.

capacity to accept sewage and organic pollution. Under the doctrine of *parens patriae*,²²⁷ Connecticut has a legal interest in protecting plant and animal life in the river, riverbed, and floodplain.²²⁸ Several threatened and endangered species have been identified in the Connecticut River basin,²²⁹ and should Connecticut demonstrate that those species' welfare and survival would be placed at risk by the proposed diversion, the Supreme Court might accord that evidence considerable weight.²³⁰

In the past, the Supreme Court's analysis of interstate water diversion cases has been devoid of ecological considerations. The cases, however, were all decided before 1946 and, in the present era, the vulnerability of life forms and of the food chain to human interference may be more effectively raised before a court than in the past. In addition, the nation is now statutorily committed to protecting all forms of life and preserving ecological balance.²³¹ As with any modern technology, water diversions can disrupt the lives of both primitive and complex organisms. The intensity and breadth of any such disruptions, if demonstrable by objective evidence, could become a focal issue in a suit to block the Northfield diversion, because of heightened awareness of ecological impacts.

Any substantial decrease in water quality could also reduce the recreational value of the Connecticut River. Connecticut currently

227. The doctrine of *parens patriae* permits Connecticut to bring suit in its role as trustee of the natural resources of the state. See generally Note, *The Original Jurisdiction of the United States Supreme Court*, 11 STAN. L. REV. 665 (1959).

228. *Geer v. Connecticut*, 161 U.S. 519 (1896), *overruled on other grounds*, *Hughes v. Oklahoma*, 441 U.S. 322 (1979).

229. The following is a list of threatened or endangered species indigenous to the Connecticut River basin: (1) *Alasmidonta heterodon* (mussel); (2) *Goniobasis virginica* (slug); (3) *Crangonyx pseudogracilis* (flea); (4) *Acipenser brevirostrum* (sturgeon); (5) *Acipenser oxyrhynchus* (sturgeon); (6) *Falco peregrinus* (falcon); (7) *Haliaeetus leucocephalus* (bald eagle); (8) *Ludwigia polycarpa* (water herb); (9) *Pandion haliaetus* (osprey); (10) *Salix interior* (willow); and (11) *Sagittaria cuneata* (arrowhead plant). M. DeFalco, *supra* note 8, at 13; D. Smith, *supra* TABLE I, note e.

Projects that require licensing or sponsorship by any branch of the federal government implicate the prohibitions of the Endangered Species Conservation Act, 16 U.S.C. §§ 1531-42 (1976 & Supp. V 1981). For one illustration of the importance of the Endangered Species Conservation Act, see *Tennessee Valley Auth. v. Hill*, 437 U.S. 153 (1978) (blocking completion of the Tellico Dam because of the dam's projected impact on the snail darter).

230. See *New Jersey v. New York*, 283 U.S. at 345 (according weight to a diversion's impact on oysters, though regarding oysters purely as a commercial resource); see also note 229 *supra*.

231. National Environmental Policy Act, 42 U.S.C. §§ 4321-61 (1976 & Supp. V 1981); see note 229 *supra*.

maintains seven parks on the banks of the river²³² and stocks scores of Connecticut River tributaries with several species of sport fish.²³³ Additionally, the river supports a large recreational boating fleet, and Connecticut maintains five major launching facilities along the main stem.²³⁴ While recreational uses have been accorded weight in only one of the prior interstate cases,²³⁵ the multiple use potential of water sources is an important concern today. Any provable impact on Connecticut's recreational uses of the river caused by the Northfield diversion might therefore be given substantial consideration by the Supreme Court.

Connecticut joins the three upstream states²³⁶ in making substantial use of the Connecticut River as a waste disposal repository.²³⁷ One dramatic effect of any decrease in river volume is the river's correspondingly reduced capacity to safely accept those wastes.²³⁸ Adequate volume is necessary to maintain water quality by keeping oxygen levels high, waste precipitation low, and waste concentrations within acceptable limits.²³⁹ Should water quality become inadequate, then legal as well as aesthetic considerations may preclude the continuation of Connecticut's present waste disposal practices.²⁴⁰ The Northfield diversion, by reducing river flow, would have a measurable impact on this waste disposal-water quality equation. Any demonstrable reduction in the river's capacity to accept wastes would have an immediate effect on the interests of Connecticut citizens and could therefore provide Connecticut with a substantial legal argument against the Northfield diversion.

In 1931, Connecticut argued that the Swift River diversion would diminish the Connecticut River shad run.²⁴¹ The Supreme

232. The seven parks are: Dart Island, Waldo, Gillette Castle, Haddam Island, Haddam Meadows, Hurd, and Selden Neck State Parks. STATE OF CONNECTICUT DEP'T OF TRANSP., OFFICIAL 1981-1982 TRANSPORTATION/RECREATION MAP (1981).

233. See STATE OF CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION, CONNECTICUT FISHERIES PAMPHLET NO. 4: 1979-1980 CONNECTICUT TROUT STOCKING REPORT.

234. STATE OF CONNECTICUT DEP'T OF TRANSP., OFFICIAL 1981-1982 TRANSPORTATION/RECREATION MAP (1981).

235. See *New Jersey v. New York*, 283 U.S. at 345.

236. *New Hampshire, Vermont, and Massachusetts*. See note 2 *supra*.

237. See generally BASIN COMM. COMPREHENSIVE INVESTIGATION, *supra* note 63.

238. See TABLE I *supra*, notes a, i-k.

239. *Id.*

240. Both state and federal law may limit discharge of sewage, even when treated, into an overburdened body of water. See e.g. 33 U.S.C. §§ 1251-1361 (1976 & Supp. V 1981); CONN. GEN. STAT. § 25-26 (1981); CONN. GEN. STAT. § 25-54 a-yy (1981).

241. *Connecticut v. Massachusetts*, 282 U.S. at 664. The shad, like the salmon, is

Court found that the proof offered to substantiate that allegation was insufficient.²⁴² Largely because of increased pollution and river damming,²⁴³ and perhaps also because of the diversion, a decrease in the shad run did occur during the early decades of the twentieth century. Recently, through the combined efforts of federal and state governments and private industry,²⁴⁴ the shad run has stabilized, and the shad fishery remains a commercially viable activity in the Connecticut River estuary.

The Northfield diversion could substantially injure the shad run, indirectly, by increasing pollution concentrations. The Northfield diversion could also impede the shad run in two, more direct, ways. Periodic intensive diversion of water could cause disruption of the operation of the fish ladders necessary to the shad's upstream migration.²⁴⁵ Also, as suggested in one study, the diversion could create so much turbulence in the Northfield reach of the Connecticut River that the shad's sensory faculties might be distorted, causing many fish to become disoriented.²⁴⁶ Either of these effects could cause a reduction in the reproductive rate of the shad, with a resultant impact on Connecticut's commercial shad fishery.²⁴⁷ In at least one interstate water suit, the Supreme Court considered such an inquiry to be of substantial relevance.²⁴⁸

an anadromous fish, living most of its life in the ocean, but which ascends fresh water streams to spawn.

242. *Id.* at 667.

243. The shad and salmon are unable to leap over either the Holyoke or Turners Falls dams on the Connecticut River, and cannot pass the dams without the aid of a fish ladder.

244. *See generally* Anadromous Fish Conservation Act, 16 U.S.C. § 757 (1976 & Supp. IV 1980). One important participant in the Connecticut River Anadromous Fish program is Northeast Utilities, owner of the Northfield facility. N.U. has constructed fish ladders at both its Holyoke and Turners Falls facilities.

245. A fish ladder is composed of a series of "stairs" over which a migrating fish may comfortably leap. Such a ladder is necessary at dams that exceed a certain height to permit fish to move upstream past the dam. In an effectively designed ladder, water is directed through a sluiceway in the dam at a rate that would roughly correspond to the natural rate of flow over rapids with a length/drop ratio comparable to that of the ladder. Fluctuations in the depth of the impounded water could affect that rate of flow, with a consequent impact on the success of the annual shad/salmon migration.

246. Brower & Walford, Model Zeta, *supra* note 38.

247. *See id.*

248. Injury to the oyster fishery in the Delaware River was one reason why the Supreme Court limited the volume of New York's diversion in *New Jersey v. New York*, 283 U.S. at 345.

B. *Hierarchy of Uses for Connecticut River Water*

It has been shown that Connecticut makes no present use of the Connecticut River for purposes of domestic water consumption, and little use of the river for industrial purposes. Connecticut uses the river primarily for recreation, navigation, and waste disposal. By contrast, the Northfield diversion would help satisfy the domestic, municipal,²⁴⁹ and industrial water supply needs of greater Boston.²⁵⁰ Superficially, then, the MDC's plan to divert and consume Connecticut River water appears to be a more beneficial and more favored use.²⁵¹

But underlying greater Boston's need for more consumable water are statistics that could prove to be the basis for compelling arguments against the Northfield diversion. A 1975 study in thirteen test communities of the MDC system²⁵² found that an average of over 85,000 gallons of water per mile of pipe leaked from the distribution network each day.²⁵³ The study found that in Boston alone approximately fifty million gallons were lost daily due to leaks and pipe ruptures.²⁵⁴ Another study, including the years through 1978, indicated that much of Boston's distribution system has not been replaced since 1890 and that in some instances, water pipes are totally decayed.²⁵⁵ The MDC study estimated that up to seventy-six million gallons of daily loss could be remedied by a system-wide repair pro-

249. Municipal uses of MDC water include firefighting, water supplies to schools and other municipal buildings, system flushing, and street cleaning. See KAYNOR, WATER ALLOCATION STUDY, *supra* note 41, at A3.

250. The population of the MDC member communities was estimated to be approximately 2.3 million in 1980. Williams, *Boston Water*, *supra* note 43, at 7.

251. *Nebraska v. Wyoming*, 325 U.S. at 618, 656.

252. The study, popularly called the Curran Report, was funded by the MDC and executed by the Water Resources Research Center at the University of Massachusetts and Curran Associates of Northampton, Massachusetts. KAYNOR, WATER ALLOCATION STUDY, *supra* note 41, at 56.

253. MASSACHUSETTS PUBLIC INTEREST RESEARCH GROUP, BOSTON IS LEAKING 2 (1981) (available at Connecticut River Watershed Council library, Easthampton, Massachusetts) [hereinafter cited as MASSPIRG, BOSTON REPORT]. The estimates and projections of system leakage that were made in the Curran Report have been defended as statistically conservative. KAYNOR, WATER ALLOCATION STUDY, *supra* note 41, at A1-A4.

254. MASSPIRG, BOSTON REPORT, *supra* note 253, at 2-3. This figure is arrived at by multiplying the estimated daily consumption in Boston (143 mgd) by the percentage of that water estimated to be unmetered (46 percent). The product is then multiplied by the estimated percentage of unmetered water that is not beneficially consumed (76 percent).

255. Moynihan, *An Examination of Urban Water Supply Systems: A Case Study of the Boston, Massachusetts Metropolitan Area*, 1 J. PUB. & INT'L AFF. 86, 87 (1979).

gram.²⁵⁶ This level of waste probably has been reduced somewhat because most MDC member communities, with state aid, are undertaking repair programs and are educating consumers on the benefits of conservation. One such program has resulted in a net savings of twenty-nine percent in per capita water consumption.²⁵⁷ Nonetheless, waste likely remains substantial.

The Supreme Court, in several contexts, has held that waste and inefficiency are important considerations in the proper allocation of water rights among the states.²⁵⁸ Waste on the scale revealed in the MDC distribution system indicates that available water supplies are not being put to their most beneficial use. The potential for savings to be realized through consumer conservation carries a similar implication. Because the 1975 estimates of correctable daily losses exceeds the MDC's projection of yield from the Northfield diversion,²⁵⁹ more recent evidence of continued inefficiencies in the MDC distribution system would be central to any interstate litigation. That evidence would undermine any contention that Connecticut River water would be put to its highest and best use through diversion and would also provide compelling proof of waste.

C. *Comparison of Benefits and Burdens Resulting from the Northfield Diversion*

Partly because of their wastefulness in the use of available water supplies, the MDC member communities will soon need additional water. Several studies indicate that the MDC is already delivering more water than the safe yield²⁶⁰ of its sources,²⁶¹ and that MDC members' demand for water is almost certain to increase.²⁶² Popula-

256. MASSPIRG, BOSTON REPORT, *supra* note 253, at 2. The town of Arlington's per capita consumption dropped from 138 gallons per day in 1971 to 98 gallons per day in 1978, resulting in a town-wide savings in excess of \$145,000 per year. *Id.*

257. *Id.*

258. See notes 106, 121, 186 *supra* and accompanying text.

259. The MDC projects an average daily yield from Northfield of 72 mgd. See notes 55-57 *supra* and accompanying text.

260. Safe yield is defined in many ways, but essentially, the term means the available volume of water that a source can provide during all but the most extreme periods of drought. See KAYNOR, WATER ALLOCATION STUDY, *supra* note 41, at 50-52.

261. See *e.g.* SPECIAL STUDY COMMISSION, REPORT, *supra* note 7, at 4.

262. See, *e.g.*, Wallace, Floyd Associates, Inc., Planning Area (Sept. 1982) (draft report) (available at Water Supply Citizens Advisory Committee, Hadley, Massachusetts); WATER QUALITY TASK FORCE OF THE SPECIAL LEGISLATIVE COMMISSION ON WATER SUPPLY, CHEMICAL CONTAMINATION (Sept. 1979) [hereinafter cited as WATER QUALITY TASK FORCE].

tion in the MDC service area is presently 2.3 million.²⁶³ That figure will grow, not simply as the result of population growth in member communities, but also because of additions to the MDC roster of water service communities.²⁶⁴ Eastern Massachusetts' groundwater has become increasingly contaminated, particularly by road salt and the organic compound TCE,²⁶⁵ an industrial solvent. The MDC system will likely absorb in the future, as it has in the past, area communities whose municipal groundwater sources become unusable.²⁶⁶ The Northfield diversion would then clearly benefit the MDC and its member communities by helping to satisfy expanding future demand.

Should Connecticut seek to enjoin the diversion, the Supreme Court would accord considerable weight to projections of need for augmented water supply.²⁶⁷ But Connecticut, as it did in 1931, would likely argue that Boston's need for water should not automatically translate into the need for Connecticut River water.²⁶⁸ At least one other viable source of supply for the MDC has been studied extensively: the Plymouth groundwater aquifer in southeastern Massachusetts.²⁶⁹ Though initially more costly, sinking wells into the Plymouth aquifer probably would yield a more reliable and purer water source than would the Connecticut River diversion.²⁷⁰

263. Williams, *Boston Water*, *supra* note 43, at 7.

264. There are several towns within fifteen miles of the State House in Boston that are not presently members of the MDC but that could become members without amending the water supply statute. MASS. GEN. LAWS ANN. ch. 92, § 10 (West 1969 & Cum. Supp. 1982-83). Several non-member towns in central Massachusetts also receive MDC water and that number could also conceivably increase as well.

265. TCE is trichloroethylene. A 1979 study found significant TCE contamination in the water supply of several communities located within fifteen miles of the State House. The towns are: Bedford, Burlington, Canton, Danvers, Dedham, North Reading, Norwood, Westwood, Wilmington, and Woburn. WATER QUALITY TASK FORCE, *supra* note 262.

266. Bedford, Dedham, and Westwood are expected to join the MDC because of local supply contamination. Canton, Norwood, and Woburn have all become increasingly dependent on the MDC as local supplies have become unusable. *Id.*

267. *See, e.g.*, *Connecticut v. Massachusetts*, 282 U.S. at 664-65, 674.

268. *Id.* at 664.

269. The Plymouth aquifer is a massive groundwater source containing water trapped in water-bearing gravel that overlays a layer of impermeable rock. Williams, *Boston Water*, *supra* note 43, at 10.

270. The Corps of Engineers has speculated that the Plymouth aquifer could safely yield 300 mgd of pure water. *Id.* There have been several other alternatives suggested, including siphoning water from the Merrimack and Sudbury Rivers. Though both flow through eastern Massachusetts, they are contaminated with large amounts of industrial chemicals and polluted by upstream sewage discharge; neither is a promising water source. It has also been suggested that Quabbin Reservoir could itself be made more

Other factors derogating from the Northfield diversion's benefits to Boston area communities are the possible impacts of introducing Connecticut River water into the MDC system. Those impacts likely would include reducing the quality of Quabbin water, disruption of Quabbin ecology, and the consequent degradation of the quality of the water distributed for use through the MDC system.²⁷¹ While not injurious to Connecticut, those impacts would be nonetheless relevant to any assessment of the benefits to be derived from the proposed diversion.

Greater Boston's need for augmented water supply, though not insubstantial, stands as the only clear benefit the Northfield diversion could provide. As noted, the quality of that benefit has not gone unchallenged even in recipient communities,²⁷² and the same benefit might be achieved by tapping alternative sources or curbing waste.²⁷³ It has also been shown that against the benefit of reducing the MDC's supply crisis is a substantial list of possible downstream injuries.²⁷⁴

But while the MDC's needs are fairly clear, no accurate projections have been yet drawn of the Northfield diversion's likely impact on Connecticut River water quality, ecology, navigation, hydroelectric power generation, waste disposal, recreation, and commercial fisheries. The MDC's Environmental Impact Report may provide accurate projections, though its primary focus will be on impacts within Massachusetts. Connecticut, of course, might undertake its own impact studies.

Because the volume of diversion, past and proposed, represents only a small fraction of Connecticut River flow, any downstream impacts would likely be subtle. Additionally, most of the issues likely to be raised in litigation to block the Northfield diversion would be subtle, at least in comparison to those raised by the titanic diversions and dry riverbeds at issue in many of the prior Supreme Court cases. Yet should Connecticut present reliable proof of MDC system waste, feasible supply alternatives and a broad range of injuries, however minor, the overall weight of evidence, when measured against the

productive through judicious tree harvesting in its watershed, which would increase rain-water runoff into the reservoir.

271. See TABLE III *supra*, notes o-q. All MDC sources eventually commingle in the distribution system.

272. See notes 252-66 *supra* and accompanying text.

273. See TABLES I-III *supra*; notes 204-48 *supra* and accompanying text.

274. *New Jersey v. New York*, 283 U.S. at 342.

dubious benefits of the Northfield diversion, should justify an injunction.

V. CONCLUSION

The controversy over the Northfield diversion may never be presented for resolution by the Supreme Court of the United States. Massachusetts' Environmental Impact Report may prove the Northfield diversion to be practically and politically infeasible. Connecticut's misgivings may be quieted by a reciprocal agreement, either informally or through a compact approved by Congress. Should interstate litigation ensue, however, evidence would likely be developed, and arguments presented, within the framework described here.

In such a suit, Connecticut would carry the heavy burden of proving, by clear and convincing evidence, substantial injury to its interests. The weight of that burden would be lessened to the extent that Connecticut could demonstrate that the Northfield diversion is unnecessary or that better alternatives exist. Connecticut should also be permitted to demonstrate that the cumulative impact of the existing and impending diversions would injure one or more of Connecticut's interests in the Connecticut River. The crucial elements in the presentation of Connecticut's case would be evidence of MDC system-wide waste, other available water sources, and downstream impacts on navigation, water quality, ecosystems, and commercial interests. Thorough development of this evidence would no doubt prove costly, but, if accomplished, persuasive.

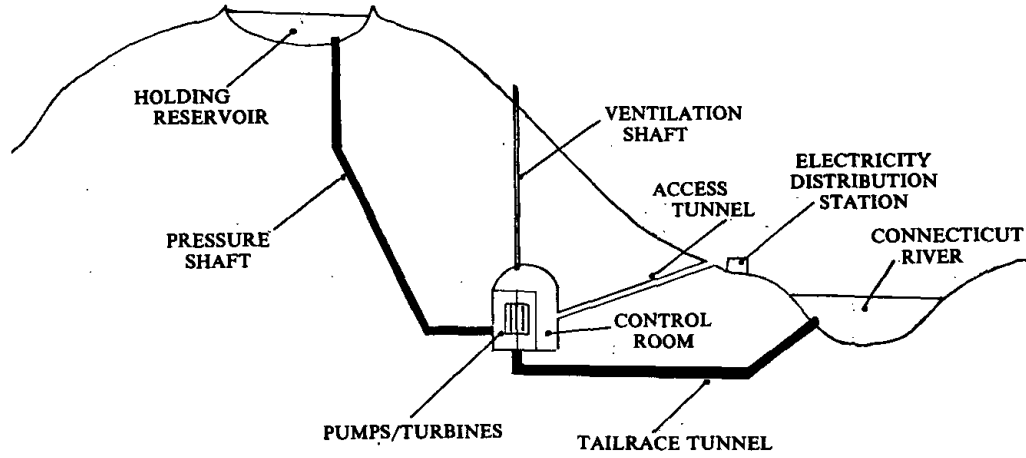
Regardless of its outcome, the Northfield diversion controversy carries substantial national implications. Potable water is becoming an increasingly scarce and valuable resource, and its allocation to one use, accomplished by modern technology, frequently makes it unavailable for other uses. That circumstance is particularly clear when water is permanently transferred out of its natural basin. Many areas, including metropolitan Boston, having insufficient supplies of water to meet future demand. Unless these water deficient areas obtain new sources of supply or begin to practice effective conservation of water resources, population and economic growth will decline and could reverse. As available water supplies continue to dwindle, the Supreme Court will likely be thrust into a more active role in the interstate allocation of water. It is hoped that the Court will perceive that its decisions must not merely effect a fair distribu-

tion of water among competing states, but also affirmatively protect water sources from overuse and further degradation.

According to geologists, the Connecticut River flowed without human interference for millenia, shaping the geography and ecology of much of New England. The river has had a similar impact on life in New England since the first European settlements: Providing water, power, food, and an avenue of transportation for a developing culture. In such a light, Justice Holmes observed fifty years ago: "A river is more than an amenity, it is a treasure." If the Connecticut, already badly tarnished, is to remain such a treasure, future development must be undertaken only with great caution.

In the past, technological development has exacted a repeated and heavy toll on the vitality of the river. The implications of the Northfield diversion must be viewed from that perspective. The diversion embodies many of the marvels of modern engineering and is intended to subtract only a small percentage from the flow of a mighty river. So too, it is designed to help satisfy a readily measurable need for water. By contrast, the nature and extent of the project's possible downstream impacts are matters of speculation, difficult to predict and likely to be felt only in the future. But impacts there will be, and with those impacts will come further degradation of the Connecticut River. Any principled resolution of the Northfield controversy must guard against such an outcome, husbanding the Connecticut River for the future, not simply partitioning its waters to satisfy present perceptions of need.

APPENDIX A.
SCHEMATIC PLAN OF NORTFIELD MOUNTAIN
POWER STATION



APPENDIX B.

