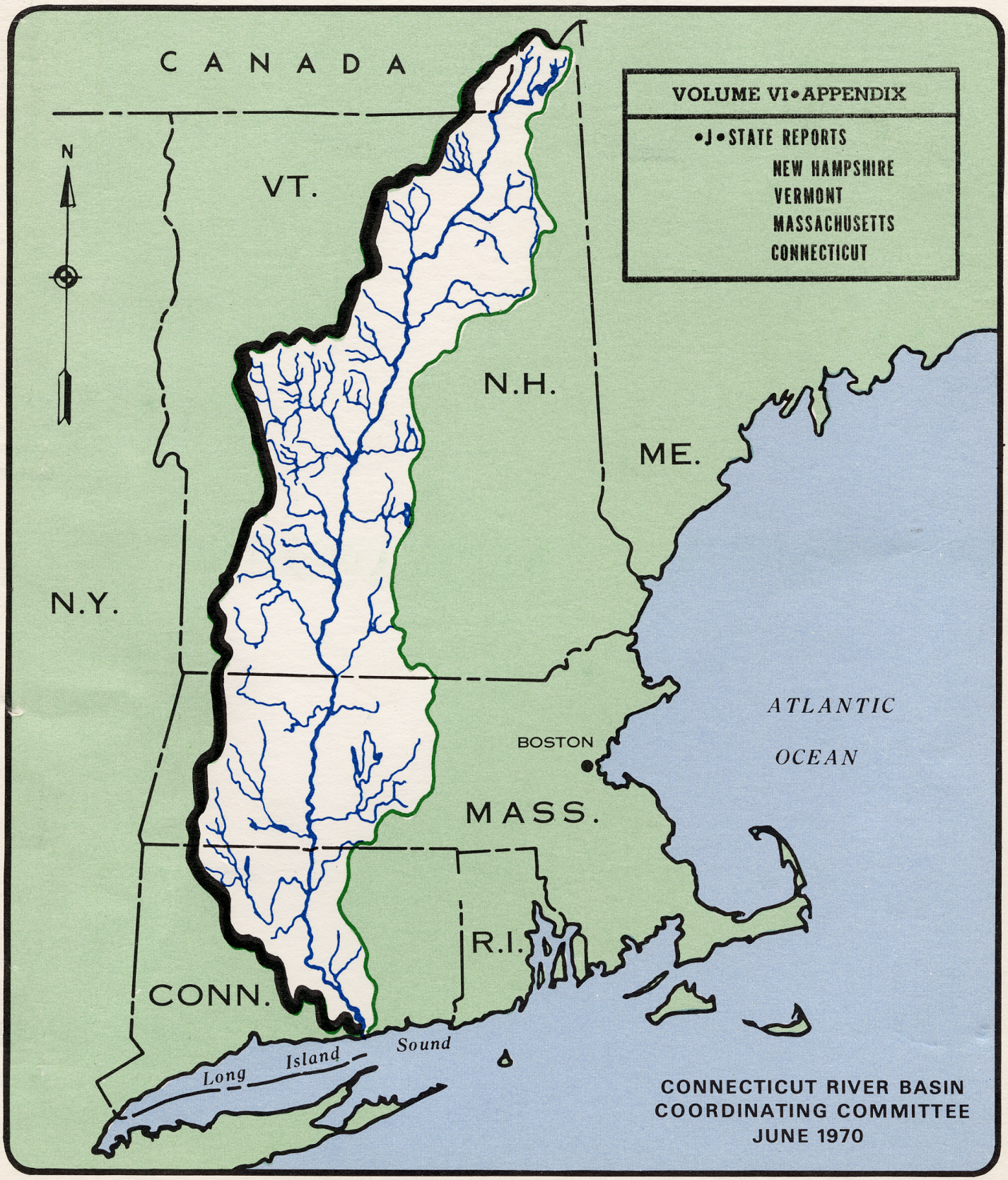
COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION

CONNECTICUT RIVER BASIN



COMPREHENSIVE WATER AND RELATED LAND RESOURCES
CONNECTICUT RIVER BASIN

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CONNECTICUT RIVER BASIN COMPREHENSIVE STUDY

NEW HAMPSHIRE STATE REPORT Appendix Jnh

June 1970

New Hampshire Department of Resources and Economic Development
Office of Planning and Research
Concord, New Hampshire

VIEWS AND COMMENTS

New Hampshire has participated actively in the Connecticut River Basin Study since its commencement. It has done so with the recognition that the size and diversity of the area in the Basin make it a unit for planning which is not homogeneous in terms of physical, economic, or other factors. Further, it is not an area capable of embarking upon a unified program of action, so each of the four Basin states must support and implement those portions of the program considered beneficial to its well-being. To be effective such courses of action must fit the overall Plan designed as a guide in the stewardship of the Basin's water and related land resources.

The New Hampshire representative endorses the Plan. This does not imply that all proposals are given unqualified support, nor does it commit any agency of the State Government to a particular course of action. It does mean that after weighing all data and opinions presented by agencies and individuals, public and private, and discussing these with other members of the Coordinating Committee, decisions were made by the Committee as a whole, and we support these decisions. The New Hampshire representative interprets this as the obligation of the individual designated to participate in this endeavor. During the course of the Study resource agencies, public and private, were kept apprised of progress. Information and views of these agencies were sought and gratefully received. Through individual agency sessions and the Council of Resources and Development, specialized information was presented formally and informally. As reports were developed they were shared and critiques and evaluations requested to assure the fair consideration of New Hampshire's position. Field trips were conducted to lead agency personnel, public and private, to on-the-spot examination of proposed development sites advocated for a variety of purposes by the U.S. Army, Corps of Engineers and the U.S. Department of Agriculture, Soil Conservation Service...New Hampshire advocated and conducted more public information sessions than any other State, and no letter requesting facts on any phase of the Study went unanswered.

The Connecticut River Comprehensive Study represents for the State of New Hampshire a guide deserving of the careful evaluation of all its citizens with a view toward taking those courses of action which can enhance the welfare of the majority.

RECOMMENDATIONS OF THE STATE OF NEW HAMPSHIRE

The State of New Hampshire recommends:

- Implementation by the State of a flood plain protection program to delineate and regulate the flood hazard areas to achieve intelligent land utilization compatible with the hazard of flooding. This preventative concept, designed to control man's uses of the flood plains, must be implemented and funded by the General Court.

- Adoption by the General Court of legislation which recognizes the need for protecting areas of unique scenic and environmental quality.

- The appropriation, at all levels of government, of money to implement fully the pollution abatement program designed to attain water quality standards set by the State's classification program.

- The requirement that erosion control standards be adopted and enforced by the State to avoid adverse and often irrevocable impacts caused by public and private construction projects.

- Advanced acquisition of land at impoundments endorsed by the State, and support of Section 209 of PL 90-483 of August 1968 which provides the Federal Government with the authority to condemn land for this purpose at the request of and with reimbursement by the State. These measures are designed to eliminate hardship, allowing sufficient time and monetary consideration for relocation of residential and commercial uses.

- The establishment of a quality monitoring network, in the Connecticut River Basin, capable of incorporation into a basin-wide control center such as the Reservoir Center at the New England Division, Corps of Engineers, at Waltham, Massachusetts.

- Implementation of the Coordinating Committee's Stream Regulation Subcommittee recommendations with regard to minimum flows at main stem dams.

- Implementation of all fish hatchery construction necessary to support resident and anadromous fishery programs.

- Support of a National Recreation Area Study based upon a definitive master plan mutually participated in by the National Park Service and the State of New Hampshire. It is further recommended that sufficient Federal funds be provided to enable the State to employ qualified and full-time staff to effect proper coordination with the Basin Communities and with the Federal agencies involved.

- Coordination of efforts of the State resource and related agencies with those of Federal and local agencies, private organizations, and individuals by the Council of Resources and Development to assure the most beneficial effects from programs relating to the Connecticut River Basin.

- Study and appropriate action to assure that adequate and quality water supplies will be available for domestic and industrial uses. It is further recommended that the State's Water Supply Study, Phases I and II, be used as a guide for such study and subsequent action.

- Appropriation of sufficient funds to pay New Hampshire's share of the Connecticut River Basin Program under the direction of the New England River Basins Commission. Recommended by the entire Connecticut River Coordinating Committee and accepted by the New England River Basins Commission, this arrangement will provide the required leadership and coordination in carrying out the water and related land resources management programs proposed by the study using existing Federal, State, interstate, and local authorities, private organizations, and programs as implementing media.

INTRODUCTION

The State of New Hampshire welcomes this opportunity to contribute additional material to the Connecticut River Comprehensive Plan. The significance of the Connecticut River Basin on the State of New Hampshire may be measured in part by the fact that about one-third of the State lies within the watershed of that river. An effective program for wise development of the Basin's land and water resources is vital to the well-being of New Hampshire and to her neighbors. A plan sufficiently flexible to accommodate the various and changing needs of these States is indispensable.

This section, STATE OF NEW HAMPSHIRE POLICIES AND PROGRAMS PERTAINING TO WATER AND LAND RESOURCES IN THE CONNECTICUT RIVER BASIN, is a capsule view of the complex mix of public and private programs, plans, and development which affect the New Hampshire portion of the Basin. Of necessity, this section can provide only a brief review of the pertinent programs and relevant background, but this review should put the Plan into perspective as it relates to New Hampshire.

This Appendix has been prepared by the staff of the Office of Planning and Research of the New Hampshire Department of Resources and Economic Development. Its preparation has been aided by the cooperative efforts of the personnel of the various state natural resource agencies.

STATE OF NEW HAMPSHIRE

STATE LAWS, POLICIES, AND PROGRAMS PERTAINING TO WATER AND RELATED LAND RESOURCES

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1. OBJECTIVES AND RECOMMENDATIONS OF THE STATE OF NEW HAMPSHIRE FOR THE LAND AND WATER RESOURCES OF THE CONNECTICUT RIVER BASIN

The following paragraphs contain New Hampshire's objectives for the management of the land and water resources of the Connecticut River Basin. The State recognizes its obligation to cooperate in programs which may benefit its neighboring states, but does not relinquish its prime objective of husbanding the resources of New Hampshire. The natural resource agencies of New Hampshire concur in the following objectives.

COORDINATION

Objective: To coordinate the wide variety of plans and projects of the State, federal, and local government agencies, of private industries and recreational interests, and of neighboring states, for the most effective and wise utilization of the Connecticut River Valley water and land resources.

Recommendations: 1. The State of New Hampshire continue to participate actively in natural resource programs which relate to the Connecticut River Basin, through the New Hampshire Office of Planning and Research of the New Hampshire Department of Resources and Economic Development.

2. The New Hampshire Council of Resources and Development continue to coordinate the efforts of the State resource and related agencies among themselves and with federal and local agencies, private organizations, and individuals to promote most beneficial effects from programs relating to the Connecticut River Basin.

3. All agencies and all private organizations and individuals be encouraged to communicate all plans, programs, and problems relating to the Connecticut River Basin to the Office of Planning and Research and to the Council of Resources and Development, whose Chairman is the Director of Planning.

FISH AND WILDLIFE

Objectives: To provide the public with opportunities for a wide range of hunting and fishing activities in the Basin;

To protect and manage the fish and wildlife in the area, in their natural environment;

To insure proper ecological balance in the Basin.

Recommendations: 1. The State of New Hampshire continue to work closely with federal agencies and with agencies of adjoining states in the fish and wildlife management projects.

2. Federal and private plans for damming be implemented only with extreme care, providing greatest possible consideration for fish and wildlife habitat; methods of allowing passage of fish over large dams on the river be investigated and action taken where possible.

FLOOD CONTROL

Objectives: To provide adequate protection against damaging floods for New Hampshire towns and cities and downstream locations;

To meet necessary responsibilities by providing sites for flood control projects;

To provide storage for low flow augmentation;

To protect recreational interests and provide for their development in storage areas;

To insure that New Hampshire public and private interests are protected and that a balance in use of the River and its environs be attained.

Recommendations: 1. The State of New Hampshire, through the Water Resources Board as the primary State liaison agency, work closely with the U. S. Army, Corps of Engineers and U. S. Soil Conservation Service in planning flood control projects.

2. The areas proposed for flood hazard area delineation have been set forth in the Flood Hazard Areas report, published in 1967. This information will be used to establish a priority system for areas to receive flood delineation measures.

a. Flood plain zoning and other controls over uses of flood plains should be established by the municipalities.

b. Legislation for a statewide flood plain regulation act should be introduced into the 1971 General Court.

FORESTRY AND WATERSHED MANAGEMENT

Objective: To manage the forest cover in the Basin in accordance with multiple-use programs, with benefits to wood-using industries, scenic qualities, wildlife, and watershed management for water supply.

Recommendations: 1. The Resources Division (Forestry) of the Department of Resources and Economic Development continue to work closely with the U. S. Forest Service, other federal and local government agencies, and private interests on forestry management programs in the Basin.

2. The Water Supply and Pollution Control Commission, the Water Resources Board, and the Fish and Game Department be consulted on matters relating to their specific concerns.

NATURAL BEAUTY AND HISTORIC CHARACTERISTICS

Objective: To protect the natural beauty and historic sites of the Connecticut River Valley from destruction or deterioration and to rehabilitate any blighted areas or ill-maintained historic sites.

Recommendations: That protection of the natural and historic values of the area be an integral part of all proposed private, local, State, and Federal projects in the Basin, and that the New Hampshire Committee on Natural Beauty and private conservation organizations such as New Hampshire-Tomorrow be consulted and encouraged to cooperate in all such programs.

OUTDOOR RECREATION

Objective: To maintain environmental quality while developing a variety of opportunities for public outdoor recreation for year-round residents and visitors to the area.

Recommendations: 1. That outdoor recreation facilities be developed in keeping with the river valley natural features.

2. That efforts of the State and local government agencies be coordinated with the federal government and private interests in providing optimum public outdoor recreational facilities.

3. That the potentials be explored for providing a continuing minimum flow in the Connecticut River on weekends and holidays for recreational and navigational purposes.

4. That depth fluctuation in impoundment areas be minimized during peak recreational use periods.

WATER POLLUTION CONTROL

Objective: To improve and maintain the water quality of the Connecticut River and its tributaries to conform to classifications set by the State Legislature, and standards of the U. S. Department of the Interior.

Recommendations: 1. The State of New Hampshire, in cooperation with federal, municipal, and private interests, proceed as fast as possible in reducing and eliminating pollution of the Connecticut River and its tributaries to meet the water quality standards set by the State Legislature.

2. That New Hampshire consider the broad regional and interstate factors in its anti-pollution policies and continue to cooperate with adjoining States and the Federal government in pollution control programs.

WATER SUPPLY

Objective: To insure that adequate water supplies will be available to meet the present and predicted future needs of the towns and cities in the Connecticut River Basin.

Recommendations: 1. The results of the Public Water Supply Study, Phase 1 (prepared by the Department of Resources and Economic Development) be studied carefully by state and local agencies to formulate plans for requisite action.

2. Water quality be improved and conserved to permit usage for municipal or industrial supply when and where necessary.

11. HISTORICAL EVENTS IN THE CONNECTICUT RIVER VALLEY (NEW HAMPSHIRE)

INTRODUCTION

The Connecticut River Valley is significant to the State of New Hampshire geographically and historically, its size and length, its service as a political boundary, its utility as a power source and as a waterway, have all contributed to its importance since the Colonial period.

Features of the valley of geographical significance are:

- the River and its watershed cover 33 percent of the total area of New Hampshire (3,058 square miles).

- the River forms almost the entire western boundary of the State with Vermont.

- the River has provided part of the New England electricity supply for over 50 years.

- the watershed is an outstanding scenic recreational resource.

- the River Valley is an important north-south transportation way and was historically the earliest route for travel between the Lower Basin and Canada.

- some of the State's urban areas lie within the watershed (Keene, Clarement, Lebanon, Hanover) and are influenced by it.

The history of the Connecticut River Valley is well documented in books that cover the subject in depth. Those who wish to pursue the historical background further should refer to the following:

The Connecticut River and the Valley of the Connecticut, by Edwin M. Bacon, published by G. P. Putnam's Sons, New York, in 1906.

Connecticut River, by Marguerite Allis, published by G. P. Putnam's Sons, New York, in 1939.

Life Along the Connecticut River, with an introduction by Charles Crane, published by Stephen Daye Press, Brattleboro, Vermont, in 1939.

The Connecticut, by Walter Hard, Rivers of America series, published by Rinehart and Company in 1947.

The following pages contain a brief description of historical events along the Connecticut River in New Hampshire. Material was obtained primarily from the sources listed above.

INDIANS

In the early days of settlement, during the 1600's and 1700's, the Connecticut Valley (now New Hampshire and Vermont) was not the habitat of any particular Indian tribe. It was instead a thoroughfare between contending powerful tribes, according to E. M. Bacon. Vermont was a beaver hunting ground of the Iroquois, the confederated Five Nations. There are reports that the Mohawks lived for a time at Colebrook, although the upper basin eventually came under the control of the Abenakis (St. Francis Indians) for their hunting grounds.

Bacon said that the Squakheags, jointly with the Pocumtucks, occupied the territory now known as Northfield, Massachusetts, Vernon, Vermont, and Hinsdale, New Hampshire. This area was settled by the English and until 1723 was the northernmost outpost in the valley. (7)

Note: Where a number in parentheses appears in the text, it refers to the publication from which the information was extracted. Each number refers to the source publication with the corresponding number in the Bibliography.

Until well toward the middle of the 18th century the Valley above the Massachusetts-New Hampshire line remained a wilderness, visited only by the hunter, trapper, and soldier.

EARLY SETTLEMENT

The early days of settlement of the Valley contain records of many conflicts between the Indians and the settlers.

In 1740 three pioneer families began the settlement of Number Four, which became Charlestown.

In 1744 the Indians went on the warpath with the outbreak of the "Old French War," 1744-1748. Most of the early settlements in New Hampshire were abandoned during this period. Bacon said the brunt of the enemy raids down the Valley were sustained by Fort Number Four as the outermost post. Several settlers at the Fort were killed or captured by the Indians. (7)

In 1751 proprietors of the townships on the east side of the River above Northfield applied to New Hampshire for new grants in place of their Massachusetts charters. Governor Benning Wentworth issued charters for Chesterfield,

Westmoreland, and Walpole in 1752, for Charlestown and Hinsdale in 1753. This was the beginning of the "New Hampshire Township Grants." Bitter controversy over the township grants followed for forty-two years. (7)

On the Coos area Bacon comments:

"Governor Benning Wentworth's scheme of colonization at the outset comtemplated the occupation of the "Coos Country" of the Upper Valley, and of the domain on the west side of the River now embraced in Vermont. He was stimulated at the close of the Old French War to move promptly on Coos lands through apprehension that the French, who had already begun to encroach upon territory claimed by the British crown, would step in and possess this valuable region." (7)

LAST FRENCH WAR OR SEVEN YEAR WAR (1754-1761)

The last French War in the Connecticut River Valley was in the period 1754 to 1761. Bacon stated that Charlestown, New Hampshire, still the outmost post with no settlement within 40 miles of it, again bore the brunt of the war. He said, "...raids upon its inhabitants were the most frequent and tragic in the Valley. Lying in the line of march of the colonial troops of Massachusetts, Connecticut, and New Hampshire passing to and from the Canadian points about which this war centered, it was a constant military rendezvous, and wore the aspect more of a military camp than of a peaceful farming community." (7)

The Indians' last raid in force was the assault upon Walpole in 1755. Roving bands, however, continued to infest the frontier River towns until the close of the war in 1760.

One of the most dramatic events of the war occurred in October, 1759. Major Robert Rogers and about 150 men (at the start the force numbered 200 men) attached the Abenaki Indian Village of St. Francis near the Saint Lawrence River, a site which served as headquarters for Indian bands who fought in the Connecticut Valley. Two hundred of the 300 villagers were killed and the village was set afire.

Rogers and his Rangers were pursued by the Indians as they headed home down the Connecticut River Valley. Rogers split up his force for the return journey but 49 lives were lost between Crown Point and the Rangers' place of return, Fort Number Four, Charlestown, New Hampshire.

Crane wrote that the destruction of St. Francis was of import because the French and Indians "felt that vengeance had come upon them and there was little raiding of New England settlements after that. Within a year Montreal was

taken, Canada became English, and the dream of a French empire in America was gone." Removal of the French and Indian menace made life in the Connecticut River Valley possible for the English settlers. (13)

MORE NEW HAMPSHIRE GRANTS

After the last French War, Governor Benning Wentworth resumed his program of New Hampshire Grants in three tiers of townships on either side of the Connecticut River. By the end of 1763, a total of 138 township grants had been made. These grants extended up the Valley on the east side of the River as far north as Northumberland. (7)

In 1782 the boundary between New Hampshire and Vermont was permanently fixed by the New Hampshire Assembly at the west bank of the River, (7) in line with action 18 years earlier, on July 20, 1764, when the King in Council determined that the boundary between the Province of New Hampshire and that of New York was to be "the western banks of the River Connecticut."

The location of the boundary was clarified in a U. S. Supreme Court decision on May 29, 1933, which stated, "The boundary between the States of Vermont and New Hampshire is the low-water mark, on the western side of the Connecticut River - not the top or westerly margin of the bank as claimed by New Hampshire; and the low-water mark for this purpose is taken to be the line to which the river recedes at its lowest stage, without reference to extreme droughts." This decision resulted from a long case that originated when the State of Vermont brought suit on December 18, 1915, for determination of the boundary line between the State and New Hampshire. Vermont had alleged that the boundary was the thread of the channel of the Connecticut River for its entire course, except for that part from the northern limits of the Town of Vernon, Vermont, south to the Massachusetts line. (28)

"THE UNITED INHABITANTS OF INDIAN STREAM REPUBLIC"

About 140 years ago a most unusual republic came into being in New Hampshire - "The United Inhabitants of Indian Stream Republic."

The Indian Stream area was a sort of no-man's land. The area was surveyed by both Canada and New Hampshire but was not very precisely defined under the rule of either. It became a haven for debtors and minor outlaws as well as a home for law-abiding citizens, according to Crane. In 1829, in resistance to the process servers of both New Hampshire and Canada, the 300 people then within the territory decided to establish their own republic, which lasted,

in fact, from July 9, 1832, to October, 1835. In time, the inhabitants became divided; one faction sought allegiance with Canada and the other with the United States. Peace came with the settlement of the boundary between Canada and the United States in the Webster-Ashburton Treaty of 1842. The Indian Stream Republic was awarded to New Hampshire and is now part of the Town of Pittsburg. (13)

THE CONNECTICUT RIVER VALLEY AS A THOROUGHFARE

All through colonial times the Connecticut River was a thoroughfare for trade and war. The Indians paddled the length of the River in their dugouts and canoes long before the colonists came. Soon after the English arrived, the flatboat or scow was contrived; it could run the Enfield rapids at high water, according to Bacon, contributing to the utility of the River.

Canals

Soon after the close of the Revolutionary War, Connecticut Valley men proposed large schemes for increasing the navigability of the river by means of a system of canals around the principal falls. In the early 1800's there was a "great fever of canal building." Crane says "the Connecticut River was, indeed, the first river in America to be improved by canals; and much English and Dutch money went into the venture, at Enfield in Connecticut, South Hadley in Massachusetts, Bellows Falls in Vermont and other places." (13)

After 1810 five sets of canals on the River made it possible for boats to approach Barnet, Vermont, at the foot of the Fifteen-Miles Falls, 220 miles above Hartford. The sixth set of the series - the Enfield Canal around the lower falls - was not opened till 1829, only a decade before the advent of the railroad in the Valley.

Bacon said: "The River life was most animated after the introduction of the canal system through the first third of the 19th century. Numerous towns along the River's banks in the upper states, now serene and retired with the dignity of a prosperous past, were then brisk and bustling places... The River became a main artery, and the turnpike the land-thoroughfare between the seaboard and the northern country, with the river-boat, the stage-coach, and the great goods-wagon as the popular means of transportation." (7)

First American Steamboat

The Connecticut River at Orford, New Hampshire, has the distinction of being the scene of the trials of the first American steamboat propelled by paddle wheels.

The steamboat was invented by Captain Samuel Morey of Orford 14 years before Fulton's "Claremont" was put on the Hudson. The trial trip on the Connecticut was made up and down the River between Orford and Fairlee, Vermont, in 1792 or 1793. Bacon writes, "From Morey, before Fulton, dispassionate examiners of the record trace the development of steamboat propulsion by paddle wheels. In their judgment, the title bestowed upon him of "father of steamboat mavigation in America" is fully warranted." (7)

Steamboating on the River had its part in history. Steamboat service was provided first in the lower River about 1824, and in the up-river section for a time but did not survive there for long. Below Hartford, steamboats ran for a longer period, with boats making a run down the River and through Long Island Sound to New York City.

Log Drives

The era of log-drives downriver was a colorful part of the New Hampshire Connecticut River Valley history. The forests of New Hampshire and Vermont were rich sources of timber in the 1800's, and continued to be, with annual log-drives on the River until they were abandoned in 1915.

Crane says he can remember seeing the River "so packed with logs that you could walk across on their backs or up the river for what seemed to be miles. The booming of the river at Bellows Falls was also familiar to me - the chaining together of many logs to form a floating guard-rail to make the channel for other logs..." He goes on to state that "in the hey-day of the drives, the lumber company mustered every spring an army of five hundred men to take their logs down...The drive took from early spring until the first of July." (13)

Railroads

At the height of the efforts in the Connecticut River Valley to expand and develop canal trade, the first local charter for a railroad was granted in Vermont. By the early 1840's railways were being built in the Valley. The system soon was extended sufficiently in the Valley so that competition in trade by canals became hopeless. Then, Bacon wrote, all the canals save Windsor Locks were abandoned for traffic and were used only for manufacturing purposes.

Allis describes the advancing of the railroads in the Valley, including the following chronological highlights:

- in 1847 the Northern Railroad had reached Lebanon.

- By January of 1849 the Cheshire Road ran an excursion train to Walpole and up along the eastern River bank as far as Charlestown.

- Bloomfield, Stratford, and Northumberland were served by the Iron Horse in 1852. The next year the White Mountain Railroad touched the River at Woodsville.

- It was not until 1887 that the first train steamed into Colebrook.

For the Connecticut River Valley, as well as the rest of the United States, the railroad was the dominant method of transporting people and goods during the last half of the 19th Century and the first half of the 20th Century. Since World War 11, railroad passenger service declined drastically, as the use of passenger automobiles increased. Today freight is the only type of railroad service in the New Hampshire portion of the Valley.

Highway System

The highway system in the New Hampshire part of the Connecticut River Valley is quite complex. It has evolved over the years from the early days of Indian and hunters' trails, then the first rough roads for the settlers, then an extension of dirt roads throughout the countryside, the paving and improvement of the major highway system, and now the four lane Interstate Highways. Upon completion, the upper states of the Connecticut Valley will be served by a) 1-91 that follows the River to St. Johnsbury on the Vermont side, b) 1-89 that reaches the River at Lebanon from Concord, New Hampshire, on the east and Burlington, Vermont on the west, and by c) 1-93 at Littleton, a direct route through New Hampshire from Boston and points south.

HYDROELECTRIC POWER

The Connecticut River is important today to millions of people in New England who depend on its hydroelectric plants as a source of their electricity. A number of dams have been built on the main River and its tributaries for hydroelectric power, flood control, water supply, manufacturing, and recreational purposes. New England Power Company has a series of six hydro stations and two upstream storage reservoirs on the Connecticut River, plus a contract for the use of the contents of a third reservoir, Lake Francis, owned by the State of New Hampshire. The Vernon Falls Project near Brattleboro, Vermont, was New England Power Company's first great power project. It was completed in 1909 and the first power from Vernon was carried over a steel tower transmission line system to the highly industrialized area of central Massachusetts. Many small dams on tributaries to the Connecticut have been

built to meet power and other needs of local industries; Sugar, Mascoma, and Ashuelot Rivers, in particular.

SETTLEMENT AND DEVELOPMENT OF THE RIVER VALLEY

While the significant events were occurring as discussed above, gradual settlement and development of the New Hampshire part of the Connecticut River Valley was taking place. Towns and cities were built; industries were established, including leather, grain, paper, lumber, textile mills and shoe factories, and electrical and machine industries. Agriculture was an important activity on the rich valley lowland and plateau lands, where dairying is still an important activity. Retailing centers developed in the larger towns.

With development of the River Valley came the problems associated with civilization - in particular, stream pollution by industries and municipalities dumping wastes into the river. The pollution trend is now being reversed as local, state, and federal entities marshal their forces to cleanse the river.

Some of the towns along the River in New Hampshire had a much larger population in the early 1800's than they do today, for instance:

Chesterfield, in 1800 had 2,161 reported persons; in 1960, 1,405.

Westmoreland, in 1800 had 2,066 persons; in 1960, only 921 persons.

Piermont, in 1830 had 1,042 reported persons; in 1960, 477.

Orford, in 1830 had 1,829 persons; in 1960, 667. (19)

A major reason for the decline in population was that the lure of richer, more easily workable, and more commercially profitable farmland in the Middle West and West drew many persons from New Hampshire towns, although the Connecticut River Valley lands provided a good living for subsistence type of farming in the early days. Many good farms are in operation today.

111. STATE AND QUASI-PUBLIC PROGRAMS AND ACTIVITIES IN THE CONNECTICUT RIVER VALLEY

INTRODUCTION

State of New Hampshire agencies have a number of programs and research studies underway in the Connecticut River Valley, many of which have implications for the use and development of the Valley. They are discussed briefly here. For further discussion of some of these programs, refer to State Planning Project Number 10, The Water Resources of New Hampshire, published in 1965.

The public interest in the use and development of the Connecticut River Valley has been established. Today people are concerned that the water quality be protected and improved, flood protection be provided, the scenic beauty of the River Valley not be destroyed, and that opportunities for public outdoor recreation be provided. At the same time the public hopes to continue to benefit from the hydroelectricity supplied by dams on the River and from industrial developments along its shores. It is the responsibility of the State of New Hampshire, as well as the federal agencies cooperating in the Connecticut River Basin Comprehensive Plan, to see that these many interests are coordinated and balanced.

HYDROELECTRIC POWER AND WATER REGULATION

Mainstream

A series of privately operated major hydroelectric power dams on the mainstem of the Connecticut River impound and control the major part of the river mileage in the State. The effects of these installations on the River and adjoining lands are, therefore, of concern.

The plans of the private companies must be meshed with State and other public agency plans in the public interest. New England Power Company, the major impoundment owner and operator, is cooperating toward this end. Representatives have met with the New Hampshire Council of Resources and Development and with individual agencies on river matters of mutual concern. It is anticipated that this cooperative relationship will continue.

Public-private cooperation is needed to: 1) explore the potentials for providing a continuing minimum flow in the Connecticut River on weekends and holidays for recreational and pollution abatement purposes; and 2) investigate and provide methods for allowing the passage of fish over the large dams on the River.

The current proceedings involving the licensing of three hydroelectric projects illustrate that cooperation is possible between the private power companies and the State of New Hampshire in planning for the Connecticut River Valley with benefits for the public. Federal Power Commission licenses for the New England Power Company hydroelectric projects Wilder, Bellows Falls, and Vernon are due to expire on June 30, 1970. New England Power Company is currently preparing an application to the Federal Power Commission for relicensing these projects, which are part of the interconnected electric system of the New England Electric System companies. The Federal Power Commission has requested and has received comments on the three projects from the State of New Hampshire. In addition, New England Power Company has met the New Hampshire natural resources agencies to request comments on plans for public recreational and other developments at the three projects.

Connecticut Lakes

The State of New Hampshire Water Resources Board owns and regulates Lake Francis in Pittsburg. This impoundment provides optimum use of water for the generation of hydroelectric power at plants downstream. Other benefits from the project are flood control, outdoor recreation, and low flow augmentation.

The dam was completed in 1940. The water surface has a maximum length of 5.5 miles and a maximum width of 1.4 miles. The water level fluctuates considerably; this extreme water fluctuation makes fish management difficult. Rainbow trout and smelt have been stocked in years past but at present, the Fish and Game Department does not manage the lake because of the water fluctuation, although the waters are classified as salmonoid.

At the inception of the Lake Francis Project, the Water Resources Board received authorization from the Governor and Council to enter into contracts with the downstream water users. These contracts called for the water users to pay to the Board annually for the life of the bonds (about fifty years) sufficient funds to pay interest on and amortize the bonds and to operate and maintain the reservoir. These water users are the New England Power Company, and the Public Service Company of New Hampshire, who pay approximately $90,000 and $12,300 per year respectively; and the Gilman Paper Company, $3,312. These figures represent 1969 user fees. These costs are based on the operating head of water that the companies use. The charges to the users remain fairly constant because they were established when the bonds for the Project first were issued in 1940.

Above Lake Francis, there is at present a storage capacity in First and Second Connecticut Lakes of 91,106 acre feet controlled by dams owned by the New England Power Company. Any discharge from these Lakes must be permitted to pass unchanged through the Reservoir, as the Water Resources Board Act (R.S.A. 481:13) specifically prohibits any interference by the Board with discharge of water from an upstream reservoir. (18)

WATER QUALITY CONTROL

The State of New Hampshire has an active state-wide program of water quality control, and has had a comprehensive program on water pollution control since 1947 when the Legislature first established the Water Pollution Commission. While the program has been underway only twenty years, it is anticipated that projects to clean up the river will be accelerated in the near future to obtain marked improvements in the Connecticut River water quality. The State of New Hampshire must achieve B quality by 1977, according to the Water Supply and Pollution Control Commission; this is contingent, however, upon receipt of the maximum amount of the State's share of Federal funds.

The 1967 session of the State Legislature passed Chapter 311, Laws of 1967, that classifies the Connecticut River and its tributaries at "B" quality or better, except for portions of several streams classified as "C". The following are the classifications:

1) Designated as Class A (highest quality waters). Those streams and water bodies within the Connecticut River Basin used as water supplies by local municipalities.

2) Designated as Class B (second highest quality water).[1] Upper Ammonoosuc, Israel, Johns, Ammonoosuc, Mascoma, Sugar and Ashuelot Rivers; Connecticut River from the crest of Murphy Dam at Lake Francis to the New Hampshire-Massachusetts line, and all other tributaries hitherto unclassified.

3) Designated as Class C (third highest quality water).[2] Mascoma River - from City of Lebanon to the confluence with the Connecticut River; Sugar River - from City of Claremont to the confluence with the Connecticut River; Ashuelot River - from Winchester to the confluence with the Connecticut River.

Passage of the legislation classifying the Connecticut River and its tributaries is a significant milestone, since standards have now been established toward which the State can work in cleaning up pollution in the river. The standards can be legally maintained through enforcement proceedings of the New Hampshire Water Supply and Pollution Control

Commission. In reality, however, much time will be required to achieve the standards. A number of municipalities in both New Hampshire and Vermont must construct primary and secondary sewage treatment plants. The industries along the river and its tributaries that dump pollutants must also undertake their own pollution control programs.

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[1] Chapter 147, Laws of 1967, defines Class B waters as "of the second highest quality and shall have no objectionable physical characteristics...the waters of this classification shall be considered as being acceptable for bathing and other recreational purposes, and after adequate treatment, for use as water supplies."

[2] Chapter 147 defines Class C waters as "of the third highest quality...the waters of this classification shall be considered as being acceptable for recreational boating, fishing, or for industrial water supply uses either with or without treatment depending upon individual requirements."

The following list (supplied by the Water Supply and Pollution Control Commission) shows the progress toward anti-pollution treatment in the Basin, as of November, 1969.

SEWAGE TREATMENT FACILITIES CONSTRUCTED OR MODERNIZED SINCE 1947

Charlestown
Claremont
Colebrook
Glencliff Sanitorium, Benton
Hanover
Keene
Littleton
Sullivan County Home

SEWAGE TREATMENT FACILITIES IN PRELIMINARY OR FINAL PLANNING STAGE

Bethlehem
Charlestown
Claremont
Enfield
Haverhill (Woodsville Fire
Hinsdale Dist.)
Lancaster
Lebanon
Lisbon
Marlboro
Newport
North Stratford
Northumberland
Sunapee
Swanzey
Troy
Walpole
Whitefield
Winchester
West Stewartstown

PROPOSED NUCLEAR POWER ELECTRIC PLANT, VERNON, VERMONT

The State of New Hampshire natural resource agencies, conservationists, sportsmen and others are concerned about the potential effects on the Connecticut River fish and

plant life of the proposed Vermont Yankee nuclear power electric generating plant at Vernon, Vermont. In 1967 public hearings were held by the Vermont Water Resources Board and the Atomic Energy Commission at which public agencies and individuals expressed their positions on the proposed project.

Project Proposal

The Vermont Yankee Nuclear Power Company plans a 549,000 kilowatt electric generating plant on the Connecticut River at Vernon, Vermont, four miles north of the Vermont-Massachusetts border. A request for a construction permit for the estimated $100 million power plant was submitted to and approved by the United States Atomic Energy Commission by Vermont Yankee Company. It is estimated that the plant may be in operation by 1972.

The Company proposes to use water from the Connecticut River in order to cool the condenser through the use of cooling towers of the dry, closed system, mechanical type. In this process, the river water is used to absorb heat from the condenser, then passed through pipes in the cooling towers, and finally pumped back into the main stream. Even after having passed through the cooling towers, the temperature of the water returned to the river is higher than the intake temperature. The Vermont Water Resources Board has ruled that controlled amounts of heated water may be discharged into the Vernon Pool in accordance with a table based on maximum river temperatures.

Concerns

(1) Thermal pollution. The major concern voiced by the New Hampshire Fish and Game Department is that of potential detrimental effects on fish and plant life from dumping heated water into the river. This thermal pollution of the river water would have adverse effects on the anadromous fish restoration project now underway.

The Water Supply and Pollution Control Commission is concerned with an activity (including the proposed dumping of heated waters in the river) which will affect the "B" quality of the river as established by the State Legislature.

The situation is complex, involving the best interests of the States of Vermont, New Hampshire and Massachusetts. Like New Hampshire, Vermont classifies the River "B" except that it classifies as "C" areas where treated effluent enters the river, with a mixing zone downstream. This conflict requires resolution of

differing views of Vermont and New Hampshire, in order to arrive at water quality standards in the Connecticut River at Vernon Falls which will be satisfactory to the many interests concerned.

(2) Legal jurisdiction. A second concern, expressed by the New Hampshire Water Supply and Pollution Control Commission, is that the Vermont Yankee Power Company does not recognize the jurisdiction of the State of New Hampshire over the waters of the Connecticut River. The River is within the legal bounds of New Hampshire; therefore, the New Hampshire Commission's function, "to listen to the evidence and decide to grant or not a license to place waste in the river," becomes operative in this instance.

The State of New Hampshire in June, 1968, filed a petition with the Clerk of Newfane County, Vermont, where Vernon is located to set aside the order of the Vermont Water Resources Board granting a temporary construction permit to Vermont Yankee Power Company. The petition is still pending in court, as of November, 1969.

(3) Radioactivity. Another concern regarding the proposed nuclear power plant at Vernon is the danger, however remote, of any release of radioactive materials with consequent detrimental effects on the surrounding area of the plant. The New Hampshire Council of Resources and Development and other groups believe that this matter merits much further study.

(4) Fog and Icing. Still another concern relates to the use of the proposed cooling towers. Mechanical, induced draft towers reportedly produce substantial amounts of ground level fog, especially during the winter. The area affected by the fog is small, extending a maximum of about one-fourth mile from the towers. Carry-over of some water droplets has been noted from the mechanical draft type and resulting precipitation occurred in the immediate vicinity of the towers, causing some minor icing problems up to 300 feet away. (34)

WATER SUPPLY

A two-phase study of the water supply needs of the State of New Hampshire, including the Connecticut River Basin, is currently being conducted by Anderson-Nichols and Company of Boston under contract to the New Hampshire Department of Resources and Economic Development, with funds provided from the State and from the Federal Water Resources Council under Title 111 of the Water Resources planning Act of 1965. Phase 1 was completed in May, 1969; Phase 11 is to be finished in November, 1970.

The study has been undertaken under Chapter 148-A of the New Hampshire Laws, 1959, which declared "that there is statewide need for long-range planning...that the health and safety of the people of the state may be protected in respect to adequate water supplies for domestic use."

Phase 1 provides specific information concerning the State's present and projected public water supply needs on a community by community basis. The data provide a guide by which to direct activities of state, local, and regional agencies in planning future water supply facilities. The study includes information on existing water supply facilities, projections of future water supply needs, and when, where, and how much additional water supply development will be necessary.

The objective of Phase 11 of the study is "to evaluate alternatives and to present a recommended plan of development of surface water sources to meet the public water requirements developed in Phase 1." Included in this phase will be an inventory of surface water sites, determination of dependable yields and storage capacities, a recommended plan for development to meet the projected demands in 2020, and methods for implementing the plan.

Another study is being conducted in three phases by the New Hampshire Water Supply and Pollution Control Commission. It is a comprehensive study of water supply and sewerage needs, both present and future, of certain communities of less than 5,500 population. The first phase of the study, which has been completed, included Sullivan and Cheshire counties. The second phase, now underway, covers Grafton and Coos counties and four other communities in northern New Hampshire. The last or third phase is to be completed by October, 1970. The funding of this program has been provided by a grant from the Farmers Home Administration.

FISH AND GAME

The New Hampshire Fish and Game Department has the following underway in the Connecticut River Basin; deer yard management programs, waterfowl area management programs, and trout stocking in the majority of the Connecticut River tributaries.

Cooperative Fishery Restoration Program

In April, 1967, a cooperative fishery restoration program was initiated for the Connecticut River basin by the States of Connecticut, Massachusetts, New Hampshire, and Vermont, the U. S. Bureau of Sport

Fisheries and Wildlife, and the U. S. Bureau of Commercial Fisheries. A Technical Committee for Fisheries Management composed of representatives from these entities has been organized to develop and implement needed research programs and fishery management procedures for this project.

The objectives of this program are to realize the full potential of the fishery resources of the River including both anadromous and resident species. The intent of this program is to provide the public with high quality sport fishing opportunities in a highly urbanized area as well as to provide for the long term needs of the population for sea food.

The program aims toward restoration of American Shad runs up the Connecticut from the ocean to above Vernon Dam. An evaluation of present spawning and nursery areas as far noth as Bellows Falls indicates that a run of up to two million shad could be realized. This run would require fish passage facilities at the dams and other projects on the Connecticut. In the spring of 1967 the New Hampshire Fish and Game Department stocked approximately 800,000 shad eggs into the River in the Bellows Falls-Vernon Dam area. These had about 75 percent success in hatching. The following spring 1.35 million eggs were liberated with similar hatching success. It has now been proved that shad eggs can successfully hatch in the River under existing conditions, and that the juvenile can live and grow to migrating size.

The program also aims toward restoration of the Atlantic Salmon runs. Historical references indicate that salmon runs at one time used to go as far as Beecher Falls near the Canadian Border. An evaluation of the River as far as Comerford Dam reveals a potential run of adult salmon of 38,000 at the River mouth.

The program also will benefit other anadromous species in the River, and other resident fish species in the basin.

Many problems must be surmounted if the fishery restoration program is to succeed. The water quality of the River must be maintained and improved. There are problems of passage for both upstream and downstream fish migrants over existing and proposed dams and other structures.

OUTDOOR RECREATION

Public and private plans and projects for outdoor recreation in the Connecticut River Basin must be meshed for more effective, economical results. Such cooperative effort is encouraged through the New Hampshire Outdoor Recreation Plan, which is maintained on a continuing basis by the Office of Planning and Research, New Hampshire Department of Resources and Economic Development.

The State of New Hampshire, through the Division of Parks, carries on a continuing program of providing public recreational facilities in the Connecticut River Basin at a series of state parks, wayside areas, and geologic and historic sites. Existing facilities are listed in Section VII, Tables J-1 and J-2 of this report.

Current projects of the State of New Hampshire in the Connecticut River Basin include:

1) Planning and acquiring the lands for a major park of 13,000 acres in southwestern New Hampshire - Pisgah Mt. State Park in the Towns of Chesterfield and Winchester. (Division of Parks).

2) Planning for the development of a river wayside park at Bedell Bridge, on the Connecticut River, in Haverhill. (Division of Parks).

3) A study (nearing completion) on proposals for a State Park and/or other methods to preserve the North Country wilderness aspects of the Connecticut Lakes area in Pittsburg. The study is being made for the Office of Planning and Research, New Hampshire Department of Resources and Economic Development, by the Resources Development Center, University of New Hampshire.

4) Cooperation of the State of New Hampshire with the U. S. Bureau of Outdoor Recreation in preparing proposals for the Connecticut River National Recreation Area (presented to the Congress and the President of the United States in October, 1968). Federal, state, local, and private interests will be involved in carrying out the proposals if the program legislation is approved and funded.

FLOOD PLAINS

A new approach to the old question of flood damages and flood control along New Hampshire's streams is currently being investigated: a preventative concept designed to control man's uses of the flood plains before flooding occurs.

A preliminary report on the matter was published by the New Hampshire Department of Resources and Economic Development in April, 1967, entitled, Flood Hazard Areas, New Hampshire. The objective of the report is "to focus attention on the need for a statewide program to achieve wise utilization of the lands in the flood hazard areas and thereby reduce future flood damages." Anderson-Nichols and Company, Inc., prepared the study.

The report proposes a statewide program to be administered by the State of New Hampshire "to delineate, disseminate and regulate the flood hazard areas in the public interests to achieve intelligent comprehensive land utilization compatible with the hazard of flooding."

When and if the program gets underway, it is clear that it will have a significant impact on land use and flood damages along the flood plains of the Connecticut River and its tributaries.

Listed below are the areas proposed for flood hazard area delineation in the Connecticut River Basin. The system of priorities was prepared to emphasize those areas where flood damage problems presently exist and areas where it is anticipated that future flood damage problems will develop.

First priority - areas of greatest need

River	Miles	Municipalities
Ashuelot	18	Keene, Roxbury, Swanzey, Winchester
Connecticut	28	From Orford-Lyme boundary to the southern boundary of Plainfield

Second priority - areas of lesser need

River	Miles	Municipalities
Connecticut	14	Strafford-Northumberland
Upper Ammonoosuc	5	Northumberland
Ammonoosuc	24	Littleton, Lisbon, Bath
Gale	3	Franconia, Sugar Hill
Mascoma	8	Lebanon
Sugar	14	Newport, Claremont

Third priority

Mink Brook	5	Hanover

Refer to pages 28 and 29, Flood Hazard Areas, New Hampshire, for a map showing the above listed areas.

WETLANDS STUDY

A study of inland and tidal wetlands in New Hampshire was made by the New Hampshire Society for the Protection of New Hampshire Forests under contract to the New Hampshire Water Resources Board. The study was funded by action of the 1967 State Legislature which recognized the need for

the State to work toward preserving its wetlands for fish, wildlife, water resources and scenic purposes. The study was approved by the Governor and Executive Council on February 26, 1968, and was completed for review by the 1969 Legislature. The overall objective of the study was to device a program to protect New Hampshire's high priority wetlands and to provide the information and recommendations necessary for future State wetland acquisitions.

The study included gathering, evaluating and cataloguing all available information on wetlands; development of a priority acquisition list of wetlands based on the order of desirability of the wetland tracts; and determination of ownership and availability of each wetland tract.

The 1969 Session of the General Court established a commission to study further the inland wetlands (under Chapter 342) and a separate commission to study tidal wetlands (under Chapter 341). Both commissions will study present and future uses of the State's inland and tidal wetlands, marshes, and flood plains, and make recommendations, if necessary, for future legislation.

QUASI-PUBLIC PROGRAMS

Three quasi-public programs that call upon a broad range of government and private interests are underway in the New Hampshire portion of the Connecticut River Basin:

New Hampshire-Vermont Development Council, Inc.

The New Hampshire-Vermont Development Council is a private, non-profit agency, incorporated under the laws of New Hampshire and Vermont, and sponsored by the Executive Departments of New Hampshire and Vermont. It covers Grafton, Coos and Carroll Counties in New Hampshire and seven adjoining counties in Vermont. The purpose of the Council, whose office is in Hanover, New Hampshire, is "to advance the economic and physical development and social welfare of the people of the New Hampshire-Vermont Development District through advice, counsel, and assistance to such governmental agencies and private organizations concerned with programs and activities to develop the resources and economic opportunities of the area." The Council aims to promote a multi-county approach to planning and development, and coordinate and expedite State and Federal programs which promote economic development.

Resource Conservation and Development Project for the North Country

A Resource Conservation and Development Project is underway for the three northern counties of New Hampshire - Grafton, Coos and Carroll counties - sponsored by the County

Soil Conservation Districts. The project, whose office is in Littleton, New Hampshire, is authorized (under a new project approach of the U. S. Department of Agriculture) to assist rural America to develop and grow. The aim is to expand economic opportunities for the people of the area, by developing and carrying out measures for the conservation, development and wise use of natural resources. This project will in all probability be involved in working toward implementation on a local level of recommendations of the Connecticut River Comprehensive Plan that apply to Grafton and Coos counties.

Rural Areas Development County Committees

Each of the New Hampshire counties located within the Connecticut River Basin has a Rural Areas Development County Committee at work. The aim of the Committees is to foster "a coordinated program designed to help rural areas make better use of all available public and private facilities to promote better utilization of human and natural resources..." The Committees are composed of representatives of local interest groups assisted by representatives of State and Federal public agencies. They formulate economic development programs, consider a wide range of problems facing their counties, and work toward implementation of these programs and elimination of the problems.

Two county Committees, Grafton and Coos, have been instrumental in having comprehensive county plans prepared by private consultants through the Urban Planning Assistance Program authorized by Section 701 of the Housing Act of 1954 administered by the U. S. Department of Housing and Urban Development and under contract to the New Hampshire Department of Resources and Economic Development.

ENVIRONMENTAL CONTROL

The Connecticut River Watershed Council is a non-profit, membership supported organization dedicated to the conservation, restoration and wise use of natural resources of the entire Connecticut River Valley. The Council believes that this natural watershed provides a most practical unit for implementation of a natural resource program because the resources themselves, not political forces, determine the management boundaries. The Council's program includes the promotion of high water-quality standards, strict control of the use of pesticides, conservation education, flood-plain zoning, research in air and water pollution abatement programs, fish and wildlife protection, and stream regulation. The Council has undertaken a Land Conservancy program which will promote "the preservation and conservation of natural resources of the Connecticut River Watershed, including water resources, marshland, swamps, woodland, and open spaces, the plant and

animal life therein, and the preservation of historical and scenic sites...by gift, purchase, lease or otherwise, of real and personal property, both tangible and intangible of every sort and description..." Emphasis will be placed on coordinating land-conservation interests so that beneficial ownership patterns and management policies for natural resources will be achieved throughout the river valley.

1V. POLICIES OF THE STATE

TRENDS

The broad policy of the State is that the State of New Hampshire does have a responsibility for the management of its water resources for the public interest, health, and welfare. The policy of the State of New Hampshire toward its water and related land resources is in a process of evolution and change in response to today's needs and demands. Actions of the State Legislature in the past 35 years have shown concern for protection of the public's interest in our water resources in regard to regulation of excess stream flows, through formation of the Water Resources Board; water pollution prevention and control and protection of public water supplies through creation of the Water Supply and Pollution Control Commission and passage of laws on water pollution; and other aspects such as recreational use of surface waters.

Private organizations such as the New Hampshire Better Water Committee, New Hampshire Audubon Society, and Society for the Protection of New Hampshire Forests are becoming increasingly outspoken on the need for the State to provide responsible management for its waters and related land resources. The Federal government is requiring that the states accept responsibility in this field and the State Legislature and State agencies are coming to realize that the State must take an active role in managing its water resources if these are to be protected for future generations.

Private industries are placing increasing demands on New Hampshire's waters. The growing population in the State means more people need more water. In future years greater pressures will be put on our existing surface and ground water supplies. In turn there will be more pressure on State Government to provide responsible management.

The State's water resources policy today is significantly changed from that of thirty-five years ago and earlier when the State had few controls over water resources. State government agencies have only relatively recently been established in the field--the Water Resources Board in 1935 and the Water Supply and Pollution Control Commission in 1947. Appendix 1 of this report, entitled, "The Formation of Natural Resources and Water Policies and Programs in the State of New Hampshire," prepared in 1965, traces the historical evolution of the State's involvement in water resources.

For further discussion refer to New Hampshire Water, Governmental Responsibilities and Activities in Relation to the Water Resources of New Hampshire, published by the

New Hampshire State Planning and Development Commission, Concord, New Hampshire, December 1953. Fifteen years ago, the New Hampshire Council of Resources and Development "singled out the need for a definite State policy on water resources as the most important current problem in the development of the State's resources." The Council has been working since that time to aid in the development of State policy in this field.

Another report to which the reader is referred is State Planning Project Report No. 10, The Water Resources of New Hampshire, 1965, for additional material on the State's water policies.

RESPONSIBILITIES FOR WATER PROGRAMS

The governmental responsibilities for management of the State's water and related land resources are divided between federal, State and local governments in a complex pattern of agencies and commissions, with often overlapping duties, activities, and jurisdictions.

The Federal government has agencies working in the State on various projects, and federal water programs encourage development of State and local water and related land projects. To date there has been excellent cooperation between the federal government agencies and State and local agencies.

The State of New Hampshire, through its agencies, takes a leading role in the management of its water resources in the State. The two major water resources agencies, Water Resources Board and the Water Supply and Pollution Control Commission, conduct on-going programs, provide technical assistance and guidance to local governments for water resources projects, and set standards and guidelines that local organizations must follow.

The following statement, exerpted from New Hampshire Water Supply and Pollution Commission booklet entitled, "Why Control Water Pollution?" published in 1958, sums up the overall approach of the Commission.

"It is clearly recognized that to restore the quality of our water resources tc their original condition today would mean to close up our industries, cities and villages and return land and water use back to a pre-industrial, purely agricultural economy. Although going back to nature may be attractive to many of us, very few are willing to relinquish a standard of living which is the direct result of our industrial growth. We have on the one hand the actuality of abuse of our water resources and on the other hand an alternative of practically no use at all. It is apparent that the first condition is wantonly wasteful and the second alternative is ridiculously impractical if

we are to continue to enjoy the highly desirable standard of living made possible by the industrial output.. A realistic and practical attitude at this time is one which strives to control the pollution of a stream to within the limits of quality prescribed by a carefully considered and duly adopted classification. Therefore, a happy medium must be worked out between the unattainable extreme of original purity for every waterway and the unforgivable extreme of gross pollution. It is conceivable that when we, as a people, apply the same energy and ingenuity to the waste disposal problem that has been and is now being applied to the many other complex problems of our day, heavy industry and large populations could make complete use of our water resources without degrading them. This happy state, of course, is the ideal situation."

The responsibilities of local municipalities on water resources matters include provision of local water supplies, and sewage treatment plants where necessary. Local health officers aid in finding and working toward correction of local pollution problems. Municipalities also have the power to zone flood plains and other areas within their bounds for certain designated uses.

COOPERATION AND COORDINATION

The State has a policy of close cooperation with the federal government in management of its water and related land resources. The Water Resources Board maintains close contact with the U. S. Army, Corps of Engineers, U. S. Soil Conservation Service, and U. S. Geological Survey, Hydrologic Branch. The Water Supply and Pollution Control Commission coordinates with the Department of Health, Education, and Welfare, including such sub-agencies as the Federal Water Pollution Control Administration. Other State agencies maintain similar contacts on water resources matters. The Council of Resources and Development and the Office of Planning and Research attempt overall coordination among federal and State efforts on water and related land resources matters in the best interests of the people of the State.

Further coordination is provided through the Office of the Governor, to whom the water resources agencies of the federal government submit request for State approval for projects, and State cooperation in studies. The Governor, in turn, obtains the cooperation of the concerned State agencies for the projects.

The State also maintains contact with private industry and commercial enterprises which are involved in plans and projects for the State's waters and related lands.

Close coordination is especially necessary in projects on our streams such as private company hydroelectric installations and major industries which use streams as coolants, to carry off wastes, or to generate power.

Coordination of the State of New Hampshire water resource agencies' efforts with those in adjoining states is achieved both on an individual agency level and also through membership in several New England-wide organizations. These organizations include the New England Governors' Conference, the New England Regional Commission, the New England River Basins Commission, and interstate compact organizations that are cited in the Section on Administrative Structure.

FINANCING OF WATER PROJECTS

1. The State has given added impetus to the construction of pollution control facilities in municipalities by offering to pay forty percent of the total treatment construction costs. However, the maximum amount of Federal funds allocated to the State has not been forthcoming, and therefore State appropriations have not been fully utilized. The net effect of State and Federal financial assistance permits the individual community to bear only 30 percent of the total treatment costs. (Laws of 1965, Chapter 14 and Chapter 217)

2. The State has authorized the Water Resources Board to cooperate with cities and towns in the development of public recreation facilities at small watershed project sites under U. S. Public Law 566, by providing financial assistance in such recreation projects. (Laws of 1967, Chapter 439)

Under the laws of the State, the Water Resources Board provides the lands, easements, and rights-of-way necessary for projects under Public Law 566 in the State.

3. The Water Resources Board is authorized by New Hampshire Revised Statutes Annotated Chapter 481:15 to provide "for the issuance of bonds for the purpose of paying the cost or portion thereof of any one or more" water resources projects provided for under Chapter 481. These projects include reservoirs, dams, diversion and distribution canals, water-works systems, and other related projects. The Lake Francis impoundment, Pittsburg, New Hampshire, was constructed by the State by means of this financing method.

RELATED LAND RESOURCES

In contrast to the surface waters of the State where the State of New Hampshire follows a policy of comprehensive management and control, i.e. inforcing quality

standards for all surface waters and groundwater, management practices and regulations on use of the land in the Connecticut River Basin are left to private individuals, to local municipalities, and to State and Federal agencies on lands in their ownership.

The State does provide through its natural resources agencies technical information and advice on land use to local governmental organizations and to private citizens. These agencies and their functions are cited in the Chapter on State Governmental Structure. The evolution of the State's policies toward uses of its lands is discussed in Appendix 1.

The State of New Hampshire is looking toward the Connecticut River Basin Comprehensive Plan and the proposals for the Connecticut River National Recreation Area for recommendations for comprehensive land use management programs that will protect the best of the scenic, historic river valley landscape while allowing for reasonable human development and utilization of the area.

In view of the pressures of population on the land, the State must move toward more direct statewide involvement in regulating the uses of land in the Connecticut River Basin and in the State as a whole if New Hampshire is to retain a quality environment.

It is anticipated that in the years ahead such a State policy will evolve.

V. STATE LAW

STATE CONSTITUTION

While the State of New Hampshire Constitution does not specifically mention water resources, it does provide in a broad manner for the enactment of laws in this field in Article 5, Part Second, as follows:

"And further, full power and authority are hereby given and granted to the said general court, from time to time, to make, ordain, and establish, all manner of wholesome and reasonable orders, laws, statutes, ordinances, directions, and instructions, either with penalties, or without, so as the same be not repugnant or contrary to this constitution, as they may judge for the benefit and welfare of this state, and for the governing and ordering thereof, and of the subjects of the same...."

STATUTES

A study is now underway by Attorney Alexander Kalinski and Dr. Robert Forste, former Resource Economist at the University of New Hampshire, entitled, "A Compendium of Water Law and Economics in New Hampshire;" it is being made for the New Hampshire Water Resources Research Center, University of New Hampshire, but will not be published in time for inclusion in this report. The reader is referred to this upcoming study for discussion of New Hampshire's water laws.

The reader is also referred to the following publication containing references to New Hampshire's water laws: "Water Law: Streamflow Rights in New England and New York State,: prepared by James H. Kendall for the New England Interstate Water Pollution Control Commission, November, 1967.

The concern of the State of New Hampshire for its water resources on a state level was set forth in the 1935 legislation establishing the Water Resources Board, as follows:

Revised Statutes Annotated, Laws of 1955, Chapter 481--

"481:1 Declaration of Need. It is declared that there is a state-wide need for the conservation and distribution of water and the regulation of the flow of rivers and streams and that the public interest, welfare, and necessity require the construction of projects for the conservation, development, storage, distribution, and utilization of water, and the corporation authorized hereunder shall be regarded as performing a governmental function in carrying out the provisions hereof. It is

further declared that there is a special public need for dams and reservoirs at strategic locations for regulating the flow of rivers and streams to lessen damages resulting from floods and to promote the state's industrial and economic welfare, by enhancing the present and potential water power along the rivers and streams and the construction, maintenance, and operation of such dams and reservoirs within the state is a primary purpose of this chapter."

Further interest in the waters of the State, in relation to the quality of the public waters, was shown by the State Legislature's 1947 establishment of the New Hampshire Water Pollution Commission (RSA Chapter 149). One of the duties of the Commission is "to study and investigate all problems connected with the pollution of the surface waters of the state." The coverage under "surface waters" is all encompassing - meaning streams, lakes, ponds, and tidal waters within the jurisdiction of the State, including all streams, lakes, or ponds bordering on the State, marshes, water courses and other bodies of water, natural or artificial.

The State Legislature took a broad state view toward its water resources in relation to the entire natural resources picture through the creation of the New Hampshire Council of Resources and Development, (Chapter 212, Laws of 1965). The Council of Resources and Development, in carrying out its duties of "consulting upon common problems in the field of natural resources and their development," has studied many proposals and projects relating to the State's water resources.

Water resources are also an important concern to the Office of Planning and Development, Division of Economic Development, in carrying out one of its statutory duties: "to prepare and keep up to date a plan for the orderly development of the resources of the state."

In the past several years public agencies and private organizations have been increasingly concerned with further methods of protecting and regulating the use of the State's waters. The 1967 State Legislature passed a number of laws aimed toward the protection of New Hampshire's water on a State level. Some of the bills passed in 1967 are:

Chapter 147. Aimed at preventing the pollution of the State's inland waters and streams through regulation of septic tank construction within 1,000 feet of any surface water in the State. The New Hampshire Water Supply and Pollution Control Commission has the regulatory powers in this law.

Chapter 311. Classified all New Hampshire surface waters to insure that through proper regulation future generations will have clean waters to enjoy.

Chapters 215, 254, 274, and 307. Four laws on dredging and filling projects in the State's inland surface waters and their shoes, conserve, or equalize the flow of such stream or streams for the benefit of any such mill or mills, upon obtaining authority so to do as hereinafter provided." The Water Resources Board requires that the person file a petition with it for such a project and that a public hearing on the project be held. (Chapter 482:19-22)

Channel Encroachment

Chapter 254, Laws of 1967, requires that a proposal for any fill operation in surface waters of the State, to include streams, be submitted to the Water Supply and Pollution Control Commission for approval. While this regulation is directed to control possible water pollution from proposed projects, it does ensure that the State be informed of projects that encroach on a stream channel.

Another regulation relating to encroachment of stream channels is R.S.A. Chapter 262-A (mentioned below) which regulates depositing of wastes and junk in streams and watercourses. This, too, is under the jurisdiction of the Watter Supply and Pollution Control Commission.

Developments in Flood Plain

There are no statutes specifically regulating development on flood plains. The Community Zoning Enabling Act, Chapter 31:60-89, R.S.A. 1955, empowers the legislative body of any city of town to regulate and restrict development of flood plains if it so desires through the zoning powers over"...the location and use of buildings, structures and land for trade, industry, residence or other purposes." In New Hampshire only the City of Keene has flood plain zoning provisions in effect.

Dredging and filling in public waters

Two laws were passed by the 1967 Session of the Legislature on projects to excavate, dredge, and fill in public waters.[1] Under Chapter 274, Laws of 1967, any person, firm or corporation proposing to "excavate, remove, or dredge any bank, flat, marsh, swamp, or lake bed that lies below the natural mean high water level of any public waters" of New Hampshire must petition to the Governor and Council for permission. The petition is referred to the Water Resources Board for investigation and recommendation to the Governor and Council for action. For purposes of the law, public waters are defined as all natural ponds of more than ten acres. The law provides for a public hearing on each proposed project.

Chapter 307 has provisions similar to Chapter 274 except that it applies to any project involving placing "any fill below the mean high water level of any public waters nor below the artificially created high water level of public owned water bodies in this state with the intent or with the effect of creating or forming filled land thereby adjacent to such water bodies..."

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1. Note: The 1969 State Legislature passed a revised version of these two laws that provides for a new committee to review dredge and fill project petitions and make recommendations to the Governor and Council (Chapter 387, Laws of 1969). The new committee is made up of representatives from the State resources agencies - a change from the earlier law whereby the New Hampshire Water Resources Board was the sole judging agency on inland water projects. This is an interim measure that expires July 1, 1971. The Legislature also established a Commission to study inland waters (Chapter 342, Laws of 1969) which will study existing laws relating to inland wetlands, marshes, and flood plains and will make recommendations for revised or new legislation in this field.

In addition to the above two chapters, Chapter 254, Laws of 1967 requires that any person proposing "to dredge, excavate, place fill, mine or undertake construction in the surface waters of the state shall be directly responsible for the submission of plans concerning such proposal" to the Water Supply and Pollution Control Commission for approval.

Discharge of Wastes

Chapter 147:9, Laws of 1967, states, "111. It shall be unlawful for any person or persons to discharge or dispose of any sewage or waste to a surface water of the state without first obtaining a written permit from the commission. In granting such permits, the commission (Water Supply and Pollution Control Commission) shall prescribe such degree of treatment as it deems reasonable and proper..."

Chapter 262-A states, "If any person shall put or place or cause to be put or placed, in or upon any...public bathing place or the approaches thereto, or into or on the ice over any public waters, streams, or watercourse...any bottles, glass, crockery, cans, scrap metal, junk, paper, garbage, old automobile or parts thereof or refuse of any nature whatsoever or any noxious thing, he shall be fined not less than twenty-five nor more than one hundred dollars."

Sewage discharges from boats operated upon waters of the state either directly or indirectly in or near any waters of the State are prohibited, as per Chapter 146:1, Laws of 1967. Regulations are established for marine toilets on boats in Chapter 149.

Construction of Public Water Supply

Chapter 148, Section 25. "1. WATER SUPPLY SYSTEMS. No person, proposing to supply water for domestic uses, shall construct any new system, or enlarge any existing system, for supplying water to the public without first submitting detailed plans of the proposed construction to the Water Supply and Pollution Control Commission and securing its approval thereof..." The law defines "public water supply" as any water system supplying water for ten or more consumers, each family, tenement, store or other establishment being considered a single consumer.

Water Quality

1) Waste Treatment. Chapter 148, Section 11. "SEWAGE DISPOSAL SYSTEMS, CONSTRUCTION. Any person proposing to install new public sewerage or sewage treatment facilities, or to extend, renovate, replace or substantially repair any such existing facilities, shall submit, at least thirty days in advance of construction, detailed plans and specifications therefor to the Water Supply and Pollution Control Commission and secure its approval thereof. The foregoing provisions shall also be applicable to any institution, accommodating thirty or more people, which provides its own facilities as to sewage disposal."

In the 1967 Session of the Legislature, a bill was passed that requires permits for septic tank systems for individual homes or groups of homes near shorelines. The purpose of the bill. Chapter 149-E, is "to protect water supplies and to prevent pollution in the surface waters of the state as defined in R.S.A. 149 by inadequate sewer or waste disposal systems near shorelines." "Near shorelines" as defined by the bill is "any land bordering on the surface waters of the State and/or within one thousand feet of the water line at maximum water line elevation or the watershed ridge line whichever is nearer the maximum water line elevation." Any person proposing to subdivide land near any shoreline or to construct a sewage or waste disposal system near any shoreline must submit copies of plans and specifications for any such system for approval in accordance with the requirements of the Water Supply and Pollution Control Commission as provided for in Chapter 149-E.

2) Registration of Engineers. Chapter 147:8, XlV, Laws of 1967, authorizes the Water Supply and Pollution Control Commission "to establish rules and regulations governing the prequalification of consulting engineers employed in the planning and construction of public water supply and pollution projects." The Commission requires that the consultant, who prepares plans and specifications for water pollution control works submitted to them for approval, be a registered professional engineer qualified to practice sanitary engineering.

WATER RIGHTS

The riparian doctrine is followed in the State of New Hampshire. "In essence this common law - the riparian doctrine - postulates that the right to use water is a property right attached to and inherent in the land, with exclusive ownership of that right resting in the landowner." The riparian doctrine prevails in the thirty-one states of the eastern half of the United States except in Minnesota and Mississippi. (31)

"In a few jurisdictions, the idea that riparian rights are governed solely by a determination of the reasonableness of the use rather than by a distinction between riparian and non-riparian land has been recognized. New Hampshire has pioneered in this attempt to expand water uses." (31)

In a discussion on navigable waters, prepared for the State Planning Project in March, 1964, by James A. Manning, an attorney-at-law, Manchester, New Hampshire, it is stated that, "...the public right to the use of the stream or river or water is limited only by the needs of the public. It is not limited to navigation, to fishery, to water storage. The limit is public need and the capacity of the public water to satisfy the need. The test to be applied is what justice and reason require."

"The State has the power to legislate for all public purposes and to control the public water for such purposes." Manning stated in his report that early in New Hampshire history it was determined that the owners of the land abutting rivers and streams which are not arms of the sea own the soil underneath the water. The court, however, has stated that the water is public if capable of public use. While the State could not control the use of the bed of the stream or river, such use would have to be reasonable and not interfere with the public right.

CASES

For a discussion of pertinent law cases regarding the water resources of New Hampshire, refer to the Kalinski - Forste study on water law.

1. A recent court case that has significance for the Connecticut River in New Hampshire was that of the New Hampshire Water Resources Board versus Lebanon Sand and Gravel, Inc., decided October 6, 1967. The question under the case was "whether title to the bed of the Connecticut River at the site of the excavation is vested in the State or in the defendant." The Company claimed title to a parcel of land in the bed of the Connecticut River to its centerline, in a location at the mouth of the Mascoma River. The Company had removed a substantial amount of sand and gravel from its claimed property.

The New Hampshire Supreme Court ruled that "we hold that the defendant had title to the bed of the river at the site of the excavation subject, of course, to the public easement to use the river for navigation, floatage, and fishery." The decision was based upon a deed dating back to Governor Benning Wentworth on July 4, 1761, and the deed, in turn, was related to the grant given Governor Wentworth by King George lll of England.

This court decision has implications for the Connecticut River; should other private abuttors remove sand and gravel from their ownerships in the river, there may be significant adverse effects on the fishery habitat and other resources of the river. Anything the private abutting owner does with his streambed property, however, must not interfere with the public rights.

2. Another case of significance was that of Vermont versus New Hampshire, decided by the United States Supreme Court on May 29, 1933. This case established the boundary line between the States of Vermont and New Hampshire as the low-water mark on the western side of the Connecticut River. This case thus placed the Connecticut River within the jurisdiction of the State of New Hampshire.

V1. STATE GOVERNMENT
ACTIVITIES AND ADMINISTRATIVE STRUCTURE

ACTIVITIES RE: THE CONNECTICUT RIVER BASIN PLAN

The State of New Hampshire, as one of the four states in the Connecticut River Basin, has worked closely with federal agencies and others on development of the Connecticut River Basin Comprehensive Plan. To insure that all the New Hampshire State resources agencies were kept informed of Plan proposals, a series of informational meetings were held in 1968 and 1969. The meetings were attended by representatives of the State resource agencies and the U. S. Army, Corps of Engineers, Soil Conservation Service, Federal Water Pollution Control Administration, Fish and Wildlife Service, and Bureau of Outdoor Recreation. The meetings permitted the benefit of a "feedback" of State agency views to the federal agencies represented in the development of the Plan. Major items discussed included the U. S. Army, Corps of Engineers proposals for multi-purpose impoundments in New Hampshire, and U. S. Soil Conservation Service recommendations for small dam projects in the New Hampshire sub-watersheds. Other topics included low flow augmentation proposals, water pollution control plans, need for public and private outdoor recreation facilities, the operation of private hydroelectric power plants, and flood plain zoning.

Field trips were held in June, 1968, to Connecticut River Basin Areas 1 and 111 in New Hampshire. State and Federal agency members visited the project sites proposed by the U. S. Army, Corps of Engineers and the U. S. Soil Conservation Service. The trips proved a valuable opportunity for all to see firsthand the proposed sites. Four public informational meetings were held in New Hampshire during 1969, to permit discussion of the proposed contents of the Plan.

The New Hampshire Office of Planning and Research, Division of Economic Development, acted as coordinator for the meetings and field trips. Its aim has been to encourage an interchange of information among all involved in the proposals for the Connecticut River Basin.

The New Hampshire Council of Resources and Development also met with the U. S. Army, Corps of Engineers, the U. S. Soil Conservation Service, and other Federal agency representatives to discuss the Connecticut River Basin Comprehensive Plan.

ADMINISTRATIVE STRUCTURE

This section contains a brief description of the State agencies, boards, and commissions and related organizations in the natural resources field in New Hampshire; in fact, most directly concerned with plans and projects for the Connecticut River Basin.

Having jurisdiction over these agencies are the New Hampshire General Court and the Governor and Executive Council.

The New Hampshire General Court, consisting of a Senate and House of Representatives, was provided for in the New Hampshire Constitution adopted in June 1784. The General Court meets biennially, in odd-numbered years. The Senate has 24 members and the House of Representatives about 400.

The State Constitution (Part Second, Article 41) vested the executive power of the State in the Governor. It states that the Governor shall be responsible for the faithful execution of the laws. An Executive Council of five members advise the Governor (Constitution, Part Second, Article 60). They meet frequently with the Governor to consider many projects requiring his approval.

INTERSTATE

Atlantic States Marine Fisheries Compact

The purpose of the compact, whose members are the coastal states from Maine to Florida, is "to promote the better utilization of the fisheries,marine, shell and anadromous, of the Atlantic seaboard by the development of a joint program for the promotion and protection of such fisheries, and by the prevention of the physical waste of the fisheries from any cause." One of the powers of the Compact Commission is that it shall "have power to recommend to the states...the stocking of the waters of such states with fish and fish eggs."

Legal basis: R.S.A., Chapter 213, Laws of 1955.

Connecticut River Flood Control Compact

The Compact between New Hampshire, Vermont, Massachusetts, and Connecticut establishes interstate cooperation for adequate storage and impoundment of the waters of the Connecticut River and its tributaries for the protection of life and property from floods. The compact provides a common agency through which the signatory States may more effectively cooperate in accomplishing the object of flood control and water resources utilization in the basin of the Connecticut River and its tributaries.

This Compact provides a method whereby the downstream States of Connecticut and Massachusetts reimburse the upstream States of New Hampshire and Vermont on an annual basis a certain percentage of the amount of taxes lost to the upstream States' political subdivisions for those

lands acquired by the United States government for flood control dams and reservoirs.

Legal basis: R.S.A. Chapter 487, New Hampshire Laws of 1955.

New England Interstate Water Pollution Compact

New Hampshire participates in regional planning for water pollution control through its membership in the New England Interstate Water Pollution Control Commission, initiated by the New England Interstate Water Pollution Control Compact approved by an act of Congress in 1947, and ratified by all seven state legislatures by 1955. The Commission aims toward a sound and equitable solution to pollution control problems through a coordinated interstate program. Because all the major river basins in New Hampshire - the Connecticut, Merrimack, Androscoggin, and Saco - are interstate drainage basins, this program is of importance to the State.

The main function of the Commission is the approval of classifications for the interstate, inland, and tidal waters of the seven-state Compact area (the six New England States plus New York State). This classification system, much the same as New Hampshire's system, permits a balanced use of the area's waters to meet the various degrees of water quality required. Each of the seven states agreed to prepare classifications of its interstate waters according to present and proposed highest use, and to submit them to the Commission for approval.

A second part of the Commission's work has been a program of surveys, investigations, and research in connection with pollution abatement programs.

Legal basis: R.S.A. Chapter 488, Laws of 1955.

New England River Basins Commission

The Commission was established under the authority of the Water Resources Planning Act by President Johnson on September 6, 1967, at the request of the New England Governors' Conference.

In accordance with Title 11 of the Water Resouces Planning Act the Commission shall:

(1) serve as the principal agency for the coordination of Federal, State, interstate, local and non-governmental plans for the development of water and related land resources in its river basin:

(2) prepare and keep up-to-date a comprehensive plan for public and private development of water and related resources:

(3) recommend long-range schedules for data collection, investigation, planning and construction of projects; and

(4) foster and undertake such studies of water and related land resources problems in its river basin as are necessary for preparation of the comprehensive plan.

New Hampshire Commission on Interstate Cooperation

The New Hampshire Commission on Interstate Cooperation has the following functions:

1. To carry forward the participation of New Hampshire as a member of the Council of State Governments.

2. To assist in establishing governmental machinery to facilitate cooperation between New Hampshire and other states, both regionally and nationally.

3. To endeavor to advance cooperation between New Hampshire and other units of government by means of adoption of compacts, enactment of reciprocal statutes, adoption of uniform administrative rules, and other methods of cooperation of government offices and officials.

Legal basis: R.S.A. Chapter 19, New Hampshire Laws of 1955.

STATE

New Hampshire Department of Agriculture

The New Hampshire Department of Agriculture has the following functions:

1. Promote agriculture and the agricultural interests of New Hampshire.

2. Cooperate with extension work at the University of New Hampshire.

3. Gather, tabulate, and maintain a file of information pertaining to agriculture within the State.

4. Collect and publish information on the agricultural resources of the State and disseminate this data throughout the nation.

5. Investigate the control of insects and ragweed, and cooperate with town and regions to eliminate trouble areas.

6. Advocate supplemental irrigation to increase agricultural production.

Legal basis: R.S.A. Chapter 426, Laws of 1955.

Department of Fish and Game

The Department of Fish and Game is involved in fish and game propagation and maintenance, surveys, technical assistance to other agencies and to individuals, protection of wildlife, habitat development, rescue and search parties, preservation of marshes, dam construction, stream and pond stocking, and eradication of rough fish species.

The Department constructs, operates, and maintains small water impoundments for the improvement of fish and game; cooperates with Federal and State agencies for water project planning and pollution abatement; reviews applications for water barriers; reclaims ponds and lakes; maintains water areas for the protection of water fowl; stocks waterways with fish; maintains migratory bird refuges; carries on studies of algae and other water growths; makes periodic surveys of most of the State's lakes and ponds, showing depth and bottom conditions; operates pheasant farms, fish hatcheries, and game refuges.

The Department also investigates needs for public access to water; advises on stream channel control to reduce sediment; cooperates with schools in teaching the children basic conservation and the safe use of firearms; makes available services of game biologists to owners and managers of forest properties; develops methods of opening up more private land to sportsmen; provides wildlife lecturers, films, educational assistance.

Legal basis: R.S.A. Chapter 206, Laws of 1955.

Department of Public Works and Highways

This Department is responsible for planning, design, acquisition of land, and construction of the entire State highway system.

The Department is aware of the necessity to develop roads of high visual quality and has won national design awards. Thus, the driver of New Hampshire roads has an opportunity to view many of the scenic qualities of the New Hampshire landscape. Recognition of the need for roadside rest areas has stimulated a development program of well designed rest areas, replacing some outmoded ones.

The Department, through the Public Works Division, serves as the construction agency for the Division of Parks, supplying construction crews and supervising the work of independent contractors for major developments within the parks. It also maintains the park roads.

A significant milestone in the evolution of public recreation and of the increasing importance of recreation is the Federal directive issued several years ago by the Bureau of Public Roads, U. S. Department of Commerce, which calls for a review of plans for Federal Aid Highway construction by representatives of the U. S. Forest Service, Wildlife Service, and the Fish and Game Department, as well as the Department of Public Works and Highway, in order to achieve a maximum coordination of public highway improvements with the requirements of fish and wildlife resources.

The Department has undertaken, also in cooperation with the other State agencies, a study of a scenic road system for New Hampshire, in accordance with a request from the Bureau of Public Roads.

Legal basis: For organization of Department - R.S.A. Chapters 228 and 229, Laws of 1955.

Department of Resources and Economic Development

The Department of Resources and Economic Development was established in 1961 by the Legislature with the purpose of improving "the administration of state government by providing unified direction of policies, programs and personnel in the field of resources and economic development making possible increased efficiency and economies from integrated administration and operation of these related functions of the state government."

The Department, under the executive direction of a commissioner appointed by the Governor for a term of four years, consists of the Division of Resources Development; Division of Economic Development which includes the subdivisions of research and planning, industrial development, and promotion; and Division of Parks. The Water Resources Board and State Port Authority are a part of the Department for housekeeping administrative purposes only.

A commission that is advisory to the Commissioner consists of seven members and is appointed by the Governor. The commission's duties are to "consult with and advise the Commissioner of Resources and Development with respect to the policy, programs and operations of the department upon a continuing basis."

Legal basis: Chapter 223, Laws of 1961.

Division of Resources Development (Forestry Division)

The Division of Resources Development manages the State Forest lands by a multiple-use plan. Elements of this management plan include timber production, wildlife management, watershed protection, insect and disease control, fire control, and forest demonstration areas.

The Division cooperates closely with the Division of Parks in State Parks where land is deivided into recreational and timber production zones.

The Division is responsible for the overall prevention and control of forest and brush fires throughout the State except within the boundaries of the White Mountain National Forest. The Division, upon request, can cooperate with counties, towns, corporations, and individuals in preparing plans for the protection and management of trees, woodlots, and timber tracts. The Division carries on a forest pest and disease research and control program in the State.

Legal basis: R.S.A. Chapters 216 through 226, Laws of 1955; and Chapter 223, Laws of 1963.

Division of Parks

The Division of Parks is responsible by State statute for the design, development, administration, operation and maintenance of the recreational facilities in State public areas of recreational significance, to wit:

1. The Division of Parks will preserve and develop unusual scenic, scientific, historical, and recreational areas and facilities within the State;

2. The Division will develop these areas and facilities for public recreational, educational, scientific, and related uses;

3. The Division will expand the facilities within the present system of State Parks, historic sites, wayside areas and scientific areas to achieve and derive maximum increase in value of these facilities as tourist attractions, in relation to the growing needs for such facilities;

4. The Division will give equal consideration to the recreational needs of all sections of the State;

5. The Division will develop the present parks and facilities thereon to their optimum capacity for skiing, camping, and other income-producing activities;

6. The Division will develop any other lands and facilities that the State now owns for optimum recreational potential; and

7. The Division will acquire new areas and facilities believed to have sound potential for development, use, and operation as State Parks, historic sites, or wayside areas.

The Division of Parks cooperates with the Department of Fish and Game in the management of State Park lands which have fish or wildlife production potential.

The Division of Parks also cooperates with the Water Resources Board, the Division of Resources Development (Forestry), and the Department of Public Works and Highways in the maintenance of dams, in forest management practices, and in the development of park facilities, respectively.

Legal basis: R.S.A. Chapters 216 and 218, Laws of 1955; and Chapter 223, Laws of 1963.

Division of Economic Development
Office of Planning and Research

The Office of Planning and Research is the central planning agency of the State and is responsible for the collection, compilation, and analysis of data bearing upon industrial, commercial, social, and physical factors which influence the present and future welfare of the State, its economic well-being, and the conservation of its natural resources.

The Office conducts special studies, administers Federal planning grants on the state, regional, and local levels, coordinates the planning functions of the Federal, state, and local resource agencies, and gives assistance to public, quasi-public, and private agencies and individuals involved in resource planning and research.

Legal basis: R.S.A. Chapter 12, Laws of 1955; and Chapter 223, Laws of 1963.

Office of State Geologist

The Office of State Geologist was established in 1967 by the State Legislature to have the following duties:

1. To collect and distribute geologic mineralogic information;

2. To coordinate cooperative projects with U. S. Geological Survey and other agencies;

3. To research the geology and mineral resources of the state;

4. To serve as editor of state geologic publications;

5. To make studies related to geology of the State;

6. To cooperate with federal agencies in collecting data on geologic activity and mineral industries; and

7. To assist in educational programs in geology and mineral resources at state educational institutions and public school.

Legal basis: Chapter 96, Laws of 1967.

Department of Safety (Division of Safety Services)

This State agency administers the boating and navigational aids program on the fresh waters of the State. In summer, the agency has approximately 75 full and part-time Boat Inspectors, who act as waterborne police. The Division is also responsible for placing more than 2,000 markers, buoys, and other navigational aids on more than 100 water bodies. Lake Winnipesaukee alone is patrolled by seven state-owned craft, some of which are on duty 24 hours a day.

Legal basis: Chapter 166, Laws of 1961; and R.S.A. Chapters 270, 271, and 272, Laws of 1955.

New Hampshire Council of Resources and Development

The Council was formed to coordinate the activities of State agencies concerned with the State's natural resources.

"The Council shall consult upon common problems in the field of natural resources and their development; consult with, negotiate with and obtain information from any federal or state agency that may or could be involved or concerned with any of its problems, reports, recommendations or studies; make such reports and recommendations as may be desirable in its opinion to the governor and council; and, subject to the approval of the board, commission or commissioner of the agency or department affected, make such studies and recommendations upon its own initiative, or upon request, to the general court concerning such changes as it may deem advisable to coordinate effectively the work of the agencies which have membership in the council. Its decisions shall be advisory only."

The Council is composed of the head of each of the following State agencies: Department of Agriculture, Department of Education, Fish and Game Commission, Department of Public Works and Highways, Water Pollution Commission,

Water Resources Board, Department of Resources and Economic Development, Division of Economic Development, Division of Resources, and Division of State Parks. The Director of the Office of Planning and Research serves as the permanent chairman.

Legal basis: Chapter 212, Laws of 1965.

Public Utilities Commission

The Public Utilities Commission has the power and duty "to keep informed as to all public utilities in the state, their capitalization, franchises and the manner in which the lines and property controlled or operated by them are managed and operated, not only with respect to the safety, adequacy and accommodation offered by their service, but also with respect to their compliance with all provisions of law, orders of the commission and charter requirements." (R.S.A. Chapter 374:4). The utilities covered by the Commission include those for electricity, gas, steam, telephone, telegraph, water, municipal utilities, railroads, express, street railways, toll roads and toll bridges, motor vehicles (carriers of passengers and common and contract carriers of property), and carriers by water.

Legal basis: R.S.A. Chapters 362 through 382, Laws of 1955.

State Conservation Committee

The State Conservation Committee was established to serve as an agency of the State. It has nine members - four State agency heads and five others appointed by the Governor. The Committee serves without compensation and has the following duties:

1. To offer assistance to the supervisors of the Soil Conservation Districts of the State in formulating and carrying out any of their programs;

2. To keep the supervisors of each District informed of the activities of all other Districts, and to facilitate an interchange of advice, experience, and cooperation among such Districts;

3. To coordinate the programs of the several Districts so far as they may be done by advice and consultation.

4. To seek the cooperation, and technical and financial assistance of the United States, of this State, and of town and county governments, in the work of such Districts;

5. To keep the public informed throughout the State, concerning the activities and programs of the Districts; and

6. To establish satisfactory cooperative arrangements and to avoid duplication between the Districts and other federal, state, or county agencies which have similar responsibilities.

Legal basis: Chapter 366, Laws of 1967.

Water Resources Board

The New Hampshire Water Resources Board is concerned primarily with conservation of State water resources and the regulation of stream flows.

A major responsibility of the Water Resources Board is flood control and protecting riverbank property from water damage. To carry out this responsibility, the Board cooperates with the U. S. Army, Corps of Engineers, and the Soil Conservation Service in their respective flood control programs. The Board is required to approve all water resource projects contemplated for New Hampshire and to provide technical advice in both the planning and construction states of such projects.

The Board supervises and, in some cases, assumes ownership of all dams and dam sites in New Hampshire. Those dams which have become State property are maintained and improved by the Water Resources Board. The Board is authorized to investigate facilities for hydroelectric power on the State's streams.

With the objective of regulating the flow of streams, the Board constructs and operates conservation reservoirs, which may be released when stream flow downstream reaches a certain minimum flow. Control of stream flow is important for diluting sewage and other wastes, and for fish and wildlife uses.

The provision of recreation facilities at Water Resources Board installations is only incidental to its primary goals; however, the Board allows the public to gain access to the water at most of its damsites.

The Water Resources Board is responsible for investigating and considering requests for permits to dredge and/or fill in the public waters of the State under Chapters 307 and 274, Laws of 1967.

Legal basis: R.S.A. Chapters 481 and 482, Laws of 1955.

Water Supply and Pollution Control Commission
Pollution Control Activities

Authority to control industrial, municipal, and private sources of water pollution in the State of New Hampshire is vested in the State Water Supply and Pollution Control Commission. The Commission, acting under New Hampshire Water Pollution Control laws and through the courts, may exercise this authority by enforcement of established legislative classifications of surface waters and of recently passed legislation controlling sewage disposal systems near shorelines.

New Hampshire has had a comprehensive program on water pollution control since 1947, when the Legislature first established the Water Pollution Commission and its program. In the 1967 Session of the Legislature the Commission's duties were expanded and its title changed to "New Hampshire Water Supply and Pollution Control Commission."

The powers and duties of the agency may be summarized as follows:

1) To study and investigate all problems connected with the pollution of the surface waters of the state;

2) To conduct scientific investigations and research on the elimination of various types of pollution;

3) To cooperate with other public or private agencies in the conduct of such investigations and research.

4) To perform all necessary work relative to classification of state surface waters;

5) To require filing of plans and specifications for wastewater treatment plants;

6) To investigate and consider all requests for permission to subdivide land near any shoreline, or to construct sewage or waste disposal systems on any land bordering on the surface waters of the state and/or within one thousand feet of the water line at maximum water line elevation;

7) To investigate and approve applications for state and federal aid for the construction of municipal pollution abatement projects;

8) To work with other states to eliminate pollution of interstate waters; and

9) To employ personnel and purchase necessary equipment.

Legal basis: Chapter 147, Laws of 1967.

Water Supply Activities

The Sanitary Engineering Division of the Water Supply and Pollution Control Commission is responsible for the protection of sources of water and ice.

The following are the Division's main activities:

1) "The Commission is empowered to investigate the sanitary conditions and methods pertaining to the source, treatment, and distribution of all public water supplies[1] for the domestic use, and to require the application of any treatment or improvement in conditions and methods as it may deem necessary to insure fitness and safety and adequate protection of the public health." (R.S.A. 148:22).

Any person constructing a new public water supply system or enlarging any existing system must submit plans for the proposed construction to the Water Supply and Pollution Control Commission.

2) The Division regulates the cutting of ice used as a source of a public water supply for domestic purposes for man.

3) The Water Supply and Pollution Control Commission is authorized to study the probable domestic water supply requirements of groups of towns and/or cities which appear likely to have increased industrial and population growths for the next fifty years. The Commission shall find out the most feasible and economic sites for sources of water supply for such long-range planning. (R.S.A. 148-A)

Legal basis: R.S.A. Chapter 148.

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1. A public water supply system, by law, is any such system that accommodates thirty or more people, including not only municipality systems but also institutions, subdivisions, etc.

University of New Hampshire Agricultural Experiment Station

The State Agricultural Experiement Stations conduct research and gather information relating to land use, farm characteristics, population, and zoning, as well as a wide range of physical and biological data useful for planning

and developing recreation enterprises. The stations, in cooperation with the National Agricultural Experiment Station, are now carrying out or are planning a number of studies bearing directly on the use of human, land, and water resources for recreation. These include surveys of recreation facilities and services on farms and potentials for further development, demands of urban residents for outdoor recreation, and sports (swimming, skiing, and so on) and indoor recreational activities (bowling, crafts, arts, and the like).

Cooperative Extension Service

The Cooperative Extension is the branch of the University of New Hampshire and the U. S. Department of Agriculture which conducts informal, off-campus education for both adults and youth. The Extension's education work is mainly in agriculture, forestry, home economics, and community planning, giving advice to both farm and non-farm residents on agricultural and forest production, management, and marketing problems through the County Agricultural Agents and the County Foresters. The County Home Economist provides assistance for families on a wide variety of family concerns. Other fields in which the Extension Service provides educational assistance include developing income-producing recreation facilities, 4-H youth work for boys and girls, and the development of natural, human and man-made resources through the county Rural Areas Development Committees.

An Extension Coordinator gives advice to Town Conservation Commissions in their local conservation projects.

Resources Development Center

The Center is an apparatus that has been established at the University of New Hampshire so that talents existing there can be brought to bear on State problems. It is a problem-solving agency that deals with natural, human, economic, and cultural resources. The Center has had the leading role in directing a comprehensive study of resources available in the Seacoast Region of New Hampshire. It has also conducted a Mount Washington users study in conjunction with the Governor's Mount Washington Study Committee. The Center assumes assignments in service responsibilities, in administrative planning, in the discovery of new techniques for commerce, industry, and business, and in practical ways of promoting progress in New Hampshire and the New England area. The Center cooperates closely with existing State agencies and authorities.

Water Resources Research Center

In July, 1964, the Governor of the State of New Hampshire designated the University of New Hampshire as the educational institution at which a Water Resource Research Center would be located in New Hampshire. The Center was authorized by the Water Resources Research Act of 1964, Public Law 88-379, July 17, 1964, as amended by Public Law 89-404, April 19, 1966, which authorized State Water Resources Research Centers in each of the fifty states and Puerto Rico.

The Center was established to plan and coordinate water resource research and graduate training in water resource research in the colleges and departments of the University. It also provides the mechanism for cooperation in water resources research with other research institutes and agencies throughout the State. In May, 1967, ten research projects projects were underway though funds provided under Public Law 88-379.

POLITICAL SUBDIVISIONS

Soil and Water Conservation Districts

The Districts, one for each of ten New Hampshire Counties, are organized under the provisions of Chapter 366 of the laws of 1967. The governing body of each of the districts consists of five supervisors (who shall be land occupiers in the district) appointed by the State Conservation Committee. The supervisors receive no compensation for their services except expenses.

The Districts do not have any funds to do the jobs listed below, but serve in an advisory capacity and work with federal agencies who plan and carry out the projects.

The Districts have the following powers:

1. To conduct research relating to soil erosion, floodwater, sediment damages, land drainage, and the conservation and development of natural resources;

2. To conduct demonstration projects within the district on publicly or privately owned lands in order to demonstrate conservation and development methods;

3. To carry out preventative and improvement measures for the conservation and development of the soil, water, and related natural resources within the district;

4. To cooperate or enter into agreements with any agency or occupier of lands within the district in carry-

ing out erosion control, flood prevention, drainage, watershed protection, and resource conservation and development projects or other works of improvements for the natural resources within the district;

5. To acquire, maintain, and sell property, real or personal, in carrying out the provisions of the law establishing the districts;

6. To make available to land occupiers within the district agricultural machinery, fertilizer, seeds, and other material as will assist such land occupiers in conservation projects upon their lands;

7. To construct and maintain structures as may be necessary under the law establishing the district;

8. To develop comprehensive plans for changes in land use, control and prevention of soil erosion, land drainage, and prevention of flood-water and sediment damages within the district; and

9. To take over by purchase, lease, or otherwise and administer any works of improvement for the conservation and development of soil, water, and related natural resources.

V11. DESCRIPTION OF WATERSHEDS WITHIN THE CONNECTICUT RIVER BASIN, NEW HAMPSHIRE

INTRODUCTION

This section highlights the major water needs and problems of the subwatersheds within the New Hampshire part of the Connecticut River Basin and contains a capsule description of the subwatersheds. Five of the subwatersheds are about 200 square miles or more in area; the remaining ones are of lesser extent.

The entire New Hampshire Connecticut River Basin is heavily wooded and predominately rural, except for the urbanized areas of Claremont, Keene, and Lebanon. The subwatersheds of the northern section (Area 1) have a wilderness aspect and despite lightly developed areas, the southern section (Area 111) is also quite wild and remote in character.

Area 1 is within the White Mountain Physiographic Section with many mountains above 2,000 - 3,000 feet in elevation. Area 111 is hilly, lies within the "New England Upland Physiographic Section," and has some mountains projecting above the surrounding terrain. Broad flat terraces extend up along the Connecticut River Valley in New Hampshire, providing some of the most arable, largest continuous tracts of land available for development.

Many important deer yards are located within the subwatersheds in New Hampshire. The entire area also provides excellent upland game habitat. Plans for the subwatersheds must aim toward protection of the deer yards from adverse affects and destruction wherever possible.

Pollution of the streams is present in almost all of the subwatersheds. Methods must be found to alleviate or eliminate pollution, other than low flow augmentation from impounded waters.

The maintenance of the high quality of the brooks and rivers in the Connecticut River Basin for recreational, municipal, and industrial uses and other purposes is a matter of continuing concern to the State of New Hampshire and the local communities.

Refer to Tables Jnh-1 and Jnh-2 for a listing of major non-federal projects in the New Hampshire portion of the Connecticut River Basin. The tables include water impoundment projects of the State and private industry; state parks, forests, and wildlife areas; and quasi public

reserves. These projects are shown on the maps. Figure Jnh-1, (except for State Parks and Forests less than 150 acres in size.)

AREA 1 - FROM PITTSBURG SOUTH TO LEBANON

Indian Stream

Indian Stream flows southerly from the Canadian border for about 16 miles in a narrow valley that trends north-south. It is bordered on both sides with hills and mountains over 2,000 feet in elevation above sea level. The watershed drainage area, 71 square miles, is mostly wilderness. The major portion is owned by one larger paper company. Hunting and fishing are important activities here. Two major deer yards are within the area.

Major Water Needs:

1. Insure protection of the water quality of the streams for good fishing.

2. Other programs needed for the Indian Stream and adjoining area include proposals for better stabilization of the water levels at the First and Second Connecticut Lakes and Lake Francis for recreational purposes and preservation in their natural state of some of the wetlands and undeveloped ponds.

Small Subwatersheds - Perry Stream to Northumberland

A series of small subwatersheds of streams that flow directly into the Connecticut River extend from Perry Stream southward to the Town of Northumberland. The streams include Perry Stream, Halls Stream, Bishop Brook, Sims Stream, Lyman Brook, and Bog Brook. These subwatersheds share the North Country characteristics of a wooded wilderness aspect, clear streams, and sparse population.

Large numbers of spruce and fir in the valley bottoms give the countryside a distinctive Christmas-tree look. Mountains in the area range to elevations above sea level of over 3,000 feet. One significant deer yard is located here.

Major water needs and problems:

1. Continued protection of the high quality of the streams for fishing and other purposes is needed.

2. There is a problem of siltation of the streams and some of the beaver ponds in this area. The siltation occurs as a result of logging operations using the new modern equipment that can cut logging roads

straight up and down hillsides. These logging roads erode, with the material washing into the stream. The silt smothers trout spawning areas, eliminating fish habitat and the fishing in the stream for years afterward. The New Hampshire Fish and Game Department estimates that once silting stops it takes from eight to ten years for the fish population to build up again on that stream.

Mohawk River

The westward-flowing Mohawk River is a small watershed of 56 square miles. Farming, mainly dairying, is carried on in the main river valley area. In the mountainous reaches, the land is still wild and wooded. The hills in the area range over 1,200 feet in elevation above sea level. Dixville Peak, on the eastern edge of the watershed, is 3,482 feet in elevation. The Mohawk drains almost the whole Town of Colebrook, (Est. 1966 population - 2,075), the built-up area of which is located near the junction of the Mohawk with the Connecticut River.

Major watershed needs and problems:

1. The village of Colebrook and the bridges and roads upstream from the village have had extensive damage from past major floods. The damage potential exists today.

2. In addition to potential damages from major floods, ice jams cause out-of-bank flow and damages at frequent intervals.

3. No public swimming area is available in the watershed.

4. This stream has a history of siltation problems similar to that described above. The silt in the streams has come from projects other than logging operations.

Upper Ammonoosuc River Watershed

The Upper Ammonoosuc River watershed is a scenic, mountainous area of 254 square miles. Mountains in the area include the Percy Peaks (elevation 3,418 feet and 3,220 feet), Sugarloaf (elevation 3,701 feet), Mt. Cabot (elevation 4,080 feet), and Hutchins Mountain (elevation 3,710 feet). The main valley floor from Milan to Groveton is wide and fairly flat. The watershed is 92 percent forested. Groveton Paper Company and International Paper

Company own large tracts of land along Nash Stream and Phillips Brook in the Towns of Odell, Millsfield, and Erving's Location (all of which have no permanent residents) and in the Town of Stratford. Most of the southern part (about 36 percent) of the watershed is within the White Mountains National Forest in Stark, Kilkenny, and Berlin. A major deer yard is located in this watershed.

Note: For further discussion refer to Mohawk River Watershed Investigation Report, Connecticut River Basin Survey, Soil Conservation Service, U.S.D.A., October, 1967.

The watershed is lightly populated. The main center of population is the village of Groveton, part of the Town of Northumberland (estimated 1966 population, 2,616), where Groveton Paper Company is located.

Major problems and needs:

1. Pollution of the Connecticut River is caused by the Groveton Paper Company and the Village of Groveton. Plans for waste disposal facilities for the Village of Groveton have been completed, and the project is ready to go into the construction phase. The Village of Groveton, Town of Northumberland, has received for the project a Federal grant of $256,800 from the Federal Water Pollution Control Administration.

At this time the Groveton Paper Company has not decided whether it is going to use the waste disposal facilities to be built by the Village or whether it shall construct its own waste disposal system.

2. The Village of Groveton presently is in need of additional municipal and industrial water. A study on the Village's water supply situation was completed by Anderson-Nichols Company in August, 1967, but to date nothing has been done to implement the recommendations of the report.

3. Local flood protection is needed along the main river valley, particularly in the Village of Groveton and for the Groveton Paper Company. On May 20, 1969, a dam on Nash Stream washed out in a flood. As a result of this occurrence, a proposal for a Public Law 566 Small Watershed Project in the area was prepared and approved by the U. S. Soil Conservation Service, Washington, D. C. A Work Plan for the project will be prepared. The proposed project will afford flood control, water supply, and recreational benefits to the area. The sponsors of the project are the

New Hampshire Water Resources Board and the local towns. Dams are being considered for construction on Nash Stream, Roaring Brook, and Phillips Brook.

4. A continuing program is needed to protect the high quality of the river and tributary streams for fishing and other recreational purposes.

Israel River Watershed

The Israel River watershed (drainage area: 135 square miles) offers some outstanding broad sweeping views of the White Mountains in the main valley. Some of the best views may be had from U. S. Route 2 that traverses the watershed from east to west. The upper reaches of the watershed are the wooded steep slopes of the Presidential Range, whose elevations exceed 5,000 feet above sea level.

The White Mountains National Forest covers the mountainous portions of the watershed. "Six Gun City" and "Santa's Village," hotels and motels, and a number of other vacation travel businesses are located in the Jefferson-Lancaster area.

The Town of Lancaster (estimated 1966 population 3,191) is located near the junction of the Israel and Connecticut Rivers.

Major needs and problems:

1. The Town of Lancaster has a serious problem of flooding that occurs frequently on the Israel River in spring, when the ice breaks up in the river and jams within the main part of town. The problem is due in part to flow problems downstream near the confluence with the Connecticut River.

2. Stream pollution abatement is needed.

Johns River Watershed

The Johns River watershed (drainage area: 76 square miles) covers almost the entire Town of Whitefield (estimated 1966 population 1,445) and parts of several adjoining towns.

Several famous large summer hotels are located here. The watershed is hilly. Cherry Mountain (elevation 5,554 feet above sea level) is located on the southeastern boundary.

At the eastern end of the watershed are Big and Little Cherry Ponds, part of a 500-acre tract owned by the New

Hampshire Audubon Society for bird and wildlife preservation purposes. A major deer yard is located in the watershed.

A good road transportation network, including U. S. Route 3 and State Route 116, serves the watershed.

Major needs:

1. Stream pollution abatement is needed.

Note: For further discussion refer to Upper Ammonoosuc River Watershed Investigation Report, Connecticut River Basin Survey, Soil Conservation Service, U.S.D.A. November, 1967.

Ammonoosuc River Watershed

The entire Ammonoosuc River Watershed covers about 402 square miles and includes the Gale River and Wild Ammonoosuc River subwatersheds.

The Ammonoosuc River headwaters are in the upper elevations of the White Mountains. The river begins at Lake-of-the-Clouds and flows westward to Littleton for about 34 miles, then southwesterly for 22 miles to its confluence with the Connecticut River.

The watershed is mountainous and heavily wooded. The White Mountain National Forest occupies much of the southeastern portion. The upper half, from Littleton to the headwaters, is a major recreation area catering to summer visitors, and to winter sportsmen. The Towns of Franconia, Twin Mountain in Carroll, and Bethleham are important vacation-travel towns there.

The lower half of the watershed from Littleton to Woodsville is less mountainous terrain. It contains the retail center of Littleton (estimated 1966 population 5,096) and the industrialized Towns of Lisbon (estimated 1966 population 1,376) and Woodsville (estimated 1966 population 3,118).

Major watershed needs and problems:

1. Local flooding problems exist along the valleys of the main river and tributary streams.

2. Stream pollution abatement is needed.

3. Minimum flow regulation is needed below the existing dams.

Wild Ammonoosuc River Subwatershed

The Wild Ammonoosuc River subwatershed is in the southwestern portion of the Ammonoosuc River watershed. It covers 58 square miles. Most of the subwatershed, whose headwaters begin at Kinsman's Notch, Woodstock, is within the White Mountain National Forest. The area is mostly wilderness and is very lightly populated. The river flows through a narrow steep-sided valley for about five miles in the mid-watershed area.

Gale River Subwatershed

The Gale River subwatershed has a drainage area of 91 square miles. Approximately 43 percent of the area is within the White Mountain National Forest. The eastern flank of the watershed consists of the steep mountain slopes of the White Mountains, including Cannon Mountain and others with elevations of 4,000 feet plus. This area, the Franconia Notch area, is one of the most outstanding tourist destination areas in the State of New Hampshire for year-round recreation.

The Village of Franconia and the adjoining Town of Easton are located on the broad flat river valley of the Gale River at the foot of the mountains.

A significant deer yard is located in this subwatershed.

A small watershed Project under Public Law 566 is currently planned for the Gale River watershed by the Soil Conservation Service.

Major needs and problems: (21)

1. The floodwater damages occur mainly to agriculture lands and farm buildings.

2. The Village of Franconia has experienced some minor flooding to residences and business establishments.

3. Lack of recreational waters for swimming and boating.

4. A larger water supply is needed for the Town of Littleton, to provide adequate supply for present consumption and also to provide an ample reserve for future expansion.

5. The north and south branches of the Gale River are restricted with no fishing allowed because the streams are used as a local water supply. The New Hampshire Fish

and Game Department believes that at some future time fishing may be allowed although the streams could continue to be used as a water supply.

Series of Small Watersheds - Littleton to Lebanon

Extending from Littleton southward to Lebanon along the main stem of the Connecticut River are a series of small subwatersheds of streams that flow directly into the River.

The streams generally originate in the mountainous lands to the east of the River and flow through less steep terrain into the River. The area includes the scenic historic towns of Orford, Lyme, and Hanover, and a famous resort area at Lake Tarleton. Route 10 is the main north-south highway crossing these watersheds along the River.

Oliverian Brook

This watershed of 15.4 square miles, in the northwestern section of Grafton County, has had a small Watershed Project under Public Law 566 completed by the S.C.S. and local cooperators. It is located on the western edge of the White Mountains. The floodplain area is relatively flat and is bordered by steep valley walls.

The project was designed to control the local flooding of farmlands and homes on the flood plain. (17)

AREA 111 - FROM LEBANON TO THE MASSACHUSETTS LINE

Mascoma River

The Mascoma River watershed has a drainage area of 194 square miles. The City of Lebanon (estimated 1966 population 9,320) is near the junction of the Mascoma River with the Connecticut River. Mascoma Lake, 1,114.9 acres in size, to the east of Lebanon, is a popular resort lake and has many summer cottages on its shores. Mt. Cardigan (elevation 3,121 feet) is on the eastern bounds of the watershed.

The upper portion of the watershed, above Mascoma Lake, has a Small Watershed Project under Public Law 566 currently in the planning process.

Major needs and problems:

1. Pollution is a serious problem in the mainstream below Mascoma Lake. (The stretch of river from Lebanon to the Connecticut River was classed in "nuisance" condition by the New Hampshire Water Pollution Commission in its Staff Report on the river in July 1966).

2. Need for local flood protection in the West Canaan area.

3. A series of small dams on the river make fish management difficult and impair the beauty of a free-flowing river.

Sugar River Watershed

The Sugar River watershed (drainage area: 275 square miles) encompasses over half of Sullivan County. A Small Watershed Project under Public Law 566 is in the planning stage for the watershed. The Sugar River rises in Lake Sunapee at an elevation of 1,091 feet and, after flowing about 25 miles, enters the Connecticut River at an elevation of 300 feet.

On the eastern upper reaches of the watershed is Mt. Sunapee (elevation 2,648 feet), location of a State Park noted especially for winter skiing. The watershed is hilly with mountains such as Mt. Sunapee, Croydon Mountain (elevation 2,375 feet), and Green Mountain (elevation 2,005 feet) projecting above the hills.

About 90 percent of the people in the watershed live in three population centers: Claremont (estimated 1966 population 13,831), Newport (estimated 1966 population 5,673), and Sunapee (estimated 1966 population 1,306). Outdoor recreation, summer and winter, is popular in the Lake Sunapee area. Agriculture, predominately dairy, poultry, and truck farming, is carried on in the valley area.

Waters of the region are used extensively by several industries, chiefly paper and textile manufacturers.

Major problems and needs:

1. Pollution of the Sugar River is a problem from Sunapee through the City of Claremont. Plans are being made for sewage and industrial waste treatment to clean up the river.

2. Flooding of residential and business buildings is a problem along the main river valley, particularly in Claremont and Newport.

3. The City of Claremont needs additional water supplies to meet its present and projected needs.

4. A series of small dams on the river make fish management difficult here, as on the Mascoma River.

Series of Small Watersheds along the Main Stem

A series of watersheds of streams that drain directly into the Connecticut River extends southward from Lebanon along the main stem of the Connecticut to the New Hampshire-Massachusetts line. The watersheds range from eight miles wide (east-west) to several miles wide. The terrain is very hilly, with most hills 1,000 to 1,500 feet in elevation. The area is not heavily populated; Plainfield has an estimated 1966 population of 1,074; Cornish, 1,225; and Charlestown, 2,764 persons.

The subwatersheds include those of Bloods Brook, Mill Brook (which drains Cornish), Little Sugar River (drains part of Unity and Charlestown), Partridge Brook, Clay Brook, and Blow-me-down Brook, for which a Small Watershed Project under Public Law 566 is being planned by the Soil Conservation Service. Blow-me-down Brook drains most of the Town of Plainfield.

Cold River Watershed

The Cold River, draining an area of 100 square miles, traverses a lightly populated area that includes the Towns of Acworth, Alstead, Langdon, and Lempster. The area is hilly with narrow valleys. Hills in the area range from 1,000 to 1,500 feet above sea level.

The Cold River is an excellent stream for trout and is being used by the New Hampshire Fish and Game Department in an experimental program to establish Atlantic salmon.

The watershed is one of two major mineralized areas in New Hampshire and was the scene of active mining for mica and feldspar in the early 1900's.

Major needs:

1. Continued protection of high quality of the river for fishing purposes.

Ashuelot River Watershed

The Ashuelot River drainage basin (area: 421 square miles) is the most industrialized and populated watershed of Areas 1 and 111. Development centers on the City of Keene (estimated 1966 population 18,517). Adjoining towns include Winchester (estimated population 2,598), Swanzey (3,191), and Troy (1,609).

More remote areas of the watershed remain undeveloped and in fact have a wilderness aspect that one would not expect in southern New Hampshire.

The most outstanding physical feature of the watershed is the broad flat floodplain on which the City of Keene is built. A second outstanding feature is Mt. Monadnock which dominates the central part of the watershed and rises to an elevation of 3,165 feet above sea level.

Subwatersheds within the Ashuelot River Basin include the Otter Brook watershed controlled by the Otter Brook Flood Control Reservoir. Another is the Ash Swamp-Tannery Brook basin for which a Small Watershed Project under Public Law 566 was completed by the Soil Conservation Service. Improvements in that project included channel improvements and construction of open and closed drains.

A major state park in southwestern New Hampshire (Pisgah Mt. State Park) is in the planning stage. The park is in the Towns of Winchester and Chesterfield and covers 13,000 acres.

A number of lakes and ponds in the watershed provide water-based recreations.

Major Problems and Needs:

1. The Ashuelot River has extremely low flows below Keene in dry periods, particularly in the West Swanzey-Winchester stretch.

2. Pollution problems exist in the river from Keene to the Connecticut River, and are aggravated by low flow conditions.

TABLE J-1
INVENTORY OF MAJOR NON-FEDERAL PROJECTS - AREA 1, UPPER CONNECTICUT RIVER BASIN, NEW HAMPSHIRE

Project & Ownership	Date Built	Purpose[1]	Location		Size			Remarks
			Sub-Basin	County	Surface Acres	Storage Ac. Ft.	Drainage Area Sq.Mi.	
RESERVOIRS								
Second Connecticut Lake New Eng. Power Co.		P,R	Conn. R.	Coos	1,272	11,613[3]	45.4	(2) Impoundment made by damming natural lake.
First Connecticut Lake New Eng. Power Co.		P,R	Conn. R.	Coos	3,125	79,493[3]	83.0	(2) Impoundment made by damming natural lake.
Pittsburg Project (Lake Francis) N.H. Water Resources Bd.	1940	P,R	Upper Conn.	Coos	2,010	99,309[3]	170	(2)
Moore Reservoir New Eng. Power Co.		P,R	Conn. R.	Grafton	3,490	114,176[3]	1,626	(2)
Comerford Dam and Reservoir New Eng. Power Co.		P	Conn. R.	Grafton	431.3	29,356[3]	1,650	

(1) WS - Water Supply, FC - flood control, R - recreation, F - forestry, P - hydroelectric power

(2) Source: New England-New York Interagency Committee Report, Part Two, Chapter XXI, Connecticut River Basin, Volumes 1, Table 6.

(3) Source: "A Report to the Federal Power Commission on the Relicensing of New England Power Company's Wilder, Bellows Falls, & Vernon Projects." June 1966. New England Power Company, Boston.

NOTE: All the above-listed water bodies were dammed for hydroelectric power purposes. Recreational use, if any, is an incidental benefit resulting from their construction.

TABLE J-1
INVENTORY OF MAJOR NON-FEDERAL PROJECTS - AREA 1, UPPER CONNECTICUT RIVER BASIN, NEW HAMPSHIRE

Project Ownership	Date Acquired	Purpose	Location		Size		Remarks
			Sub-Basin	County	Surface Acres (Land)	(Water)	
STATE PARKS, FORESTS, AND WILDLIFE AREAS (Ownership for all below: State of New Hampshire)							Adjacent water: Second and Third Conn. Lakes - Upper Moose Falls Pond
George E. Roberts State Park		F	Upper Conn.	Coos	1,448	100	(total 1,576.6 acres)
Pittsburg Project (Lake Francis)		F	Upper Conn.	Coos	2,400		Adjacent water: Lake Francis
Beaver Brook Falls Wayside Area		R	Mohawk R.	Coos	2		
Coleman State Park		R	Mohawk R.	Coos	1,082		Adjacent water: Big & Little Diamond Ponds (total 232.5 acres)
Dixville Notch State Forest		F,R	Mohawk R.	Coos	137		
Weeks State Park		R	Israel R.	Coos	430		
Forest Lake State Park		R	Johns R.	Coos	430		Adjacent water: Forest Lake (191.7 acres)
Strawberry Hill State Forest		F	Ammonoosuc R.	Grafton	55	5	
Cushman State Forest		F	Gale R.	Grafton	20		
Franconia Notch State Park	1928	R,F	Gale R.	Grafton	6,400		Includes Echo L., Profile L., Lonesome L. Part also in Merrimack R. Basin (total 70.4 acres)
Black Mt. State Forest	1919-20			Grafton	699		
Bedell Mt. State Forest		R	Conn. R.	Grafton	70		Proposed for development, 1970-71

TABLE J-1

INVENTORY OF MAJOR NON-FEDERAL PROJECTS - AREA 1, UPPER CONNECTICUT RIVER BASIN, NEW HAMPSHIRE

Project & Ownership	Date Acquired	Purpose	Location		Size		Remarks
			Sub-Basin	County	Surface Acres (Lands)	(Water)	
STATE PARKS, FORESTS, AND WILDLIFE AREAS (Ownership for all below: State of New Hampshire)							
QUASI-PUBLIC RESERVES							
Cherry Ponds Bird Sanctuary (Audubon Society)			Johns R.	Coos	500		Cherry Pond and Little Cherry Pond adjacent. (total 123.7 acres)
Lost River Reservation (Soc. for the Protection of N. H. Forests)			Wild Ammonoosuc R.	Grafton	770		

TABLE J-2

INVENTORY OF MAJOR NON-FEDERAL PROJECTS - AREA III, MIDDLE CONNECTICUT RIVER BASIN, NEW HAMPSHIRE

Project & Ownership	Date Built	Purpose	Location		Size			Remarks
			Sub-Basin	County	Surface Acres	Storage Ac.Ft.	Drainage Area Sq.Mi.	
RESERVOIRS								
Wilder Dam Project New Eng. Power Co.	1950	P	Conn. R.	Grafton	3,100*	13,350**	3,375)	These projects are essentially run-of-the-river operations rather than storage reservoirs.
Bellows Falls Dam Project New Eng. Power Co.	1928	P	Conn. R.	Cheshire	2,804*	7,476**	5,414)	
Vernon Dam Project New Eng. Power Co.	1909	P	Conn. R.	Cheshire	2,550*	11,950**	6,266)	
Goose Pond New Eng. Power Co.		R,P	Mascoma R.	Grafton	554.0	11,688	16	
Grafton Pond New Eng. Power Co.		R,P	Mascoma R.	Grafton	235.0	3,310	3	
Crystal Lake New Eng. Power Co.		R,P	Mascoma R.	Grafton	364.8	1,725	10	
Mascoma Lake New Eng. Power Co.		R,P	Mascoma R.	Grafton	1,114.0	7,744	153	

* Ponded storage on the mainstem of the Connecticut. Source: "A Report to the Federal Power Commission on the Relicensing of New England Power Company's Wilder, Bellows Falls and Vernon Projects." June 1966. New England Power Co., Boston, Massachusetts.

** *Available to meet load variation.*

TABLE J-2
INVENTORY OF MAJOR NON-FEDERAL PROJECTS - AREA III, MIDDLE CONNECTICUT RIVER BASIN, NEW HAMPSHIRE

Project & Ownership	Date Acquired	Purpose	Location		Size		Remarks
			Sub-Basin	County	Surface Acres (Land)	(Water)	
STATE PARKS, FORESTS, AND WILDLIFE AREAS (Ownership for all below: State of New Hampshire)							
Cardigan State Park	1918-24	R	Mascoma R.	Grafton	5,525		
Mascoma State Forest	1916	F	Mascoma R.	Grafton	231		
A. Duncan State Forest		F	Bloods Brk.	Sullivan	113		
Mt. Sunapee State Park		R	Sugar R.	Merrimack	1,995		Lake Sunapee adjacent.
Hubbard Hill State Forest	1927	F	Conn. R.	Sullivan	743		
Connecticut River State Forest	1927	F	Conn. R.	Sullivan	216		
Pillsbury State Park	1920-24	R	Ashuelot R.	Sullivan	3,430	300 (approx)	Contains North & May Ponds.
Dodge Brook State Forest	1919	R,F	Cold R.	Sullivan	222		
Honey Brook State Forest	1918-21	F	Cold R.	Cheshire	975		
Pitcher Mt. S.F. Fire Tower	1925	F	Ashuelot R.	Cheshire	5		
Leighton State Forest	1925	F	Ashuelot R.	Cheshire	75		

TABLE J-2

INVENTORY OF MAJOR NON-FEDERAL PROJECTS - AREA III, MIDDLE CONNECTICUT RIVER BASIN, NEW HAMPSHIRE

Project & Ownership	Date Acquired	Purpose	Location		Size		Remarks
			Sub-Basin	County	Surface Acres (Land)	(Water)	
STATE PARKS, FORESTS, AND WILDLIFE AREAS (Ownership for all below: State of New Hampshire)							
Otter Brook State Park		R	Otter Brook	Cheshire	365	85	Located at Otter Brook Flood Control Reservoir.
Chesterfield Gorge Wayside		R	Conn. R.	Cheshire	15		
Pot Holes & Bear's Den State Park	1929	R	Ashuelot R.	Cheshire	95		
Hyland Hill State Forest		F	Conn. R.	Cheshire	20		
Pierces Island		R	Conn. R.	Cheshire	5		An island in Spoffard Lake.
Wantastiquet Mtn. State Forest		F	Conn. R.	Cheshire	907		
Pisgah Mt. State Park		R	Ashuelot R.	Cheshire	13,000	160 (approx)	In Planning & Acquisition Stage. Seven (7) ponds within park.
Gay State Forest	1929	F	Ashuelot R.	Cheshire	120		
Mt. Monadnock State Park	1915	R	Ashuelot R.	Cheshire	699		
Binney Pond State Forest	1931	F	Millers R.	Cheshire	77	17	
Grant State Forest	1925	F	Millers R.	Cheshire	8		

VIII. PROJECTIONS

It is anticipated that State of New Hampshire natural resources agencies will continue to be active in the water resources field in the coming years in response to increased pressures from an expanding population and economy. The State will continue to work closely with federal and local governmental agencies as well as with private interests to achieve the aim of wise use of its waters and related land resources in the public interest.

The following are projected programs of State resources agencies for the immediate future.

FISH AND GAME DEPARTMENT

The New Hampshire Fish and Game Department is currently spending approximately $230,000.00 per year on research and development projects in the Connecticut River Watershed. It is estimated that slightly more than one-half of this expenditure relates to their trout and salmon stocking program. The remaining expenditures are: 1) coordination programs with the Corps of Engineers, Soil Conservation Service, Highway Department, etc; 2) pond reclamation; 3) pond construction and dam maintenance; 4) pond access; 5) warmwater fish management; 6) anadromous fish restoration.

It should be noted that in addition to the money spent by this department for anadromous fish restoration, the Federal Government is spending considerable sums in the propagation of salmon.

The power companies along the River indicate plans to construct fish passage facilities.

The Fish and Game Department currently is conducting resource management projects in seven different areas, as follows:

	Cost to the Department
Airport Marsh, Whitefield	$ 5,300.00
McDaniels Marsh, Springfield	17,300.00
Wilder Refuge, Lyme	6,200.00
Cold Pond, Enfield	63,000.00
Brown Company lands,	10,000.00
Lake Francis, Pittsburg [1]	2,000.00 (annually)
Habitat research [2]	8,000.00 (annually)

1. The Fish and Game Department pays the Water Resources Board $2,000 per annum to manage deer yarding areas around Lake Francis.

2. Federally aided project to keep abreast of habitat changes resulting from projects of government agencies (U.S. Army, Corps of Engineers, Soil Conservation Service, N.H. Public Works Department, etc.) and private interests (land developers, etc.)

Future plans concerning the Connecticut River watershed should take the Fish and Game Department's ownerships and projects into consideration. If trends continue as in the past, it may be expected that Fish and Game expenditures for the projects listed above will increase at the rate of approximately four percent per year.

DIVISION OF PARKS

The Division of Parks, in cooperation with the Office of Planning and Research, as part of the New Hampshire Outdoor Recreation Plan, prepared a comprehensive priority program for the fiscal year 1970 through 1975. This program reflects three major resource management objectives:

1) acquisition of lands important for public outdoor recreation opportunities;

2) optimum development and effective maintenance of recreational facilities and services for public use; and

3) protection and preservation of those resources which have statewide significance as areas of scenic, scientific, historic, or other value.

Table J-3 contains a list of those projects within the Connecticut River Basin that are included in the Six-Year program. The priority projects listed have been planned in response to three major forces affecting the State Park System: (1) escalating land values; (2) increased pressure upon existing park facilities and services for both residents and non-residents; and (3) the need to expand the scope of park services to provide for an increasingly wider range of outdoor recreation opportunities. The estimated costs of the proposed projects will require Federal support from the Land and Water Conservation Fund.

WATER RESOURCES BOARD

The Water Resources Board proposed projects in the Connecticut River Basin, totalling $316,403.00 of State funds for the 1970-71 Biennium. The following projects for dams, water rights, and lands and land easements were submitted for approval to the 1969 Session of the General Court.

Improvement of existing State dams in need of repair:

Little Sunapee Dam, New London	$15,000

State's participation in Small Watershed Projects under Public Law 566

	State's share	Total cost (including Fed. funds)
Sugar River Watershed (7 sites)	$243,203.00	$893,416.00
Gale River Watershed (1 site)	25,500.00	525,500.00
Indian Brook, Lancaster (1 site)	32,700.00	183,600.00

The following is a listing of water resources projects on the Connecticut River Watershed, considered by the New Hampshire Water Resources Board as having potential values for development.

Indian Stream Conservation Storage - Kim Day Dam
W.R.B. - Corps of Engineers

Colebrook - Mohawk River Regulation and Flow Augmentation including Ice Jam Relief
S.C.S. - Corps of Engineers - W.R.B.

Whitefield - Johns River Tributary
Recreation - W.R.B.

Lancaster - Israel River Ice Jam Relief and Flow Augmentation
W.R.B. & Corps of Engineers

Upper Ammonoosuc River Soil Conservation Flood Control and Flow Augmentation Sites

Ammonoosuc River Soil Conservation Flood Control and Flow Augmentation Sites
Corps of Engineers (Bethlehem Jct. and Twin Mountains) and Soil Conservation Sites

Gale River Flood Control and Recreation Sites
Soil Conservation

West Canaan Flood Control and Flow Augmentation
Corps of Engineers

Claremont Flood Control and Flow Augmentation
Corps of Engineers

Sugar River Flood Control and Flow Augmentation Sites
Soil Conservation

Stocker Pond Flood Control
Corps of Engineers

Cold River Flood Control
Corps of Engineers

Cold River Flood Control and Flow Augmentation Sites
Soil Conservation

Ashuelot River Flood Control, Flow Augmentation and Recreation Sites
Soil Conservation Service

Surry Mountain Redesign (Flow Augmentation & Flood Control)
Corps of Engineers

Surry Mountain Pumped Storage for Power
Corps of Engineers

Hammond Hollow Flood Control and Recreation
Corps of Engineers

Beaver Brook Flood Control and Water Supply
Corps of Engineers & City of Keene

Honey Hill Flood Control, Flow Augmentation and Recreation
Corps of Engineers

WATER SUPPLY AND POLLUTION CONTROL COMMISSION

The Commission recognizes a need for expansion of its activities in the Connecticut River Basin, and statewide, to meet growing demands and increasing responsibilities. In order to effect the necessary expansion, the Commission will require raised salary levels (to make recruitment of professional personnel possible), expansion of professional staff, additional programs of technical assistance to local communities, additional supervision of municipal treatment plant operations, and increased stream monitoring activities. The Commission views as desirable the establishment of regional offices for professional field staff, creation of a specific public works function with the agency, and development of land absorption systems to protect water quality.

Table J-4 lists water pollution treatment facilities in the Connecticut River watershed (proposed through the year 1977), their estimated dates of completion, and the total estimated costs of the projects.

Estimated total cost for water pollution treatment projects in the entire State in the period 1968-1979 is $155,000,000.00.

At this time, there are no major municipal water supply system projects underway in the Connecticut River

Basin which require financial participation by the State of New Hampshire and the federal government. Phase 1 of the Public Water Supply Study (conducted by Anderson-Nichols and Company for the Office of Planning of the New Hampshire Department of Resources and Economic Development) indicates that there will be only minor water deficiency in the existing public water systems along the Connecticut River until well into the twenty-first century. These anticipated deficiencies will be situated primarily in the southern half of the River's New Hampshire border communities.

TABLE J-3

ACTION PROGRAM. ACQUISITION, PLANNING AND DEVELOPMENT PROJECTS IN THE CONNECTICUT RIVER BASIN, STATE OF NEW HAMPSHIRE, DIVISION OF PARKS. 1968-1975.

Source: New Hampshire Outdoor Recreation Plan, 1968, prepared by the New Hampshire Department of Resources and Economic Development, Concord, New Hampshire. May, 1968; and Division of Parks, December 1969.

AREA	FUNDING ESTIMATE (Total Cost)*	COMMENTS
CURRENT STATUS - DECEMBER, 1969.		
Pisgah State Park (Southwestern), Chesterfield, Winchester, Hinsdale	$1,000,000.	Approximately 5,000 of the 13,000 acres have now been acquired The balance of the fund will not be sufficient to cover all the remaining acquisitions.
Franconia Notch State Park, Cannon Mountain Project, Franconia	880,000.	Snowmaking Project completed and improvements made to upper trails. Total Cost: $544,000. Cannon Mt. Station-Lodge. The following are under architectural and engineering design for bid award and construction starting Spring 1970: addition to lodge, power cable to summit, new heating plant, rewiring, increased water storage, sewage disposal system, alterations to present building, architect and engineering fees. Total Cost estimate: $336,000.
Mt. Sunapee State Park, Sunapee Ski Lift Newbury	470,000.	Chairlift project completed.
Connecticut Lakes, Pittsburg Area	25,000.	Being done by Resources Development Center, University of New Hampshire. Authorized by the 1965 Session of the General Court. Study is concerned with preservation of unusual scenic and scientific spots, and recommendation of recreational uses. Given special consideration are related land and water use of all the Connecticut Lakes; extension of a Connecticut River Parkway to the Connecticut Lakes; and more public use of Lake Francis with particular emphasis on the importance of day use, as traffic to this section of the State increases.
Total	$2,375,000.	

Costs: Shared on a 50-50 basis, State-Federal Government under the Land and Water Conservation Fund Program.

TABLE J-3
ACTION PROGRAM. STATE OF NEW HAMPSHIRE, DIVISION OF PARKS, 1968-1975.
IN THE CONNECTICUT RIVER BASIN.

AREA	PRIORITY[1]	FUNDING ESTIMATE (Total Cost)*	COMMENTS
ACTION PROGRAM, Fiscal Years 1970 and 1971.			
Acquisition Projects			
Bedell Bridge, Haverhill	2	$30,000.	70± acres of farm land on river bank.
Miscellaneous Lands		40,000.	Authorized by 1969 Legislature for opportunistic purchases. $30,500 of this amount has been expended in 1969 for acquisition of a single parcel of residential property adjacent to Bear Brook State Park in Allenstown.
Plans and Construction			
Mt. Sunapee State Park		60,000.	Sewage disposal system.
		132,000.	New bathhouse at Sunapee Beach.
Plans and Engineering			
Franconia Notch State Park		100,000.[2]	Relocation of facilities at the Flume, the Basin, and Lafayette Campground. Planning underway.
		350,000.	Additional Peabody Base Lodge
		104,000.	Peabody Slope T-Bar
Construction			
Franconia Notch State Park		46,000.	Peabody Chairlift Mid-Station
TOTAL		$862,000.	

1. Priorities are those given to each project ranked in a statewide list of projects, May, 1968.
2. State appropriation.

TABLE J-3
ACTION PROGRAM. STATE OF NEW HAMPSHIRE, DIVISION OF PARKS, 1968-1975
IN THE CONNECTICUT RIVER BASIN.

AREA	PRIORITY	FUNDING ESTIMATE (Total Costs)*	COMMENTS
ACTION PROGRAM, Fiscal Years 1972 and 1973.			
Acquisition Projects			
Connecticut Lakes, Pittsburg	1	$200,000.	Acreage unknown. A study is presently underway within an area of some 400 square miles to determine the most desirable site or sites to meet present and future public outdoor recreation needs.
Pillsbury State Park, Washington	3	175,000.	2,480± acres. Lands along present entrance road and a connecting corridor along the ridge top between Pillsbury and Sunapee State Parks.
Bedell Bridge		20,000.	This is to supplement the $30,000 shown under the proceding biennium Program.
Beaver Brook Falls		20,000.	15-20 acres, including waterfalls (and water rights).
Sunapee Beach		1,500.	1± acre contiguous to the State property.
Miller State Park, Peterborough		30,000.	6-8 acres at base of mountain, plus a protection corridor along road to summit.
Monadnock State Park		50,000.	Lands to protect the Park approach.
Pisgah State Park		400,000.	To complete the acquisition phase.

TABLE J-3
ACTION PROGRAM. STATE OF NEW HAMPSHIRE, DIVISION OF PARKS, 1968-1975.
IN THE CONNECTICUT RIVER BASIN.

AREA	PRIORITY	FUNDING ESTIMATE (Total Cost)*	COMMENTS
ACTION PROGRAM, Fiscal Years 1972 and 1973.			
Plans and Engineering			
Pillsbury State Park	4	6,000.	Mill Pond dam.
Monadnock State Park Summit Shelter, Jaffrey	2	2,000.	Summit shelter.
Pisgah State Park	9	100,000.	Access roads to park.
Dixville Notch, Dixville	10	1,000.	Improved parking facilities.
Bears Den, Gilsum		3,000.	Parking facilities.

TABLE J-3
ACTION PROGRAM. STATE OF NEW HAMPSHIRE, DIVISION OF PARKS, 1968-1975.
IN THE CONNECTICUT RIVER BASIN.

AREA	PRIORITY	FUNDING ESTIMATE (Total Cost)*	COMMENTS
ACTION PROGRAM, Fiscal Years 1972 and 1973. (Continued)			
Construction			
Pisgah State Park (Phase I)	4	2,740,000.	Access roads to Park.
Monadnock Summit Shelter	5	20,000.	Develop storm shelter near summit.
Dixville Notch State Park	13	13,000.	Improve parking facilities.
Pillsbury State Park		60,000.	Mill Pond Dam.
Pisgah State Park		75,000.	Site preparation.
Bear's Den, Gilsum		30,000.	Parking facilities.
Franconia Notch State Park		2,200,000.	Relocation of facilities for the Flume, the Basin, and Lafayette Campground because of construction of Interstate 93.
TOTAL		$6,146,500.	

TABLE J-3
ACTION PROGRAM. STATE OF NEW HAMPSHIRE, DIVISION OF PARKS, 1968-1975
IN THE CONNECTICUT RIVER BASIN.

AREA	PRIORITY	FUNDING ESTIMATE (Total Cost)*	COMMENTS
ACTION PROGRAM, Fiscal Years 1974 and 1975.			
Acquisition Project			
Forest Lake State Park, Dalton	1	$10,000.	Property east of State Park, including frontage on Forest Lake.
Plans and Engineering			
Forest Lake	1	5,000.	Engineering surveys and plans for construction of beach, picnic area expansion, and other projects.
Connecticut Lakes	2	20,000.	Surveys and plans for development of such state park facilities as may be recommended in current Connecticut Lakes Study.
Pillsbury State Park	3	100,000.	Surveys and plans for construction of facilities recommended in master plan for this park.
Pisgah State Park		200,000.	Phase I development.
Bedell Bridge		30,000.	Total park development, including restoration of covered bridge.
Beaver Brook Falls		1,200.	Parking facilities.

TABLE J-3

ACTION PROGRAM. STATE OF NEW HAMPSHIRE, DIVISION OF PARKS, 1968-1975
IN THE CONNECTICUT RIVER BASIN.

AREA	PRIORITY	FUNDING ESTIMATE (Total Cost)*	COMMENTS
ACTION PROGRAM, Fiscal Years 1974 and 1975. (Continued)			
Construction			
Forest Lake	6	50,000.	Expansion of the beach, picnic facilities, manager's residence, and maintenance facility.
Connecticut Lakes		200,000.	Various day-use facilities.
Pillsbury State Park		1,000,000.	General development.
Pisgah State Park		2,000,000.	Phase I development.
Bedell Bridge		200,000.	Total park development, including restoration of covered bridge.
Beaver Brook Falls		12,000.	Parking facilities.
TOTAL		$3,828,200.	

TABLE J-4

WATER POLLUTION TREATMENT PROJECTS PLANNED FOR THE CONNECTICUT RIVER WATERSHED PROJECT STATE OF NEW HAMPSHIRE, 1970-1977. 1

MUNICIPALITY	TYPE OF TREATMENT	PRELIMINARY REPORT	FINAL PLANS	TOTAL ESTIMATED PROJECT COST[2]	ESTIMATED COMPLETION DATE
Lancaster	secondary	x	x	$1,900,000.	1970
Whitefield	secondary	x		1,200,000.	1976
Bath	primary	no study		400,000.	1976
Haverhill	secondary	x		1,000,000.	1977
Enfield	secondary	x		900,000.	1975
Sunapee	secondary	x		1,600,000.	1975
Newport	secondary	x		1,700,000.	1971
Claremont	secondary	not completed		1,900,000.	1975
Lebanon	secondary	x	x	3,000,000.	1970
Northumberland	secondary	x		9,000,000.	1973
Stewartstown	secondary	x		325,000.	1974
Stratford	secondary	x		175,000.	1974
Charlestown	secondary	x		230,000.	1976
Walpole and N. Walpole	secondary	x		1,900,000.	1977
Hinsdale	secondary	x		4,600,000.	1976
Winchester	secondary	x		1,400,000.	1976
Grafton County Home	secondary	x		100,000.	1974
Coos County Home	secondary	x		50,000.	1974
Cheshire County Home	secondary	x		25,000.	1976

NOTES: 1) Source: N. H. Water Supply & Pollution Control Commission, December 1968.
2) Total costs for most projects listed will be cost-shared - State 40%, Federal 40%, Local 20%. In a few cases local government must pay a larger share, or all of costs where project not eligible for cost-sharing.

APPENDIX

THE FORMATION OF NATURAL RESOURCES AND WATER POLICIES AND PROGRAMS IN THE STATE OF NEW HAMPSHIRE *

Introduction

From the time of its peak agricultural peak of 100 years ago, New Hampshire has become more and more aware of the value of its forest, water and other resources.

Through the efforts of private citizens and state government, attention has been directed toward our forests and water resources and the fish and wildlife they contain. The problems of destructive practices (fire, indiscriminant cutting, and water pollution) affecting these resources are increasingly well understood and control is being initiated. A park and forest system, fish and game laws, and a boating program have been established.

The vast public works program of the Depression years accelerated New Hampshire's progress as a recreation State, and the development and refinement of programs to maintain this status have continued.

Today new State programs are underway to improve and conserve water, forest, wildlife, soil, and recreation resources. By the active implementation of these programs we can insure the best development of these invaluable assets for the use and enjoyment of present and future generations of residents and of visitors to "scenic New Hampshire."

History

One hundred years ago when New Hampshire reached its highest agricultural peak, little, if any, consideration was given to conservation or preservation of water or other natural resources. Lumber operations were widespread and indiscriminate, generally a by-product of clearing land for agriculture. Cleared land occupied about one-half of the State.

In 1867, New Hampshire sold its last remaining public forested lands. This was followed by a period of widespread and massive forest fires. The population of game and wildlife was at an all-time low.

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* 16. Report No. 10, State Planning Project.

The first formal appointment of a State agency to deal with natural resources occurred in 1866, with the formation of a Fisheries Commission, which was reorganized in 1880 as the "Commission of Fisheries and Game." Fish was the primary and major concern of this body, yet it wasn't until 1891 that firm law enforcement for the protection of fish and wildlife was undertaken.

In 1881, largely through the efforts of private interests and initiative, New Hampshire appointed a committee to study the problem of forest depletion. In 1893, the first Forest Committee report was presented. This was an excellent and far-seeing document, and comprehensive in its coverage. Later that same year, the State Forestry Act of 1893 was enacted. This act provided for a study to obtain accurate information regarding the forests of the State; to consider the economic, social, and climatic effects of timber removal; and to suggest an educational program to acquaint the public with the need for conservation of New Hampshire forest land. This study anticipated the potential of the State's forest land for recreation and other purposes. Both the preservation of water resources and the scenic value of forests were stressed. The Act also authorized the formation of a Forestry Commission.

In the 1890's New Hampshire began to purchase (actually, to repurchase) forest tracts for public reserves; in 1891 the Legislature enacted laws permitting the State to accept gifts of forest areas for recreation and other purposes.

In 1891, the South Pact Monadnock Mountain in Peterborough-Temple, now the site of Miller State Park, was deeded to the State. This gift formed the basis for what was to become an outstanding state park system.

Even in this early period, boating was recognized as an important activity, although most boats were used for commercial transportation and navigation aids such as buoys were first installed in 1890. The Public Utilities Commission, established in 1911, was responsible for boat programs, and in 1913 the first private boats were licensed.

In 1901, under the leadership of Governor Frank West Rollins, a group of citizens, prompted by large fires annually burning the recently lumbered slopes of the White Mountains, organized the Society for the Protection of New Hampshire Forests. This private, non-profit membership organization has contributed significantly over the years to the conservation, protection, and development of the natural resources of the State.

Its first big victory was the successful support of legislation in 1908 to create a State Forestry Department which would organize fire protection, a nursery, and forest land acquisitions.

From its inception, the Society interested itself in national legislation to create a forest reserve in the White Mountains. Its efforts culminated in the Weeks Act of 1911 which granted authority to the Federal government to purchase forest lands for National Forests. Previously National Forests had been created only by transfer from the public domain in the West. The stated purposes of the new law, interestingly enough, was the protection of the headwaters of navigable streams.

The Society's leadership in the fight for National Forests east of the Mississippi, and its subsequent campaign for funds for one-half the purchase price of Franconia Notch in 1927, brought much publicity to the State of New Hampshire.

Over the years the Society has acquired several thousand acres of forest, much of which it has turned over to the State, notably part of Franconia Notch, Sunapee Mountain, and Kearsarge Mountain. It still retains title to most of Grand Monadnock, the Lost River Reservation and several smaller tracts for forest management and demonstration purposes.

As early as 1820 and 1870, the Legislature had set up a Board of Agriculture, but the Department of Agriculture was not organized until 1913. Its value in the management of water resources is primarily the encouragement of land treatment and forest practices which benefit water conservation.

It is recorded that the production of wood products was so extensive along the Piscataqua River in 1750 that sawdust pollution had eliminated the salmon population for good. However, the problem of water pollution was first recognized by the Legislature in bills passed in 1917 and 1929. This legislation prohibited certain pollutants in specific cases.

Of further assistance to water resource management was the passage, in 1917, of the New Hampshire Sanctuary Law. The first Federal and private refuges, with the State cooperating, were established in 1922; Congress established the Northeastern Forest Experiment Station in 1923.

During World War 1 natural resource interests were primarily engaged in producing wood products for the war effort, and little more was accomplished.

The 1930's saw the greatest activity in natural resource and water conservation and development of any period in the history of the State. This was due to a number of factors, and reflected similar activity at the Federal level.

The primary motivating forces included the realization of the need for conservation programs, as demonstrated by the major floods, fires, and hurricanes of the period. The means to carry out these programs were provided by the Depression-spawned public works program.

At one time more than 6,000 people were employed in the State by the Civilian Conservation Corps, the Civil Works Administration, the National Recovery Act, and many similar programs. The conservation and recreation projects carried out were many and varied, and included projects that otherwise would have taken years to accomplish. These programs gave tremendous impetus to New Hampshire as a forestry and recreation leader, a position the State still proudly retains.

The many camps occupied by these workers were distributed throughout the State and provided much of the basic development work on the State Parks and other recreational facilities we enjoy today. For example, recreational facilities were constructed at Wentworth Lake in Wolfeboro, Forest Lake in Dalton, Kezar Lake in Sutton, Bellamy Park in Dover, and at Peterborough Pool. Bear Brook State Park was a major center for these activities, and was later presented to the State by the National Park Service. As part of the program, the State Forestry Department administered those areas which provided recreational developments.

Not only recreational facilities were provided. Some of the other activities of the construction force included: construction of artificial water holes and fire lines, opening of trails, building of look-out towers and cabins, renewal of dams and bridges, the undertaking of many other improvements throughout the State.

Other State activities kept pace with the Federal-state relief programs. In 1933, a State experimental forest was established in Hillsboro on land originally deeded to public ownership as a gift.

1934-35 saw the first major steps to combat the growing problem of water pollution. The annual meeting of the Society for the Protection of New Hampshire Forests was highlighted by the comments of the Governor who pointed out the need for pollution control and advance planning. An advisory committee on pollution of public waters, under the auspices of the State Planning Board, gave further consideration to pollution abatement.

The Fish and Game Department undertook research and modern management practices in 1935, and in the same year

the Governor and Legislature gave recognition to the expanding activities of the Forestry Department in the field of recreation. Development of programs and activities in the field of game management were undertaken by the Fish and Game Department through Federal funds provided by the Pittman-Robertson Act.

Major floods occurred in 1927 and 1936. In a special session of the Legislature in 1936, major emphasis was placed on the problem of flood control. The Water Resources Board, created in 1935, was established to conserve, control, and distribute surplus water. Small dam construction was part of this program.

Under Federal legislation the Governor authorized the construction of major flood control dams at Webster (Blackwater), Keene (MacDowell), Surry (Surry Mt.), and Franklin (Franklin Falls). The 1927 and 1936 floods provided the needed impetus for greater interstate planning and cooperation, and gave rise to such organizations as the Connecticut River Watershed Council, Inc., a major force in the flood control development of that River. The hurricance and flood of 1938 further stimulated corrective efforts.

Until 1937, all New Hampshire State Parks were free to the public. At that time legislation was passed requiring an entrance fee; the administration of these areas has been based on this requirement ever since.

Following the Second World War, the emphasis on natural resources was two-fold: water conservation and recreation. Most State activity centered upon improvement, reorganization (in 1950 and 1961), and expansion of existing programs.

One of the innovations in the mid 1940's was the County Forester program, and education aid program for forest owners. It was conducted by the Agricultural Extension Service with State assistance.

In 1943, the Forestry and Recreation Commission was established, and 1945 saw the appointment of a Director of Recreation.

The Water Pollution Commission was established by legislative action in 1947 to carry out investigations of water pollution and to implement the classification of surface waters, under which all New Hampshire lakes and ponds were classified as B-1 or better (acceptable for most uses after treatment).

The Fish and Game Department initiated an education

division in 1951, and extended fisheries management work under Federal funds provided by the Dingle-Johnson Act.

In 1952, a major interstate effort, called the New England-New York Interagency Committee, conducted an exhaustive study project on the water and other resources of the region. This study emphasized flood control and hydroelectric power generation. The results have, and will continue to have, great influence on the development of water resources in the New England region.

Federal legislation in 1964 provided for a water research institute in each state. A Water Resources Research Center has currently been formed at the University of New Hampshire to conduct basic research and deal with the technological aspects of the water resources of the State.

Two significant recent developments were the passage of a bond issue for State Park expansion, and initiation of the work of the State Planning Project.

In 1961, the Legislature approved a nine million dollar bond issue to "preserve, develop, and expand unusual scenic, scientific, historical and recreational areas and facilities within the State." State ski facilities, two new major parks at Greenfield and Nottingham, and the coastal beaches and harbors have been the major projects under this bill. The 1965 Legislature voted an additional bond issue for further expansion of the State Park System, to be used only if matching funds are available from the Federal Land and Water Conservation Fund. At this writing, benefits from this legislation are still to be determined.

The State Planning Project, initiated in May of 1963 as a two-year study, is a state-wide planning effort for a major comprehensive study of the physical and economic conditions of the State of New Hampshire. Particular emphasis has been directed toward long range study and planning for outdoor recreation. The results of this work, of which this report is a part, will provide a basis for intelligent long term development of the State's natural and economic resources.

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Biological Survey of the Connecticut Watershed. Survey Report No. 4. N. H. Fish and Game Department. 1939.

2. Biological Survey of the Lakes and Ponds in Coos, Grafton, and Carroll Counties. Survey Report No. 8a. Report of Arthur E. Newell, Biologist, N. H. Fish and Game Department. Concord, 1960.

3. Biological Survey of the Lakes and Pounds in Sullivan, Merrimack, Belknap, and Strafford Counties. Survey Report No. 8b. Report of Arthur E. Newell, Biologist, N. H. Fish and Game Department.

4. The Connecticut. Walter Hard. Rivers of America series. Rinehart & Co., Inc. 1947.

5. The Connecticut River. Marguerite Allis. G. P. Putnam's. 1939.

6. Connecticut River and Tributaries. Canadian Border to Upper Ammonoosuc River. N. H. Water Pollution Commission. October, 1958.

7. The Connecticut River and the Valley of the Connecticut. Edwin M. Bacon. G. P. Putnam's. 1907.

8. Coos County, New Hampshire, Comprehensive Plan. Phase 1. James W. Sewall Co., Old Town Maine, under contract to the State of New Hampshire. 1965.

9. Flood Hazard Areas, New Hampshire. Report to N. H. Department of Resources and Economic Development by Anderson-Nichols & Co., Inc., Concord, New Hampshire. April, 1967.

10. Grafton County, New Hampshire. Comprehensive Plan. Report No. 1. Physical Features and Natural Resources. Metcalf and Eddy, Boston, Massachusetts, under contract to the State of New Hampshire. 1965.

11. How to Get Clean Water in the Connecticut Valley. Connecticut River Watershed Council. Greenfield, Massachusetts, 1963.

12. Laws Relating to the Water Supply and Pollution Control Commission. Concord, October 1967.

13. Life Along the Connecticut River. Introduction by Charles Crane. Stephen Daye Press, Brattleboro, Vermont. 1939.

14. Mohawk River Watershed Investigation Report. Connecticut River Basin Survey, Soil Conservation Service, Durham, New Hampshire. October, 1967.

15. New England Heritage. The Connecticut River National Recreation Area Study. U. S. Department of Interior, Washington, D. C., July, 1968.

16. New Hampshire State Planning Project Reports, Concord, New Hampshire, 1963-65.

Report No. 4. New Hampshire Water Bodies and Public Access Points

Report No. 10. The Water Resources of New Hampshire

Report No. 12. New Hampshire Public Water Bodies and Public Access Points. Part II

Report No. 13. New Hampshire Outdoor Recreation Plan

17. New Hampshire Water, Governmental Responsibilities and Activities in Relation to the Water Resources of New Hampshire. New Hampshire State Planning and Development Commission, Concord, 1963.

18. The Pittsburg Conservation Reservoir Development of the New Hampshire Water Resources Board. Richard S. Holmgren, New Hampshire Water Resources Board. Reprinted from the April, 1940, Journal of the Boston Society of Civil Engineer.

19. Population of New Hampshire, Part 1, 1623-1940. New Hampshire State Planning and Development Commission, Concord, 1946.

20. Population Reports for New Hampshire, 1960. U. S. Bureau of Census, Washington, D. C.

21. Preliminary Investigation Report and Work Outline, Gale River Watershed. U. S. Soil Conservation Service, Durham, New Hampshire. August, 1964.

22. A Report to the Federal Power Commission on the Relicensing of New England Power Company's Wilder, Bellows Falls and Vernon Projects. New England Power Company, Concord, New Hampshire. June, 1966.

23. The Resources of the New England-New York Region. Part Two. Chapter XXI. Connecticut River Basin. New England-New York Inter-Agency Committee, 1954.

24. Southwestern Park Planning Study. A feasibility Report. Prepared for New Hampshire Department of Resources and Economic Development by Per Nylen, Northampton, Massachusetts, 1967.

25. Staff Report on Portions of the Androscoggin River, Connecticut River, Merrimack River Watersheds. Report No. 53. New Hampshire Water Pollution Commission. July, 1966.

26. State of New Hampshire Water Resources Board Laws. Concord.

27. The Sugar River Watershed. Staff Report. New Hampshire Water Pollution Commission. Concord, New Hampshire, January, 1951.

28. United States Supreme Court Decision. Vermont v. New Hampshire, Volume 289, U. S. 593 (1933)

29. Upper Ammonoosuc River Watershed Investigation Report. Connecticut River Basin Survey, Soil Conservation Service, Durham, New Hampshire. November, 1967.

30. Water Law: Streamflow Rights in New England and New York State. New England Interstate Water Pollution Control Commission, Boston, Massachusetts, November, 1967.

31. Water Resources and the Law. University of Michigan Law School, Ann Arbor, Michigan, 1958.

32. Waterways of New Hampshire - Their Types and Distribution. James A. Lee, Senior Game Research Biologist, New Hampshire Fish and Game Department, Concord, 1966.

33. Why Control Water Pollution? New Hampshire Water Pollution Commission, Concord, 1958.

34. Industrial Waste Guide on Thermal Pollution. Revised. U. S. Department of the Interior, Federal Water Pollution Control Administration, Northwest Region, Pacific Northwest Water Laboratory, Corvallis, Oregon, September 1968.

COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION

CONNECTICUT RIVER
UPPER BASIN

SCALE IN MILES
0 4 8 12

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PROVINCE OF QUEBEC

MAINE

NEW HAMPSHIRE

VERMONT

AUKLAND
Fourth Lake
3rd CONN. LAKE
GEORGE E. ROBERTS STATE PARK
SECOND CONNECTICUT LAKE
FIRST CONNECTICUT LAKE
Bog Brk.
Halls Stream
Indian Stream
Perry Stream
PITTSBURG
LAKE FRANCIS
PITTSBURG PROJECT
Wallace Pond
Leach
CANAAN
BEECHER FALLS
W. STEWARTSTOWN
Roaring Brk.
CANAAN HATCHERY
Willard Str.
Bishop Brook
COLEMAN STATE PARK
COLEBROOK
Mohawk River
DIXVILLE NOTCH
Sims Str.
Blodgetts Brk.
Clough Brk.
Mill Brk.
East Branch
North Branch
Yellow Branch
Black Branch
CONNECTICUT RIVER
E. BRIGHTON
Nulhegan
Lyman Brk.
COOS CO.
WESTMORE
BALD HILL HATCHERY
Bald Hill Pond
WILLOUGHBY ST. FOR.
FERDINAND
BLOOMFIELD
N. STRATFORD
Wheeler Str.
BRUNSWICK
Center Pd.
Clark Pond
East Branch
E. HAVEN
MAIDSTONE
Maidstone Lake
Granby Brk.
Bog Brk.
Nash Stream
Phillips Brk.
STRATFORD
MATHEWSON ST. FOR.
Miller Run
West Branch
WHEELOCK
E. BURKE
ESSEX CO.
MAIDSTONE ST. FOR.
GROVETON
Ammonoosuc R.
GUILDHALL
Upper
NORTHUMBERLAND
WHITE MOUNTAIN NATIONAL FOREST
Wheelock Branch
Chandler Pond
Coles Pond
LYNDONVILLE
LYNDON
VICTORY ST. FOR.
Passumpsic River
VICTORY
LANCASTER
CALEDONIA CO.
Sleepers R.
LUNENBURG
WEEKS STATE PARK
Joes Pd.
Water Andric Brk.
Joes Brk.
DANVILLE
W. DANVILLE
ST. JOHNSBURY
CONCORD
GILMAN
Miles Pond
Israel
Upper
Keiser Pond
Ewell Pond
PASSUMPSIC
Stiles Pond
DALTON
CHERRY PONDS SANCTUARY
Martins Pd.
PEACHAM
COMERFORD DAM
MOORE RES.
WHITEFIELD
FOREST LAKE STATE PARK
RANDOLPH
Stevens R.
W. BARNET
BARNET
E. BARNET
Fifteen mile
LITTLETON
Lake Groton
Harveys L.
MCINDOE FALLS
MONROE
BETHLEHEM
TWIN MOUNTAIN
MT. WASHINGTON EL. 6288
GREEN MOUNTAINS
GROTON ST. FOR.
Seyon Pd.
Ricker Pond
Wells
GROTON
EAST RYEGATE
S. RYEGATE
LYMAN
Ammonoosuc
Gale R.
FRANCONIA
BRETTON WOODS
WHITE MOUNTAINS
WASHINGTON
WELLS RIVER
WOODSVILLE
BATH
Wild
FRANCONIA NOTCH STATE PARK
GALE RIVER P.L.566 PROJECT
W. TOPSHAM
TOPSHAM
Waits
Tabor Branch
BLACK MTN. ST. FOR.
GRAFTON CO.
WASHINGTON ST. FOR.
NEWBURY
ORANGE CO.
HAVERHILL
WHITE MTN. NATIONAL FOREST
WOODSTOCK
Ammonoosuc River
Oliverian Brk.
LOST RIVER RESERVATION
OLIVERIAN BROOK P.L.566 PROJECT
BRADFORD
CHELSEA
VERSHIRE
PIERMONT
Ompompanoosuc
Lake Morey
Miller Pd.
W. FAIRLEE
FAIRLEE
Lake Fairlee
Lake Abanaki
STRAFFORD
S. STRAFFORD
Branch
UNION VILLAGE
Reservoir
UNION VILLAGE DAM
THETFORD
LYME
THETFORD HILL ST. FOR.
APPALACHIAN TRAIL

N

LEGEND

- WATERSHED BOUNDARY
- STATE PARK OR FOREST
  - over 1,000 acres
  - 500–1,000 acres
  - 150–500 acres
- SIGNIFICANT NON-FEDERAL IMPOUNDMENT
- QUASI-PUBLIC RESERVATION
- FISH HATCHERY
- PUBLIC LAW 566 SMALL WATERSHED PROJECT (completed or currently under planning)
- GAME FARM
- WHITE MOUNTAIN NATIONAL FOREST

DRAFTED BY—GRAPHIC ARTS
N.H. DEPARTMENT OF RESOURCES AND ECONOMIC DEVELOPMENT
CONCORD, N.H. – 1969

MAJOR NON-FEDERAL WATER DEVELOPMENTS AND OUTDOOR RECREATION IN THE CONNECTICUT RIVER BASIN

PLATE NO. Jn.h.-1

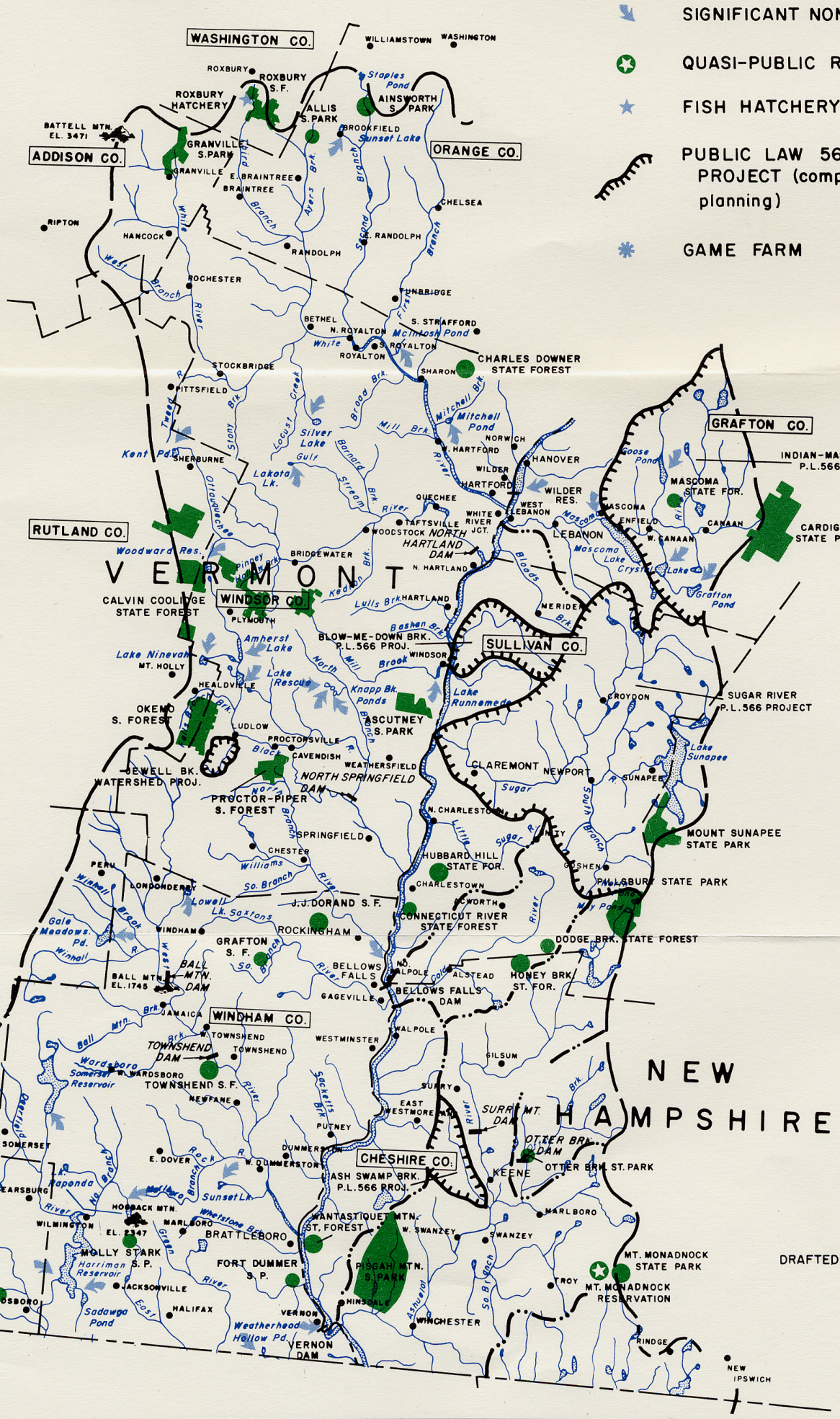
MAJOR NON-FEDERAL WATER DEVELOPMENTS AND OUTDOOR RECREATION IN THE CONNECTICUT RIVER BASIN

COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION

CONNECTICUT RIVER
MIDDLE BASIN

SCALE IN MILES
0 4 8 12

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.



LEGEND

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- PUBLIC LAW 566 SMALL WATERSHED PROJECT (completed or currently under planning)
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DRAFTED BY—GRAPHIC ARTS
N.H. DEPARTMENT OF RESOURCES AND ECONOMIC DEVELOPMENT
CONCORD, N.H. – 1969

PLATE NO. Jn.h.-2

COMPREHENSIVE WATER AND RELATED LAND RESOURCES

CONNECTICUT RIVER BASIN

APPENDIX Jv

STATE OF VERMONT

PREPARED BY

DEPARTMENT OF WATER RESOURCES
MONTPELIER, VERMONT

JUNE 1970

APPENDIX Jv

STATE OF VERMONT

STATE LAWS, POLICIES AND PROGRAMS Pertaining to WATER AND RELATED LAND RESOURCES

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STATE OF VERMONT

STATE LAWS, POLICIES, AND PROGRAMS

pertaining to

WATER AND RELATED LAND RESOURCES

STATE LAW

1. Synopsis

Water rights in Vermont are based on the common law doctrine of riparian rights, as modified or augmented by specific legislative enactments.

Although certain statutes appear to tend toward the more recent appropriative doctrine, the fundamental concept of riparian doctrine has been changed but little.

Changes in character of water usage, and differing demands upon existing water supply, have led to the enactment of statutes to meet specific needs and purposes. Additional legislative action can be expected in the future, with the arising of newer demands and usages which are not adequately provided for, or may be incompatible with the existing riparian rights doctrine.

a. State Constitution

There is little mention of water resources in the Constitution of the State of Vermont. The only specific mention is contained in Chapter II, Section 63, in which the inhabitants of this State are given the liberty to fish in all boatable and other waters (not private property) under regulations as might be made by the General Assembly.

However, Chapter I, Article 2nd provides that private property is subject to public use, provided adequate compensation is made to the private owners; and further, Chapter I, Article 5th provides for the police power of the State, which has been interpreted by a multitude of court decisions as being founded on the duty to conserve public health, safety and morals, and as such, has been construed to apply to the beneficial public enjoyment of the State's water resources.

b. Statutes

The water policy of Vermont is set forth in Title 10, Vermont Statutes Annotated, Section 571, as follows:

> "It is hereby declared to be the policy of the state that the water resources of the state shall be protected, regulated and, where necessary, controlled under authority of the state in the public interest and to promote the general welfare; and it is further declared that said policy necessitates the creation of a state agency which shall be known as the department of water resources, in which there shall be the Vermont water resources board, ..."

Further, legislation enacted in 1970 by the General Assembly provides:

> "Lakes and ponds which are public waters of Vermont and the lands lying thereunder are a public trust, and it is hereby declared to be the policy of the state that these waters and lands shall be managed in the public interest and to promote the general welfare, and it is further declared that the management of these lands shall be exercised by the Vermont water resources board. For the purposes of this chapter, jurisdiction of the board shall be construed as extending to all waters and lands lying beneath the mean water level of such lakes and ponds, as such mean water level is determined by the board." --1969, No. 281 (Adj. Sess.), §1, eff. July 1, 1970.

and also:

> "To aid in the fulfillment of the state's role as trustee of its navigable waters and to promote public health, safety, convenience and general welfare, it is declared to be in the public interest to make studies, establish policies, make plans, make rules, and authorize municipal shoreland zoning bylaws for the efficient use, conservation, development and protection of the state's water resources. The purposes of the rules shall be to further the maintenance of safe and healthful conditions, prevent and control water pollution; protect spawning grounds, fish and aquatic life; control building sites, placement of structures and land uses, preserve shore cover and natural beauty, and provide for multiple use of the waters in a manner to provide for the best interests of the citizens of the state." --1969, No. 281 (Adj. Sess.) §13, eff. July 1, 1970.

c. Case Law

The Vermont Supreme Court, although accepting the principles of English common law, rejected the more appropriative procedents in vogue in England at the time when in Martin v. Bigelow, Aikens II, 184 (1827), the doctrine of riparian rights was accepted governing water flowing in definite channels on the surface of the ground, predating the English acceptance by six years.

Case law has subsequently modified previously established rules of usage as newer or previously undefined uses have developed or statutory enactments have modified specific concepts.

In Chatfield v. Wilson, 28 Vt. 49 (1855), the Court distinquished between surface and percolating waters and held that the latter were not subject to correlative rights as were the former. The Court declared that rights to percolating water were to be regarded as a part of the land itself.

Cases discussed here are mentioned to demonstrate the willingness of the Vermont Supreme Court to rule on new concepts of water rights and usages and will be discussed more fully later in this study.

2. Water Rights

a. Doctrine

The state in which water is found determines the applicable water rights. Rights to flowing surface water are subject to the reasonable use rules of riparian usage.

Ground water, or water percolating under the surface of the ground, is not subject to the riparian doctrine, but such rights attach to the ownership of the land instead.

b. Surface water

Surface water flowing in a stream or definite channel is not subject to ownership itself. The riparian owner, however, has a right to the enjoyment of this flowing water as it passes along or through his property.

This is the riparian rights doctrine and it has been adopted by the Vermont Supreme Court as the law applicable to flowing streams.

The case of Martin v. Bigelow, Aikens II (1827), rejected prior appropriation as a basis for acquisition of water rights and adopted from Weston v. Alden, 8 Mass. 136, and others, the riparian rights doctrine.

Under the riparian rights doctrine, there has developed two theories which regulate the rights of a riparian owner in relation to other riparian owners on the same stream or body of water. These developments are the "natural flow" and the "reasonable use" theories.

The distinction between these theories is slight, however, in accepting the rule that each case should be decided on its merits, the "reasonable use" theory has been laid down by the Vermont Supreme Court in its numerous decisions on such matters.

Equality of right between riparian owners is the essence of the doctrine, each owner having an equal right to make a reasonable use of the waters of the stream, subject to the equal right of other owners likewise to make a reasonable use. What is a reasonable use is a matter for the trier.

The Court, in Kasuba v. Graves, 109 Vt. 191, 194 A. 455 (1937) thoroughly discussed the implications of reasonable use, although this case involved the discharge of excess waters rather than the more usual problems encountered during normal or low flow periods. See also Lawrie v. Silsby, 76 Vt. 240, 56 Atl. 1106 (1904) and Fraser v. Nerney, 89 Vt. 257, 95 Atl. 501 (1915).

Diffused surface water, not flowing in a definite channel, does not fall within the riparian doctrine. In Fire District No. 1 v. Graniteville Spring Water Co., 103 Vt. 89, 152 A.42 (1930), the Court ruled that there are no correlative rights in percolating waters, that percolating water belongs to the owner of the land, and that riparian rights did not attach to percolating waters until after they had become part of a flowing stream.

c. Ground Water

In Chatfield v. Wilson, 28 Vt. 49 (1855), the Court adopted from Greenleaf v. Francis, 18 Pick. 117, its rules relating to the use of water in the earth. Such water is to be regarded as part of the land itself, to be enjoyed absolutely by the proprietor within whose territory it is. The riparian doctrine governing use of water in streams is inapplicable, there being no correlative rights existing between the proprietors of adjoining lands.

This original opinion has been reaffirmed in numerous cases, notably Chatfield v. Wilson, 31 Vt. 358 (1858), and Fire District No. 1 v. Graniteville Spring Water Co., 103 Vt. 89, 152 A. 42 (1930).

d. Access to Lakes and Streams

The right of access to lakes and streams varies depending whether the person asserting the right is a riparian owner or a member of the general public. If the party involved is a member of the general public, then his rights are more of an implied than described nature.

The general rule is that a riparian owner has the right, by virtue of his ownership, of access from his land to any navigable or public water of the State. Jurisdiction over boatable waters, and other waters not private property, is expressly reserved to the State (Section 63 of Chapter II, Vermont Constitution; New England Trout and Salmon Club v. Mather, 68 Vt. 338, 35 Atl. 323 (1895); State v. Malmquist, 114 Vt. 96 (1944), and others). Municipalities may restrict public or private access to waters which are utilized for potable water supply. (State v. Quattropani, (1925) 99 Vt. 360, 133 Atl. 352, 72 A.L.R. 677).

The general public is entitled to the free and undisturbed use of all boatable or public waters (Section 63, Chapter II, Vermont Constitution), subject to such regulations as the General Assembly may prescribe. This right of access to boatable or public waters would not include, however, the right of access to such waters over adjacent lands which are privately owned. Access by the public is generally limited to public fishing access areas or other public premises.

In view of the right of the public to the use of a boatable (navigable) stream, the test of determining whether a stream is boatable becomes an important factor. Public waters are waters which are boatable in fact. Boatable waters, within the meaning of the Constitution, are waters that are of "common passage", as highways. The capability of use by the public for the purposes of transportation and commerce affords the true criterion of the navigability of a river, pond or lake, rather than the extent or manner of that use. If they are capable in their natural state of being used for purposes of commerce, no matter in what mode the commerce may be carried on, they are navigable in fact, and therefore, become in our law public waters or highways, they must be navigable to some purpose useful to trade or agriculture. (New England Trout and Salmon Club v. Mather, supra).

e. Diversion or Impoundment of Streams

The right of a riparian owner to construct a dam to impound water for use for reasonable purposes has, from an early date (1827 - Martin v. Bigelow, supra), been upheld by the Court.

However, concern for the public safety and public good led to legislative enactment; 10 V.S.A., Chapter 29; requiring prior approval of an appropriate State agency.

Further legislative enactment, 10 V.S.A., Chapter 28, Subchapter 1, provides for steps to secure regulated discharge from water storage reservoirs in existence at the time of passage of the statutes.

Diversion of water for usage on riparian lands must meet the reasonable use principles of the riparian doctrine. Streams may be diverted to protect highways from damage.

f. Eminent Domain

The right of eminent domain will be discussed more thoroughly as each board, agency or department is listed along with its functions.

For the purposes of this section on State law, it is sufficient to state that the right of eminent domain in relation to water resources development and related facilities resides in the State agencies so impowered and in the several municipalities of the State. These groups may exercise this right when it becomes necessary in order to fulfill their functions.

At the State level, the power of eminent domain resides with the Water Resources Board for flood control purposes.

3. Regulatory Authority

a. Permits or Approvals Required

(1) For Drilling or Abandoning Wells

No permit is required of the owner of land to drill or abandon a well located on land belonging to him.

Persons (including firms, corporations, etc.) engaging in the practice of water well drilling must obtain a license to practice from the Water Resources Board (10 V.S.A., Chapter 35), and must file reports on each well, with data on yield, materials encountered, and other information, with the Department of Water Resources.

(2) For Impoundments

Before any impoundment which would impound 500,000 cubic feet or more of water can be constructed, prior approval must be obtained from the State agency having jurisdiction. The Public Service Board has jurisdiction over those dams involved in the generation of hydro-electric energy for public use or as a part of a public utility system. All other dams are under the purview of the Water Resources Board.

Before granting approval for the construction of an impoundment, the State agency involved must hold a public hearing on the matter and must determine the effect of the proposed impoundment upon various aspects relating to the public good, and upon the public safety. (Title 10, V.S.A., Chapter 29). Legislation enacted in 1970 (Title 10, V.S.A., Section 707a) directs the Department of Water Resources to prepare a classification plan defining whether any future dam constructed for private usage would be likely or unlikely to be in the public interest.

If the proposed impoundment involves a natural lake or pond which is a public water of the State, the Water Resources Board, must also establish rules and regulations relating to the surface water level to be maintained. (Title 10, V.S.A., Section 575 (a)(11).)

Approval of the construction of an impoundment could also permit or deny diversion of water or manipulation of stream flows. The Board may also require the dedication of lands for public access or other use if the dam is to be located on certain streams. (Title 10, V.S.A., Section 706.)

Approval must also be obtained, under the same statutes, for remodelling, reconstruction, alteration, enlargement, or raising or adding to any existing structure.

The appropriate State agency may, after hearing, order the reconstruction, repair or removal of any dam which has been determined to be in any unsafe condition. Upon failure or inability of an owner to comply with the order, the Board may exercise power of eminent domain to acquire such rights as may be necessary to effectuate such remedy as public safety or public good may require. (Title 10, V.S.A., Section 714.)

(3) For Channel Encroachment

Any activity which would alter or modify the course, current or cross-section of any stream with a drainage area of ten square miles, either by fill or excavation of ten cubic yards or more, would require the approval of the Water Resources Department. (10 V.S.A., Chapter 28, Subchapter 2.) Proper stream bank stabilization measures for protection of existing property are exempted from the required approval.

No fill or other artificial encroachment may be placed in any public or boundary waters, and no alteration may be made to the bed of such public or boundary waters (Title 29, V.S.A., Chapter 8), unless approved by the Water Resources Board. Structures not more than fifty feet long and ten feet wide, and those existing structures built under permission granted by the United States Army, Corps of Engineers, are permitted to remain if ordinary navigation is not impeded.

However, such structures may not be permanently enlarged, extended or added to except under authority of the cited act, administered by the Water Resources Board.

No noxious or deleterious materials may be placed into any of the waters of the State.

(4) Developments in Flood Plains

Municipalities may adopt zoning regulations for the regulation, restriction or prohibition of uses of structures at or near flood plain areas (Title 24, V.S.A., Section 4405) within any area designated by the Department of Water Resources as subject to periodic flooding (Title 24, V.S.A., Section 4407).

(5) Discharges of Wastes

No person, without written authorization of the Board, shall discharge into the waters of the State any waste which by itself or in combination with the wastes of other sources reduces the quality of the receiving waters below the classification established for them. This subsection shall not prohibit the proper application of fertilizer to fields and crops. On July 1, 1971, this subsection shall expire and be deemed repealed. On and after July 1, 1971, no person shall discharge any waste, substance or material into waters of the State without first obtaining a permit for such discharge from the Department. This subsection shall not prohibit the proper application of fertilizer to fields and crops. (Title 10, V.S.A., Section 909.)

The Department of Fish and Game also operates in the area of flow regulation in the interest of propogation of fish and other aquatic life.

(6) Protection of Navigable Waters and Shorelands

A wide-ranging enactment during the 1970 legislative session directs the Department of Water Resources to make studies, establish policies and make plans for the efficient use, conservation, development and protection of the State's water resources and to prepare a comprehensive plan as a guide for the preparation of a State, regional, or municipal land use or development plan. (Title 10, V.S.A., Section 1102.)

The Water Resources Board may establish rules to regulate the uses, areas, conduct and time of utilization on public waters. (Title 10, V.S.A., 1103.)

The Department of Water Resources shall assist the Central Planning Office in the preparation of model bylaws and all State agencies and municipalities are directed to mutually cooperate in the establishment of zoning bylaws covering that area not less than 500 nor more than 1,000 feet inshore from public waters. (Title 10, V.S.A., 1104.) If a municipality fails to adopt such bylaws, or if the adopted bylaws are determined to be insufficient, on June 1, 1972, the Water Resources Board shall adopt bylaws for the municipality. If the municipality fails to administer the bylaws, the Department may act as administrative officer, and the Board as the board of adjustment, administering such bylaws and assessing the costs thereof against the municipality. (Title 24, V.S.A., Section 4410a.)

(7) Administrative and Other Fees

Title 10, V.S.A., Section 909 requires written authorization from the Board before any discharge of waste which by itself or in combination with the wastes from other sources would reduce the quality of the receiving waters below the classification established for them. On or after July 1, 1971, a permit is required from the Department of Water Resources. Rules to be followed in the issuance of such permits are outlined in Title 10, V.S.A., Section 911a, while provisions for temporary permits are outlined in Title 10, V.S.A., Section 912a. The latter section also directs the Water Resources Board to establish pollution charges rates based upon measurable units of the degradation of water quality.

Title 10, V.S.A., Section 575(a)(15) allows the Board to:

> "Establish such fees as the board shall by rule determine to be reasonable to defray the expense incident to processing, reviewing and evaluating applications for orders or permits in cases or procedures under its jurisdiction." --1969, No. 281 (Adj. Sess.), §5, eff. July 1, 1970.

(8) Construction of Public Water Supply

Municipalities must submit plans for proposed water systems to the Department of Health for advice (Title 18, V.S.A., Section 1206). The Water Resources Board administers a program of State aid to municipalities (Title 24, V.S.A., Chapter 74A) for construction, improvement or expansion of water sources or systems.

If an impoundment is involved, permission to construct a dam or dams must be obtained from the Water Resources Board. (Title 10, V.S.A., Chapter 29.) (See also under item (2) previous "For Impoundments".)

b. Water Quality

(1) Waste Treatment

The Water Resources Board is the agency charged with requiring the degree of treatment which will protect the stream for use by downstream water users and will enable the stream to attain its desired classification. These duties are set forth in Title 10, V.S.A., Section 575 and Title 10, V.S.A., Chapter 33, Subchapter 1. (Jurisdiction is transferred from the Board to the Department of Water Resources by 1969, No. 292 (Adj. Sess.), eff. July 1, 1971.)

(2) Flow Regulation

The Water Resources Board is charged with recommending the flow to be maintained from regulated discharges to protect the public interest. (Title 10, V.S.A., Chapter 28, Subchapter 1.) The Board also is the State agency to cooperate with agencies of the Federal Government and of other states in this matter. (Title 10, V.S.A., Section 577.)

1. Interstate

a. Water Pollution Control

(1) New England Interstate Water Pollution Control Commission

This Commission is an interstate regulatory agency established by a compact among the States of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. Operations of the Commission are designed to promote and coordinate pollution control on a regional basis and make determinations regarding control measures.

The Commission engages in various activities including: inventories of the status of pollution control systems and progress in pollution control by municipalities and industries; surveys of and research in regard to industrial waste treatment; and research involving the legal aspects of water rights and varieties of usage.

The compact creating this Commission is found in Title 10, V.S.A., Chapter 33, Subchapters 3 and 4.

b. Flood Control

(1) Connecticut River Valley Flood Control Commission

This Commission was created by the compact appearing in Title 10, V.S.A., Chapter 31, Subchapters 1 and 2. The Commission acts as the coordinating agency for the States of Connecticut, Massachusetts, New Hampshire and Vermont in matters relating to the construction of flood control reservoirs by the Federal Government and adjudicates and makes awards relative to economic and tax losses occasioned thereby.

As a party to the Connecticut River Valley Flood Control Commission, the State of Vermont has concurred in the construction of existing dams at Union Village on the Ompompanoosuc River; at North Hartland on the Ottauquechee River; at North Springfield on the Black River; and at Ball Mountain and Townshend on the West River.

c. Others

(1) Interstate Commission on the Lake Champlain Basin

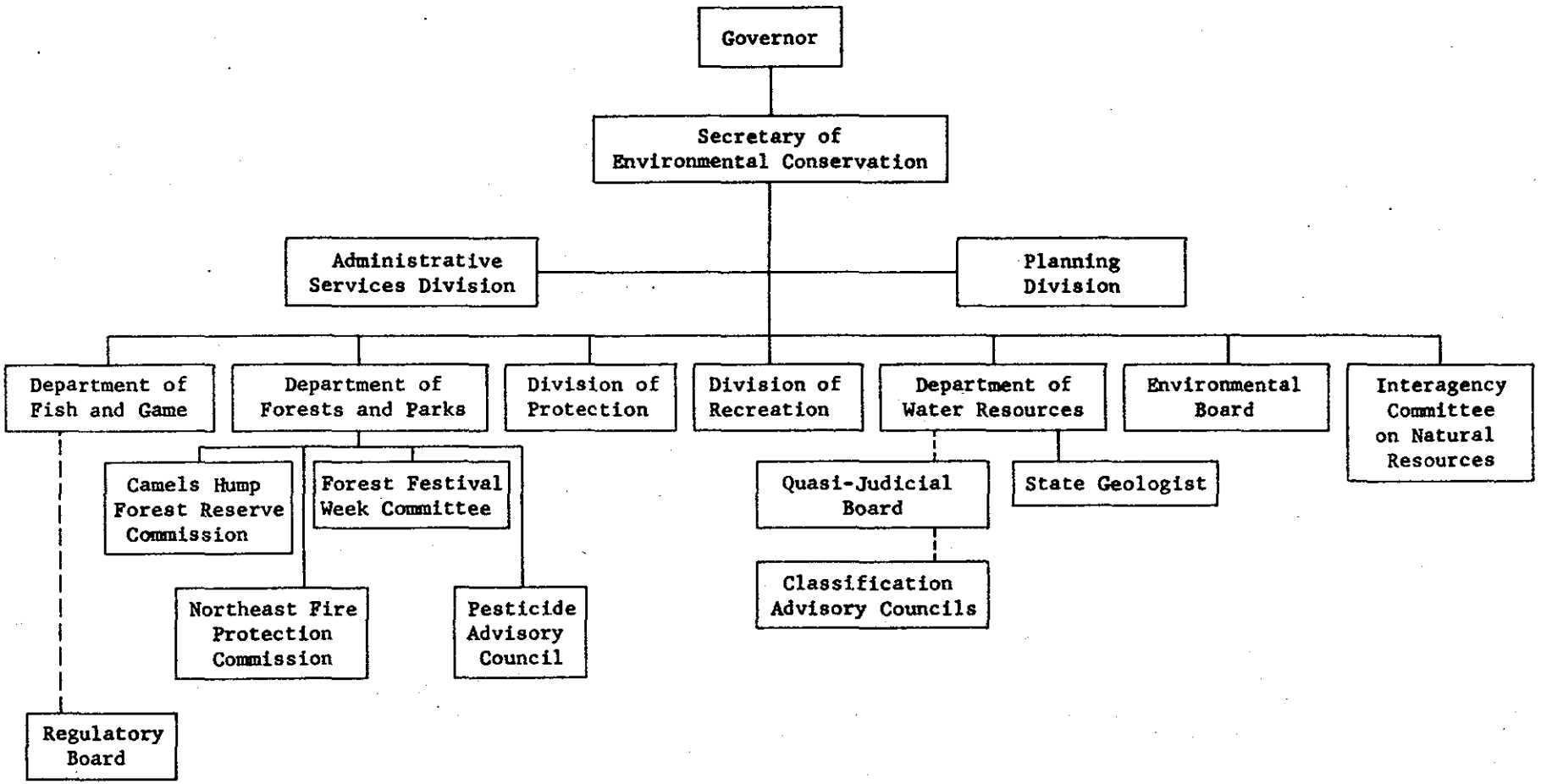
This Commission was created by the Champlain Basin Compact (Title 10, V.S.A., Chapter 9) between the States of New York and Vermont to promote the sound development of water and related resources under a comprehensive multi-purpose plan.

2. State Departments and Agencies

Reorganization of State government (1970, No. 246 (Adj. Sess.) eff. June 1, 1970) has provided for the coordination of natural resources-oriented agencies within an Agency of Environmental Conservation.

(See Organization Chart)

AGENCY OF ENVIRONMENTAL CONSERVATION



Attached for Administrative Support:

-- *Interstate Commission on Lake Champlain Basin*
-- New England Interstate Water Pollution Control Commission
-- State Natural Resources Council
-- Connecticut River Flood Control Commission

Effective June 1, 1970

a. Department of Water Resources

The Department of Water Resources is a statutory unit of government (Title 3, V.S.A., Section 212 and Title 10, V.S.A., Section 571) headed by a commissioner appointed for an indefinite term by the Water Resources Board with the approval of the governor.

The Department, under the purview of the Water Resources Board, has authority to exercise all administrative functions of the State relating to:

(1) The protection, regulation and control of the water resources of the State;

(2) Flood control for all purposes;

(3) Classification of the future quality of the waters of the State and abatement of pollution;

(4) Investigation of the surface and ground water resources of the State;

(5) Collection, mapping and evaluation of data pertaining to bedrock and surficial geology of the State; and

(6) Development of a State water resources plan.

The functions of the Department are carried out by the three divisions, which make up the Department.

(1) Administrative Division

This Division provides all administrative support for the Department and the Water Resources Board (Title 10, V.S.A., Section 571-579).

(2) Planning and Management Division

This Division administers the following programs within the State relating to water resources:

(a) Basic data collection, stream gaging and related survey work (10 V.S.A., Section 575).

(b) All matters relating to flood control including programs implemented under Public Law 566, Small Watershed Flood Control (Title 10, V.S.A., Sections 633-636) and programs through other agencys of the Federal Government. (Title 10, V.S.A., Sections 575, 576, 577 and 719.)

(c) Supervision and approval of all dams not related to hydro-electric generation (Title 10, V.S.A., Chapter 29).

(d) Operation and maintenance of State-owned flood control dams (Title 10, V.S.A., Section 714).

(e) Water resources planning (Title 10, V.S.A., generally).

(f) Licensing and regulation of water well drillers (Title 10, V.S.A., Sections 1151-1157).

(g) Regulation and control of stream alterations (Title 10, V.S.A., Sections 651-654).

(h) Regulation and control of lands under public waters (Title 29, V.S.A., Chapter 8).

(i) Administer the Department's program of water rights and property acquisition and pond outlet reconstruction under the Federal Bureau of Outdoor Recreation program (Title 10, V.S.A., Section 21 and 23).

(j) Ground water investigation (Title 10, V.S.A., Section 575b).

(k) Development of a comprehensive State water resources plan (Title 10, V.S.A., Section 1102).

(3) Water Supply and Pollution Control Division

This Division administers the following programs within the State relating to water resources:

(a) Water supply development and construction program (Title 10, V.S.A., Section 578) including administration of State grant-in-aid program (Title 24, Chapter 74A).

(b) Pollution control facilities development and construction program (Title 24, V.S.A., Chapter 77, 79 and 80), including administration of State grant-in-aid program (Title 24, V.S.A., Chapter 70).

(c) Water quality management (Title 10, V.S.A., Chapter 33).

(d) Stream classification program (Title 10, V.S.A., Chapter 33).

(e) Aquatic biology management, including control of algicides, insecticides and herbicides (Title 10, V.S.A., Section 575(a)(14)).

The Department of Water Resources works closely with the other departments and agencies of the State government. Frequently, work is coordinated with the Department of Health, the Department of Fish and Game, the Department of Forests and Parks, and the Department of Highways, as well as with/or through the Interagency Committee on Natural Resources, of which the Commissioner of Water Resources is a member.

Within the Department is the Water Resources Board, a quasi-judicial and policy-making body. There are three members of this Board and they are appointed by the governor, with the advice and consent of the Senate, for six-year terms.

b. Department of Health

The Department of Health is concerned with the protection and preservation of the health of the citizens of the State. Certain programs of the Department are, therefore, directly related with public water supply and come within the purview of this report.

The Bureau of Environmental Sanitation and the Bureau of Laboratories safeguard public and institutional water supplies. (Title 18, V.S.A., Chapter 23.)

c. Department of Fish and Game

This statutory unit of government was created to conserve and protect the State's wildlife resources. The Department is organized under the authority granted in Title 10, V.S.A., Section 4041 and its duties are to administer and enforce the laws and regulations adopted under Title 10, V.S.A., Chapters 101, 103, 105, 107, 109, 111, 113, 115, 117, 119 and 121.

The policy-making body within this Department is the Fish and Game Board, a seven-member group appointed by the governor, with the advice and consent of the Senate, for six-year terms. The Commissioner of the Department is appointed by the Board, with the approval of the governor, for a term of six years.

The Department has direct relationships with other agencies of State government, primarily in the conservation area. The Department collaborates with the Department of Water Resources in matters relating to water pollution and stream encroachment or alteration, as well as with other resources agencies through the Interagency Committee on Natural Resources, of which the commissioner is a member. There are also close working relationships with Federal agencies for the protection of fish and wildlife.

d. Department of Forests and Parks

The Department of Forests and Parks is concerned essentially with the management and improvement of Vermont's system of State forests and parks. Due to the dependence of recreational facilities on ample water resources, the Department is concerned with development of these resources, and as such, must be included within this survey.

While the interest of the Department is more of a resultant nature than in the promulgation of laws, policies, etc., the Department strongly encourages the acquisition of property, including outlet structures, on the public waters of the State. The Department is especially interested in maintaining stable pools, when possible, through the vacation season.

The Department is created and organized under authority granted by Title 10, V.S.A., Chapters 51, 53, 55, 57 and 59. The policy-making body within this Department is the Board of Forests and Parks, a three-member group appointed by the governor, with the advice and consent of the Senate (Title 10, V.S.A., Section 1301) for terms of six years. The Commissioner of the Department is appointed by the Board, with the approval of the governor, for a term of six years.

e. Interagency Committee on Natural Resources

This agency, created by Title 10, V.S.A., Sections 21-23, consists of the governor, as chairman, and the commissioners of the Departments of Agriculture, Development, Fish and Game, Forests and Parks, Health, Highways, Public Service, and Water Resources. The primary duties of the Committee are to coordinate the activities of the various member agencies for the proper development, management and preservation of Vermont's natural resources, to develop policies for the proper and beneficial development of resources in harmony with the State's comprehensive planning program and to promote the effective application of these policies by the departments affected. In addition, the Committee administers the State recreation plan and State participation in the Bureau of Outdoor Recreation program under the Land and Water Conservation Fund.

f. Department of Public Safety

The Marine Division, within the Department of Public Safety, was established by Title 25, V.S.A., Section 316(a). The Division is responsible for registering power boats and patrolling the waterways of the State.

g. Department of Public Service

The Public Service Board, within the Department of Public Service, consists of three members appointed, for terms of six years, by the governor with the advice and consent of the Senate (Title 30, V.S.A., Section 3). The chairman of the Public Service Board serves as the Commissioner of Public Service (Title 30, V.S.A. Section 1(b)). Under the provisions of Title 10, Chapter 29, of Vermont Statutes Annotated, the Public Service Board has jurisdiction over dams impounding 500,000 cubic feet of water, used or incident to the generation of electric energy for public use or as a part of a public utility system.

The Public Service Board has supervision over companies, other than municipalities, engaged in the collecting, sale and distribution of water for domestic, industrial, business or fire protection purposes (Title 30, V.S.A., Section 203(3)), and over companies which operate ferries (Title 30, V.S.A., Section 203(6)).

All construction of generating facilities and all transmission facilities with voltage in excess of 48 kilovolts must first be approved and certified by the Public Service Board (Title 30, V.S.A., Section 246). Before the Board shall issue its certificate of public good, it must be found that the construction is needed for present and future demands of service and will not interfere with orderly regional development, will not adversely effect system stability and reliability and economic factors, and, will not have undue adverse effects on aesthetics, historic sites, air and water purity, the natural environment, and the public health and safety.

3. Boards and Commission

These units of State government have been previously listed within items 1 and 2, or will be treated separately under the following heading.

4. Special Purpose Districts

a. Conservancy

None - see Natural Resource Conservation Districts.

b. Flood control

None - see Natural Resource Conservation Districts.

c. Sanitary

None.

d. Soil and Water Conservation Districts

(1) Natural Resource Conservation Districts

The 1968 session of the Vermont Legislature amended existing statutes and re-designated Soil and Water Conservation Districts as Natural Resource Conservation Districts, and at the same time, greatly expanded the powers and authority conveyed to such districts.

Under the provisions of Title 10, V.S.A., Section 401 et seq., Natural Resource Conservation Districts have been given wide powers pertaining to the conservation, protection and development of the lands, waters, forests, and wildlife of the State. Such delegated powers permit districts to participate in virtually the full spectrum of Federal, State and locally sponsored projects, including such activities as being a local sponsor of Public Law 566 small watershed flood control projects.

Supervision over districts is exercised by the State Natural Resource Conservation Council (Title 10, V.S.A., Section 403), consisting of the Director of the State Extension Service, the Commissioner of Agriculture, and the chairman of the Vermont Water Resources Board, or their designated representatives, and one member elected from each of the Natural Resource Conservation Districts. In addition, the chairman of the State Forests and Parks Board, the chairman of the State Fish and Game Board, or their designated representatives, and the Director of the Central Planning Office are advisory members. A representative of the United States Secretary of Agriculture may be appointed as an advisory member.

The Council exercises control over all funds appropriated by the Legislature for the purposes delineated above.

5. Other Political Subdivisions

a. Municipal

Under Vermont law (Title 1, V.S.A., Section 126), a municipality is defined as including a city, town, town school district, incorporated school or fire district or incorporated village and all other governmental incorporated units.

(1) City, town or incorporated village

The powers and authority conveyed by statute to special districts or municipalities, are likewise conveyed to cities, towns or incorporated villages, and the following delineation of powers and authority pertaining to special purpose districts are to be read as including such powers and authorities being conveyed to cities, towns and incorporated villages.

(2) Fire Districts

Fire districts may be established for the purpose of providing fire protection to residents of the district. Such district may consist of an entire town or a portion of a town (Title 20, V.S.A., Section 2481).

In addition to fire protection, fire districts may also engage in a variety of other enterprises, including the construction and operation of sewers and sewage treatment facilities (Title 20, V.S.A., Section 2601).

Fire districts may levy taxes (Title 20, V.S.A., Section 2601) on properties located within the district for funds to operate the district.

The right of eminent domain has been granted to fire districts by Title 20, V.S.A., Section 2606.

(3) Consolidated Water Districts

Two or more municipal corporations are permitted, under Title 24, V.S.A., Chapter 74, to join together to establish a consolidated water district. Under the provisions of Title 24, V.S.A., Section 3301 et. seq., municipal corporations may exercise the power of eminent domain. Consolidated water districts may establish water rates and levy taxes as necessary (Title 24, V.S.A., Section 3348 et. seq.).

1. Centralized vs. Decentralized Responsibility

The ultimate responsibility for water management functions is found at the State agency level, in particular, with the Water Resources Board. The various statutes that require approval from the interested State agencies have resulted in a centralized control of these management functions and the State agencies are active in enforcing these statutes.

An example of this centralized policy is Title 10, V.S.A., Section 575(a) 13, which grants the Water Resources Board jurisdiction to administer loans, grants and contracts from the Federal, State and local governments, and from other sources, public and private, with the approval of the governor, for furthering the water resource programs of the State.

A similar centralization of responsibilities appears in the area of stream pollution and water quality control. The Water Resources Board is responsible for the protection, control and regulation (Title 10, V.S.A., Section 571) of the water resources of the State, and for the future classification and attainment of water quality (Title 10, V.S.A., Chapter 33). The Board has actively enforced such statutes and has prosecuted and enjoined several individuals and businesses which had been found to be in violation of the statutes.

Further illustrations of the ultimate responsibility which is found at the State level is the Water Resources Board's supervision over flood control activities and over the construction of dams. These regulatory authorities exercised by the Board have been pointed out previously in this document.

2. Financing

Financing for the various water management projects is furnished at the level of governmental unit involved. Local projects are financed by funds derived at the local level augmented by State and Federal funds administered at the State level.

An example of the local level financing is the construction of water pollution control facilities. Municipalities may levy taxes or user charges on the ratable property within the community (Title 10, V.S.A., Section 3608) and may likewise bond to secure the necessary funds.

The State cooperates with municipalities and further administers Federal and State grant-in-aid and loan programs.

3. Cooperation, Coordination and Cost-Sharing

a. With Federal Programs

The Water Resources Board is authorized by statute (Title 10, V.S.A., Section 575(a)(3)) to have supervision over and act as the State's agency in all matters affecting flood control, and (Title 10, V.S.A., Section 575(a)(4)) to cooperate with agencies of the Federal Government in all matters relating to interstate streams and all matters relating to grants-in-aid to municipalities for construction or operation of sewage treatment facilities. The Board may accept (Title 10, V.S.A., Section 575(a)(13)) such financial assistance from Federal agencies as may be necessary, or may participate and provide such financial assistance from State funds as may be necessary, within the limits of authorized expenditures.

All programs concerning water supplies and water pollution control are carefully coordinating with all Federal programs. The Water Resources Board cooperates with all Federal agencies toward the solution of problems of water pollution control. Matching funds are available to the Department of Water Resources under Public Law 660 for program development.

The Water Resources Board, acting as a co-sponsor, works closely with the Soil Conservation Service of the United States Department of Agriculture in developing small watershed projects under Public Law 566.

b. Interstate

The principal areas of interstate cooperation, coordination and cost-sharing are in flood control and in stream sanitation. The appropriate commissions have been delineated and the compacts which enumerate their powers and duties have been listed under "Administrative Structure - Interstate".

The states which are members of these interstate commissions appropriate the necessary funds for salaries, office and administrative expenses to the proper proportion as determined by the provisions of the enabling compact.

The Department of Water Resources is responsible for cooperation and coordination with the agencies of any other state when these agencies are engaged in work which affects the functions of the Department.

c. With Political Subdivisions

As previously discussed, there is a great deal of cooperation and coordination between State agencies and political subdivisions including cost-sharing and administration of Federal aid programs in reference to eligible projects. Each division of the Department of Water Resources cooperates closely with political subdivisions when these local bodies are engaged in a project which comes within the jurisdiction of the particular division. The interested division provides planning, technical aid, and the services of divisional personnel, as well as financial assistance in eligible projects, when approved by the Water Resources Board.

In the areas of water supply and sewage facilities, the Water Supply and Pollution Control Division of the Department cooperates closely and to the fullest extent possible with local political subdivisions. State funds are available to these local governmental units for the planning and development of water and sewage treatment facilities (Title 24, V.S.A., Chapter 74A; Section 3614; Chapter 80).

In the area of watershed protection and flood prevention, the Water Resources Planning and Development Division provides close cooperation with local political subdivisions in developing potential projects. State funds are available for up to 100 per cent participation in non-Federal costs of such projects.

d. Multi-Purpose Operations

Cooperation among the State agencies in developing water management projects is essential. The number of State agencies or local political subdivisions which may be involved in the development of a water project necessitates a very close cooperation among the concerned parties.

Examples of this type of close coordination include the Department of Water Resources' project of lake outlet acquisition and construction. Such projects must be coordinated with park development or expansion programs of the Department of Forests and Parks and with fisheries management programs of the Department of Fish and Game.

Programs involving fisheries management must also be considered by the Water Resources Board and the Department of Water Resources in the classification of the future quality of water in the State's continuing program of stream pollution abatement.

The construction and operation of flood control reservoirs must also take into account and provide for the coordinated multiple use development in order to insure the maximum beneficial utilization. Flood control reservoirs require close and coordinated effort between such agencies as the Water Resources Board and the Department of Water Resources, the Department of Forests and Parks, the Department of Fish and Game, the Department of Highways, and the Interagency Committee on Natural Resources, as well as with the concerned local political subdivisions.

4. Use of Existing Authorities

The many State agencies, departments and commissions, in executing their functions, make maximum use of all existing authority to develop and conserve Vermont's water resources.

5. Changes

The Water Resources Board was, prior to the 1959 General Assembly, known as the Water Conservation Board. The same legislation (Title 3, V.S.A., Section 212 et seq.), established the Department of Water Resources, which previously had been an adjunct or administrative arm of the Water Conservation Board. These changes did not, however, involve any major changes in policy execution but did confer a more executive stature to the Department.

In recent years, the water resources field has been the scene of vast changes. State aid programs in water supply, water pollution control facilities, and in small watershed flood prevention projects as well as statutory controls on stream alteration or encroachment, lands under public waters, and registration of water well drillers are some of the new authorities which have been granted by the Legislature in its recognition and sanction of a widely expanded program of control and development of Vermont's water resources.

a. Under Study

The State of Vermont is engaged, through its Legislature and various executive departments, in a continual program of planning, evaluation and development of all aspects relating to the conservation, preservation, use and enjoyment of Vermont's water resources.

PROGRAMS

1. Research

Several research programs are being conducted by the many State agencies concerned with water resources.

There has been established at the University of Vermont, the Vermont Resources Research Center established under Public Law 88-379. Presently, the Center is engaged in a variety of research programs, with a concentration of investigative effort into the myriad aspects of Lake Champlain, Vermont's largest water resource.

The Department of Fish and Game has several research programs being conducted. A comprehensive stream survey of fisheries has been completed. Studies presently underway include investigations relative to the re-establishment of anadromous fishes (Atlantic salmon and shad) in conjunction with agencies of New Hampshire, Massachusetts and Connecticut and the Federal Government, and studies relating to commercial fisheries potential of Lake Champlain in conjunction with the State of New York.

The Department of Highways, in cooperation with the United States Geological Survey, is engaged in a program of small watershed stream gaging for the purpose of determining flood flows for culvert and bridge design.

The bulk of State participation in research projects is carried on by the Department of Water Resources, the State's paramount agency in the field of water resources (Title 10, V.S.A., Section 1102). The Department participates in cooperative stream gaging and other research projects of the U. S. Geological Survey and of the Agricultural Research Service, U. S. Department of Agriculture. A State-wide survey of ground water availability, being conducted in cooperation with the U. S. Geological Survey, is nearing completion of its first phase.

Research into the problems created by, and the methods of treatment and elimination of industrial wastes, including woolen mill wastes, wastes from stone products industries, and milk industry waste, are being conducted by the Department's Water Supply and Pollution Control Division.

In addition, the Department of Water Resources is conducting studies relating to water supply, low stream flow and stream regulation, thermal pollution, municipal and industrial wastes, water uses and demand and a variety of other problems.

2. Data Collection and Interpretation

a. Inventory Studies

The Department of Water Resources conducts a continuous program of compiling water data from all sources for dissemination for general use. Basic inventories are continually being revised and up-dated.

Inventories are prepared for all phases of water demand and usage. As more complex and changing usages develop, inventories must be revised with the incorporation of more and newer data.

A need exists for the development and cataloging of a more versatile inventory system to meet the demand of the various and changing requirements.

3. Planning

While many individual planning programs have been initiated in the past, an over-all, long-range plan for a program of water resources development in Vermont has not been formulated. While the Vermont Planning Council is delegated with the responsibility of coordination of the planning activities of departments of the executive branch of State government (Title 10, V.S.A., Section 304(c)(1)), the primary effort in water resources planning rests with the operating agencies, in particular, the Department of Water Resources.

Specific phases of an overall water resources development plan have been completed. Certain of these completed phases include the adoption of general policy, water use classes and standards of quality for intrastate and interstate waters, and implementation plan, by the Water Resources Board, as prepared by the Water Supply and Pollution Control Division of the Department of Water Resources, and the State Recreation Plan (dependent to a large degree on water-based recreation) developed under the auspices of the Interagency Committee on Natural Resources.

An example of planning of this type, is the preparation of rural comprehensive water and sewage plans prepared for all counties of the State. These are preliminary studies for all towns with a population of 2,500 or less.

A thorough re-examination of Vermont's potential growth and demand upon its water resources needs to be made before final policy decisions and priority of programs can be ascertained.

4. Construction and Development

a. Flood Control

In 1928, the State of Vermont began its flood control programs, on the heels of its most disastrous flood in history, which occurred in November of 1927.

The 1933 General Assembly appropriated funds to secure title to lands and water rights, and to provide all necessary easements to enable the construction of three flood control dams within the Winooski River basin by the Civilian Conservation Corps under the aegis of the U. S. Army, Corps of Engineers. The completed structures are operated and maintained by the Department of Water Resources.

The 1966 General Assembly authorized the Water Resources Board to assume up to 100 per cent of the non-Federal costs of Public Law 566, Small Watershed Projects, for flood control, public recreation, fish and wildlife development, and storage for stream flow augmentation for multiple purposes (Title 10, V.S.A., Section 637) and provided funds for those purposes. There is presently one such project, involving four flood control dams and a channel diversion, under construction.

b. Water Supply

The Tri-Town Water District has recently completed and put into operation its first-in-the-Nation rural water supply assisted by State and Federal grants-in-aid.

Several communities within the State have completed modifications or extensions of existing public water supply facilities. Additional municipalities are in various stages of study or planning for new or improved sources or facilities for potable water supply. Such completed or proposed improvements have been accelerated by technical and financial assistance furnished by the Department of Water Resources.

A continuing program will remain a necessity to provide adequate water supplies for many of the State's smaller communities and for the modification and expansion of existing facilities which are reaching the maximum capacity of present systems.

c. Water Quality Control

Under the State grant-in-aid program and the Public Law 660 program, virtually all sewerable municipalities have constructed or are in the process of designing and constructing municipal water pollution control facilities, in concert with the Water Resources Board's and Department of Water Resources' stream classification plan and water quality implementation plan.

d. Hydro-Power

The Water Resources Board exercises authority in the construction and development of hydro-power insofar as cooling waters may degradate the waters of the State. The Board also exercises authority insofar as cooling water and radioactive or other wastes from nuclear power generation is concerned.

e. General Recreation

In order to provide additional recreational opportunities for residents and tourists alike, the existing park system and State-owned lands are being expanded at a rapid rate. With the importance now afforded water-based recreation, all interested agencies have been participating in the increased development of the State's water resources. Public access is being provided to nearly all boatable waters and acquisition and control of outlets of public lakes and ponds are being acquired and developed to provide stabilized surface water levels to permit orderly and proper public and private development.

f. Fish and Wildlife

The Department of Fish and Game is responsible for the conservation and propogation of fishes in all public waters of Vermont. The Department has a long-standing and continuing program of habitat improvement and impoundment construction for wildlife enhancement and public fishing. Other current programs of the Department have been listed under the heading "Research".

5. Regulation

a. Water Use

Reasonable use of water, insofar as quantity or quality is not adversely affected, is not subject to statutory control. Uses which may be detrimental to the public good are discussed in the following subchapter.

b. Water Quality

(1) Domestic Wastes

The Water Resources Board regulates the degree of treatment required for domestic wastes before discharge of any effluent into the waters of the State. Further, Title 10, V.S.A., Section 909 provides that no new sources of pollution could be created after June 1, 1949, unless authorized by the Board, and Title 10, V.S.A., Section 903 provides that all waters of the State, not previously classified, shall become Class C waters on January 1, 1969, unless special permits issued by the Board, authorized the temporary discharge of wastes.

(2) Industrial Wastes

The same statutes apply to industrial wastes as found applicable to domestic wastes. The Water Resources Board may require industries to provide special treatment for the purpose of neutralizing or removing toxic materials which may be present in this type waste.

(3) Agricultural Wastes

Agricultural wastes are treated in the same manner as other wastes, with the exception of runoff from proper application of fertilizer to fields or crops (Title 10, V.S.A., Section 909).

(4) Special Problems

No discharge of edgings, slabs, sawdust, shavings or any other sawmill waste is permitted (Title 10, V.S.A., Section 951). Wastes from stone products presents a special problem compared with other industrial wastes. The wastes are generally inorganic and pollute the waters by adding to the turbidity and by coating the stream bottoms with a finely grained waste, thereby stifling biologic growth. All such wastes have been ordered to be removed from discharges to streams by means of settling lagoons.

c. Construction

Construction of water management projects, public or private, is supervised and approved by the Department of Water Resources, from both regulatory and administrative aspects. With the passage of many new pieces of legislation, virtually all phases of water management fall within the purview of the Department of Water Resources or the Water Resources Board.

If the facility involves the construction of a dam impounding 500,000 cubic feet or more of water, the alteration or relocation of a stream, lands under public waters, or water pollution control facilities, the work would require necessary permits from the Water Resources Board. In addition, if State funds are to be involved in the grant-in-aid programs for the construction of water supply, water pollution control facilities, or small watershed flood control projects, then such facilities and grants-in-aid must be approved by the Department of Water Resources and the Water Resources Board.

d. Well Drilling

The Water Resources Board has supervision over the licensing of water well drilling (Title 10, V.S.A., Chapter 35) and the establishment of necessary rules and regulations. The collection and evaluation of data compiled in the drilling of wells is administered by the Department of Water Resources.

Presently, a permit is not required prior to the construction of a well.

e. Channel Encroachments

The Water Resources Board, through the Department of Water Resources, regulates any construction that encroaches upon the channel of any stream with a drainage area of ten square miles or more (Title 10, V.S.A., Chapter 28, Subchapter 2).

f. Use of Flood Plains

There is presently no State-wide statutory authority for control of the use of flood plains.

However, flood plain zoning studies are presently underway in a number of communities. Following such studies, municipalities may, under authority granted by Title 24, V.S.A., Section 4407(9), regulate the permitted uses and type of construction within flood plain areas within areas delineated by the Department of Water Resources.

6. Reservoir Sites

The Department of Water Resources has prepared a map survey of all potential impoundments within the State.

Investigations will be conducted by the Department of Water Resources and the Department of Fish and Game to determine the feasibility of those sites which appear most promising for future development.

The Department of Water Resources has been directed to prepare a classification of the streams within the State to determine whether dams constructed for private use would be likely or unlikely to be in the public interest. (Title 10, V.S.A., Section 707a.)

PROJECTIONS

1. Policy and Program Trends

Trends indicate increased cooperation and participation with the Federal Government by the various State agencies.

In the field of water pollution, the implementation plan for water quality has been developed setting forth the proposed schedule for the classification and management of the future water quality of all waters of the State.

After January 1, 1971, no industry shall be permitted to discharge any wastes into the waters of the State without written approval of the Water Resources Board. Any such permit granted by the Board will be dependent upon the prior acceptance by the Board of the industry's plans and schedule for construction of any required pollution abatement facilities.

It is anticipated that the State's program for the classification of the future water quality of the waters of the State will be complete by the end of 1970. Schedules for the attainment of the assigned water quality for each particular water of the State will call for installation of the necessary pollution abatement facilities within two to three years after the date of classification, depending upon financial capabilities.

It is expected that all necessary water pollution control facilities will be substantially complete and in operation by December 31, 1974.

An increased interest in and utilization of flood plain zoning can be expected during the next decade, with the completion of flood plain studies of the affected locations.

Water supply facilities for the State's principal communities are expected to be enlarged and capacities increased as demands and requirements increase, particularly in the industrial field. Smaller communities without municipal systems, or whose existing systems are inadequate, will need to establish adequate systems for public water supply.

2. Water Management Problems - Possible Solutions

a. Water Supply

(1) Municipal

With the increasing water utilization in a modern society, particularly for industrial and manufacturing purposes, existing supplies of potable water will be greatly taxed.

More communities will be forced to seek newer, larger and more dependable supplies. Those communities within the Champlain valley, located adjacent to Lake Champlain, may, as the need arises, be forced to turn to the lake for further water supply. Throughout the remainder of the State, usage of ground water, and construction of new surface water reservoirs, can be expected to intensify.

Existing Federal and State grant-in-aid programs will need to be expanded, and a higher level of funding provided, to meet the increased activity in this field.

(2) Industrial

The trend for new industrial developments to be located in more rural areas, will place many such developments outside of areas serviced by municipal water supply systems. Utilization of ground water sources has been, and will continue to be, greatly increased.

Industries which are or will be located adjacent to flowing streams will need to be considered in programs of stream flow maintenance or flow supplementation.

(3) Agricultural

Vermont agriculture consists, in the main, in dairy farming. While milk cow population has remained fairly constant, the number of farms in operation has decreased greatly, resulting in fewer but larger farms remaining in operation. This trend toward concentration of herds has likely resulted in more intensive water supply demands at productive farms.

Historically, dairy farm water supplies have been from springs and shallow wells, both of which have not proven to be dependable in times of drought. Drilled wells, which will tap the more dependable ground water supplies, will be needed at many of the dairying enterprises.

At present, there is very little water used for irrigation. Presently, water is used at apple orchards and similar enterprises.

Increase in use of water may represent a substantial percentage increase as farms become more diversified. An important factor in this field is that water used for irrigation cannot be reused for other purposes as it returns to the atmosphere through evapotranspiration.

The demand for irrigation uses is concentrated during the growing season. Demand is highest when there are drought conditions existing. These factors then, will require that water must be stored and properly controlled to be available when needed for irrigation uses.

Solutions to agricultural water supply problems will require a better use of existing water supplies by the individual farms. Better conservation practices are needed to protect or increase available water supplies.

b. Water Quality Control

(1) Waste Treatment

Sewage and sanitary wastes from communities and industries represent the major source of pollution of streams.

The recently adopted, and previously mentioned classification program and implementation plan, will provide for the orderly removal and proper treatment of all wastes presently discharged to streams from these sources.

(2) Problem Areas

Low flows in streams due to diurnal fluctuation in releases from power generation reservoirs, can result in water quality falling below the desired standard. Such conditions will require either further treatment of wastes before discharge to the receiving stream, or controlled upstream releases for dilution purposes, or both.

c. Flood Control

(1) Critical Areas

In practically every area of the State, problems of flooding exist, primarily due to ice jams, flood plain encroachments, and channel restrictions in built-

up areas. Alleviation has been or will be provided to areas which lie downstream of completed or proposed flow control reservoirs.

(2) Local Protection

There presently exists the need for local protection works at Rutland and Waterbury to protect those communities from the reoccurrence of floods which have occurred in the past.

(3) Small Watershed Protection

Many of the smaller watersheds within the State have histories of damaging floods. The active participation of the State and program of financial assistance will enable the construction of necessary works of improvement.

(4) Flood Plain Zoning

Current flood plain studies and enabling legislation which permits the zoning of flood plain areas, has provided the necessary tools to reduce future damages in such areas.

d. Recreation

(1) General

The proximity of Vermont to the great population centers in the eastern megalopolis, will place rapidly expanding pressures on existing recreational facilities.

The program of expansion of existing facilities, development of new facilities, providing of additional water surface, and acquisition of rights to stream banks as delineated in the State Recreation Plan, will provide solutions to the increased recreational demands.

(2) Fish and Wildlife

There are many problems to be solved concerning fish and wildlife. Among these are management of State-owned lands to improve the habitat for large and small

game and upland game birds, management of wetlands for the propogation of waterfowl and improvement of stream habitat for the propogation of, and improvement of, fisheries. The current programs of the Department of Fish and Game, carried out as a part of the State Recreation Plan, will concentrate efforts in these activities.

Other area of concern are:

(A) Maintenance of stream flow to provide adequate water temperatures and oxygen levels;

(B) Fluctuation of water levels in reservoirs which can adversely effect spawning;

(C) Competition between fishermen and high-speed motorboats and water skiers for use of available water surfaces.

The latter problem may be solved by zoning of waters either by area or time of usage. Enabling legislation would be required to permit this zoning on public waters.

(3) Boating

The problems vis-a-vis boaters and fishermen were discussed previously under the fish and wildlife section. Mainly, it is one of regulation and it increases as the number of boats and boating enthusiasts increase.

The Marine Division of the Department of Public Safety registers motorboats and promotes safety and courtesy among boaters.

e. Hydro-Power

The diurnal fluctuations of stream flow caused by releases from power reservoirs creates problems of fisheries management and water quality control. These aspects have been discussed in their respective sections. The requirement that a sustained minimum flow must be maintained is a necessity and must be incorporated in any license or permit issued to the constructing utility.

The use of waters for cooling purposes at nuclear generation plants poses the problem of increased temperatures and lower oxygen supply. Here again, any license or permit issued to the constructing utility must incorporate all necessary measures to protect fisheries and water quality.

In view of the foregoing statements, it appears obvious that from the state's standpoint, the excellent work that has been done by the Coordinating Committee for the Connecticut Basin, must now be examined and integrated with ongoing analysis of needs for the rest of the State. At this point in time, it is apparent that both the state and local governments in Vermont will have difficulty in implementing programs to meet many of the needs documented by the committee. Add to this, the yet-to-be documented needs for other areas in the state and it becomes apparent that a careful, thorough examination must now be undertaken to delineate critical needs and set priorities to meet those needs within the limitations of the entities involved.

Pending an in-depth review of the entire report, the State of Vermont does desire to indicate that it does not concur with the following specifics now contained in the report:

1. Proposed multi-purpose reservoir at Victory.
2. Proposed multi-purpose reservoir at Gaysville.
3. Those recommendations contained in the Connecticut National Recreation Area study, dealing with proposed federal acquisition of lands in the Coos Unit.

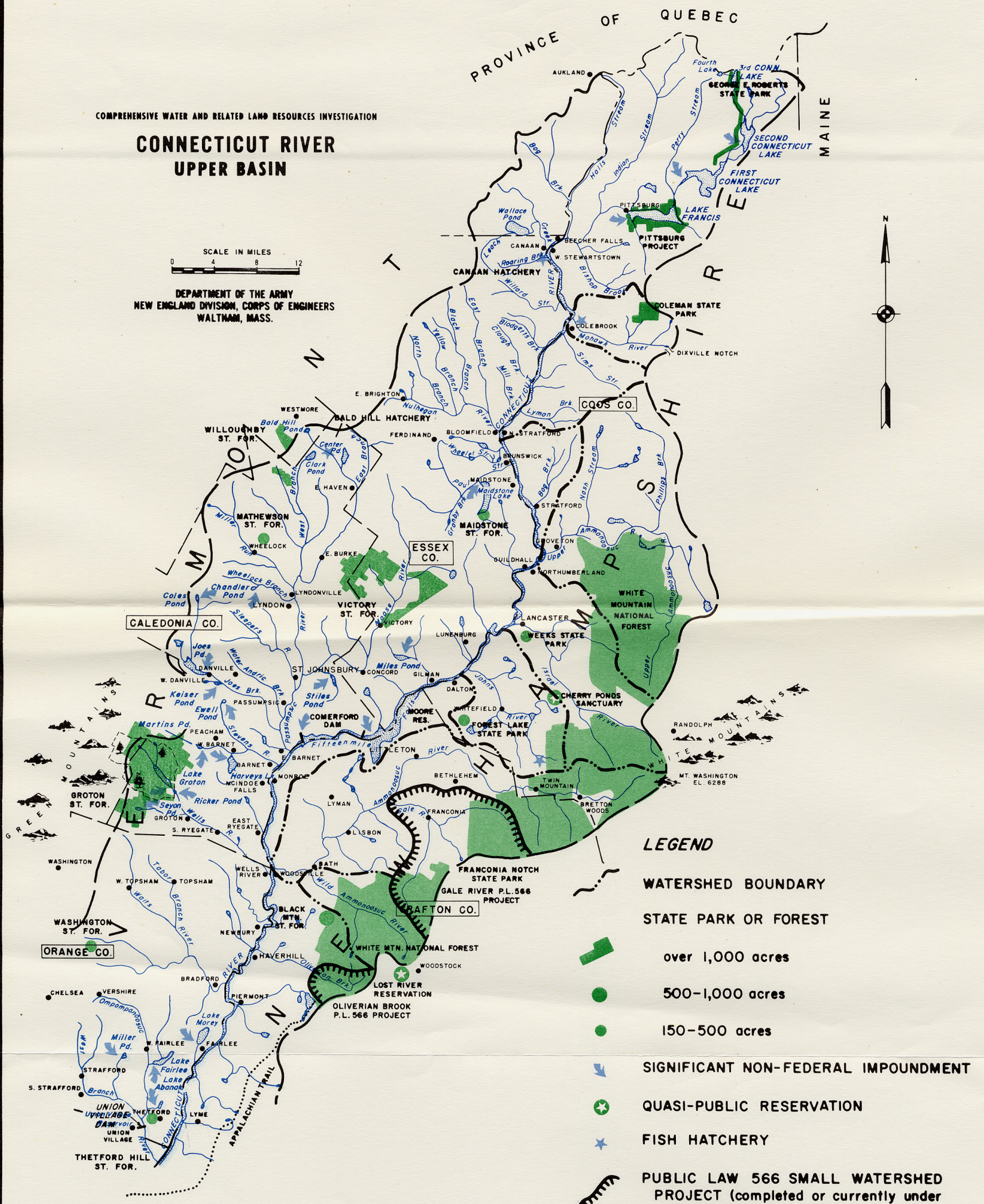
Detailed objections to the above specifics will be documented in the comprehensive response on the part of the Governor to the entire report.

COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION

CONNECTICUT RIVER
UPPER BASIN

SCALE IN MILES
0 4 8 12

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.



N

LEGEND

- WATERSHED BOUNDARY
- STATE PARK OR FOREST
  - over 1,000 acres
  - 500–1,000 acres
  - 150–500 acres
- SIGNIFICANT NON-FEDERAL IMPOUNDMENT
- QUASI-PUBLIC RESERVATION
- FISH HATCHERY
- PUBLIC LAW 566 SMALL WATERSHED PROJECT (completed or currently under planning)
- GAME FARM
- WHITE MOUNTAIN NATIONAL FOREST

DRAFTED BY—GRAPHIC ARTS
N.H. DEPARTMENT OF RESOURCES
AND ECONOMIC DEVELOPMENT
CONCORD, N.H. – 1969

MAJOR NON-FEDERAL WATER DEVELOPMENTS AND OUTDOOR RECREATION IN THE CONNECTICUT RIVER BASIN

PLATE NO. Jv-1

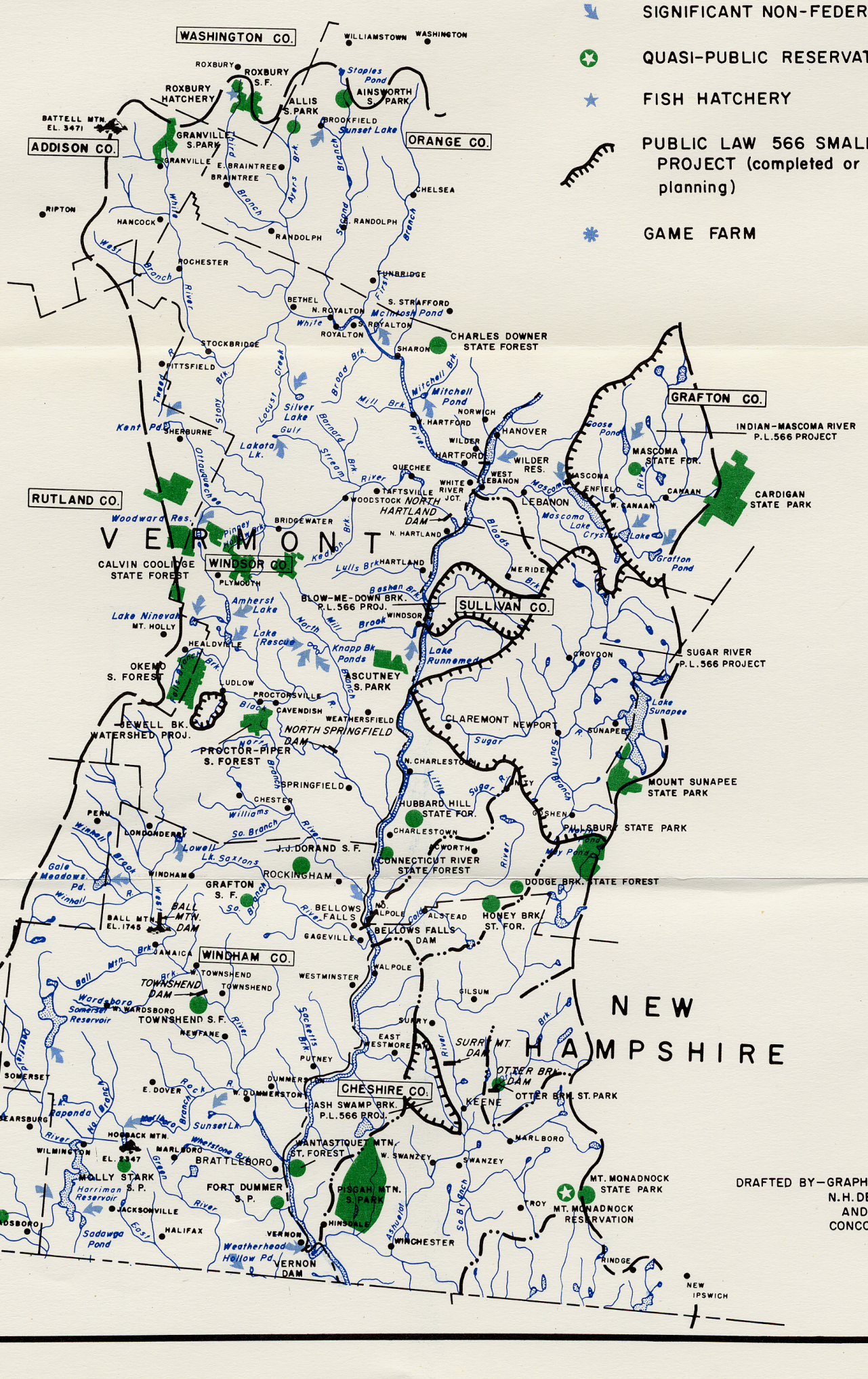
MAJOR NON-FEDERAL WATER DEVELOPMENTS AND OUTDOOR RECREATION IN THE CONNECTICUT RIVER BASIN

COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION

CONNECTICUT RIVER
MIDDLE BASIN

SCALE IN MILES
0 4 8 12

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.



LEGEND

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- SIGNIFICANT NON-FEDERAL IMPOUNDMENT
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- FISH HATCHERY
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- GAME FARM

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CONCORD, N.H. — 1969

PLATE NO. Jv-2

COMPREHENSIVE WATER AND RELATED LAND RESOURCES

CONNECTICUT RIVER BASIN

APPENDIX Jm

COMMONWEALTH OF MASSACHUSETTS

PREPARED BY

MASSACHUSETTS
WATER RESOURCES COMMISSION
DIVISION OF
WATER RESOURCES
BOSTON, MASS.

JUNE 1970

The Commonwealth of Massachusetts
Department of Natural Resources
State Office Building, Government Center
100 Cambridge Street, Boston 02202

May 30, 1969

Colonel Frank P. Bane
U. S. Army Corps of Engineers
Chairman, Connecticut River
Coordinating Committee
424 Trapelo Road
Waltham, Massachusetts

Dear Colonel Bane:

In accordance with the Plan of Survey I am pleased to furnish the enclosed summary of state laws, policies and programs pertaining to the water and related land resources of the Commonwealth. As a state member of the Coordinating Committee of the Connecticut River Basin Study, I am keenly aware of the importance of state participation in comprehensive river basin planning.

The long period of working together on this study has forged invaluable links between the many state and federal agencies involved in water resources planning. A knowledge of state programs is essential in order that federal projects and programs can serve to complement the efforts of state agencies and to prevent duplication and conflicts.

We are pleased to know that the Commonwealth's contribution will become a part of the final report of the Connecticut River Basin Comprehensive Water and Related Land Resources Investigation. We pledge our continued interest and support in seeking to implement the recommendations of this study.

Sincerely yours,

Arthur W. Brownell, Chairman
Water Resources Commission

AWB/m

Personnel and Acknowledgements

This report was prepared by Emerson H. Chandler and Clinton E. Watson, Resource Planners, and William M. Everberg of the Massachusetts Division of Water Resources.

We wish to acknowledge the assistance of the following Massachusetts agencies: Department of Natural Resources, Division of Forests and Parks, Division of Marine Fisheries, Division of Fisheries and Game, Division of Conservation Services, Division of Water Pollution Control, Department of Commerce and Development, Metropolitan District Commission, Division of Waterways, Department of Public Health, and the Department of Public Utilities. Other agencies which provided valuable assistance in the preparation of this report were the U. S. Army Corps of Engineers, U. S. Soil Conservation Service, New England River Basins Commission, U. S. Geological Survey, and the Westfield and Farmington River Watershed Associations.

The preparation of this report was financed in part by funds allocated under Title III of the Water Resources Planning Act (P. L. 89-80, 79 Stat. 224).

Participation in this study by the Water Resources Commission was authorized by Chapter 87 Resolves of 1963, Massachusetts General Court.

Views of the Massachusetts Water Resources Commission

In designating the Chairman of the Water Resources Commission as a member of the Coordinating Committee for the Connecticut River Basin Study, the Legislature of the Commonwealth of Massachusetts accepted the congressional mandate to derive a conceptual plan to meet the short and long range water and related land resource needs of the Connecticut Basin.

Appendix Jm contains a State interagency review coordinated by the Division of Water Resources. It purports to identify those elements, which from a comprehensive planning viewpoint, meet the needs identified by the study. It is inevitable that any conceptual plan designed to meet a vast array of needs will contain elements which are not only controversial, but which may be on a local basis, unacceptable. The planner must, where viable alternatives are not available, recommend such elements if he is to provide a functional plan for the entire basin.

It is in this spirit that the Massachusetts Water Resources Commission has participated in the study. Whether the plan will in a substantial way be implemented depends on many things: political decisions as to whether certain needs be met; the express public demand, or lack of it; and the recurrence of flood or drought conditions.

It is not too early, however, to indicate that certain elements of the plan have strong support and should be given priority. The recommendations of the Water Resources Commission for early implementation are as follows:

(1) That there be established a continuing planning process and that the plan be considered a conceptual one, rather than a rigid program outline.

(2) Water Quality - The sewage treatment program must be fully implemented. Special low flow augmentation sites will be considered only if a program of sewage treatment has been vigorously pursued and found wanting. Low flow augmentation, where it can be accommodated with other uses without serious damage to other values, may be considered.

(3) Acquisition of Sites - High priority should be given to the early acquisition of those stream bank areas which will be made more desirable by pollution abatement or by the re-establishment of anadromous fisheries. Reservoir sites which might reasonably be foreseen to be utilized under existing or planned programs should be purchased as soon as possible. Emphasis should be given to multi-purpose sites.

(4) Upland areas should be placed under zoning restrictions or easements to preserve open space and flood plain areas and to complement the Commonwealth's Inland Wetlands program.

(5) Flow Regulation - All dams of significant capacity should be regulated so as to provide reasonable and continuous flows. Additional regulatory powers should be granted where required.

(6) Anadromous Fisheries - Fish passage facilities, hatchery construction and the previously-mentioned water quality and acquisition programs should proceed according to the earliest realistic time schedule.

(7) Institutional Arrangements - A basin-wide planning and coordination agency under the New England River Basins Commission should be instituted. Such an agency could coordinate the planning and management of conventional water resources programs and could formulate new approaches to problems, e.g., devising means to facilitate flood plain zoning, perhaps by indemnifying local governmental subdivisions against suits of parties aggrieved by flood plain ordinances.

Public participation is an important factor in planning studies; and although sought early and continuously throughout the Connecticut Study in the form of scheduled and special meetings, selected mailing lists and routine public status reports, it did not begin to materialize until a plan was formulated. Participation then took the form of reaction rather positive action. In future studies means must be developed to obtain an early and positive public contribution.

COMMONWEALTH OF MASSACHUSETTS

STATE LAWS, POLICIES, AND PROGRAMS
PERTAINING TO
WATER AND RELATED LAND RESOURCES

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COMMONWEALTH OF MASSACHUSETTS

STATE LAWS, POLICIES, AND PROGRAMS PERTAINING TO WATER AND RELATED LAND RESOURCES

A. STATE LAW

1. Synopsis

a. State constitution

While the Constitution of the Commonwealth of Massachusetts amply protects the equal rights of its citizens to safety, happiness and private property, it delegates to the legislature broad powers to act for the common good. Article X of the Declaration of Rights states that "no part of the property of any individual can, with justice, be taken from him, or applied to public uses, without his consent, or that of the representative body of the people". However, it further provides that "whenever the public exigencies require that the property of any individual should be appropriated to public uses, he shall receive reasonable compensation therefor".

Resource acquisition, development and regulatory programs have an additional firm basis of constitutional authority in Massachusetts. An amendment, Article XLIX, states that, "The conservation, development and utilization of the agricultural, mineral, forest, water and other natural resources of the Commonwealth are public uses, and the general court shall have power to provide for the taking, upon just payment therefor, of lands and easements therein, including water and mineral rights, for the purpose of securing and promoting the proper conservation, development, utilization and control thereof and to enact legislation necessary or expedient therefor".

Statutes regulating land use can also be enacted under the constitutional provision which empowers the general court to regulate building zones in cities and towns. (Massachusetts Constitution Article LX, of the Amendments).

The Massachusetts Constitution restricts taxation only in the most general manner, giving much authority to the legislature to enact statutes concerning taxation. While the constitution protects the citizen against a tax without consent, it stipulates that the individual is obliged to contribute his share of the expense to promote the

common good. The individual's acquiescence to taxation is made through the action of the representative body. (Massachusetts Constitution, Articles, X, XXIII, Declaration of Rights).

Borrowing at the state level is regulated by Article LXII, Sections 2, 3 and 4 of the Amendments. Debt limits governing municipal finances are contained in the general laws (Statutes).

The administrative framework of the Massachusetts Water Resources Commission and its two constituent divisions, the Division of Water Resources, and the Division of Water Pollution Control, is governed by the constitutional amendment which limits to twenty the number of departments authorized to conduct the executive and administrative business of the Commonwealth. (Massachusetts Constitution, Article LXVI of the Amendments).

Some basic resource law actually predates the Massachusetts Constitution. The Ordinance of 1641-47 reserves the use of "great ponds" for the public. Some of these early colonial ordinances remain valid because of the constitutional provision which stipulates that former laws approved and practiced by the Province, Colony or State of Massachusetts Bay shall remain in force until altered or repealed by the Legislature, or unless repugnant to the Constitution. (Massachusetts Constitution Chapter VI, Article VI).

The so-called Home Rule Amendment adopted in 1967 gives a town powers to restrict the taking of land within its boundaries. This may have increased importance as the more populated areas must search for sources of water in outlying areas. (Massachusetts Constitution Article LXX of the Amendments).

b. Statutes

A listing of significant Massachusetts legislation would certainly include the following (references are to current general laws, Chapter and Sections abbreviated as "GL" "c" and "s", and include all amendments to date):

(1) State government

The 1956 Law creating a Division of Water Resources in the Department of Natural Resources under the control of a special nine member Water Resources Commission and authorizing said Division to act as the coordinating agency in all water programs. (GL c. 21, ss. 1, 2, 8-16).

The 1962 Law creating the Public Access Board and Public Access Fund (GL c. 21, ss. 17, 17A).

The 1963 law creating in the Department of Natural Resources a Division of Conservation Services, The Committee for the Conservation of Soil, Water, and Related Resources and the Conservation Districts (GL c. 21, ss. 1, 18-25).

The 1963 law regulating the dredging or filling of coastal wetlands which provides procedures for applications, hearings and determinations involving the towns, the Department of Public Works and the Division of Marine Fisheries. (GL c. 130, s. 27A).

The 1965 law which further protects wetlands by providing the legal mechanism for the taking in fee, in certain cases, of coastal wetlands. (GL c. 130, s. 105).

The 1966 Massachusetts Clean Waters Act creating the Division of Water Pollution Control in the Department of Natural Resources under the control of the Water Resources Commission. (GL c. 21, ss. 26-50).

The 1966 law regulating the dredging or filling of inland wetlands which is similar to the 1963 coastal law, but differs in detail. (GL c. 131, s. 40).

The 1968 Inland Wetlands Act which further protects inland wetlands and provides a mechanism for the taking in fee, in certain cases, of inland wetlands. (GL c. 131, s. 40A).

The laws creating the Department of Natural Resources and prescribing the duties and functions of the various other Divisions of the Department of Natural Resources. (GL c. 21, ss. 1, 2-7).

The laws relating to the role of the Department of Public Health in the water resource area, especially in the protection of water supplies. (GL c. 111, ss. 5, 5f, 5g, 17, 162, 164, 167, 170-173, 184A).

The laws relating to marine fisheries. (GL c. 130, ss. 1-104).

The laws relating to inland fisheries and fishways and great ponds. (GL c. 131.)

The law authorizing the Commissioner of Natural Resources to acquire land and waters for recreation, etc. (GL c. 132A, s. 2A).

The laws relating to the Department of Public Works, Division of Waterways concerning tidal waters, tidelands, great ponds and certain rivers. (GL c. 91, ss. 1-62).

The laws relating to mills, dams and reservoirs. (GL c. 253, ss. 1-62, c. 266, ss. 137, 138).

The State Reclamation Board and reclamation district enabling laws. (GL c. 252, ss. 1-24).

The law authorizing the Metropolitan Water and Sewage Districts. (GL c. 92, ss. 1-32).

(2) Cities, Towns and Counties

The 1955 law which authorizes District Planning Commissions to make plans and recommendations to cities and towns regarding water resources, water supplies and sewers. (GL c. 40B, ss. 5, 5A).

The 1957 Town Conservation Commission enabling laws. (GL c. 40, s. 8C).

The 1960 enabling law providing authority for matching grants to cities and towns by the Commissioner of Natural Resources for approved acquisition and development projects. (GL c. 132A, s. 11).

The 1966 enabling law providing authority for cities and towns to borrow above debt limits for the repair and construction of reservoirs and filter beds. (GL c. 44, s. 8).

The authorizations for cities and towns to provide water and sewerage services. (GL c. 40, ss. 21, 38-42I, GL c. 41, ss. 69-69b and GL c. 83, ss. 1024).

The law authorizing and regulating the establishment of zoning districts in cities and towns including flood plain zones. (GL c. 40A, s. 2).

The laws which impose debt limit restrictions on municipal financing. (GL c. 44, ss. 1-10).

The public beach district enabling laws. (GL c. 40, ss. 11A-13).

The law which provides tax loss reimbursement to cities and towns for property taken for flood control purposes. (GL c. 58, s. 17A).

The law which provides for payment in lieu of taxes for property held in one town by another city, town or district for water supply purposes. (GL c. 59, ss. 6, 7).

The law which authorizes counties, cities and towns to appropriate money for works of improvement to waterways. (GL c. 91, ss. 29, 29A).

The law establishing the Massachusetts Port Authority. (Chap. 465, Acts of 1956).

The Port of Boston Commission enabling law. (GL c. 6, ss. 53-55).

The law placing responsibility for the safety of certain dams in the hands of the county commissioners. (GL c. 253, ss. 44-50).

The law which provides that each coastal community shall have at least one common landing. (GL c. 88, s. 14).

The law which provides for county layout of shore reservations. (GL c. 45, ss. 23A-C).

The law which provides a public petition procedure to request the construction of public access to great ponds by counties. (GL c. 91, s. 18A).

(3) Other

The 1961 law which lists tax exemptions for equipment used for pollution abatement. (GL c. 59, s. 5 (39)).

The 1965 law which requires that no permit for a building requiring water service may be issued unless a water supply is available. (GL c. 40, s. 54).

The 1966 law which allows for an elective tax deduction and exemption for the construction or improvement of industrial waste treatment facilities. (GL c. 63, s. 38D)

The laws which regulate the operation of water and aqueduct companies. (GL c. 165, ss. 1-28).

The laws which created and regulate the activities of the Commission on Interstate Co-operation. (GL c. 9, ss. 21-24).

c. Case Law (significant court decisions)

The following is a list of important decisions in Massachusetts water law:

(1) Sacco v. D.P.W. 1967 Mass. Advance Sheets 1007 defining public rights to great ponds. Other cases relating to great ponds include: Slater v. Gunn, 170 Mass. 509, 49 N.E. 1017, 4 L.R.A. 268 (1898); Rowell v. Doyle, 131 Mass. 474 (1881); Peoples' Ice Co. v. Davenport, 149 Mass. 322, 21 N.E. 385, 14 Am St. Rep. 425 (1889); Inhabitants of Lynnfield v. Inhabitants of Peabody, 219 Mass. 322, 196 N.E. 977 (1914); Watuppa Reservoir Co. v. City of Fall River, 147 Mass. 548, 18 N.E. 465, 1 LRA 466 (1888).

(2) Ware v. Allen, 140 Mass. 513, 5 N.E. 629 (1886) stating the rights of riparian owners on a stream to the use and enjoyment of a streams natural flow subject to such interruption as is necessary and unavoidable by the reasonable and proper use of the water in the stream above.

(3) Stratton v. Mt. Hermon Boy's School, 216 Mass. 83, 103 N.E. 87, 49 L.R.A. (N.S.) 57 (1913). Held that while a riparians use of water must be within the watershed of a stream, that diversion of a stream outside of its watershed, if for a reasonable use, may not be a cause for action of a lower riparian owner unless actual damage results.

Other cases involving riparian rights include: Whitney v. Wheeler Cotton Mills, 151 Mass. 396, 24 N.E. 774, 7 L.R.A. 613 (1890); Boston Belting Co. v. City of Boston 183, Mass. 254 (1903).

(4) Davis v. Spaulding, 157 Mass. 431, 32 N.E. 650 (1892) stating that "it is generally held that water percolating underground, and not running in a definite stream or watercourse, is in law part of the land itself" and as a constituent part of the land is absolute property. Like land itself, the percolating waters cannot pass by a deed of other land as appurtenant to the land conveyed.

(5) Gallerani v. U. S., 41 F Supp. 293 (1941) stating that "Both at common law and under the law of Massachusetts.... there is no property right in underground percolating waters, and

any injury resulting from the loss of same through the lawful acts of an adjoining landowner is considered damnum absque injuria."

(6) Cowdrey v. Inhabitants of Woburn, 136 Mass. 409 (1884). Holds it immaterial whether pond waters are taken by direct pipe or by percolation insofar as the liability for the lowering of pond water is concerned. Other cases concerning percolating or ground waters include:

Hollingsworth & Vose Co. v. Foxborough, 165 Mass. 186, 42 N.E. 574 (1896); Inhabitants of Town of Holliston v. Holliston Water Co. 306 Mass. 17; 27 N.E. 2d 194 (1940).

(7) Stanchfield v. City of Newton, 142 Mass. 110; 7 N.E. 703 (1886). Concerning surface drainage defining a water-course as having a certain direction, regular channel, banks and sides. Other cases relating to drainage include: Jackman v. Arlington Mills, 137 Mass. 277 (1884); Wells v. New Haven and Northampton Co; 151 Mass. 46; 23 N.E. 724, 21 Am. St. Rep. 423 (1890); Bamard v. City of Newton, 154 Mass. 255, 27 N.E. 995 (1891); Ryder v. Town of Lexington, 303 Mass. 281, 21 N.E. 2d 382 (1939).

(8) Sprague v. Door, 185 Mass. 10, 69 N.E. 344 (1904) stating that laws forbidding the discharge into streams of polluting matter of such kind and amount as will corrupt or impair the quality of the water are a reasonable limitation on private rights of property in reference to the common good.

(9) Parker v. American Woolen Co. 195 Mass. 591, 81 N.E. 468, 10 L.R.A. (N.S.) 584 (1907) stating that no riparian proprietor has the right to use the waters of a natural stream in such a manner as will materially corrupt to the substantial injury of a lower proprietor. Other cases concerning water pollution include: Inhabitants of Brookline v. Mackintosh, 133 Mass. 215 (1882).

(10) Commonwealth v. Alger concerns riparian and public rights on navigable streams. Other cases concerning navigable waters include: Comm. v. Chapin, 22 Mass. 199, 202; Brosnan v. Gage, 240 Mass. 113, 118; Ingraham v. Wilkinson, 21, Mass. 268, 271; and Comm. v. Alger, 61 Mass. 97 (1851).

(11) Foster v. S. Volpe and Co. Inc. 349 Mass. 104, 206 N.E. 2d 666 (1965) recognizing the right of the state to regulate land use to protect shellfish and marine fisheries.

(12) Thurber v. Martin, 68 Mass. (2 gray) 394 (1854) provides guidelines to help determine what is a reasonable or unreasonable nature of the obstruction of a watercourse. Other cases relating to dams and mill operation include: Barre H. v. Parsons, 65 Mass. 367 (1852); Gould v. Boston Duck Co. 79 Mass. 442 (1859); Mason v. Whitney, 193 Mass. 152, 78 N.E. 881 (1906); and French v. BraintreeMfg. Co. 40 Mass. (23 pick) 216, cited in notes, 14 L.R.A. 488, 18 L.R.A. 537.

A U. S. Supreme Court decision affecting Massachusetts

State of Connecticut v. Commonwealth of Massachusetts, 282 U. S. 660 (1930). The Metropolitan District Commission provides Metropolitan Boston and other areas with water, over 60 percent of which is diverted from the Connecticut River Basin. The diversion of the Ware and Swift Rivers was authorized by the Secretary of War (Act of March 3, 1899 ss. 10, 30 Stat. 1151) after hearing arguments from both the Commonwealth and Connecticut, the lower riparian. The diversion of flood waters was permitted when flows in the Ware River exceeded 85 mgd, and only during the period between October 15 and June 15. The ruling allowed the diversion of the entire Swift River; except that flows from the Quabbin Dam would have to be passed to the Swift River as follows: at all times not less than 20 mgd; when the flow of the Connecticut River at Sunderland was less than 4650 cfs, 71 mgd must be passed and when the Connecticut flow was between 4650 cfs and 4900 cfs, 45 mgd would have to be passed.

The State of Connecticut brought suit against the Commonwealth contesting the diversion as a riparian. The Supreme Court ruled that the Masters findings summarized below were sustained and adopted them as its findings:

1. These diversions effect 2.93% of the watershed above Connecticut and diminish flows by 2%. However, 94% of this loss occurs when the Hartford gauge is above 3.5 feet. At this level, navigation depths are sufficient. "The maximum diversions are at high water and lessen depths 5 or 6 inches. At median stages, the diversion is less, and at very low stages the flow is increased. The diversion will not perceptibly or materially interfere with navigation.

2. Loss of flood waters to agricultural land will have advantages and disadvantages. Any damage to hayland cannot be demonstrated by the evidence to be of any magnitude.

3. No present use of water for power production will be disturbed.

4. No injury to the shad run or perceptible increase to pollution can be proven.

5. Substitute plans proposed by Connecticut for the provision of water to Boston were inadequate, uncertain, inferior or not feasible.

The court based its findings on the following grounds:

"The governing rule is that this Court will not exert its extraordinary power to control the conduct of one State at the suit of another, unless the threatened invasion of right is of serious magnitude and established by clear and convincing evidence." N. Y. v. N. J. 256 U. S. 296, 309; Mo. v. Ill. 200 U. S. 466, 521.

"The burden on Connecticut to sustain the allegations on which it seeks to prevent Massachusetts from making the proposed diversion is much greater than that generally required to be borne by one seeking an injunction in a suit between private parties." N. D. v. Minn. 263, U. S. 365, 375. "There has been brought forward no adequate reason for disturbing the Master's findings of fact. They are amply sustained by the evidence and are adopted by the court."

The "laws in respect to riparian right that happen to be effective for the time being in both states do not constitute a dependable guide or just basis for the decision of controversies such as that here presented...every state is free to change its laws governing riparian ownership of flowing waters for such purposes as it may deem wise." U. S. v. Rio Grand Irrigation Co. 174 U. S. 690, 702.

"For the decision of suits between states, federal, state and international law are considered and applied by this court as the exigencies of the particular case may require."

d. Attorney General's opinions of special importance

The following opinions represent all the more recent pertinent determinations of the Attorney General's office:

(1) Division of Waterways; Reconstruction of privately owned dams not authorized. (Letter, Attorney General, Jan. 20, 1960).

"The question propounded by your inquiry is whether or not your department has the authority to reconstruct a privately owned dam which operates for profit and as an incident thereto furnishes water to one or more municipalities. The answer is negative."

"The provisions of (Chapter 91) section 11 and 31 clearly indicate that one of the essential requirements for construction or work under the provisions of these sections is public ownership; and the language of both sections vests the department with the right of eminent domain to accomplish such ownership."

(2) His Excellency Christian A. Herter, Governor; Constitutionality of zoning enabling act. (Letter, Attorney General, April 30, 1954).

"Of course, reasonable zoning laws are an exercise of the police power."

"The bill appears to be in proper form, and if enacted into law would, in my opinion, be constitutional."

(3) Department of Correction; Right of Commonwealth to build a dam and flow water on land of another. (Letter, Attorney General, August 21, 1928).

"Briefly summarized, a riparian owner has the right to reasonable use of water as it passes through his land, having due regard to the correlative rights of other riparian owners above and below."

"An answer to your second question must depend upon the extent to which lands of upper riparian owners are overflowed during the ice cutting season. Small and trivial flowage of such lands would be regarded as injuries not meriting compensation..."

(4) Department of Public Works; Property rights, and rights to fill, of the City of New Bedford, as to certain lands in the tide waters. (Letter, Attorney General, April 23, 1962).

While this case concerns a statutory exception to the general laws governing the public status of tide lands, the opinion contains this clear description of the usual rule: "Save for statutes such as the 1806 act, proprietors of adjoining uplands own only the land between high and low water mark which does not extend more than 100 rods from the high water mark, and that ownership is with a reservation of certain rights in the public." Colonial Ordinance, "The waters and the land under them...are held by the State, both as owner of the fee and as the responsitory (sic) of sovereign power, with a perfect right of control in the interest of the public." Michaelson v. Silver Beach Improvement Assoc. Inc., 1961 A.S. 453, 455.

(5) Division of Motorboats; Regulations of Motorboats by Local Commissions. (Letter, Attorney General, Jan. 19, 1962). Chapter 275 of the Acts of 1960... displays on its face an intent to supersede local and special laws and to repeal inconsistent special statutes.

"I am, therefore, constrained to rule that the Lake Boone Commission is presently without power to promulgate and enforce rules and regulations which are in any way inconsistent with the provisions of c. 275 or rules and regulations of the director issued under authority thereof."

(6) Water Resources Commission; Rights in Tideland below high water mark. (Letter, Attorney General, Jan. 11, 1963).

"The answers...are that in Massachusetts, owners of land on the shore of the sea have title, subject to the public rights of navigation, fishing and fowling, to low water mark or where the tide ebbs more than that distance to one hundred rods from high water mark, that private interests in the public lands can be...created... by the legislature, and that the owners of interests in lands, in tidewaters between high water mark and low water mark, or having grants from the Commonwealth of interests in public lands in tidewaters, which are taken by eminent domain by the Commonwealth have a right to recover damages...."

(7) Department of Public Works; Private Tidal Flats Appropriated for Navigational Improvements (Letter, Attorney General, Dec. 21, 1964).

"It is my opinion that the holder of private tidal flats in Massachusetts is not entitled to damages when said flats are appropriated by the Commonwealth for public use to improve Navigational facilities".

(8) Water Resources Commission; Under a statute creating the Thames River Valley Flood Control Commission is there a reimbursable tax loss if a building to be taken is moved to another municipality. (Letter, Attorney General, Oct. 30, 1964).

"The terms of the Thames River Valley Flood Control Compact states that Connecticut will reimburse Massachusetts a percentage "of the amount of taxes lost" as a result of the project."

"Nowhere in the compact is a situation contemplated or provided for in which one town might lose a building which another

town might gain. Therefore... the intent of the compact in this regard was to compensate forty per cent of the taxable losses resulting to the municipalities in the flood control district."

"The principal purposes of this compact are: a) to promote interstate comity among and between the signatory states; b) to assure adequate storage capacity for impounding waters of the Thames River and its tributaries for the protection of life and property from floods."

"The reimbursement for actual tax loss to a Massachusetts town is, in my opinion, very much a part of the scheme as stated in article I."

(9) Lake Quinsigamond Commission. Regarding the Authority to Regulate the Filling of Lake Quinsigamond. (Letter, Attorney General, Jan. 14, 1966).

"It is my opinion... that the Commission's authority to regulate the filling of Lake Quinsigamond must be shared with the Department of Public Works and the Department of Natural Resources in accordance with the provisions of c. 220 of the Acts of 1965."

(10) Water Resources Commission. Status of United States Letter of Credit guaranteeing payment for flood water structures questioned by Comptroller. (Letter, Attorney General, June 3, 1966).

"If a letter of credit which the government proposes to deposit with the treasurer incorporates an unconditional pledge of credit of the United States to the amount indicated therein, I see no reason why it should be treated differently from currency or other accepted obligations of the United States government."

(11) Water Resources Commission. Taking of land to Provide a Location for a Utility Line Displaced by a works of improvement project. (Letter, Attorney General, March 26, 1964).

"It appears clear that Chapter 565 of the Acts of 1962 and the Assurances given to the U. S. Army Corps of Engineers... give the Commonwealth the authority to acquire all lands and easements necessary to carry out the project... there appears nothing authorizing the Commonwealth to exercise its right of eminent domain to purchase land or easements for the purpose of relocating the transmission lines displaced."

(12) Metropolitan District Commission. Approval of Sewerage Projects planned by said Commission. (Letter, Attorney General, Feb. 16, 1967).

Stated in effect that sewerage project plans must be approved by the Division of Water Pollution Control as well as the Department of Public Health.

(13) Division of Sanitary Engineering, Department of Public Health. Control and jurisdiction over water supplies. (Letter, Attorney General, Sept. 5, 1967).

Stated in effect that the Department of Public Health retained control and jurisdiction over water supplies.

2. Water Rights

a. Doctrine

In Massachusetts, the riparian doctrine is the fundamental rule of water law. This doctrine has not been materially clarified by the passage of statutes, but rather has been interpreted by the judicial process. The doctrine holds that the owner of land on a watercourse has, as an inseparable incident of his ownership of that land, the right to the reasonable use of water.

Litigation between riparian owners has built a body of case law seeking to determine whether a use is, or is not, reasonable. Prescriptive rights can, however, be gained by accepted continuous use for twenty years.

In contrast to the riparian doctrine, with its emphasis on an individual's ownership of property, the early Colonial Ordinances reserved to public use the major natural ponds of the Commonwealth and certain navigable waters and tidelands. The rights to great ponds and tidal areas are well defined and utilized, while the status of navigable waters is more obscure.

The Mill Acts can be considered to mark the emergence of the doctrine of governmental endorsement of water resource development for the public good. This enabling legislation greatly facilitated the private construction of dams necessary for the Commonwealth's participation in the Industrial Revolution. This critical need for greatly expanded water power sources has several more recent parallels in water resource needs.

The expanding demands on our water resources made by an increasing population were recognized in the Constitutional Convention of 1919. Article XLIX granted the general court the power to enact legislation expedient for the conservation of water resources. From this authority has emerged the doctrine of total stewardship of water resources by a single coordinating agency, the Massachusetts Water Resources Commission.

b. Surface Water - Private and Public property in Water (Riparian rights and public rights as interpreted by Massachusetts Courts or established by the Colonial Ordinances).

"Diffused surface water" is water which is not confined to a channel. It includes rain water, melted snow and water held in wetlands. In general, such water may be captured and treated as a propriety feature of the land. Water confined to a channel, flowing in an ascertainable direction and having some permanency of source is said to constitute a "watercourse".

In Massachusetts, the riparian doctrine grants propriety interests to an owner of land on a watercourse, and within limits, rights on natural ponds to the littoral owners. Riparian rights are assumed to be included in the transfer of title of land bordering a watercourse, but such rights can be withheld, or conveyed separately.

The riparian owner holds the right to use a stream and its waters in any reasonable manner which is lawful, beneficial and not inconsistent with the reasonable use of other riparians. Since no lawful purpose is unreasonable per se, and since no lawful use is preferred over another, the question involved is whether the means used to gain a purpose are reasonable.

The question of the effect on other riparian owners weighs heavily in the test of reasonableness. Other factors which are considered include the use of adjacent land, public policy, and the likelihood that technological advances may rectify the objectionable features of a use.

While the test of reasonableness cannot be precisely defined, the findings of previously decided cases may be used to gain an impression of what have been considered to be reasonable, or unreasonable, uses in particular situations. In addition to the proof of the existence of an unreasonable use, an aggrieved riparian owner must also demonstrate actual damage to his present or potential use of his property.

The riparian doctrine is based primarily on case law because of the necessity of judging values in terms of degrees rather than absolutes. Identical uses in different situations can be held in different lights by the court. An opinion by Chief Justice Shaw illustrates this point:

"To take a quantity of water from a large running stream for agricultural or manufacturing purposes would cause no sensible or perceptible diminution of the benefit, to the prejudice of a lower riparian, whereas, taking the same quantity from a small running brook passing through many farms would be of great and manifest injury to those below, who would need it for domestic supply or watering cattle..." (Elliot v. Fitchburg R. R., 64 Mass. (10 Cush) 191 (1852).

In brief, one could conclude that litigation must judge first whether a use is reasonable and secondly whether such a use has a significantly damaging or unreasonable effect on other riparian owners. This rule of reason seemingly has resulted in contradictory decisions, but through them all run the essential threads of balancing uses against damage, and the sharing of the water resource by the various riparian owners.

Riparian rights do have some well-defined limitations. They may only be exercised within the watershed of the stream. They may be affected by the gaining of prescriptive rights through 20 years of adverse possession by another riparian. They are subject to the public's right to the use of navigable streams and great ponds. Non-tidal rivers must also be kept open and free for the passage of migratory fish.

The securing of water supplies by municipalities has been accomplished by a fee taking of the water sources and appurtenant riparian rights. Damages to lower riparians affected by takings for water supply purposes have been awarded. (Fosgate v. Town of Hudson, 178 Mass. 225, 59 N. E. 809 (1901).

The structure of riparian case law is not sufficient to deal with all the many problems facing water resource planners and managers in Massachusetts. The Legislative Research Council in Rights to Surface and Sub-surface Water in Massachusetts, refers to the need for further evaluation of factors "such as extent of investment and relative social desirability...In a prolonged water shortage there may well have to be established some order of preference among different types of uses on the basis of their relative value to society."

c. Ground Water

Ground water has no statutory definition or well-defined legal status in Massachusetts. Many of the cases dealing with the subject are old, and a narrow range of cases is available for reference. While classes of ground water are not well categorized in state law a distinction is drawn between springs and percolating waters. (Town of Holliston v. Holliston Water Co., 306 Mass. 17, 27 N.E. 2nd 194 (1940). In this case, the court held that an authorization to take springs and streams did not cover the taking of property containing only percolating waters, although no difference in the legal status of the two classes of ground water has evolved.

In general, ground water, while not property, is considered to be an intrinsic part of the land itself, just as the rock or stones within it. An owner may draw large quantities of water from his property even though this water would, by natural percolation, enter his neighbors' land. By the same token, the owner of land can, by mechanical obstruction, seek to exclude percolating groundwaters from his property. In brief, actions taken on one's own property even though they may effect ground water in adjacent property are not unlawful. (Gallerani v. U. S., 41 F. Supp. 293 (1941).

One can assume that this has evolved as the only practical approach to the problem. In the words of the court:

"It is impossible to know in what direction percolating water finds its way into a well... Its ways of approach, and its amount, vary with the operation of obscure natural causes not controlled by the owner of the land through which it passes. If the grant... were held to impose an obligation upon all the land from which the well might derive supplies, the burden would be very indefinite, uncertain, and shifting, and tend to prevent, without offsetting benefit, the improvement of the land as with buildings or its use for mining, etc. It would be contrary to the public good..." (Davis v. Spaulding, 157 Mass. 43., 32 N.E. 650 (1892).

The discharge of sewage into the ground is regulated by the Massachusetts Department of Public Health under Article XI of the State Sanitary Code. (Authorized by GL c. 111, ss. 5 & 127A). While it does not specifically refer to the pollution of ground water, the code does forbid the direct discharge of sewage into ground water. Certain minimum percolation distances are required above the water table and distances to water supplies are controlled.

No broad ground water pollution control powers or programs have been specifically authorized, since the problem has thus far occurred on a localized basis. It is an undecided question in Massachusetts as to whether the Department of Public Health or the Division of Water Pollution Control of the Water Resources Commission has the primary responsibility in protecting ground water resources.

Legislation relating to ground water includes the following:

The enabling legislation setting up the Water Resources Commission and Division of Water Resources and authorizing its interest in "underground...water supplies." It authorizes the establishment of rules and regulations governing well drillers, and requires their registration and filing of certain reports. (GL c. 21, ss. 8-16).

The law making it a felony to willfully poison any spring, well or reservoir with intent to kill or injure. (GL c. 265, ss. 28).

d. Access to lakes and streams

The Colonial Ordinance of 1641-47 reserved to the people of Massachusetts the right to fish and to obtain fowl on the waters of ponds containing over ten acres in their natural state. These specific uses have been extended by interpretation to include any use to which the water is capable of being put, although the ordinance was later modified to restrict the right to fish to those ponds over twenty acres.

Although rivers and streams above the ebb and flow of the tides are not navigable in law, they may be navigable in fact. An easement can be acquired affording the public a right to use a stream for passage in boats, or other craft, or on the frozen surface of the water, for the purposes of business, convenience or pleasure. Leading cases on this subject include Comm. v. Alger, 61 Mass. 97 (1851); Comm. v. Chapin, 22 Mass. 199, 202 (1827); Brosnan v. Gage, 240 Mass. 113, 118 (1921).

The right to trespass on unimproved land to reach "great ponds" did not prove to be a sufficient guarantee of public access, nor did a cumbersome public petition procedure involving access construction by counties fulfill the needs of the public, as private development increasingly usurped the shorelines of most lakes. The Public Access Board, created in 1962, was authorized to construct boat ramps and parking areas using funds allocated from gasoline taxes. The Board, with eminent domain powers, has obtained sites and constructed boating access facilities on inland and coastal waters.

Public access sites and facilities have also been provided by the Massachusetts Division of Forests and Parks, the Massachusetts Division of Fisheries and Game, the Department of Public Works, the Metropolitan District Commission, the various counties, cities and towns, the Department of the Interior and the Corps of Engineers. The dominant agency in the boating access program is, however, the Public Access Board, in the Department of Natural Resources, as authorized by GL c. 21, ss. 17 and 17A. From 1963 to 1968, 45 facilities have been constructed by this agency. Streambank acquisition by lease or purchase for use as public fishing grounds has been a feature of the program of the Fisheries and Game Division. although much stream frontage has been, and will be, acquired by the Division of Forests and Parks. Wetland purchases of significant magnitude have been made by the U. S. Bureau of Sports Fisheries and Wildlife of the Department of the Interior. The Department of Natural Resources will undoubtedly be involved in a massive program of wetland preservation as a result of the coastal and inland wetland acts (GL c. 130, s. 105, and GL c. 131, s. 40A). It is reasonable to believe that increased access to this type of water resource may result from this program.

Private boat launching and parking facilities are available - often on a user fee basis. Private development is important since many thousands of acres of impounded waters do not fall under the public access laws. Public use of most private stream areas and many of the private impounded waters is tolerated by riparian owners, or owners of water rights. The public can be legally prosecuted for simple trespass on such private areas only if statutes concerning the giving of notice or posting of such lands or waters are complied with by the owners. (GL c. 266, s. 120, and GL c. 131, s. 36). In most rural areas access in fact, if not in law, is provided. Cooperation of landowners and recreationists is urged by state resource agencies, and in some cases, use agreements have been negotiated with riparian owners.

e. Diversion between basins

There is no specific statutory regulation of water diversion, although the "Hatch Act", (GL c. 131, s. 40) does control the alteration of stream banks. Case law prevails in water diversion disputes, except of course, where special acts of the legislature have authorized specific diversions. Within limits, riparian owners in Massachusetts

can expect to receive the natural flow of a stream. Certain reasonable uses, by way of incorporating water into a product, may permanently remove limited amounts of water from a watercourse with a degree of impunity; thus the use of water for agricultural purposes was considered legal in Weston v. Alden, 8 Mass. 136 (1811). However, the courts later held against riparians who diverted all or most of the water of streams for the purpose of irrigation, thereby consuming water and preventing lower riparians from operating their mills. Other cases were based on the relative amount of water removed in comparison to the amount returned to the stream.

In the preceding cases, the problem dealt primarily with the consumptive use of water within the watershed, and the test of reasonable use was widely applied. In Elliot v. Fitchburg R. R. Co., 64 Mass. (19 Cush.) 191 (1852), water was removed and consumed outside of the watershed by locomotives. The court again held that a determination of reasonable use and actual damage to a lower riparian were the issues, without discussing the place of use. The court favored this non-riparian use by stating: "We think it was properly left to the jury to find whether the defendants...had by their diversion of water for a valuable and highly beneficial use, caused any actual or perceptible damage, and if not, to find for the defendants,".

In Stratton v. Mount Hermon Boy's School, 216 Mass. 83, 103 N. E. 87, 49 L. R. A. (N. S.) 57 (1913), the court held that the privilege of reasonable use could be exercised only within the watershed, stating:

"A brook or river, so far as concerns surface indications, is inseparably connected with its watershed and owes the volume of current to its area. A definite and fixed channel is part of the conception of a watercourse. To divert a substantial portion of its flow is the creation of a new and different channel, which to that extent defeats the reasonable and natural expectations of the owners lower down on the old channel (and) increases (the flow) which drains the watershed into which the diversion is made, and may injure thereby riparian rights upon it."

It is not altogether clear whether the restriction to the watershed rule, or a determination of reasonableness, will prevail in future cases. The situation is best summed up in Water Law: Stream flow Rights in New England and New York State, James Kendall, 1967, which states:

"Thus, it appears that in Massachusetts cases of irrigation, the court will consider the reasonable use upstream relative to the reasonable use downstream. In those cases of permanent diversion, however, reasonableness does not appear to be a factor, despite the language of the courts. While the authorities or legal writers may state or imply that diversion of water for sale might come within the reasonable use doctrine, or that a diversion of merely a portion of the stream for other uses might be deemed reasonable, the cases do not seem to bear this out. On the contrary, only those diversions for riparian uses in which a portion of the water may be returned to the stream, or for domestic uses or minor manufacturing, appear to be within the reasonable use doctrine. All other cases, those of permanent diversion, seem to be actionable so long as there is actual injury to the lower riparian estate."

For a discussion of diversions affecting another state see "Case Law," page five, Conn. v. Mass. 282, U.S. 789.

f. Eminent Domain

The statutes relating to the exercise of the power of the State and its sub-divisions to take land is contained in Chapter 79 of the General Laws. Specific references to the exercise of these powers by some individual agencies for certain purposes are contained in several other Chapters, and are also granted by special acts of the legislature. Agencies authorized eminent domain powers by statute in the water resources field include:

The Water Resources Commission to implement pollution abatement programs by providing storage sites for low flow augmentation.

The Commissioner of the Department of Natural Resources with the consent of the board, Governor and Council, and the board of selectmen in any town to acquire lands and waters for state parks, forests, recreation areas and reservations.

The Commissioner of the Department of Natural Resources under special procedures set up to provide protection to coastal and inland wetlands.

The Public Access Board to provide access to coastal and inland waters.

The State Reclamation Board with Town approval and reclamation districts to make improvements to lowlands.

The Department of Public Works with the approval of the Governor and Council for improvements to waterways.

Cities and Towns and Counties for conservation purposes.

Cities, Towns and the Metropolitan District to provide water and sewerage services.

City councils, town selectmen or water commissioners, water commissioners of water supply and fire and water districts, officers having control of county institutions having waterworks, heads of all state departments having waterworks, and water companies serving communities to provide water supplies in emergencies.

Cities and Towns (except Boston) for any municipal purpose if authorized by vote of the city council or town meeting -- this would include beaches.

Coastal Towns or Counties to provide landing places on tidal waters.

Towns to provide passage of anadromous fish.

Water companies having franchise rights covering an entire city, town or district, with the consent of the Department of Public Health, to provide water supplies.

Under special acts of the legislature other agencies in the water resources field have in some instances, been granted eminent domain powers including:

The Water Resources Commission to provide sites for works of improvement under the Federal Watershed Protection and Flood Prevention Act, and to provide sites for certain Corps of Engineers projects.

The Division of Fisheries and Game for fish and wildlife management purposes.

3. Regulatory Authority

a. Permits or approvals required

(1) For drilling wells

Under the statutory authority of the Water Resources Commission, any person engaged in the business of digging or drilling wells must be registered with the Commission. "Within thirty days of the completion of any new well by digging or drilling, each registered well digger or driller, shall submit a report to the Commission setting forth such information as may be required under the rules and regulations established by said Commission." (GL c. 21. s. 16). The report form provided by the commission consists of a complete log of the well, including site location, diameter, total depth, depth to bedrock, subsurface materials, depth to water, drawdown, etc.

(2) For building dams

Dams over ten feet in height, or those with over one square mile of watershed, or those impounding over one million gallons of water must be approved by the County Engineer.

The Department of Public Works, under Chapter 91, may license or prescribe the terms of construction or extension of a dam, road, bridge, or other structure or the filling of land on the Connecticut and parts of the Westfield River, the non-tidal portion of the Merrimack River, or on any stream on which Federal, State or municipal funds have been used for any form of flood control work.

The Department of Public Works also may license wharves, piers, walls, road, bridges, structures, pilings, or the filling of great ponds and tidewaters.

Under Chapter 131, no pond may be drained without notifying the Director of the Division of Fisheries and Game forty-eight hours in advance. In the case of a Great Pond, the Department of Natural Resources must be notified.

(3) Channel encroachments

The Department of Public Works, as noted in the previous section, regulates the filling or the placing of structures in many of the larger streams, great ponds, and tidal waters. The following two sections contain other state powers in reference to flood plains, which also could relate to channel encroachment.

(4) Development in Flood Plains

Legislation protecting flood plains is contained in Chapter 131, sections 40 and 40A.* Under section 40, any person wishing to fill or dredge any bank, flat, marsh, meadow or swamp bordering inland waters must file a written letter of intention with the Town Selectmen or Mayor, the State Department of Public Works and the State Department of Natural Resources. Local officials must hold a hearing and transmit local recommendations to the Commissioner of Natural Resources. The State Department of Public Works considers the application from the standpoint of its obligations and authority under Chapter 91, and the Department of Natural Resources determines if the area involved is essential to public or private water supply or to proper flood control. The Commissioner may, by written order, impose such conditions as may be necessary to protect the aforementioned interests.

Section 40A further implements the protection of inland wetlands by granting the Commissioner of Natural Resources the power to adopt, amend, or repeal orders regulating, restricting, or prohibiting dredging, filling, removing or otherwise alteting or polluting certain inland wetlands. Provisions concerning notice, hearing, exceptions, objections and appeal are included, as well as provision for the taking of such land or interest therein by eminent domain.

Municipalities have, in some cases, adopted flood plain zoning ordinances under the authority of Chapter 40A.

(5) Discharge of Wastes

The Massachusetts Clean Waters Act of 1966 established the Division of Water Pollution Control under the Water Resources Commission and authorized it to establish a program for the prevention, control, and abatement of water pollution. The act further provided that no new outlet or disposal system may be installed without first obtaining a permit, which the Director of the Division of Water Pollution Control is authorized to issue (GL c. 21, ss. 26-50). Permits must also be obtained from this agency in order to dispose of waste oil.

*Roughly similar legislation protects coastal wetlands.

Sub-surface disposal of wastes is controlled by the Massachusetts Department of Public Health under authority of Chapter 111. Individual household and other small systems are usually issued permits by local health authorities under authority delegated by the State agency.

Less sweeping roles in pollution prevention or abatement are played by municipalities (Chapter 40, 83). The Department of Public Works (Chapter 91), the Metropolitan District Commission (Chapter 92), the Department of Public Safety (Chapter 270), the Division of Marine Fisheries (Chapter 130), and the Division of Fisheries and Game (Chapter 131).

(6) Public Water Supply

The Massachusetts Department of Public Health under Chapter 111 is the agency responsible for maintaining water standards for drinking purposes and swimming. Recreational use permits on public water supplies are handled by local water boards and the Metropolitan District Commission, under powers delegated by the state agency.

(7) Miscellaneous

Permits from the Division of Fisheries and Game are necessary before fish are stocked, or toxic chemicals used.

b. Water quality

(1) Waste Treatment (see paragraph 3a (5) supra.)

(2) Flow regulation

The Commonwealth of Massachusetts has not implemented an overall program of flow regulation. The Massachusetts Clean Waters Act does authorize the Division of Water Pollution Control to construct reservoir sites for low flow augmentation to abate pollution (see 2. f. supra). Special Acts which created the Quabbin Reservoir and Ware River diversion set up certain minimum flow standards which affect the Chicopee River drainage and the Connecticut River. Other special acts limit water users to certain periods of the year or to the use of flows above a certain minimum on other streams, but no general plan is in existence for the State.

B. ADMINISTRATIVE STRUCTURE

1. Interstate

The following Commissions and Compacts affect or have jurisdiction in the Connecticut River Basin:

a. Connecticut River Valley Flood Control Commission. The Commission was established as a result of an interstate compact approved by the states of Connecticut, Massachusetts, New Hampshire, and Vermont on September 8, 1953. The compact was formulated to facilitate the construction of reservoirs and dams on tributary streams of the Connecticut River for flood control. The principal purposes of the compact are " (a) to promote interstate comity among and between the signatory states; (b) to assure adequate storage capacity for impounding the waters of the Connecticut River and its tributaries for the protection of life and property from floods; (c) to provide a joint or common agency through which the signatory states, while promoting, protecting and preserving to each the local interest and sovereignty of the respective signatory states, may more effectively cooperate in accomplishing the object of flood control and water resources utilization in the basin of the Connecticut River and its tributaries." The compact was established with the assumption that a comprehensive flood control system should include dams and reservoirs to control flood run-off from approximately twenty-five percent of the total drainage above Hartford, Connecticut. The compact provides an interstate agreement for the construction of flood control dams and reservoirs at Barre Falls (Ware River) in Massachusetts; West Townshend (West River), Ball Mountain (West River), North Hartland (Ottauquechee River), Groton Pond (Wells River), Victory (Moose River), Bloomfield (Nulhegan River) in Vermont; and at South Keene (Otter Brook), Walpole (Cold River), Bethlehem Junction (Ammonoosuc River), Franconia (Ammonoosuc River) and Swiftwater (Wild Ammonoosuc River) in New Hampshire. The compact also provides that Connecticut and Massachusetts will refund ninety percent of taxes lost by the upstream states as a result of the flood control program, and establishes the Commission as the working agency to carry out the provisions of the compact. The Commission, composed of three members of each of the signatory states, has operated as an advisory and coordinating agency to facilitate the construction of proposed flood control projects in the river basin. As a result of the comprehensive Type II study, the role of the Commission in this respect will be an increasingly important one.

b. New England Interstate Water Pollution Control Compact. The New England Interstate Water Pollution Control Commission (NEIWPCC) was established by an interstate compact adopted by the Commonwealth of Massachusetts and the states of Connecticut, Rhode Island, New York, Vermont, New Hampshire, and Maine between 1947 and 1955. The area of jurisdiction of the Commission includes all interstate waters of signatory states and tidal waters ebbing and flowing past the boundaries of any two signatory states. The waters under the jurisdiction of the Interstate Sanitation Commission (New York, New Jersey, and Connecticut) are excluded.

The Commission consists of five commissioners from each signatory state. The purpose of the Commission includes the establishment of water quality standards for various classifications of use in the water bodies under its jurisdiction, and to formulate programs to meet established standards. In accomplishing its purpose, the Commission is acting as an action agency with abatement and control of pollution its primary function. The Commission works very closely with the pollution control agencies of each of its member states in carrying out its purpose. Any comprehensive planning function would be undertaken by the New England River Basins Commission with the NEIWPCC advising on matters concerning the quality of water.

At the present time the Commission is carrying out various programs in relation to its function of pollution abatement and control including:

(1) Research programs pertaining to methods of treatment.

(2) Standards (criteria) Development for various uses of water bodies as a continuous program.

(3) Training of existing sewage treatment plant operators.

(4) Public information and education.

(5) Coordination of interstate water pollution control activities.

(6) Studies of specific problems which are of significant concern to the area as a whole. For example, pollution from small boats.

In order to further alleviate water pollution of the interstate waters, the Commission hopes to add to its present programs by undertaking the following:

(1) Obtain the powers of enforcement of standards where in interstate waters, individual states are unable to gain compliance. These enforcement powers would be with the approval of the states involved.

(2) Conduct a training program for new operators to aid in filling the need for qualified persons presently unavailable for operating the many treatment facilities presently understaffed and additional facilities which will be constructed in the near future.

(3) Establish a continuing surveillance program on interstate waters to observe quality and aid in enforcing quality standards.

The commission's major goal may be summed up as follows:

----- To design and construct necessary major additions and improvements to the metropolitan water, sewerage, and flood control systems within the metropolitan area.

It is the commission's objective to continue studies necessary to determine water and sewerage needs to meet future demand and to construct such improvements as are needed therefore.

Basic information collected by the commission includes rainfall data (in watersheds which contribute to supply sources within the system); quality samples of water from reservoirs, aqueducts and pipelines; air temperatures; evaporation test results; consumption data; river flows (gaging by U.S.G.S.). Information is manually filed in the central office of the MDC with copies sent to interested agencies.

The MDC presently serves about 40 communities with sewerage, and 42 communities (including 10 outside its district) with water.

Because of its large service area, the even larger area of influence of its water resources and reservoirs (extending 70 miles ± west of Boston), and its experience and expertise in providing systems of such magnitude, the MDC is an extremely important "partner" in the planning and management of water resources in Massachusetts.

c. Commission on Interstate Cooperation. Legislation passed in 1937 established in the department of the Secretary of State, a thirteen member Commission whose duties include the formulation of proposals for cooperation between this commonwealth and other states, and with the Federal government, and to organize and maintain facilities for accomplishing these purposes.

d. New England River Basins Commission. The New England River Basins Commission (NERBC) is one of several such commissions that are authorized to be set up throughout the country under Title II of the Federal Water Resources Planning Act of 1965 (PL 89-80). The area under the jurisdiction of the Commission includes all of New England and the bordering parts of New York State with the exception of the Hudson River and Lake Champlain Areas.

The Commission, which was formally established late in 1967, is designated to serve as the principal agency for the coordination of Federal, State, interstate, local and non-governmental plans for the development of water and related land resources in its area. It is also charged with preparing and maintaining a comprehensive, coordinated, joint plan for development for its area.

All matters being undertaken by the Commission are decided by a consensus of its members. Membership includes a chairman appointed by the President of the United States, representatives of the member states (a vice chairman is elected by them), representatives of Federal agencies having substantial interest in the Commission's work, and representatives of interstate agencies whose jurisdiction extends to the waters of the area for which the Commission was created.

The first major project of the NERBC is participation in the completion of the on-going North Atlantic Regional Water Resources Study which is a "framework" study of the needs and resources of water to the year 2020. The Commission is also participating in the Northeastern United States Water Supply Study and the Connecticut River Comprehensive Study. All three of these studies are presently under the direction of the Corps of Engineers and are funded, for the most part, fully by Federal monies.

The Commission has programmed studies to be accomplished under their jurisdiction. These include:

(1) A comprehensive study for southeastern New England.

(2) A study of small dams in New England including aspects of resource value, safety, and measures needed to salvage existing dams.

(3) A study of flood plains including methods of applying zoning or other applicable controls, methods of acquiring land for public use, and other methods which would reduce future flood hazards.

(4) A project to promote coordination between electric power development and other resource and environmental values.

It is expected that in order to successfully complete the studies presently programmed, technical assistance will be required from many of the Federal agencies which are involved in water resources. Input from various state agencies will also be necessary to achieve the objective of a comprehensive coordinated joint plan.

The New England River Basins Commission has, by resolution, assented to the Water Resources Council that future multi-purpose water and land resources investigations within its area should be carried out with the Commission serving as the leading and coordinating agency, with Federal agencies carrying out specific study elements in accordance with an overall plan of study.

It will be necessary for the Commission to overcome several administrative and budgeting problems to successfully assert itself as the principal agency in water resources planning. Such items as Federal provision of coordinated budgets and the elimination of legislation assigning certain studies to individual Federal agencies will be necessary to effectively place the coordination of all water resources studies in the hands of this one agency, the New England River Basins Commission.

2. State Departments and Agencies

a. Massachusetts Water Resources Commission

MASSACHUSETTS WATER RESOURCES COMMISSION
DIVISION of WATER RESOURCES

ELECTORATE

STATE CONSTITUTION

LEGISLATIVE BRANCH

EXECUTIVE BRANCH

JUDICIAL BRANCH

GENERAL COURT
SENATE - HOUSE

SPECIAL LEGISLATIVE COMMISSIONS

ATTORNEY GENERAL

AUDITOR

GOVERNOR

SECRETARY of STATE

TREASURER & RECEIVER-GENERAL

SUPREME JUDICIAL COURT

LT. GOVERNOR & EXECUTIVE COUNCIL

Division of Civil Defense

Metropolitan Area Planning Council

Port of Boston Commission

Executive Office for Administration & Finance

AGRICULTURE

- State Reclamation Board

COMMERCE & DEVELOPMENT

- * Economic Development
- * Planning
- Tourism

COMMUNITY AFFAIRS

- * Planning
- * Urban Renewal

METROPOLITAN DISTRICT COMMISSION

- Parks Engineering
- Recreation
- Sewerage
- Water
- Neponset River Drainage & Flood Control Apportionment Boards

NATURAL RESOURCES

- * Conservation Services
- * Forests & Parks
- * Law Enforcement
- * Marine Fisheries
- * Mineral Resources
- * Fish & Game Board
- * Fisheries & Game
- * Public Access Board
- * Water Resources Commission
- * Water Resources
- * Water Pollution Control

PUBLIC HEALTH

- Bureau of Environmental Health Engineering
- Biologic Laboratories
- Pesticide Board
- * Sanitary Engineering
- Advisory Council on Radiation Protection

PUBLIC WORKS

- Administrative Services
- Highway Construction
- * Highway Engineering
- Highway Maintenance
- * Motorboats
- * Waterways
- Massachusetts Port Authority

LEGEND
*Agencies with close working relationships
DEPARTMENTS
Divisions
Advisory Boards or Commissions

BANKING & INSURANCE | CIVIL SERVICE & REGISTRATION | CORPORATIONS & TAXATION | CORRECTION | EDUCATION | LABOR & INDUSTRIES | MENTAL HEALTH | PUBLIC SAFETY | PUBLIC UTILITIES | PUBLIC WELFARE

FIGURE 1 1/69

MASSACHUSETTS STATE GOVERNMENT EMPHASIZING AGENCIES WITH WATER AND RELATED LAND RESOURCE RESPONSIBILITIES

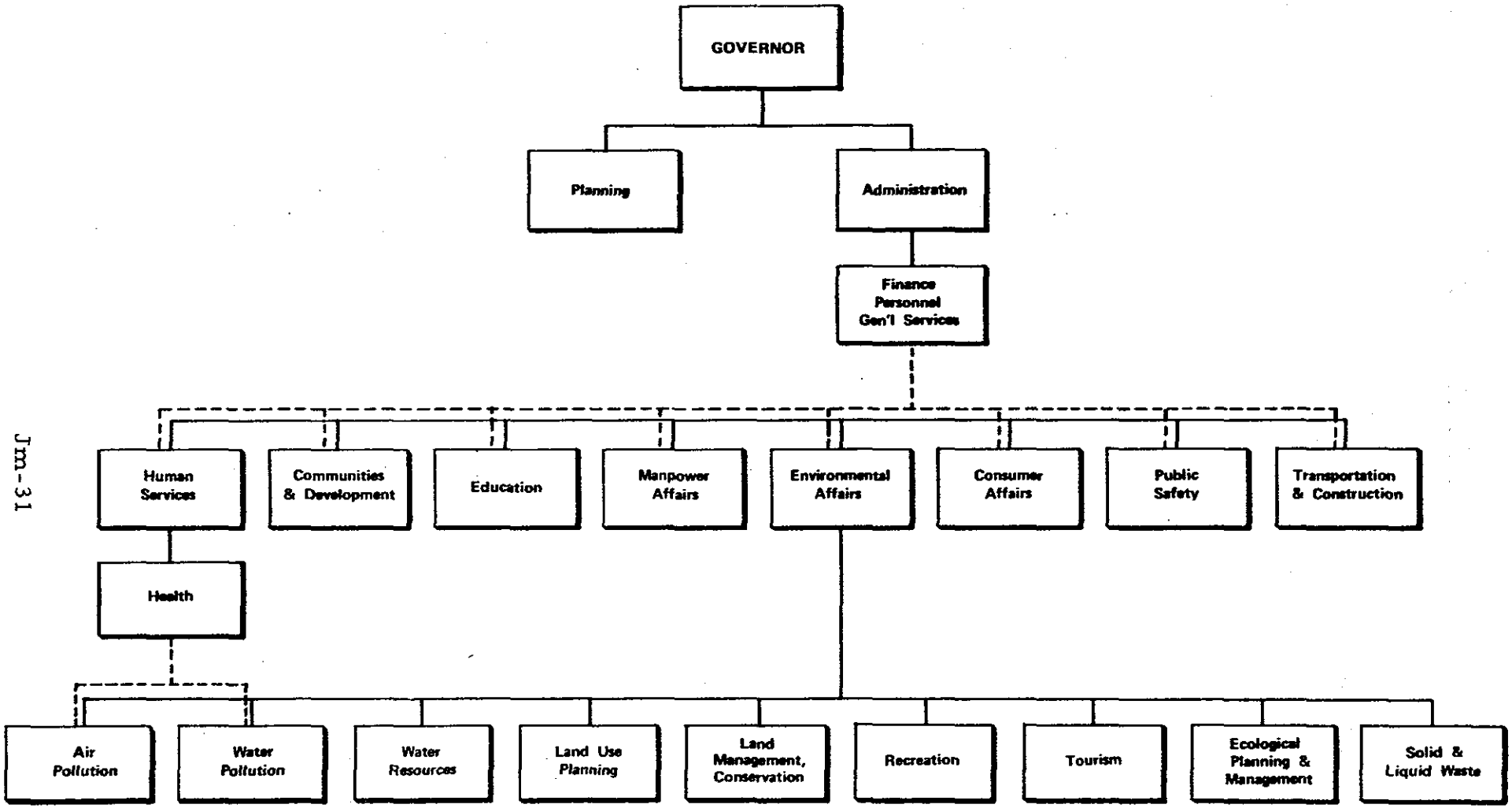


FIGURE 2

ORGANIZATION OF MASSACHUSETTS STATE AGENCIES
To Be Implemented Beginning April 30, 1971

(1) Division of Water Resources

The Division of Water Resources was created by Chapter 620 of the Acts of 1956 within the Department of Natural Resources, but under the control of a special eleven-member Water Resources Commission. The Commission of the Department of Natural Resources is the chairman of the commission. Other members include representatives of the Department of Public Health, Public Works, Commerce and Development, the Division of Fisheries and Game, and four citizens appointed by the Governor.

The Division is charged with the following general responsibilities:

Coordinate all water and related land resource activities of State, Interstate, and Federal agencies as they affect Massachusetts.

Guide the formulation of water resource policy and law based upon the interests of agriculture, industry, recreation, wildlife, conservation, domestic consumption, and flood protection.

Study the needs, supplies and resources of the Commonwealth with respect to water conservation and flood protection.

Supervise programs provided for by the Watershed Protection and Flood Prevention Act. (PL-566).

Contract for ground-water favorability studies upon local application.

Administer comprehensive water and land related resources planning program under the Water Resources Planning Act (PL 89-80), and to receive Federal Funds under Title III of the Act.

The above responsibilities have been translated into the following goals:

To develop scientific and equitable methods for the management of the state's water resources through coordination of basic data collection, establishment of effective planning, and formulation of necessary regulatory measures.

To prepare and guide programs based upon planning recommendations to insure the optimum use, conservation, and development of state water and related land resources through the organization of cooperative state interagency, local-state and state-federal partnership efforts.

The Division has proposed a number of objectives which define the items to be included in a work program necessary to achieve these goals. These objectives were used for the most part as a starting point in developing the program presented in Chapter III, and therefore are not included herein.

The Division, as the coordination agency for water resources activities as they affect Massachusetts, is responsible for providing the state input and guidance required in many of the water resources programs of the Corps of Engineers, the Soil Conservation Service, the Geological Survey, and the Water Resources Council.

(2) Division of Water Pollution Control

The Division of Water Pollution Control was established in the Department of Natural Resources, under the control of the Water Resources Commission by Chapter 685 of the Acts of 1966. The Division is broadly responsible for improving the quality and value of the Commonwealth's water resources. The principal duties and responsibilities are contained in Chapter 687 of the Acts of 1966 and in the establishing act. These duties and responsibilities are:

Establish a program for the prevention, control, and abatement of water pollution and encourage the adoption and execution of this plan by users of the waters of the Commonwealth.

Study, research, and demonstrate new and improved methods of pollution abatement.

Adopt standards of water quality applicable to the waters of the Commonwealth and plan for the implementation and enforcement of the standards.

Examine periodically the water quality of the waters of the Commonwealth.

Propose water pollution abatement districts.

Cooperate with appropriate Federal agencies, agencies of other states and interstate agencies in matters related to water quality control, and shall receive and dispense funds from any such agency as may be available for the prevention, control and abatement of water pollution.

Regulate the construction and operation of new disposal systems for the discharge of sewage or industrial wastes or the effluent therefrom by the issuance of permits.

Regulate, by order, the operation of water pollution control facilities to insure adequate treatment prior to discharge to any watercourse.

The Division has taken a sentence out of its establishing act as its goal, which is "To enhance the quality and value of water resources in the Commonwealth through a program for the prevention, control, and abatement of water pollution." The following specific objectives have been set forth to pursue this goal:

Encourage,and if necessary, require the adoption and execution of plans for abatement of 190 known sources of pollution by 1970 and 345 known sources by 1975.

Conduct research and demonstration programs in the areas of combined sewers, eutrophication, waste oil disposal, effects of the disposal of toxic wastes in the ground and at sea, advanced waste treatment, thermal pollution from watercraft, and the disposal of dry wastes through sanitary sewers.

Establish 36 monitoring stations by 1973.

Establish a technical school specializing in courses on the methods of water pollution control and the operation of water pollution abatement facilities.

Authorize and direct a total of 50 cities, towns, political subdivisions and water pollution abatement districts by 1970 (120 by 1975) to apply for Federal grants applicable to the capital outlay cost of pollution abatement facilities.

Construct or enlarge reservoirs throughout the Commonwealth for the purpose of providing low flow augmentation by 1975.

The Division of Water Pollution Control works closely with the Federal Water Pollution Control Administration, particularly in regard to stream standards and enforcement on the interstate waters of the Commonwealth. These two agencies transfer information and data gathered, and the FWPCA provides technical assistance to the Division. Often working together in cooperative programs, these two agencies provide for the collection, analysis, and publication of water quality data on a continuing basis.

The Bureau of Envrionmental Health Engineering and the Division shares deep interest in the control and abatement of water pollution since contamination in many cases accompanies pollution. The sections of the water quality standards adopted by the Division and approved by the Department of Interior relating to public health were formulated with the approval of the Commissioner of Public Health. The two agencies have attempted to reduce the difficulty arising from the overlapping of functions by a mutually agreed upon schedule of operating procedures.

The Division has just oriented an extensive program of water quality monitoring. Up to this time, the Division has provided a limited amount of first person data mostly in the form of grab sample analysis. The data presently available is stored on laboratory report sheets in the central office of the Division and is not generally published except in conjunction with a specific report. However, the Division continues to be a prime source of water pollution control information, particularly, in the form of engineering reports, special studies, enforcement proceedings, and permits. The primary functions of the Division at the moment are: to encourage and promote the development of water pollution abatement facilities, review and endorse applications for Federal grants and loans for pollution control projects (HUD), review and endorse reports, designs, and specifications for water pollution abatement facilities, monitor water quality in the waters of the Commonwealth, and administer the state construction grant program for water pollution abatement facilities.

The Division has not to date initiated a comprehensive planning program. The Division in the short time since being established has directed itself to the more pressing problems of classification and enforcement.

b. Massachusetts Department of Natural Resources

(1) Division of Acquisition and Construction

The Division of Land Acquisition and Construction was departmentally organized recently to serve the other Divisions within the Department of Natural Resources by providing legal and engineering services in matters pertaining to the acquisition and disposition of lands, and to the development of recreational areas under the jurisdiction of the Department. In particular the Division performs the duties required to complete the land transactions, contracts for project design, reviews the plans and specifications, and acts as the contracting body for construction projects.

The Division of Land Acquisition and Construction uses data collected by other divisions of the Department of Natural Resources and by the Department of Public Health. This data includes water quality (for swimming purposes), runoff (for dams), depths and contours of ponds (for swimming), aquatic weed control, and insect pest control.

Acquisition and Construction, being a service division, is by its nature project oriented and does not in itself carry out any long range planning.

(2) Division of Conservation Services

The Division of Conservation Services was established within the Department of Natural Resources by Chapter 664 of the Acts of 1963. This act abolished the State Soil Conservation Committee in the Department of Agriculture and added the Division of Conservation Services to the Department of Natural Resources.

The legislation also established a State Committee for the Conservation of Soil, Water and Related Resources in the Division. This committee is composed of seven voting members and one non-voting advisory member. The seven voting members include the Commissioner of Agriculture, Commissioner of Natural Resources, the Dean of the College of Agriculture at the University of Massachusetts, together with four appointed members suggested by the Massachusetts Association of Conservation Commissions, the Executive Committees of the State Grange and the Farm Bureau Federation, and the Association of Soil Conservation Districts. The State Conservationist of the

United States Soil Conservation Service is the advisory member. The duties of the Committee are to encourage and assist educational work in the area of conservation, to advise the Director of the Division of Conservation Services in developing policies, and to promote the organization and operation of conservation districts.

The powers and duties, both statutory and delegated, of the Division of Conservation Services in the realm of water resources include:

Administer the state aid and assistance programs provided to serve the conservation districts. (Among other duties these conservation districts are empowered to develop comprehensive plans for conservation, development, and disposal of water, together with plans for the prevention of floodwater and sediment damages).

Administer the Self-Help Program which assists local conservation commissions by providing reimbursements of up to 50 per cent of the cost of land acquisition for conservation and recreation purposes.

Administer and have overall responsibility for resource review of matters relating to the inland and coastal wetlands.

Coordination of the Bureau of Outdoor Recreation Land and Water Conservation Fund Program.

Administer to the Public Access Board.

The Division has formulated three goals in order to guide it in carrying out its responsibility. One of the goals refers to its role in resources management and is stated as follows:

To conserve the renewable natural resources (soil, water, plant life, woodland, fish and wildlife, and outdoor recreation resources) of the Commonwealth through the various programs and through cooperative efforts with all Federal, State, county, local public, and private resource agencies.

The following objectives, significantly related to the overall planning and management of water resources, have been developed to achieve the above goal:

Control detrimental alterations to non-restricted coastal marshlands and inland wetlands as specified respectively under Chapters 130 and 131 of the General Laws.

To place under restriction 40,000 acres of coastal marshes as determined by the findings of the Marine Fisheries Study of Coastal Wetlands.

To promote the development of small watershed projects featuring flood prevention and multi-purpose facilities.

To control disbursement of monies from the Federal Land and Water Conservation Fund in accordance with the State Outdoor Recreation Plan.

In performing the duties heretofore noted, the Division works closely with the United States Soils Conservation Service, the Federal Bureau of Outdoor Recreation and the Corps of Engineers. For projects of mutual interest, the Division exchanges information, opinions, and documentation with these Federal agencies.

The Division of Conservation Services maintains close ties with the Division of Water Resources and other state agencies concerned with mutual resources conservation and development, a number of the agencies are included within the Department of Natural Resources. The Division obtains data, information and opinions from these agencies and integrates these in reviewing inland and coastland wetlands development applications. Similar inputs are requested of the Department of Public Health, Bureau of Environmental Health Engineering, and the Department of Public Works, Division of Waterways in the areas of water supply and flood plain alteration, respectively.

The Division, at the present time, is embarking on an updating of the 1966 Outdoor Recreation Plan; this plan will be an input into any comprehensive water resources planning undertaken. It is not expected that the Division of Conservation Services will undertake water resources planning itself; however, because of its role in natural resource conservation and development, it is expected that the Division will contribute much to such comprehensive planning when undertaken by others. In addition the Division has administrative functions of local conservation districts that may develop comprehensive plans for water development on a local basis. This planning should be coordinated with area-wide and statewide water resources planning.

(3) Division of Fisheries and Game

The Division of Fisheries and Game was established under the General Laws Chapter 21, Section 7, within the Department of Natural Resources, but is supervised by a Fish and Game Board of five members, the members of which are appointed by the Governor. The duties of the Division are basically contained in the provisions of Chapter 131 of the General Laws.

The responsibility of the Division of Fisheries and Game which significantly relate to water resources management and planning include:

Acquire fishing rights and privileges in water bodies including brooks, streams, and ponds other than great ponds.

Stock and restock applicable bodies of water.

Manage the resources and environment of fish and wildlife including approximately 40,000 acres of land and water owned or controlled by the Division.

(4) Division of Forests and Parks

The Division of Forests and Parks was established within the Department of Natural Resources by the provisions of Section 8, Chapter 21 of the General Laws. The general duties and responsibilities are contained in Chapters 21, 61, and 132. The statutory duties directly related to water resources management and planning include:

Plan, acquire, design, and develop the state forests, parks and reservations under the jurisdiction of the Department.

Provide technical aid in natural resource planning for the Department together with Federal, regional and local planning or management agencies.

Provide year-round outdoor recreation opportunities on all its lands.

Manage the forest and outdoor recreation aspects of the Department in connection with the Corps of Engineers and the U.S. Department of Agriculture flood control projects within the Commonwealth.

As can be noted from the above, the role of the Division in water resources planning and management is to assure the availability of water needed for forest management and recreational uses and flood protection on lands under the jurisdiction of the Department of Natural Resources.

In order to carry out its responsibilities as stated above, the Division of Forests and Parks has formulated the following goal:

To improve the quality and quantity of experience of the out-of-doors through the provisions of lands under the control of the Division by 1973.

The Division of Forests and Parks has set forth several objectives for carrying out the water resources aspects of this goal including the following:

To inventory and develop management plans including recommendations for policy with Division personnel for all lands under the control of the Division by 1973.

To develop a continuous planning process for all lands under the control of the Division by 1970 through technicians of the Bureau of Forest Department.

To continue cooperative resource planning with regional planning agencies and communities.

To develop a unit within the Department responsible for a major program of information and education by 1975.

To reinventory the forest lands of Massachusetts in cooperation with the U. S. Forest Service by 1975.

Through cooperative programs the Division receives and exchanges technical assistance, data, and information with a number of Federal agencies including the U. S. Forest Service, the Geological Survey, the Weather Bureau, the Soil Conservation Service, and the Corps of Engineers. The Division supplies such data and information as rainfall records and water levels and receives data and information on weather forecasts, fire hazard classification, flood levels. Continual technical assistance on Forest Management Techniques is provided by the Forest Service.

The Division interchanges information with other state agencies and localities when mutual interests are involved (e. g. M. D. C. water reservoirs in State Parks).

The Division collects and maintains central office files such as levels of reservoirs, precipitation, and stream flow, all for specific projects. This information is manually retrieved when desired. In addition to information presently gathered, the Division intends to gather information on pond bottom contours, sedimentation rates, and water needs and methods of supplying water for forest management.

The Division has a large role in developing comprehensive plans for recreation (Massachusetts Outdoor Recreation Plan), and in cooperating with regional planning groups. Because of the importance of "water" to its work, the Division works in close cooperation with the Division of Water Resources.

(5) Division of Marine Fisheries

The Division of Marine Fisheries was established under the provisions of Chapter 21 of the General Laws. The duties and responsibilities of the Division are generally contained in the establishing act together with Chapters 130 and 715. These duties include:

Preserve, protect, and manage the marine and anadromous fishery resources of the Commonwealth.

Cope with the problems involving pollution to marine life.

Prevent the physical alteration of estuarine wetlands.

Secure and maintain statistical records of the catch of each species of marine fishery.

The Division of Marine Fisheries has formulated the following goal relating to water resources which guides it in carrying out its responsibility.

To protect and enhance the marine environment.

The following objectives have been proposed to realize this goal.

To inventory and map coastal rivers and streams in reference to fishways, impoundments, barriers to fish passage, water use, and potential spawning grounds.

To inventory marine resources and the environment in selected estuaries and coastal bays throughout the Commonwealth at the rate of 2 to 4 areas per year, and to publish comprehensive reports together with the recommendations for the protection, enhancement and utilization of these resources.

To investigate proposed coastal wetland alteration projects in order to protect marine fisheries by imposing restrictions on the work as required, and further, to preserve unaltered wetlands through the implementation of the Coastal Wetlands Protection Act.

The Division of Marine Fisheries receives research funds from the Department of Interior's Bureau of Commercial Fisheries under PL 88-309. Through research projects, the Division exchanges information on fish production and resources inventories.

To date the Division has published five reports on the marine resource inventories on certain coastal bays and estuaries of the Commonwealth. These inventories contain data on the type, status, and value of the marine resources in the areas and data concerning the physical and chemical characteristics which affect the marine resources. Additional activities of the Division include: the issuance of licenses; maintenance of a lobster hatchery and research station on Martha's Vineyard; and operation of a shellfish purification plant.

The Division in its approach to its duties and responsibilities has directed itself into areas of specific marine inventorying and research geared to population dynamics. The information and data they have gathered would be invaluable to any water resources planning involving coastal waters.

c. Massachusetts Department of Public Health

(1) Bureau of Environmental Engineering

The Bureau of Environmental Health Engineering resulted from recent reorganization and expansion of the Division of Sanitary Engineering as authorized and approved by the Public Health Council. The Bureau consists of five functional divisions and one administrative support division. Each of the five functional divisions will oversee and regulate one aspect of environmental health engineering. These divisions are: (1) Division of Air Use Management and Radiological Health, (2) Division of General Environmental Control, (3) Division of Water Quality Evaluation, (4) Division of Land Use Management, and (5) Division of Laboratory Support Services. The Bureau will continue to staff and maintain four district offices which perform much of the field work and supply field information to the central office.

The principal powers and duties of the Bureau are included within the provisions of Chapter 111 of the Massachusetts General Laws, particularly Section 5. In addition, the Bureau has additional responsibilities delegated by Special Acts and other sections of the General Laws, including Chapters 40, 83, and 130.

Some of the principal duties of the Bureau are as follows:

Oversight of inland waters, including surface and subsurface water, and sources of water supply, and control the pollution or contamination of any or all of the lakes, ponds, streams, tidal waters and flats within the commonwealth and of the tributaries of such tidal waters and flats.

Regulate the application of chemicals for weed and aquatic nuisance control by private individuals.

Control algae, weeds, and other aquatic nuisances in such lakes, ponds, streams, and other bodies of water within the commonwealth.

Regulate any city, town or district water supply by requiring such treatment facilities as are needed to insure the delivery of a safe water supply to all consumers.

Advise communities or persons as to the most appropriate source of water supply and the best method of assuring its purity, and the best method of disposing of sewage or drainage.

Examine water from water supply systems to ascertain their purity and fitness for domestic use.

Regulate the discharge into coastal waters of sewage or other substances injurious to health.

Examine coastal waters and flats of the Commonwealth to determine whether these areas are contaminated.

Control and direct operations of all water resources for communities during disaster emergencies.

Investigate the utilization of low lands and swamps by draining, for the protection of public health.

In order to carry out the responsibilities as stated above and, in general, to promote the public health the Bureau has formulated goals to guide future actions. One of the goals refers to its role in water resources management and is stated as follows:

To promote the public health, safety, and convenience associated with water and related land uses by assuring plentiful supplies of safe and suitable water to be furnished for human consumption and related uses, to eliminate environmental health hazards associated with harvesting shellfish from contaminated water and contamination of bathing waters, and control of aquatic nuisance plants and organisms.

The Bureau has set forth several objectives for carrying out this goal. The most significant with respect to long-range water resources planning and management are:

To maintain a current inventory of basic engineering data for each public water supply in the Commonwealth in a form useful for water supply system design, municipal and regional planning, and emergency operations.

To develop an on-going 25-year plan for development of additional water sources (and related land) to fulfill projected safe water needs of 350 community water systems.

Maintain a program for engineering surveillance of all public water supply sources and facilities including treatment works.

To complete a sanitary survey and classification of all shellfish growing areas in the Commonwealth, comprising approximately 2,000 miles of coastline and over 50,000 acres, and to develop capability for conducting resurveys and reclassifications of each area once every year in accordance with National Shellfish Program Standards.

To expand the program for conducting biological surveys review and approve of proposals, and preparing contracts for chemical treatment and supervising control work on lakes, ponds, streams and other bodies of water within the Commonwealth.

To achieve a fully adequate engineering surveillance program and review of plans for existing and new liquid waste treatment plants, to insure compliance with public health laws, rules, and regulations.

To establish an on-going program for public health surveillance of streams.

Close liaison is maintained by the Bureau with the Public Health Service in the U.S. Department of Health, Education and Welfare. The Bureau also exchanges information and receives cooperative assistance from other Federal agencies including U.S. Corps of Engineers, U.S. Geological Survey, U.S. Soil Conservation Service, the U.S. Department of Housing and Urban Development, and the Federal Water Pollution Control Administration. The Bureau reviews and endorses applications for Federal planning funds, reviews engineering reports on sewerage and water (some being done with Federal funds), performs analyses on shellfish (interstate shipments), supplies statistics, and cooperates in analytical work. The Federal agencies supply the Division with technical and research data.

The Bureau of Environmental Health Engineering continually cooperates with other state agencies as well as local community agencies in most matters pertaining to sanitation and water supply. In addition to providing laboratory facilities for testing and analysis, the Bureau reviews plans and reports for water and sewerage improvements, and reviews proposals for developing wetlands from a public health standpoint.

The Bureau participates in the comprehensive planning process continually by such activities as discussion of proposals and feasibility studies, and review of plans from a public health standpoint.

A large amount of staff time is spent participating in the planning process as differentiated from regulatory or research activities.

The Bureau of Environmental Health Engineering collects and maintains a considerable amount of basic data and information pertaining to water resources. This data and information includes water quality analysis, water consumption data, statistical data, and engineering reports. Analyses information is stored alphabetically by community and is available at the central office of the Bureau and at the Lawrence Experimental Station. Water consumption data are also filed alphabetically and are available in printed summaries periodically.

d. Massachusetts Department of Public Works

(1) Division of Waterways

The Division of Waterways was established within the Department of Public Works to carry out the provisions of Chapter 91 of the General Laws. The duties and responsibilities of the Division are contained in Chapters 91 and 648 together with a number of special acts. These duties and responsibilities include:

To undertake shore protection, harbor development, stream clearance and flood control work.

Coordinate Federal harbor development and flood control projects.

Charge of great ponds, public rights in lands, flats, shores, and tide waters belonging to the Commonwealth.

Improvements, maintenance, and protection of tidal and non-tidal rivers and streams and shores along public beaches.

Control of use and construction, by others, on lands under its jurisdiction by licensing powers.

In order to carry out its prime responsibilities under the statutes, the Division has formulated the following goal:

To protect the shorelines of the State while providing the public with safe, functional and convenient access to, and upon, the public waters of the Commonwealth. These waters include the coastline, harbors, rivers and Great Ponds.

For the purpose of carrying out their goal, the Division has set forth approximately ten objectives. Five of these objectives relate directly to water resources management. They are:

To regulate control of all filling and structures erected in public waters.

To provide interstate cooperation in the use of mutual boundary waters.

To conduct hurricane and flood control construction studies and construction projects.

To provide State cooperation with Federal agencies in river and harbor projects.

To provide State cooperation in regional compacts with noncontiguous states.

The Division of Waterways, because of the similarity of certain work performed relates to the U.S. Corps of Engineers, especially in projects requiring dredging for navigation purposes. For projects of mutual interest the contracting agency would provide the other agency with copies of plans or reports.

The Division of Waterways does not currently maintain water resources data on a regular basis. When needed for specific projects, the Division conducts surveys to provide study or design information and data. The Division obtains certain basic data including tide information, stream flows, and rainfall data from the U.S. Coast and Geodetic Survey.

The Division carries out an interrelationship of its undertakings with water resources planning by:

1. Having a representative on the Massachusetts Water Resources Commission, and

2. Reviewing proposals for developing wetlands in cooperation with the Department of Public Health, the Division of Water Resources, and the Division of Conservation Services, Department of Natural Resources.

e. Massachusetts Department of Commerce and Development

The Department of Commerce and Development was established in 1964 under Chapter 23A of the General Laws. Many of the duties of the Department are in relation to housing and urban renewal which are contained in Chapters 121 and 121A of the General Laws.

The broad powers included in the enabling legislation include provisions for all facets of comprehensive planning. The Department, as organized, incorporates a deep involvement in the planning process but does not have a program for statewide planning. The Planning Division administers the Federal 701 planning program for local communities and acts in an advisory capacity in regional and metropolitan planning in the state.

Other activities of the Department include economic development, tourism, housing, and industrial and urban renewal. The availability of water in adequate quantity and quality is recognized as vital to all the activities within the domain of commerce and development and therefore the Department is expected to exert a great influence on any water resources planning which is undertaken. The Department should provide a large input in studies undertaken in the realms of economic and population projections. One example of where a study of water resources could be combined with efforts of the Department of Commerce and Development is in the area of developing offshore resources of the state.

Recently (November 1, 1968), a new State Department of Community Affairs has come into being. Under legislation passed during 1968 under Chapter 23B of the General Laws, several of the functions of the Department of Commerce and Development have been transferred to the new department including housing, urban renewal, relocation and planning assistance.

At the present time, it is not expected that the new department will have an increased role in water resources planning over that presently undertaken by DCD. It is also expected that the Department of Administration and Finance will coordinate the several planning documents, including water resources, that will make up the state's comprehensive development plan.

f. Massachusetts Department of Agriculture

The Department of Agriculture was established under Chapter 128 of the General Laws. The department is principally a regulatory agency looking after the wholesomeness and quality of agricultural commodities and the health of livestock.

The duties of the department include the regulating of milk producers and out-of-state pasteurizing plants which distribute within the Commonwealth. The State Department of Public Health regulates pasteurizing plants within the state. In cooperation with the Federal Department of Agriculture, the Department carries out inspections of animal health, consumer marketing, and plant pest control (for agricultural commodities).

The major function of the Department pertaining to water resources is to check the quality of water used in milk production. Although the Department is most interested in assuring quantity and quality of water for agriculture use, they do not, themselves, undertake any program in this behalf. Studies in relationship to water needs for agriculture purposes are undertaken by the University of Massachusetts College of Agriculture Extension Services.

g. Metropolitan District Commission

The Metropolitan District Commission was formed in 1919 by reason of a state constitutional amendment requiring that all state boards and commissions be organized into not more than twenty departments. The Commission as organized under Chapter 92 of the General Laws encompasses functions of providing sewerage, water and parks systems in the Boston Metropolitan Area.

In the field of water resources, the Commission has been charged with the construction, maintenance and operation of water and sewer systems, sufficient to serve its member communities. The Commission has separate divisions for the operation and maintenance of its separate functions pertaining to water, sewerage, and parks. The Construction Division incorporates the function of long-range planning of facilities and resources needed to meet future demands.

The Metropolitan District Commission does not carry out a fully comprehensive planning program since its responsibility is limited to that of a service function. It does, however, conduct and carry out a planning program wherein it is continually investigating and programming the measures needed to serve the expanding needs of its member communities in the field of its jurisdiction.

The existing systems evolved from long-range planning efforts, that although essentially "single-purpose" in nature, contain the element of providing for projected future needs.

The commission's major goal may be summed up as follows:

To design and construct necessary major additions and improvements to the metropolitan water, sewerage, and flood control systems within the metropolitan area.

It is the commission's objective to continue studies necessary to determine water and sewerage needs to meet future demand and to construct such improvements as are needed therefore.

Basic information collected by the commission includes rainfall data (in watersheds which contribute to supply sources within the system); quality samples of water from reservoirs, aqueducts and pipelines; air temperatures; evaporation test results; consumption data; river flows (gaging by U. S. G. S.). Information is manually filed in the central office of the MDC with copies sent to interested agencies.

The MDC presently serves about 40 communities with sewerage, and 42 communities (including 10 outside its district) with water.

Because of its large service area, the even larger area of influence of its water resources and reservoirs (extending 70 miles ± west of Boston), and its experience and expertise in providing systems of such magnitude, the MDC is an extremely important "partner" in the planning and management of water resources in Massachusetts.

h. University of Massachusetts

(1) Water Resources Research Center

During 1965, the University at Amherst established a Water Resources Research Center, the chief objectives of which were:

1. To conduct basic, developmental and applied research relevant to water resources and their efficient use.

2. To stimulate the development of curricula and research programs within the framework of the Graduate School to provide professional workers with advanced training for the water resources fields.

The Center, while basically funded under Public Law 88-379, the Water Resources Act of 1964, has received yearly grants to conduct special studies for the Massachusetts Water Resources Commission. It is hoped that employees of the Commission's two divisions will be able to

avail themselves of advanced training courses in Water Resource Management which may be arranged on an in-service training basis.

Current studies involving the Connecticut basin include a study to be conducted in cooperation with the wildlife unit concerning wetlands classification, an evaluation of discontinuities in regional population projections, watershed responses to hydrologic influences and many others.

(2) Cooperative Wildlife Research Unit

The Unit at the University at Amherst was established in 1948. The chief objectives of the unit are to:

1. Train personnel in the wildlife field.

2. Conduct basic research in the utilization of wildlife resources.

3. Promote education through such means as demonstration, lecture and publication.

4. Provide technical assistance to state wildlife and other agencies.

Federal funds available under P. L. 86-686 are augmented by grants from the Wildlife Management Institute and the Massachusetts Division of Fisheries and Game.

A current study of marshes along the Connecticut River from Turners Falls to Holyoke will examine their history and utilization, including the recreational aspects of waterfowling.

A proposed project will be to determine criteria for evaluating inland wetlands.

(3) Cooperative Fishery Unit

The unit at the University of Massachusetts was established in 1964 under authority of P. L. 86-686. Its aims are comparable to those of the wildlife unit.

The unit is supported by the U. S. Bureau of Sports Fisheries and Wildlife, the University, the Massachusetts Division of Fisheries and Game and the Massachusetts Division of Marine Fisheries.

Current studies involving the Connecticut River include a life history of the shad, food habits of all species and factors affecting their distribution and abundance. A study to evaluate factors causing shad mortality is planned.

(4) Massachusetts Agricultural Experiment Station

This facility was established by the State Legislature in 1887 with the support of Congress. Its principal functions include:

1. The conduct of research in the natural and biological sciences.

2. The conduct of economic research.

3. The operation of a field station to conduct specialized research in plant culture, disease, genetics, environmental pollution's effect on economic plants, etc.

4. The operation of a cranberry station whose studies include the effect of pesticides on estuarine pollution.

(5) Massachusetts Cooperative Extension Service

The service is the educational arm of the land-grant college (University of Massachusetts) and operates through the University staff, county, and regional Extension specialists. The staff provides information and guidance concerning agricultural production and marketing, natural resources development and use, home economics and consumer services and youth (4H).

The Service recently published a paper by Professor MacConnell concerning the use of aerial photography in evaluating recreational potentials along the Connecticut River.

i. Department of Community Affairs

The Department was created by the amendment of the General Laws inserting Chapter 23B, sections 1-26. Among other functions it is concerned withzoning, planning, and training of personnel at the community level. The legislation was passed in 1968 and directs the new agency to "formulate in cooperation with the related state agencies and submit annually to the governor and the general court beginning on or before December 4, 1970 and from time to time thereafter biannually a five-year Community and Environmental Development Program, including, but not limited to: establishment of the number and location of areas requiring the need and priority for area improvements involving sewer, water, parks, public safety, urban beautification, solid waste, health welfare education and recreation centers, traffic and public works, establishment of unified code enforcements personnel training and evaluation procedures; and establishment of a financial program which shall identify the required participation by federal agencies, Commonwealth, and municipalities, and which shall give consideration to the Commonwealth contributing one half of the federal share;..."

j. Future Administrative Structure

A new administrative structure will be placed in operation on April 30, 1971. (See Figure 2). The many agencies of the Commonwealth will be grouped in eight executive offices, each headed by a secretary to be appointed by the governor. While each existing agency shall be transfered intact, provisions have been made for the shifting of certain functions of specific agencies as is found to be appropriate.

Functions concerning water and related land resources are largely to be grouped under Environmental Affairs. Agencies specifically listed include the following: Department of Agriculture; Department of Natural Resources, including the Division of Fisheries and Game and Water Resources Commission; the Metropolitan District Commission; The Outdoor Advertising Board and Division; and several other lesser boards and commissions.

Provisions are included to permit the later inclusion of The Pesticide Board and the air and water pollution control functions of the Department of Public Health. The remainder of the functions of the Department of Public Health will be placed under the Executive Office for Human Services.

The Executive Office of Communities and Development will contain the Departments of Commerce and Development. The Department of Community Affairs and The Metropolitan Area Planning Council. The office will, among other duties, plan for and promote the economic development of the Commonwealth.

C. POLICY

1. Centralized vs. Decentralized responsibility for water management functions

Since water resources problems are seldom confined within the physical boundaries of individual political sub-divisions, centralization of responsibility in most phases of water management has tended to occur. Water for consumptive use, waste water and floodwaters are managed with differing degrees of centralization, based on precedent, source of funds or State and Federal enabling legislation.

In Massachusetts, the management of water for human consumption falls under the jurisdiction of the Massachusetts Department of Public Health, to the degree that it is the agency which maintains the standards of water purity for drinking and swimming purposes. Public Health does not, however, function in the area of planning or construction of new supplies. These functions have been fragmented among the various cities and towns, the Metropolitan District Commission and private water companies. The greatest degree of centralization is represented by the Metropolitan District Commission, which obtains water from both the Connecticut and Merrimack watersheds and serves over 1,600,000 people (30 percent of the total state population), in over 30 cities and towns. Population growth and competition for available supplies will require that a single state agency give greater direction to the planning, construction and operation of water supply systems. Several advisory studies have already been sponsored by the Division of Water Resources involving both ground and surface water supply potentials.

The Massachusetts Clean Waters Act authorized the Division of Water Pollution Control to give forceful direction to cities, towns, districts and industries in abating the pollution of the inland and coastal waters of the Commonwealth. Local initiative is involved in hiring consultants, partial funding, site location, and placement of lateral sewers, but waste water standards, implementation schedules,

plan review, inspection, and enforcement are clearly state functions.

The Division of Water Resources, under the Water Resources Commission has pre-eminent authority in the field of flood control. As authorized by statute, the division is the State coordinating agency with the Corps of Engineers in flood control work, and supervises the Department of Agriculture's small watershed program (P. L. 566). Local sponsors of small watershed projects apply to the Water Resources Commission, which acts as the coordinating and contracting agency, and acquires title to lands needed for works of improvement.

The Division of Waterways in the Department of Public Works becomes involved with cities and towns in local flood abatement projects which usually involve the installation of riprap materials, flood walls and channel dredging.

While the tendency to centralize water management functions under the two divisions of the Water Resources Commission may continue, it is planned that this agency will itself decentralize. The establishment of field offices based on watersheds is contemplated in order to deal more effectively with water resource problems and the public.

2. "Home Rule" Concept

Article XXXIX of the Articles of Amendment to the Constitution of the Commonwealth of Massachusetts indicates that the general court shall have the power to act in relation to cities and towns, but only by general laws which apply alike to all cities, or to all towns, or to a class not fewer than two, and by special laws on the basis of local petition, or by a two-thirds vote of each branch of the general court on the recommendation of the Governor.

It confers to cities and towns the right of self government in local matters, the power to adopt and revise charters consistent with the Constitution, and the power to enact ordinances or by-laws not inconsistent with the Constitution. It generally forbids to cities and towns the regulation of most elections, the levying and collection of taxes, borrowing, disposition of park land, enactment of private or civil law, the provision of punishment for a felony or imposition of imprisonment.

This strong "home rule" amendment was passed in 1966, and its meaning and impact on water resource management and development is not clear at this time.

3. Financing

The financial responsibility for the construction and maintenance and operation of water pollution control facilities rests with the person, municipality, sewer district, or industrial establishment discharging the waste water. The producer of the waste water must be prepared to bear the cost of pollution abatement. The State under the Massachusetts Clean Waters Act is authorized to make grants to municipalities and sewer districts to match federal grants for sewage treatment facilities on any case, the State may make grants to municipalities and sewer districts so that the cost to the municipality or district shall not exceed forty percent. The state grant program is administered by the Division of Water Pollution Control. The federal grant program is administered by the Federal Water Pollution Control administration.

In the case of flood control projects constructed under cooperative agreements between the U. S. Department of Agriculture (P. L. 566) and the Massachusetts Water Resources Commission, local sponsors (towns, conservation districts, etc.) are authorized by statute to obtain land and easements needed for works of improvement. In order to facilitate the program, the Division of Water Resources has, in most instances, however, purchased needed sites, using bond issue fund provided by special acts of the legislature. Other agencies which may contribute funds to provide multi-purpose benefits in such projects include the Massachusetts Division of Forests and Parks, the Massachusetts Division of Fisheries and Game and municipalities for water supply purposes.

4. Cooperation, Coordination and Cost Sharing

a. Federal Programs: The enabling legislation creating the Water Resources Commission and the Division of Water Resources in 1956, placed heavy emphasis on the role of this agency in coordinating all the state and federal programs which have an impact on Water Resources. The Commission remains the state's primary contact with the Corps of Engineers and U. S. Soil Conservation Service during all stages of the planning, development and operation of their various

water management programs. The views of appropriate state and local agencies are solicited by the Division of Water Resources to evaluate the effect of proposed flood control projects, and to establish whether multi-purpose reservoirs through cost sharing might be planned. In most P. L. 566 projects, and in some Corps of Engineer projects, site acquisition is made by the state agency using state funds. The Water Resources Commission, through the Division of Water Resources, reviews design plans and is, as previously stated, the contracting officer for the structures involved in the small watershed protection program.

Other areas of state-federal cooperation involve the mutual funding of groundwater favorability studies by the Division of Water Resources and the U. S. Geological Survey; the contribution of funds to the Geological Survey to partially defray the operating costs of certain stream gaging stations; and the provision of state rainfall data to the U. S. Weather Bureau. In the area of planning, the Division of Water Resources cooperates with the Water Resources Council and receives grants for planning purposes under Title III of the Water Resources Planning Act, P. L. 89-80. The Water Resources Commission provides funds to match (in part) federal grants available to the Water Resources Research Center at the University of Massachusetts.

The Water Resources Commission, through the Division of Water Pollution Control works cooperatively with the Federal Water Pollution Control Administration in the Department of the Interior to abate water pollution under the pertinent State and Federal statutes. The state agency administers federal grants-in-aid to communities for the planning and construction of waste water treatment facilities, and further provides state grants-in-aid. Communities can receive up to 80 percent of the cost of approved treatment facilities by obtaining combined state-federal grants.

The Massachusetts Division of Fisheries and Game works cooperatively with the U. S. Bureau of Sports Fisheries and Wildlife in the Department of the Interior, and administers cost-shared projects under the Dingell-Johnson and Pitman-Robertson programs. This agency in turn cost-shares research projects with the Fisheries and Wildlife cooperative units at the University of Massachusetts.

The Massachusetts Department of Public Health cooperates with the U. S. Public Health Service in a program of water supply protection and the suppression of water-bourne diseases.

b. Interstate. The Commonwealth by statute is pledged to a program of interstate cooperation. By virtue of special acts of the legislature, Massachusetts, through the Water Resources Commission, is represented on interstate river valley flood control commissions for the Thames, Connecticut and Merrimack Rivers.

The New England Interstate Water Pollution Control Commission was an active organization before the passage of strong federal pollution abatement legislation. This organization, which includes the New England states and New York, continues its cooperative program.

Interstate cooperation in studying water resource problems will undoubtedly grow as the New England River Basins Commission develops its planning program as authorized by the Water Resources Planning Act. Other studies with Federal impetus that have fostered interstate cooperation include the Northeast Water Supply (NEWS), the North Atlantic Regional Water Resources Study (NAR), and the New England-New York Inter-Agency Committee (NENYIAC).

c. Political Sub-divisions. The Division of Conservation Services of the Department of Natural Resources administers an active self-help program with town and city conservation commissions. The Commissioner of Natural Resources may reimburse cities and towns for up to fifty per cent of the costs incurred in acquiring, maintaining, improving, protecting, conserving or properly utilizing open spaces and other land and water areas.

As stated previously, the Division of Water Pollution Control administers both federal and state grants to cities and towns to provide sewage treatment plants.

The Division of Water Resources has been authorized to contract for the construction of P. L. 566 projects sponsored by a city or town.

Other state agencies having cooperative programs with cities and towns include the Division of Waterways in local flood control works of improvement, and the State Reclamation Board in drainage projects.

d. Multi-purpose Operations. The Statute prescribing the duties of the Water Resources Commission is a virtual mandate

to consider multiple use of water resources. Chapter 21, Section 9 of the General Laws states that the Commission shall "make recommendations for legislation designed to provide the Commonwealth with a basic water policy based upon the common and interdependent interests of agriculture, industry, recreation, wildlife, conservation, domestic consumption and flood prevention."

The legislation further requires the Commission to be the coordinating agency between all departments in carrying out water conservation and flood control programs. With this legislative background, the Commission has viewed water resource developments as potential opportunities for multiple use operation. The Commission has promoted P. L. 566 flood control projects with secondary use or uses for fish and wildlife management, supplemental flow, recreation, and water supply. All Corps of Engineers projects are reviewed by the Water Resources Commission and recommendations for multiple use development are solicited from appropriate agencies. Corps flood control projects in Massachusetts have been placed under use licenses to several agencies including the Division of Fisheries and Game, the Division of Forests and Parks and municipal water supply departments.

5. Use (or non-use) of existing authority

Existing authorities are utilized by state agencies in Massachusetts to the extent that funds and staff are provided by legislative appropriation. In many instances, authority, powers and duties are outlined by legislation several years before adequate funds or personnel are provided.

The Water Resources Commission was authorized in 1967 to take land and construct storage sites for low flow augmentation. The flood abatement program has understandably not yet advanced to the point where this phase of the program can be implemented.

6. Changes

a. Recently adopted changes. Most of the important legislation relating to water resource management is of very recent origin (see State Law Statutes).

b. Recommended but not adopted. The legislation submitted in the 1968 legislative session which would have provided a ten-year bond issue to be used to fund a comprehensive water resource planning program was defeated. The planning program will continue to be a major goal of the Water Resources Commission, but an alternative method of financing will be sought.

c. Under Study. The administration of private dams will be studied by a commission set up by the legislature. It is possible that legislation may be proposed to authorize changes in the present county supervision of private dams.

d. Completed Study. A HUD-financed study of the organization of state government has recommended sweeping changes in the structure and functions of state agencies. The report recommends that the 173 existing units who now report directly to the governor should be reorganized into eleven state cabinet-level offices.

The study was embodied in legislation which was passed in the 1969 legislative session. The report's recommendations will be placed in effect on April 30, 1971. (See Administrative Structure).

D. PROGRAMS

1. Research

Many state agencies conduct research concerned with water and related land resources. Continuing programs of research are conducted by staff personnel in the Division of Marine Fisheries and the Division of Fisheries and Game. The Division of Water Resources and the Division of Water Pollution Control conduct research, for the most part, by contracting for the services of private consultants.

The Fisheries and Wildlife Cooperative Units at the University of Massachusetts conduct water related research and often receive financial support from the Division of Fisheries and Game and the Division of Marine Fisheries, while the University Water Resources Research Center receives grants from the Division of Water Resources and the Division of Water Pollution Control. The latter agency was granted ten million dollars under the Massachusetts Clean Waters Act to "conduct a program of study and research and demonstration, by itself or in cooperation with other governmental agencies" to find improved methods of water quality control. At present, research funding dealing with other phases of water resource management is available in relatively small amounts.

The Department of Public Health has conducted problem-oriented research with the use of consultants, with industry sponsorship, but has no program of continuing research.

2. Data Collection and Interpretation

The Division of Water Resources collects and interprets data from the 116 rainfall stations which it operates. As part of its program of well driller registration, it maintains logs of all wells installed. In addition, the Division works cooperatively with the U. S. Geological Survey in maintaining a network of 27 stream gaging stations, in obtaining data from observation wells, and in conducting groundwater favorability studies. The Department of Public Works maintains 25 stream gaging stations, while the Metropolitan District Commission operates 16. The Division of Water Resources gathers data on flood levels in relation to the implementation of flood plain protection laws with the cooperation of the Corps of Engineers. In specific water use problem areas it maintains records of water levels and consumption rates.

The Division also receives and stores stream runoff data from the U. S. Weather Bureau, snow survey and flood profile reports from the Corps of Engineers, and selective low flow measurements and aerial photographs of flood conditions from the U. S. Geological Survey. The Division acts as a central repository of hydrological data for its own use and for the convenience of other agencies and the public.

The Department of Public Health conducts a program of routine water purity sampling covering over 300 domestic water supply systems, and collects data relative to shellfish purity and swimming water standards. The Metropolitan District Commission collects water quality data on its large reservoir and watershed holdings.

The Division of Water Pollution Control has collected the water quality data necessary to establish stream classification standards throughout the Commonwealth. Although problem oriented data collection is continuing, regular collection of data from prescribed stations was limited at the time of this writing (1968) to six automatic monitoring stations recording pH, DO, temperature and conductivity. The Division also compiles monthly reports from sewage treatment plant operators.

The Division of Marine Fisheries collects and interprets data on commercial and sports fisheries derived from license and permit records, catch statistics and specific estuarine studies. Biological information collected includes data on DO, pH, Salinity, and CO_2. Population statistics and age and growth studies are used as a basis for harvest regulations on certain inshore species.

The Division of Fisheries and Game collects and interprets data needed to preserve and enhance inland sports fisheries and game. Limnological characteristics of ponds and streams, population estimates,

and age and growth data are collected to provide the basis for the management of fresh water fisheries. Creel census surveys provide catch data and fishing pressure information. Participation levels can also be inferred from license and permit records maintained by the Division. Biological data concerning game birds and mammals are gathered to wisely regulate harvest rates.

The Division of Forests and Parks collects data relative to the present use and future demand for outdoor recreation, timber stand inventory and forest product utilization. The Division also maintains 13 weather stations which provide data to compute the forest fire index. Records on the size and frequency of occurrence of forest fires are also maintained by this Division.

The newly established Division of Mineral Resources administers laws, rules, and regulations regarding the mineral resources of the Commonwealth, but the collection and interpretation of geoscience data is the responsibility of the State Geologist, a new position in the Department of Public Works.

a. Inventory

Inventory studies relating to water quality are, from varied standpoints, conducted by the Division of Water Pollution Control, the Department of Public Health, the Division of Fisheries and Game and the Division of Marine Fisheries.

Water resource inventories aimed at identifying quantitative resource potentials regarding surface supplies, ground water availability and multi-purpose impoundment sites are conducted by the Division of Water Resources. A central data bank of all water-oriented inventory information will be set up in this agency.

A program which provides technical assistance to towns, features the use of a "Natural Resource Team" approach. Representatives of the many state and federal and county agencies in the resource field, at the request of a city or town, prepare a Town Natural Resource Inventory.

3. Planning

The 1956 legislation creating the Water Resources Commission was a mandate to provide a comprehensive water policy which would include "the common and interdependent interests of agriculture, industry,

recreation, wildlife, conservation, domestic consumption and flood prevention" (GL. c 21, s. 9). The Governor of the Commonwealth on September 15, 1966, designated the Water Resources Commission as the Massachusetts State Agency to administer the program authorized by Title III of the Water Resources Planning Act of 1965.

Until recently, the Division of Water Resources has been engaged in many problem-oriented studies and research projects. Cooperative studies with federal agencies have produced a vast amount of data; however, a definite program to fill the gaps in available data, to correlate it and evolve a comprehensive long range water resources plan for the state has just begun.

Comprehensive (Type IV) river basin studies are currently in progress in cooperation with the U. S. Soil Conservation Service. Other comprehensive state-federal studies are under way or planned for the Connecticut River Basin, the Southeast New England Coastal drainage and the Charles River Basin.

Small watershed work plans (PL 566) have been completed on 10 watersheds, and are being formulated on 4 others. Applications on 3 additional watersheds have been approved by the Water Resources Commission and 2 are pending approval. The completed plans call for the construction of 47 dams of which 29 are multi-purpose structures incorporating flood control uses with fish and wildlife enhancement, recreation, low flow augmentation, or water supply. Single purpose flood control structures are currently planned for 18 sites. Other land treatment and structural measures are planned in this program which involves the Soil Conservation Service, the Division of Water Resources, local sponsors and other cooperating state agencies.

Such sub-basin work plans have, with increasing emphasis, featured a multi-use approach to watershed planning and will be incorporated into more comprehensive plans for the state and New England region.

Additions to the current staff of the Division of Water Resources will be needed to implement the statewide water resource planning program recommended by a recent study. A pilot program is developing a water management plan for the Ipswich River watershed. This 155 square mile drainage embodies the full range of management problems which water resource engineers and planners are likely to face in the Commonwealth. By demonstrating the efficiency of comprehensive planning on this watershed, the Commonwealth will have a model for the establishment of a statewide water management program.

The Division of Water Resources will provide overall guidance in water resource planning, incorporating the needs of other agencies and political subdivisions in the more comprehensive state plan. Many state agencies and regional planning groups have established their water needs, but broad-based long range planning at the state level is essential if efficient watershed management is to become a reality.

4. Construction and Development

a. Flood Control

The Division of Waterways of the Department of Public Works is authorized under Chapter 91 of the General Laws to construct works of improvement for flood control purposes. Projects constructed by this agency usually involve channel improvements, bank stabilization, stream clearance and, in some cases, the repair of flood damaged dams. This agency handles approximately 20 projects a year, the number depending on requests and budgetary appropriations. This program is local in scope, usually requiring fifty percent funding by the local community requesting the project.

Chapter 21, Sections 8-16 of the General Laws established the Water Resources Commission and designated it as the agency of the Commonwealth having supervisory responsibility over programs provided for by the Federal Watershed Protection and Flood Prevention Act. Since 1961, the Commission has contracted for the construction of 18 works of improvement on the sites it has purchased. The U. S. Soil Conservation Service has primary responsibilities in the design of structures and in the provision of resident engineering services during construction. Project plan review, contract administration and project maintenance are responsibilities of the Water Resources Commission.

The Commission is the state agency designated to review U. S. Army Corps of Engineers flood control project plans. In some instances the Commission has signed project assurances, and in other cases, municipalities have done so. The Water Resources Commission makes recommendations regarding the licensing of Corps of Engineers flood control reservoir storage basin areas to appropriate state agencies.

b. Water Supply

The development of water supply reservoirs, well fields, and water systems is generally considered to be a responsibility of local

municipalities, or private companies serving municipalities or particular areas. Development of a major water supply system for the Greater Boston Metropolitan area was made possible by enabling legislation passed in 1895, (Chapter 92, section 10). This legislation, and later amendments, authorized the Metropolitan District Commission to acquire and develop over 100,000 acres of water and watershed lands, including Wachusett and Quabbin Reservoirs and the Ware River diversion. Over 30 percent of the population is served by this system.

Maintaining water quality standards for domestic water supplies is the responsibility of the Massachusetts Department of Public Health as specified by Chapter 111 of the General Laws. Water supplies for public use must be approved by this agency.

At the present time, no agency is empowered to allocate water supplies, however, in specific instances the Water Resources Commission has been requested to provide assistance in cases where water supply sources were shared or were in dispute. The Division of Water Resources gathers and makes data available as to the potential availability of water supplies, however.

In the administration of the Watershed Protection and Flood Prevention Program (PL 566), the Water Resources Commission has approved the construction of multi-purpose dams incorporating municipal water supply and flood control provisions. While the state acts as the contracting agency in the construction of such reservoirs, the town must agree to pay for that portion of the structure needed to provide the additional water supply storage and facilities.

c. Water quality control

The Division of Water Pollution Control, under the Water Resources Commission, is charged with the maintenance of water quality standards. All plans for the construction of waste treatment facilities discharging to surface waters must be approved by this agency. The state and federal grant programs for the construction of municipal sewage treatment plant facilities are also administered by the Division of Water Pollution Control.

Construction of industrial treatment facilities is a private responsibility, although joint municipal-industrial plants have been approved where wastes are compatible and cost-sharing arrangements could be satisfactorily arranged.

d. Navigation

Works of improvement to benefit navigation may be constructed by the Division of Waterways of the Department of Public Works and, within the Port of Boston, by the Massachusetts Port Authority.

(1) Commercial

Navigational improvements at the state level to facilitate the use and development of the Port of Boston is the prerogative of the Massachusetts Port Authority, as established by the Acts of 1956. (see paragraph Alb (2) supra).

(2) Recreational

The Division of Waterways on a cost-sharing basis with coastal communities establishes marinas and makes channel improvements for recreational boating under the authority of Chapter 91. It also operates several state piers used both commercially and for recreational boating. The Division of Waterways may excavate and dredge mooring basins for yachts and small craft, dredge channels, construct shore protection and remove hulks and wrecks within the Port of Boston providing that said acts are not in conflict with the development plans of the Massachusetts Port Authority.

e. Hydro-Power

The development of Hydroelectric power facilities in Massachusetts is primarily a function of private utility companies serving the consumer. Some industrial firms generate power for inplant use from company-owned dams. The Metropolitan District Commission operates 3 stations in conjunction with their water supply system, selling its output to private utility companies for transmission to consumers. One city operates four plants for its own municipal light and power system.

The breakdown of hydroelectric power production in Massachusetts is as follows:

Private utility companies own or lease 25 hydroelectric stations which generate	182,566 Kilowatts
The Metropolitan District Commission owns four stations which produce	9,060 Kilowatts
The City of Holyoke owns four stations which produce	2,906 Kilowatts

47 industrial firms generate and use	43,690 Kilowatts
Total Hydroelectric power production from 80 stations in Massachusetts	238,141 Kilowatts

A pumped storage project being constructed on the Connecticut River in Northfield will produce 1,000,000 Kilowatts by 1972, and a planned project on the Deerfield River, Bear Swamp, will produce 500,000 Kilowatts upon its installation.

f. General Recreation

The Division of Forests and Parks operates 45 outdoor recreation facilities which hosted 2,028,906 visitors in 1968. Construction of major facilities, such as dams, bathhouses, beaches, paved areas, and comfort stations is done on contract with private firms. Division employees often construct trails and facilities appurtenant to the 1980 campsites operated in these areas. Three forestry camps operated in cooperation with the Department of Natural Resources and the Department of Corrections are used in forestry-related recreation development of state forest holdings.

During the past ten years, the Division of Forests and Parks has developed ten new state park facilities, and five more are in the active planning stage (acquisition completed). In addition, three outdoor recreational areas constructed by the Corps of Engineers in connection with flood control reservoirs have been turned over to the Division. Four ocean beach facilities formerly under the jurisdiction of the Department of Public Works have been assigned to this division, as have three indoor skating rinks. Two additional indoor rinks and 7 planned indoor pools will be constructed by the Department of Public Works, but operated by the Division of Forests and Parks.

Additional development of general recreation facilities has been assured by the passage of legislation providing for a $15,000,000 bond issue to be largely used for site acquisitions, design and development of state forests and parks. A great emphasis will continue to be placed on providing water-based recreation facilities, but an increasing emphasis will probably be placed on winter recreation.

g. Fish and Wildlife

The Division of Fisheries and Game has constructed facilities required for the propagation of freshwater fish used for restocking purposes. Raceway and pool systems are used to rear trout at five installations. A new facility just completed adjacent to the Swift

River, the Charles I. McLaughlin Hatchery, will be the first fully modern facility operated by the Commonwealth. Other hatcheries in the basin include: Montague, Sunderland, and Palmer.

With an anticipated production of 200,000 pounds, its operation will allow for the closing of some of the less efficient hatcheries which today produce approximately 370,000 pounds in total. Hatcheries in Massachusetts obtain water from surface supplies, gravel-packed wells and springs. In addition, three pond systems with a total surface acreage of 270 acres are maintained for the propagation of warm water species for restocking in managed lakes.

The Division has constructed and/or maintains two impoundments for waterfowl management totalling 163 acres, and two impoundments for warm water fishing with an aggregate area of 127 acres. The emphasis of this agency has been directed toward the provision of access to existing ponds rather than to the construction of new impoundments.

5. Regulation (see also Regulatory Authority)

a. Water use

(1) Surface Water

There is no reference in the General Laws to any authority to regulate water use beyond the references to pollution, drinking and swimming water standards and the right to use certain public water for fishing, fowling, etc. The Riparian doctrine, as embodied in case law governs the right to use surface waters, except where special acts of the legislature have granted use rights to certain users to specific waters. The Department of Public Utilities approves rates set by private water companies.

(2) Ground Water

There are no general laws regulating the use of sub-surface water except those relating to their protection from pollution caused by the sub-surface disposal of sewage. In a specific instance of ground water use conflict, the Water Resources Commission has been designated by the Legislature as the agency to supply technical information as an aid to arbitration.

There is an increasing need for the delegation of the authority to allocate water from the Legislature to a qualified state agency.

b. Water Quality

Regulations governing the discharge of any pollutant to surface waters are made by the Massachusetts Division of Water Pollution Control. The sub-surface disposal of sewage is regulated by the Department of Public Health, the agency which also issues regulations relative to the purity of water supplies and shellfish, swimming area suitability, the application of pesticides, and camping area standards.

c. Construction

All filling of and erection of structures in public waters must be licensed by the Division of Waterways of the Department of Public Works. In addition, any filling of coastal and inland wetlands fall under the provisions of Chapter 131, section 40, and Chapter 130, section 27 A, respectively, of the general laws. Construction necessitating filling in such areas is subject to regulations to protect the public interest from the view points of water supply and flood control. These regulations apply to all private and governmental bodies except for the Reclamation Board, and mosquito control projects in the case of coastal wetlands and land used for agricultural purposes. Regulations and forms relating to Chapter 131, Section 40 are submitted as Exhibit I.

The construction or alteration of certain dams is specifically regulated by the County under provisions of Chapter 253, section 44, of the general laws. Plans for any dam which is to be over ten feet in height, will impound more than one million gallons or where the area draining into the impoundment exceeds one square mile must be submitted to and approved by the County Commissioners. Small dams constructed for irrigation or other purposes, the breaking of which would not involve risks to life or property, are exempt from this section of law. Dams under county supervision are subject to inspection as often as once in two years.

An opinion of the attorney general, dated July 3, 1933, indicates that the state departments operating within their statutory powers and duties, or under the authority of special acts of the legislature, need not submit their construction plans to the County for approval.

A legislative resolve, Chapter 119, acts of 1968, formed a special commission to study the laws and procedures governing dam construction and maintenance.

d. Well Drilling

The Water Resources Commission, under authority of Chapter 21, section 16, is authorized to register any person engaged in the business of digging or drilling wells within the Commonwealth. Within thirty days after completion of any well, the driller must submit a report setting forth such information as the Commission may require under the rules and regulations it may establish. Well drillers forms are included as Exhibit II.

e. Channel encroachments

As discussed under "Construction", the Division of Waterways has jurisdiction over the filling of public waters. The previously cited legislation regulating the filling of coastal and inland wetlands can also prevent channel encroachment.

By special act of the legislature, the Water Resources Commission has been authorized to establish encroachment lines and flood plain zones on several streams in eastern Massachusetts.

f. Use of Flood Plains

The filling of flood plains along inland waters and areas subject to tidal flooding is regulated by the previously cited legislation, Chapter 131, section 40, and Chapter 130, section 27 A.

Two additional pieces of legislation allow the Commissioner of Natural Resources, after a public hearing to issue orders against altering coastal wetlands in order to promote public safety, health and welfare, and to protect public and private property, wildlife and marine fisheries (Chapter 130, section 105 A). Private owners of land placed under such orders may petition the superior court that the order constitutes a taking without compensation. If the court holds this to be true, the Commissioner may take the fee or any lesser interest in such land by eminent domain. The actions authorized above may not restrict or impair the lawful powers and duties of the Department of Public Works, the State Reclamation Board or mosquito control projects.

Similar legislation, Chapter 131, section 40 A, was passed to promote public safety, health and welfare, and to protect public and private property, wildlife, fisheries, water resources, flood plain areas and agriculture on inland wetland areas. The Commissioner can issue orders on marshes or swamps bordering on inland waters or that portion of any bank which touches any inland waters, or any marshes or swamps

subject to flooding by freshwater. A similar method of landowner redress to the courts is provided as is the Commissioner's option to take an interest in fee. Flood plains may be zoned under Section 2 of Chapter 40A.

6. Drainage

Section 27 A of Chapter 130, and section 40 of Chapter 131 state that no person shall remove, fill or dredge any bank, flat, marsh, meadow or swamp bordering on any coastal or inland waters without filing notice and complying with the prescribed regulatory procedures. To the extent that drainage usually involves the removal or dredging of such areas, drainage is regulated by these General Laws. The implementation of this legislation is administered by the Division of Conservation Services of the Department of Natural Resources. These sections of law do not apply to mosquito control work authorized under Chapter 40 of the General Laws, and do not control the activities of the State Reclamation Board. In addition, inland areas used for agriculture may be improved for these purposes without compliance with Chapter 131.

The improvement of lowlands through drainage is specifically covered by Chapter 252 of the General Laws, which deals with the flowage or drainage of lowlands, the removal of stream obstructions affecting lowlands and the eradication of mosquitoes. It sets up the State Reclamation Board, authorizes the formation of reclamation districts and the methods of financing projects.

7. Irrigation

The Commonwealth does not sponsor or specifically regulate irrigation projects. Private enterprise, operating within the riparian doctrine, and the General Laws covering mills, dams and reservoirs (Chapter 253), provides storage and transmission facilities needed for irrigation. The U. S. Soil Conservation Service State Office estimates that 48,254 acres receive sprinkler irrigation and 770 acres are irrigated by gravity flow. Major users of irrigation are market gardens and tobacco and cranberry growers. The use of irrigation by golf courses and ski-areas (snow-making) is expected to increase substantially.

8. Control of erosion and sedimentation

The preamble to the act establishing the Water Resources Commission lists the prevention of erosion and sedimentation as primary purposes for the agency's creation. The Water Resources Commission through its Division of Water Resources has supervisory responsibility

over programs provided for by the Watershed Protection and Flood Prevention Act (Public Law 566). Through the supervision of these programs, the Division of Water Resources has become involved in promoting land treatment and structural measures to control erosion and sedimentation. The Division of Waterways is involved in the control of beach erosion through the installation of rip rap materials, bulkheads, jetties and groins. The Division of Marine Fisheries, by way of its involvement with the coastal wetlands act, reviews the installation of such control measures. The Division of Waterways alters the effects of sedimentation through its stream clearance and channel dredging projects.

Erosion and sedimentation problems are not widespread in Massachusetts. Approximately 70 percent of the state has a forest cover, and erosion tends to occur only in those few local areas subject to poor farming practices, highway or similar construction or in coastal areas subject to wind and wave action

9. Reservoir sites (see also PROGRAMS section, Planning, Construction and Development)

a. Acquisition

The Division of Water Resources has purchased fifteen (15) reservoir sites needed in the Public Law 566 program during the past seven years. The Division is also in the process of identifying all potential reservoir sites in the Commonwealth as a part of a cooperative program with the U. S. Soil Conservation Service. This Type IV comprehensive study will identify all sites capable of impounding ten or more surface acres of water with watersheds exceeding one-half square mile.

The Metropolitan District Commission has purchased and developed three basic reservoir systems, the Sudbury, Wachusett, and Quabbin systems. The latter two are still fully used as water supplies, while the former system has been largely converted to water-based recreation use. Virtually every city and large town outside the M. D. C. system has developed reservoir sites or acquired natural ponds.

In addition, many sites were pre-empted for industrial use during the nineteenth century. Many of these reservoirs are no longer used by industry and have fallen into disrepair, or have been converted to recreational use.

No state agency has independently developed a major program of reservoir site purchase and construction for recreational purposes.

Multiple use reservoirs in connection with federal flood control projects have been developed, but few wholly state-funded single purpose recreation lakes have been constructed in the last decade.

Private enterprise has, however, purchased sites and constructed several lakes in order to provide sub-divisions for vacation homes. Many small reservoir sites have been and will be purchased and developed for day-use recreation and for irrigation purposes. At least two pumped storage reservoirs for power generation will be constructed by private power companies.

While no specific programs for setting aside potential reservoir sites has as yet been implemented, the water development possibilities of land tracts are considered when land is purchased by the Divisions of Fisheries and Game and Forests and Parks.

E. PROJECTIONS

1. Policy and program trends

Needless to say, policies and programs can be implemented only to the extent that enabling legislation and funding is provided. The Division of Water Resources does, however, believe that water resource needs will require that the following trends will inevitably continue or develop:

a. The total management of water and related land resources in the State will be placed under the control of one "lead" agency.

b. Water resources management will have as its foundation a well-conceived, comprehensive, interrelated and coordinated planning program, using computerized systems analysis techniques.

c. As water demands outstrip available supplies, legislation modifying the riparian doctrine and providing for the allocation of the available water resources will be enacted.

d. Greater emphasis will be placed on multiple use and re-use of water resources.

e. Institutional structures based on watersheds will operate as functional units, and/or as advisory groups.

f. A program of early acquisition of reservoir sites will be implemented.

2. Financing Future Developments

	Fiscal 1970* Budget Request	Fiscal 1980
Division of Water Resources		
Water Resources Planning	$ 479,899.00	$ 1,250,000.00
Operations -- (PL 566, Flood Control Commissions, etc.)	1,151,306.00	2,000,000.00
Administration	190,412.00	550,000.00
Division of Water Pollution Control		
Operations -- (Construction grants, local aid, L.F.A., etc.)	15,420,000.00	20,000,000.00
Administration (Law Enforcement, surveys, etc.)	848,605.00	1,600,000.00
Research and Development	800,000.00	1,600,000.00
Metropolitan District Commission		
Water (supply) Division	8,560,823.00	16,000,000.00
Public Access Board	500,000.00	500,000.00

*The 1970 figures represent requests which may or may not be granted. They also include pro-rated portions of the bond issue funds which will be available during the year. Bond issues in the following amounts have been granted:

Division of Water Resources For Small Watershed Program (Since 1960)	$14,570,000.00
Division of Water Pollution Control Clean Waters Bond Issue of 1967	$15,000,000.00
Metropolitan District Commission Northfield Mountain Diversion Bond Issue	$25,000,000.00

The 1980 projections are subjective estimates by the staffs of the various agencies.

3. Water Management Problems and Recommended Solutions

a. Water Supply

Legal and institutional changes will be needed before the type of effective watershed management required to satisfy even short range water needs can be achieved. A single state agency should be given the pre-eminent role in water supply planning and implementation. Legal barriers to intra- and inter-state water diversions must be overcome as metropolitan areas will continue to outgrow local sources. Greater public tolerance to the use of waters previously used for recreation or for the disposal of treated wastes will have to be developed in order that major rivers can serve as water supply sources. Important needs will be satisfied if the use of the Connecticut and Merrimack Rivers for water supply purposes can be vastly increased.

Industrial use of water will present an increasing threat of thermal pollution as cooling water demands will grow tremendously. The development of improved heat dissipation systems will be needed if fisheries values are to be maintained. The location of steam electric plants will have to be closely controlled until such time as improved cooling technology is devised.

It is not anticipated that agricultural use of water will greatly increase, as the role of agriculture in the Commonwealth is declining in the face of increased urbanization, although irrigation water for turf maintenance and snow making will increase.

b. Flood Control

Upon the completion of currently authorized comprehensive studies, solutions to many major flood control problems will be identified. Currently authorized projects and several others identified in Type II and Type III studies will deal with major downstream areas. Potential Small Watershed Flood Prevention Projects will be identified by a statewide Type IV water resources study currently in progress.

State-municipal stream clearance projects aimed at specific local damage reduction will continue, but will not be a major consideration in the over-all flood control program of the Commonwealth.

The protection of flood prone inland wetlands will become a major non-structural flood control measure. The passage of legislation setting up procedures for the designation and protection of coastal and inland wetlands will require many years to fully implement, as boundaries will have to be precisely established, owners notified and, in come cases, land damages established.

c. Forestry and Watershed Management

While there is very little likelihood that significant areas in this state will in the future be devoted exclusively to forestry or watershed management, all land should be managed with the knowledge that it has watershed functions. Whether land is important for its relationship to water supply or to flood control, its auxiliary values for wildlife, visual aesthetics, recreation, forestry, and agriculture should be given full recognition in a program based on ecological considerations as well as economics.

As both agriculture and commercial forestry lose out in the economic race for space, it is desirable that there be a method devised to maintain a desirable mix of farm and forest types in our landscape. Whether the most fruitful approach involves accelerated land acquisition by the state and federal governments, by the assumption of zoning powers by the state or by incentive payments to owners has not been ascertained. To a very limited and ineffective degree, a mix of these approaches exists in the Commonwealth today.

d. Hydro-Power

A study completed in 1967 of the power needs of New England concluded that present planned construction will supply power needs through 1972. Included in the construction program will be the completion of the pumped storage hydroelectric facility at Northfield Mountain in Erving. The facility, which will have a generating capability of one million kilowatts, will be installed at an estimated total cost of seventy million dollars. Annual operating and maintenance costs were estimated at $125,000. Water from the Connecticut River will be pumped at night, a mile and one quarter through a thirty-one foot diameter shaft, up to a 300 acre, 5-1/2 billion gallon reservoir which will be created on Northfield Mountain. Reversible pump turbines will generate electricity during peak daytime hours as the water is returned through the shaft to the river.

Subsequent to 1972, future demand for electricity in Massachusetts will be met by the construction of a network of nuclear and pumped storage hydroelectric generating facilities. This will include the construction in 1984 of a 500 megawatt pumped storage unit in Northwest Massachusetts. Planning for this project has resulted in the Bear Swamp proposal on the Deerfield River in the towns of Florida and Rowe. The project, costing an estimated 47 million dollars, will be designed to produce 610 megawatts of electricity. An upper reservoir of 120 acres will be constructed at Bear Swamp and a 150 acre lower reservoir will be formed by the installation of a 130-foot high dam across the Deerfield River.

In addition to the Bear Swamp proposal, a one million kilowatt pumped storage unit is scheduled to be constructed in 1989 in Southwestern Massachusetts. Installation cost is estimated at seventy-five million dollars, and annual operating costs of this facility are estimated at $400,000.

e. Water Quality Control

There are many municipal and industrial secondary wastewater treatment plants to be built. In some cases, nutrient removal facilities are also needed. Serious construction delays may result from the unavailability of authorized federal funds. Additional state funding will also be required.

A research and demonstration program to develop new methods of nutrient removal is vitally needed to prevent the further eutrophication of our inland waters. Methods of handling combined sewer discharges will also have to be found.

The storage of water for flow augmentation will become a common use of impoundments in order to provide the dilution volumes needed by waste treatment plants on those streams subject to low flows. State regulation of dams to prevent withholding of these augmented flows will be required.

f. Recreation

Currently accepted water quality standards when implemented will help satisfy water-based recreational needs. The existing "D" classifications set for the Blackstone and Otter Rivers should, however, be upgraded as soon as technically possible. Public demand also indicates that several streams in the "C" classification do not satisfy the local and regional needs. Sections

of the Ware, Millers and Nashua Rivers are examples of streams in this category.

Expanded use of water supplies for water-based recreation should be studied, because of the extraordinarily low-level of reservoir use presently permitted in the Commonwealth. Current thinking tends to emphasize the negative public health impact of recreational use of water supplies, while ignoring the positive health values which could accrue from increased recreational opportunities. Swimming, boating, and fishing would become acceptable uses of water supplies if complete water treatment facilities were considered as a necessary feature in many surface water supply systems. A method by which the cost of additional treatment could be charged to recreation rather than the water supply agency might hasten the acceptance of this concept.

Boating, fishing, general recreation, and aesthetic values would be enhanced by increased stream flows during the summer months in general, and on weekends in particular. Flow augmentation obtained by providing upstream storage, and regulation of existing power and process water impoundments would provide the sustained flows needed for recreationists. Inclusion of all power dams under Federal Power Commission licenses with provisions for maintenance of specific continuous flows is recommended.

Flow regulation and efficient passage facilities for anadromous fish will be needed on several streams to re-establish or enhance shad, salmon, and herring fisheries. Major fish passage facilities will be needed on the Connecticut, Merrimack, and Charles Rivers. Waterfowl habitat will be preserved by the implementation of the inland wetlands program. A program of habitat improvement via marsh management may be initiated by the Division of Fisheries and Game.

Public access to streams and ponds is needed and will be provided by the Public Access Board on public waters. Acquisition of stream-banks should be greatly expanded over the current program conducted by the Division of Fisheries and Game and the Water Resources Commission. Public rights to private mill reservoirs which are no longer used or adequately maintained should be obtained by an appropriate state agency. Major private reservoir construction should be regulated by a state agency in order to ensure that the public interest is protected, and that watersheds are wisely developed.

Existing water areas will not be sufficient to provide 1980 demands for water-based recreation. Both Corps of Engineers and small watershed projects (P. L. 566) should seldom be developed as single purpose projects. Dry bed flood control reservoirs or reservoirs with single purpose water supply uses will no longer find easy public acceptance in the Commonwealth of Massachusetts.

g. Role of Government

(1) The State

At the present time there are a multitude of agencies participating in water resources management on the state-wide level; the agencies having a major role include the Divisions of Water Resources and Water Pollution Control under the control of the Water Resources Commission; the Divisions of Acquisition and Construction, Conservation Services, Forests and Parks, and Marine Fisheries, under the control of the Department of Natural Resources; the Bureau of Environmental Health Engineering in the Department of Public Health; the Division of Fisheries and Game under the control of the Fish and Game Board; the Division of Waterways in the Department of Public Works; the Department of Commerce and Development; the newly created Department of Community Affairs; the Department of Agriculture; and the Metropolitan District Commission.

Although many of these agencies carry on a limited planning program to guide them in project development, there does not presently exist an organized integrated comprehensive planning and management program for water resources on a state-wide basis.

In order to make the optimum utilization of water and related land resources in Massachusetts the following two facts stand out:

The total management of water and related land resources in the state must be under the control of one "lead" agency. To be effective, water resources management must have as its foundation a well conceived, comprehensive, interrelated and coordinated planning program.

A consulting firm's report recommends that the Water Resources Commission be the agency responsible for formulating

state-wide water resources plans and be responsible for coordinating the activities of all other state agencies in developing these plans. This recommendation is based on the following facts:

1. It is essential that some one agency assume overall responsibility for any comprehensive planning program.

2. The role and duties of the Water Resources Commission (including the Divisions of Water Resources and Water Pollution Control) encompass responsibilities in more areas relating to the total water resources field than any other state agency.

3. Most of the other state agencies which have major roles in water resources management are represented on the Water Resources Commission.

4. The Water Resources Commission has already been designated as the principal state agency in water resources planning.

5. The Water Resources Commission has no role or duties which do not pertain to water resources.

To produce a well coordinated program there must exist a firm structure of planning responsibility. In addition to water resources planning at a state-wide level, there is a need for planning on the Federal, interstate, regional, and local levels to complement and supplement state-wide planning. All agencies having a substantial role in water resources management must be integrated into the planning process by the "lead" agency at the various levels. There are presently in existence at each of these levels, agencies with the enabling powers to carry out comprehensive water resources planning.

The "lead" agencies at the five recognized levels are:

Federal level	Water Resources Council
Interstate level	New England River Basins Commission

State level	Water Resources Commission
Regional level	Metropolitan or Regional Planning Districts
Local level	Municipal Planning and Public Works Department

It is imperative that all comprehensive planning undertaken by the five levels of administration be coordinated with the agencies next in line. The "lead" agencies at the five levels would be responsible for the interaction of all planning efforts at their respective levels in order to integrate planning efforts. For example the New England River Basins Commission should expect the Water Resources Commission to coordinate the planning efforts of regional planning districts with the Water Resources Commission's planning efforts which, in turn, have been coordinated with the New England River Basins Commission's planning efforts.

Some of the areas in which the initial planning efforts of the Water Resources Commission should be directed include:

(1) Develop water resources data bank and staff proficient in operation.

(2) Expand ground water investigations throughout the state to include not only favorability but also quantity estimates and quality evaluation.

(3) Conduct state-wide major surface water impoundment investigations.

(4) Develop "state" policy for the conservation, protection, development and utilization of water resources.

(5) Conduct comprehensive studies of major river basins which have implications affecting more than one planning district and are not adequately covered by other studies. It is recommended that the Commission choose one such basin area and concentrate its efforts. This would enable the Commission to develop a methodology and staff experience which would ultimately benefit other undertakings of this nature.

(2) Metropolitan or Regional Planning Districts

Twelve planning districts have been established to date in Massachusetts in order to apply an area-wide approach to all aspects of planning and development. A great catalyst in the formation of the planning districts is the fact that certain Federal aids to municipalities are contingent upon the municipalities being part of the area-wide comprehensive planning. One of the area-wide planning requirements established by the U. S. Department of Housing and Urban Development (HUD) is that there exists, consistent and coordinated with comprehensive planning, long-range water and sewer planning adequately setting forth the basic framework of the water and sewer systems and a short-range program for a unified or officially coordinated water or sewer system for the urban area.

It can be seen from the above that the planning districts have a major role in the comprehensive water resources planning process. As noted before, it will be necessary to integrate the work done by the planning districts with over-all water resources planning to be done by the State.

(3) State Assistance

There are several instances where the district planning efforts can benefit from input by the state-wide planning effort. These include:

(a) Comprehensive study of watersheds and flood plains which include parts of two or more districts.

(b) Full evaluation of opportunities for joint facilities and solutions between regions.

(c) Integration of those communities, which are not presently included within the jurisdiction of any established district or are not members of their respective district's comprehensive plans.

(d) More extensive ground water investigations which cannot be undertaken within the districts budgets.

(e) Technical expertise to guide the district planning staffs for formulation and maintenance of comprehensive plans.

(f) State-wide approach to alleviating imbalance of resources and needs in different areas of the State.

(4) Work Program Framework

It would also be desirable to have a large degree of consistency in the framework of the planning districts' studies so that this work can be more readily integrated into the state-wide comprehensive water resources planning program.

The following work program is presented as a guide for undertaking metropolitan or regional water and sewer planning in the various districts.

(a) Inventory

Inventory all major water and sewerage systems in the district including data such as type and capacity of sources of water supply, location of water sources, quality of water supply, locations and size of trunk sewers, type, capacity, and degree of sewage treatment, population served by water and sewerage and extent of service areas.

Collect data on water consumption including average and peak rates of demand, and quantities and type of sanitary sewage flow including average and peak flows.

Identify problem areas, such as deficient water supply or pollution problems.

(b) Analysis

Determine logical service areas for the foreseeable future. Estimate extent and capacity of each water and sewerage system needed for the immediate future (year 2020). Identify potential surface and/or ground water sources of water supply including estimate of safe yield of potential resources utilizing to the fullest extent information available from the Water Resources Commission and others. Determine adequacy of existing water systems and sources of water supply to meet estimated future demands.

Consider stream quality standards set by the state, the capacity of natural water courses to receive sewage effluent from treatment plants, the effects of thermal pollution, and low flow augmentation.

(c) Development Program (Planning-Programming-Budgeting)

Identify problems and implications pertaining to water and sewage facilities including their effects on recreation, transportation, conservation, irrigation, fish and wildlife; and industrial, commercial and residential development.

Develop policies and objectives consistent with state-wide policies with respect to water and sewerage elements being considered.

Prepare alternate plans which consider the advantages and disadvantages of regional water and sewerage systems. Consider inter-connections between systems that would be to the mutual advantage of two or more communities. Place emphasis in the potential of multi-purpose project development.

Make benefit-cost comparisons of alternate plans.

Formulate plans including immediate and long-range projects to be undertaken to implement the recommended water and sewerage plans.

Prepare a short-range program including the staging and budgeting of recommended water and sewerage projects. This program should cover a time period of between six and ten years. A more generalized long-range program should be developed, setting priorities for recommended projects beyond the short-range program.

If the plans formulated by the planning districts do not substantially follow the scope set forth above, it may become necessary for the Water Resources Commission to "fill in voids" prior to utilizing the districts' plans for formulating a state-wide plan.

(5) Personnel Recruitment

A management problem which encompasses all areas of water resources management involves the inability of this state agency to establish and fill the staff positions required to adequately plan and manage the state's Water Resources. The Division of Water Resources has found it difficult to provide inputs to important studies of Federal agencies and to pursue simultaneously its own legitimate planning program. Increased staffing and in-service training are badly needed to enable this agency to perform its basic responsibilities. Increased budget allocations and participation in training programs at the Water Resources Research Center at the University of Massachusetts will help solve this problem.

(6) The Municipality

The role of individual municipalities is to plan, design and construct water and sewage facilities as necessary to serve their residents. Up to the present time municipalities have normally planned their systems as solutions to single purpose needs. This very often does not result in the most beneficial and efficient utilization of available resources. In addition, many advantageous opportunities are available to the municipalities outside their boundaries. Larger reservoirs can not only serve several communities, but usually have greater multiple use potential.

Because of the requirements that in order to receive Federal grants, municipal water and sewer facilities must be consistent with area wide plans and programs, the trend is for individual municipalities approaching their water and sewer planning on a broader basis, giving consideration to regional facilities and multi-purpose uses.

Plans formulated by municipalities are subject to review by their respective planning district in order to qualify for Federal aid.

APPENDIX

A. WATERSHED DESCRIPTION

1. CENTRAL CONNECTICUT WATERSHED

a. Description of Basin

The Central Connecticut Watershed is made up of the several smaller watersheds draining directly into the main stem. The 740 square mile area includes, among others, the basins of the Falls, Sawmill Fort, Mill (4) Manhan and Scantic Rivers. The broad central river valley is bordered by uplands with moderate to steep topography.

The flat valley contains highly valuable agricultural lands where tobacco, potatoes, asparagus, onions and other crops make significant contributions to the economy of the region. The population of close to 600 per square mile, largely concentrated in the lower third of the valley, is the highest in CRB-V. There is also a concentration of educational institutions in the lower valley, including the University of Massachusetts, Amherst, Smith, Mt. Holyoke, Springfield, Westfield State and Western New England colleges.

The river is used for hydro-electric power generation, industrial purposes, sport fishing and recreational boating. While a successful shad run is maintained by the passage of spawning shad above the Holyoke Dam by an elevator installation operated by the Holyoke Water Power Company, no passage facilities exist at the dam at Turners Falls. The relatively high percentage of open land in the valley accounts for the low harvest of deer and beaver (lowest in CRB V). Hunting for farm game species along the river main stem is excellent, however, in lightly populated farming communities.

b. Problems and Needs

There is a growing awareness of the importance of the Connecticut River as a recreational as well as utilitarian resource. A major improvement in water quality with provisions for coping with future pollution problems should be a primary concern of the basin's citizens. Not only will higher levels of sewage treatment be required, but provisions for flow maintenance during critical periods must be provided. Anadromous fish restoration and general recreation depend on this upgrading of the main stem. The concept of the diversion of peak flows to areas of greatest need must be recognized as a legitimate and essential part of the management of the Connecticut River.

The maintenance of an attractive landscape which includes a mix of farm and forest land as well as areas of urban and suburban development is a need which prompt State and Federal action can help achieve. The National Recreation Area proposed for the Connecticut Valley is a feasible approach to meeting this need, and will help meet the enormous recreational demand exerted on CRB V.

While only one Corps of Engineers damsite falls within this central corridor, Corps and SCS structural measures located on tributaries and in the upstream States will have major impact on flooding and flow maintenance on the main stem. Navigational improvements on the Connecticut River conducted with a view to the preservation of fisheries values are also favored.

Corps site 290A on the Falls River does fall within this subbasin. This potential recreation impoundment has been deferred to the 2020 category because of the need to evaluate the effect of the discharge of the Bernardston municipal sewage treatment plant immediately upstream. SCS sites which have been favorably considered for inclusion in the 1980 category include: NHMI - sites 1, 3, and 4; M8 - site 2; and M9 sites 2, 3, 4, and 7 as possible PL 566 projects. In the deferred category (2020), we favor M5B - sites 1 and 4, M7 - sites 1 and 3 and MC 3 - site 3.

This Division favors the implementation of an anadromous fisheries restoration program including provisions for augmented and continuous flows, prevention of critical levels of thermal pollution and the construction of fish passage facilities at the Holyoke and Turners Falls Dams. Improvements to navigation for recreational boating below Holyoke Dam are favored, as are later improvements above this reach. It is assumed that channel improvement will be accomplished in a manner which will minimize deleterious effects on fisheries and aesthetic values.

It should be emphasized that the valley communities themselves have the greatest opportunity to determine the use of the river's flood plain. The enormous flood storage potential of low-lying areas should, as outlined in this study, be placed under local flood plain zoning bylaws as authorized under Chapter 40A, Section 2 of the Mass. General Laws.

2. WESTFIELD RIVER WATERSHED

a. Description of the Basin

This 525 square mile watershed lies almost entirely in Massachusetts. The main river rises in the Town of Savoy and is joined in the Town of Huntington by the "Middle" and "West" branches. Approximately 60 percent of the entire river's drainage area lies above the confluence of the three streams. Much of the watershed is relatively mountainous, with narrow valleys, steep hillsides and thin soil cover - factors contributing to rapid run-off, flooding and wide fluctuations in stream flow. Even though 80 percent of the watershed's land area is forested, and the percentage is increasing, the number employed locally in forest industries is decreasing due to mechanization and centralization of processing facilities.

The population of approximately 190 persons per square mile is below the CRB V average, and the bulk of this population is clustered in four downstream communities. The population density in the remaining 18 towns is very low. There has been a steady decline in the agricultural economy in most of the small upper valley communities during the last half century, accompanied until recently by a corresponding decline in population. This economy is presently being replaced in small part by a recreation economy, principally in areas where there are opportunities for water-related activities. Fishing, hunting, picnicking, hiking, sight-seeing and seasonal living are important activities in the Westfield watershed. The harvest of deer and beaver is average for CRB V (using peak year data). As downstream areas make greater use of this watershed for domestic water supply purposes, this recreation-oriented economy will, under present health rules and regulations, be increasingly restricted.

The Westfield River Watershed Association, a non-profit privately supported agency whose objectives are to promote the conservation of the Valley's natural resources, was formed the year following the creation of the Connecticut River Watershed Council. The Association "aims to promote the restoration and conservation of the natural resources of the watershed; to protect and conserve fish and wildlife, forests and other plant life, water sources and soils; to promote and encourage an understanding among the citizens of the watershed of the need for such construction; and to help promote through coordination and integration those activities of other agencies, industries and organizations having an interest in the resources of the watershed...". Much of the material here summarized was provided by the Westfield River Watershed Association.

b. Major Needs and Problems of the Area

Serious floods have occurred in 1927, 1936, 1938, 1948, and 1955. Existing Corps of Engineers reservoirs and projects planned by the Soil Conservation Service (P. L. 566) on the West Branch will have to be supplemented with additional structural and non-structural measures. There is strong local support for the creation of multiple use flood control works and equally strong opposition to the creation of large water supply impoundments which preclude water contact sports. A resolution of this use conflict ranks as one of the major problems in this basin.

The Westfield River Watershed Association favors the creation of new recreational impoundments which incorporate, where feasible, bathing, boating, fishing, camping, and low-flow augmentation. The watershed is not well endowed with natural water bodies and the largest non-Federal water development, Cobble Mountain Reservoir (and its Little River Watershed holdings) is closed to recreational use. The construction of multi-purpose reservoirs in the Westfield drainage should receive high priority. The acquisition of stream frontage for fishing should be greatly accelerated before major opportunities are lost to private development, especially since pollution abatement will make many reaches infinitely more desirable. Expanded recreational use of current water supply holdings consistent with proper health safeguards should be considered.

Elements of the basin plan which we feel should be considered for early implementation(1980) include: modification of #-322 (Knightville Dam) to include a permanent pool incorporating recreation and flow augmentation, eleven SCS sites included in the P. L. 566 West Branch of the Westfield preliminary work plan, M10 A-sites 3 and 8, M14A - sites 1, 2, 3, 4, 5, 6, 7, and 9, and M14B2 - site 1 is recommended for inclusion in the 2020 category.

Due to recent development along the Little River, it is not possible to construct a flood control storage reservoir which would alleviate this problem; therefore, a system of local protection, including dikes, flood walls and associated works is recommended.

All three branches in the main stem of the Westfield should be placed in the recreation category with the reach from the confluence of the Swift River to West Chesterfield designated as a wild river.

3. DEERFIELD RIVER WATERSHED

a. Description of the Basin

Approximately 350 square miles of this 665 square mile watershed lie in Massachusetts. The Deerfield River's steep narrow valley has given rise to its use for hydro-electric power generation. The Green and North Rivers are its major tributaries, having 89 and 92 square mile watersheds, respectively. The basin is almost devoid of natural lakes, and large river meadow areas occur only in the lowest reaches. Most of the watershed is heavily wooded with substantial agricultural activity limited to its eastern fringes.

The population of about 80 persons per square mile is the second lowest in CRB V and over half of this population is centered in the Town of Greenfield. Hunting, fishing and camping are important activities in this watershed. The deer harvest of seven per square mile was the highest in CRB V (probably because of its long common boundary with Vermont), and the beaver take was below the basin average (using peak year data). The development of additional impoundment sites which provide recreational opportunities will supplement the forest-recreation economy in this largely rural region.

b. Major Needs and Problems of the Area

The hydro-electric power development at the Deerfield river has brought with it drastic interruptions to normal stream flows. Periods of low flow and high temperatures have adversely affected fishing for cold water species. If the Bear Swamp Pumped Storage Project is implemented as planned, flow augmentation will be provided. Flow augmentation is also desirable in the North River. If the Greenfield sewage treatment plant is located on the Green River, instead of on the Connecticut main stem, flow augmentation may be required on the Green River.

The promotion of tourism along the "Mohawk Trail" is extremely important to the economy of this basin. The development of recreational lakes and the preservation of stream-side areas and scenic vista should receive a high priority in this basin. Pollution abatement, acquisition of public fishing areas, and the provision of increased continuous flows will help to restore the Deerfield to its former prominence as a major fishing water.

Elements of the plan which will enhance these purposes are highly favored by the Division of Water Resources, and include Corps site C-296, and the following SCS sites: M4B - sites 1 and 2 on the Cold River, VTM4E2 - site 1 on the North River and M4F - sites 1, 3 and 5. A Corps of Engineers single purpose flood control structure, C-300, should be constructed in a manner which will preclude interference with fish passage (when not operating), which will create the least damage to the scenic nature of the undeveloped reach of the Deerfield River involved, and which will provide for recreational development of the reservoir basin area to be taken.

The Division recommends the inclusion of non-structural measures which will enhance the environmental quality of this basin, including recreational designation for many reaches of the Deerfield, North, South and Green Rivers.

4. FARMINGTON RIVER WATERSHED

a. Description of the Basin

One hundred square miles of the 602 square mile watershed of the Farmington River lies in five towns in the Commonwealth of Massachusetts. Both the east and west branches of the Farmington River arise in Massachusetts. Steep slopes and rapid run-off typify the basin. The watershed is heavily forested and lightly populated, the lightest in CRB V (about 30 persons per square mile).

Otis Reservoir is the major non-Federal water development within the basin. The water rights to this private impoundment were purchased by the Department of Natural Resources and a major recreational development has been established on adjacent land. The Buck, Clam and east and west branches of the Farmington are important trout-fishing waters in Massachusetts, and form the headwaters of Hartford's water supply. They should be placed in the recreation river category.

The Farmington River Watershed Association, Inc., is a private group with members in both Massachusetts and Connecticut. Formed in 1953 to promote the wise use of valley resources, the group seeks to foster the preservation of open spaces, wetlands, and forest cover; to encourage long-range water and land-use planning; to obtain construction of domestic and industrial sewage treatment plants; to obtain water quality in streams, lakes and reservoirs suitable for all forms of recreation, to foster the construction of small dams and to create an informed and alert membership.

b. Major Needs and Problems of the Area

The aims of the Farmington River Watershed Association seek to cover all potential problems which may occur within the basin. From the standpoint of environmental quality, the portion of the basin which lies in Massachusetts is presently singularly blessed. Clean streams and wild forested areas are the rule. The deer harvest of 3.5 per square mile (1958) is the second highest in CRBV, and the harvest of 2.8 beaver per square mile is the highest (1965-66).

While several state recreation areas within the basin have yet to be developed to their full potential, the location of this watershed in southern CRBV insures that the creation of additional water areas will be needed to serve future needs. Additional stream frontage should be purchased to guarantee future opportunities for fishing and camping. Multiple use of Hartford's watershed holdings (5,934 acres) could be increased if they were developed for outdoor recreation activities compatible with their primary function.

Elements of the basin plan in the Farmington watershed which we feel should be considered for early implementation (1980) include the following SCS sites: MC4A - sites 4 and 5, MC4F2a - site 3. In the 2020 category we would include: MC4A - site 3, MC4D - site 1 and MC4E - sites 1 and 2.

5. MILLERS RIVER WATERSHED

a. Description of the Basin

Approximately 320 miles of the 384 square mile Millers River Watershed lie in Massachusetts. The terrain is heavily forested and the topography is hilly to moderately steep. Its principal tributaries are the Tully and the Otter Rivers.

Ten towns and one city lie wholly or substantially within the watershed. The population density of about 160 persons per square mile is below the CRB V average. A substantial proportion of this population lies immediately along the river, or in the industrial city of Gardner. Agricultural land is very limited and probably of less commercial importance than forest lands. The harvests of deer and beaver are average for the Connecticut River Basin in Massachusetts. Forest-recreation enterprises would benefit significantly by the development of several of the many impoundment opportunities identified in this study.

b. Major Needs and Problems of the Area

The Otter River is grossly polluted with the industrial and domestic wastes of Templeton and Gardner. These effluents, especially paper wastes, greatly exceed the assimilative capacity of the Otter River, and degrade the Millers River as well. The only stream in CRB V with a future use classification of "D", its summer flows must be augmented and its status upgraded.

A reach of the Millers River below the Otter's confluence, the Bear's Den section, has been purchased as a wilderness fishing area by the Division of Fisheries and Game on the assumption that a very significant upgrading of the river will be accomplished. The present quality of the Millers River has indefinitely delayed proposed plans to divert its surplus flows to Quabbin Reservoir. Diversion from the Millers, or its tributary the Tully, is likely in the immediate future to meet demands exerted on Quabbin Reservoir by the M. D. C. water system.

There is a strong interest in the basin in the promotion of tourism. Route 2, the "Mohawk Trail", traverses the basin extending westerly into the Deerfield watershed. It is a major tourist route, especially for fall foliage viewers. Civic groups have attempted to promote increased multiple use of the Quabbin Reservoir area in the adjacent Chicopee Basin. The development of the Northfield Mountain Pumped Storage Project (see Projections-Hydro-Power) envisions a major recreational adjunct including facilities for all forms of recreation. The proposed system of land and water recreation areas which would lie partly in this watershed would develop over 32,000 acres of land. Included would be land already part of State forest or power company holdings, as well as areas not yet acquired.

The installation of the Army Corps of Engineers site (C-277) on the Otter River with its low flow augmentation provisions and/or advanced waste treatment should receive high priority. Multi-purpose sites in this watershed indentified by the United States Soil Conservation Service which the Division of Water Resources recommends for the 1980 category include: NHM2 A-1 - site 2, NHM 2B - sites 2 and 3, M2C - site 1 and M2D - sites 3 and 4. The Division endorses the inclusion of M2D - sites 1 and 2 in the 2020 category. The acquisition of streambanks should receive a high priority in this basin to take advantage of the pollution abatement program.

The Division of Water Resources favors the modification of the existing Tully Reservoir flood control dam (C-285) to provide facilities for the diversion of peak flows to Quabbin Reservoir (flood-skimming). During the summer season, the pool should be designed to provide recreational opportunities. The Massachusetts Department of Natural Resources, Division of Forests and Parks has indicated its interest in managing such a multi-purpose development.

The acquisition of additional public land will insure the perpetuation of hunting as a major outdoor recreation in this basin. Interior, partially enclosed, and contiguous private holdings at Corps of Engineers projects or State forests should receive the earliest attention in such a program. While open grassy herbaceous marshland areas occupy a very small part of this basin, wooded swamps are very common and extensive. These areas not only perform hydrologic functions but also contribute significantly to forest game populations and to the quality of the fall foliage for which the basin is noted. The Millers River from Winchendon to its confluence should be devoted to recreation, and substantial streamside acreage placed in public ownership.

6. CHICOPEE RIVER WATERSHED

a. Description of the Basin

The Chicopee River Watershed is the largest sub-basin of the Connecticut River lying in Massachusetts. The 721 square mile watershed stretches from the western suburbs of Worcester and Fitchburg to its confluence in Springfield. The watershed is generally hilly but not precipitously so. Natural great ponds and impoundments are more numerous than in the western portions of the Connecticut Basin. Its three tributaries, the Ware, the Swift and the Quaboag join to form the Chicopee River near the village of Three Rivers. Nearly 90 percent of the Chicopee Watershed lies above the confluence of these three streams.

Twenty-two towns lie wholly or substantially within the watershed, but over one-half the entire population in the watershed live in the basin portions of the cities of Chicopee and Springfield. Excluding these two urban areas, the remaining population density of 120 persons per square mile is quite low. If the two urban areas are included, the population of 290 persons per square miles makes it the second most populous sub-basin of the Connecticut in region V.

The northern portion of this basin is sparsely settled and heavily wooded. The Upper Swift and Ware Rivers are utilized as water supply sources for the Quabbin Reservoir. One hundred and eighty-six square miles of the Swift River Watershed lie behind the Quabbin Dam. Peak flows (over 85 mgd) are diverted from the 98 square mile Ware River Watershed to Quabbin, or (rarely) to the Wachusett Reservoir in the Merrimack drainage nearer Boston. Certain flows must be released to the Swift River from Quabbin (see Case Law). For a description of the M. D. C. water supply system see the appendix.

The central portion of the watershed contains significant acreage devoted to agriculture, especially dairying, apple growing and market gardening. One of the largest inland marsh areas in basin V is located on the Quaboag River. Quabbin Reservoir is noted for its cold and warm water fisheries. Quabbin fishing rules and regulations administered by the Metropolitan District Commission.

Many thousands of acres of watershed land owned by the M. D. C. are open to hunting, fishing and trapping and contribute significantly to the Chicopee Basin deer kill of 1 per square mile and the beaver take of 0. 3 per square mile (using peak harvest year data). Such harvests are above the State average but slightly below the basin average. Watershed holdings around the Quabbin Reservoir are at this writing, closed to hunting. The State's largest trout hatchery is located on the Swift River below the Quabbin Reservoir Dam. The 2, 500 acre Harvard experimental forest is located on the headwaters of the Swift River above Quabbin.

b. Major Needs and Problems of the Area

Water areas for recreational use are badly needed in this basin because much of the northern half of the basin is set aside for water supply purposes. Water contact sports even in tributary streams are not presently allowed by public health rules and regulations. The problem is further complicated by the immediate pollution of the Ware and Swift Rivers below the sections set aside for water supply purposes.

Flow augmentation may be required on the Ware, Quaboag, Seven-mile and Chicopee Rivers to meet water quality and fisheries objectives. The development of currently planned multi-purpose reservoirs in the Upper Quaboag Project (P. L. 566) and along the lower Chicopee (proposed State Red Bridge Development) would

only partially ease the recreational demands on this watershed which lies between the Commonwealth's second and third largest cities. Opportunities to enhance fish and wildlife opportunities exist along the Quaboag River flood plains. The acquisition of these wetland areas and large tracts of newly-abandoned farm land for wildlife management purposes is at present financially feasible. A short section of pastoral river valley landscape between Wheelwright and Gilbertville on the Ware River is worthy of preservation for its scenic value.

While the need to augment the inflow to Quabbin Reservoir is actually a problem for the out of basin areas it primarily serves, the declining water levels do also adversely affect fishing in the reservoir itself. The diversion of additional surplus flows from the Connecticut River or its tributaries into Quabbin is a pressing and unquestioned need. Increased recreational use of the Quabbin Reservation (80,420 acres) could be made if it were developed for outdoor activities compatible with its water supply function.

The Army Corps of Engineers has attempted to identify solutions to the problem of providing flow augmentation in the Ware River below South Barre. The Division of Water Resources favors such flow augmentation, providing that the public investment involved compares reasonably to the value of the industries aided and to the industries' own water pollution abatement efforts. We do not favor the storage of large quantities of water at the Barre Falls dam for low flow purposes, but prefer to work with industry to lower pollution loadings. It is hoped that low flow augmentation for the Seven-mile and Quaboag Rivers will be included in a revised work plan for the Upper Quaboag small watershed program. In meeting the needs of the Ware and the Quaboag, the requirements of the Chicopee should also be met. Currently under consideration is the piping of sewage effluent to the main stem of the Connecticut and/or the acquisition and reregulation of certain power dams on the Chicopee River.

The Division of Water Resources recommends that the 1980 list include M 13A - site 5, M 13c- site 3, and M 13D1 - sites 6 and 11. An additional major recreation area in this basin is badly needed, and this Division will support any practical proposal to provide it. A reevaluation of the Upper Quaboag watershed will explore the possibility of including a major recreation and low flow augmentation facility at a P. L. 566 site identified on the Turkey Hill Brook in Spencer.

Non-structural measures favored by this Division would include recreation designation for the following streams above route 122 in Barre (MDC watershed): Ware River, East Branch of the Ware from Mare Meadow Reservoir, the West Branch below Brigham Pond and the Burnshirt River below Williamsville.

The Quaboag River from Quaboag Pond to Palmer should be placed in the recreation category. Holdings by the Division of Fisheries and Game and the Department of Public Works currently protect parts of these reaches.

The Swift River's east branch above Quabbin runs through holdings of the M. D. C., Audubon Society, and Worcester Natural History Society. While it does suffer from low flows, it does provide good trout fishing and two small dams do not alter its scenic character. It could be included in the recreation category.

The main branch from Quabbin Dam to the Bondsville Dam should be designated as a recreation river. Extensive holdings of the Division of Fisheries and Game, a family camping area and the Swift River Sportsmen's Club already utilize this tailwater of Boston's water supply.

B. MDC WATER SUPPLY

HISTORY AND USE

Chapter 488 of the Acts of 1895 provided for the formation of the Metropolitan Water District which included by law the cities of Boston, Chelsea, Everett, Malden, Medford, Newton, and Somerville as well as the towns of Belmont, Melrose, Revere, Watertown, Winthrop and Hyde Park (now part of Boston). A provision was included in the law to allow the admission of any city or town which lay within ten miles of the State House. Water supply was provided by the Sudbury and Cochituate reservoirs, Spot Pond reservoir (Medford) and the Mystic Lakes in Medford (now abandoned as a source of supply). The construction of Wachusett Reservoir in 1908 provided an additional source of supply for the District. The Ware and Swift River Projects in 1926 and 1927 resulted in the Ware River diversion facilities, the Quabbin Reservoir, and Quabbin Aqueduct. This is a 26 mile long rock tunnel which carries water from the Ware River and Quabbin Reservoir to the Wachusett Reservoir. Many further improvements in distribution have been made to the system, as well.

In 1943 legislation was passed to permit any town within fifteen miles of the State House to be admitted to membership in the District. By 1963 thirty cities and towns were members of the Metropolitan Water District. The average daily water consumption in 1965 for these communities was about 227 mgd.

Members of the Metropolitan Water District:

Arlington
Belmont
Boston
Brookline
Cambridge
Chelsea
Everett
Hyde Park*
Lexington
Lynnfield
Malden
Marblehead
Medford
Melrose
Milton
Nahant
Needham
Newton
Norwood
Peabody
Quincy
Revere
Saugus
Somerville
Stoneham
Swampscott
Wakefield
Waltham
Watertown
Winchester
Winthrop

*Now part of Boston

TABLES

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

Project & Ownership	Purpose	Location (City or Town)	Total Acs. Inc. Water
State Forests & Parks			
Savoy State Forest	F, C, R	Adams, Florida, Savoy	11,304
Windsor State Forest	F, C, R	Savoy, Windsor	1,558
Florida-North Adams State Forest	F, C, R	Florida, North Adams	510
October Mt. State Forest	F, C, R	Lee, Lenox, Washington	14,305
Otis State Forest	F, C, R	Becket, Otis, Sandisfield, Tyringham	3,468
Sandisfield State Forest	F, C, R	New Marlborough, Sandisfield	4,059
Brimfield State Forest	F, C, R	Brimfield, Wales, Monson	3,090
Spencer State Forest	F, C, R	Spencer	1,047
Becket State Forest	F, C, R	Becket	3,076
Chesterfield Gorge	C, R	Chesterfield, Middlefield	1,084
Mohawk Trail State Forest	F, C, R	Charlemont, Hawley, Savoy, Florida	6,452
Monroe State Forest	F, C, R	Florida, Monroe	4,056
Peru State Forest	F, C, R	Peru Middlefield, Worthington	2,257
Buckland State Forest	F, C, R	Buckland	145
Chester-Blandford State Forest	F, C, R	Blandford, Chester	2,537
Chicopee Memorial Park	C, R	Chicopee	574
Colrain State Forest	F, C, R	Colrain, Heath	1,925
Conway State Forest	F, C, R	Conway, Williamsburg	1,838
South River State Park	C, R	Conway	107
D, A, R State Forest	F, C, R	Ashfield, Goshen	1,280
Erving State Forest	F, C, R	Erving, Orange	2,720
Hawley State Forest	F, C, R	Hawley, Plainfield, Windsor	7,497
Huntington State Forest	F, C, R	Huntington, Montgomery	686

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS (Cont'd)

Project & Ownership	Purpose	Location (City or Town)	Total Acs. Inc. Water
Gardner State Park	C, R	Huntington	29.3
Leverett State Forest	F, C, R	Leverett	91
Leyden State Forest	F, C, R	Leyden	60
Ludlow State Forest	F, C, R	Ludlow	51
Middlefield State Forest	F, C, R	Middlefield	1,278
Montague State Forest	F, C, R	Montague	25
Mount Grace State Forest	F, C, R	Warwick	1,440
Northfield State Forest	F, C, R	Northfield	401
North Sugarloaf	C, R	Deerfield	447
Orange State Forest	F, C, R	Orange	59
Paxton State Park	C, R	Paxton	310
Shelburne State Forest	F, C, R	Shelburne	49
Wilcox Hollow State Park	C, R	Shelburne	25
Shutesbury State Forest	F, C, R	Shutesbury, Wendell	792
Granville State Forest	F, C, R	Granville, Tolland	1,246
Tolland State Forest	F, C, R	Otis, Blandford, Tolland	3,913
Warwick State Forest	F, C, R	Warwick, Royalston, Orange	7,422
Wendell State Forest	F, C, R	Montague, Wendell, Orange	7,398
Worthington State Forest	F, C, R	Worthington	175
Barre State Forest	F, C, R	Barre	168
Hubbardston State Forest	F, C, R	Hubbardston, Phillipston	1,397
Mass. Federation of Womens Clubs State Forest	F, C, R	Petersham	1,001
Oakham State Forest	F, C, R	Oakham, Rutland	975
Otter River State Forest	F, C, R	Winchendon, Royalston, Templeton	894
Rowe State Forest	F, C, R	Rowe	264
Petersham State Forest	F, C, R	Athol, Petersham	570
Robinson State Park	C, R	Agawam, Westfield	858

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS (Cont'd)

Project & Ownership	Purpose	Location (City or Town)	Total Acs. Inc. Water
Royalston State Forest	F, C, R	Royalston	608
Skinner State Park	C, R	Hadley, South Hadley	375
Templeton State Forest	F, C, R	Hubbardston, Templeton	1,495
Rutland State Park	C, R	Rutland	28
West Brookfield State Forest	F, C, R	West Brookfield	129
Westminster State Forest	F, C, R	Gardner, Westminster	1,416
Winchendon State Forest	F, C, R	Winchendon	177
Ashburnham State Forest	F, C, R	Ashburnham	1,636
Wilbraham State Game Farm		Wilbraham	144.0
Grace A. Robson Wildlife Sanctuary	C	Westfield	69.5
Watatic Mt. Wildlife Sanctuary	C	Ashburnham, Ashby	139
Peru Wildlife Management Area	R, C	Peru	2,525
Chester Wildlife Management Area	R, C	Chester	1,126
Barre-Phillipston Wildlife Management Area	R, C	Phillipston, Barre, Petersham	1,865.7
Quaboag Wildlife Management Area	R, C	Brookfield, West Brookfield	796.9
Winnimisset Wildlife Management Area	R, C	New Braintree	378
Paxton Wildlife Management Area	R, C	Paxton	327
Millers River Wildlife Management Area	R, C	Athol, Royalston, Phillipston	573.0
Spencer Wildlife Management Area	R, C	Spencer, Paxton, Leicester	577
Conway Wildlife Management Area	R, C	Conway	525.0
Swift River Wildlife Management Area	R, C	Belchertown, Ware	869.1
Becket Wildlife Management Area	R, C	Becket	234

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS (Cont'd)

Project & Ownership	Purpose	Location (City or Town)	Total Acs. Inc. Water
Little River	R, C	Huntington, Worthington	181.8
Birch Hill	R, C	Winchendon, Templeton, Royalston	499
Aughey Area	R, C	Savoy	428.0
E. Branch Ware River	R, C	Rutland	80
Montague State Fish Hatchery		Montague	72
Palmer State Fish Hatchery		Palmer	301.9
Sunderland State Fish Hatchery		Sunderland	137.8
Charles L. McLaughlin Fish Hatchery		Belchertown	*
Special State Reservations (Special Commissions - Joint State & County Jurisdiction)			
Deer Hill State Reservation	R, C	Cummington, Plainfield	260
Mt. Sugarloaf State Reservation	R, C	Deerfield	90
Mt. Tom State Reservation	R, C	Holyoke, E. Hampton, Northampton	1,800

* Included in Swift River Wildlife Management Area

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS (Cont'd)

Project & Ownership	Purpose	Location (City or Town)	Status	Total Acs. Inc. Water
Public Access Board Sites				
Asnacomet Pond Access Site	R	Hubbardston	C	---
Congamond Lakes Access Site	R	Southwick	C	0.4
Manhan River Access Site	R	Easthampton	C	1.2
Quaboag Pond Access Site	R	Brookfield	C	1.4
Ware River Access Site	R	Rutland	C	0.5
Lake Monomonac Access Site	R	Winchendon	P	1.5
Moosehorn Pond Access Site	R	Hubbardston	P	10.0
Bartons Cove Access Site	R	Gill	C	4.0
Windsor Pond Access Site	R	Windsor	C	0.9
Shaw Pond Access Site	R	Otis	P	0.7
Otis Reservoir Access Site	R	Otis	C	---
Connecticut River (East Bank Access Site)	R	Chicopee	C	---
Bondis Island Access Site	R	Agawam	C	---

STATUS: P - Proposed, C - Completed
PURPOSE: R - Recreation, F - Forestry, C - Conservation, WS - Water Supply

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS (Cont'd)

Project & Ownership	Purpose	Location (City or Town)	Total Acs. Inc. Water
MDC Watershed lands			
Swift R. Watershed (Quabbin Reservoir)	WS	New Salem, Shutesbury Belchertown, Pelham, Ware, Hardwick, Petersham	80,420
Ware R. Watershed (diverted to Quabbin)	WS	Barre, Hubbardston, Oakland, Rutland	20,250
University of Massachusetts Holdings			
Coldwell Memorial Forest	F,C	Belchertown, Pelham	1,200
Mt. Toby Demonstration Forest	F,C	Leverett, Sunderland	755
Horticultural Research Center	F,C	Belchertown	215
Harvard University Holdings			
Harvard Experimental Forest	F,C	Petersham	2,500
Hartford M.D.C. Watershed Lands			
Farmington River Watershed	WS	Sandisfield, Granville, Tolland	5,934

PURPOSE: R - Recreation, WS - Water Supply, F - Forestry, C - Conservation

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS (Cont'd)

TOWN FORESTS

Project & Ownership	Purpose	1962 Total Acreage Inc. Water
Athol	F, C, R	965
Barre	F, C, R	40
Bernardston	F, C, R	100
Blandford	F, C, R	70
Chester	F, C, R	950
Conway	F, C, R	160
Cummington	F, C, R	100
Deerfield	F, C, R	110
Easthampton	F, C, R	75
Gardner	F, C, R	122
Goshen	F, C, R	100
Granville	F, C, R	100
Ludlow	F, C, R	112
Middlefield	F, C, R	160
Monroe	F, C, R	102
Monson	F, C, R	230
New Salem	F, C, R	33
Northampton	F, C, R	2,873
North Brookfield	F, C, R	124
Petersham	F, C, R	135
Rowe	F, C, R	500
Russell	F, C, R	3,035
South Hadley	F, C, R	50
Spencer	F, C, R	178
Templeton	F, C, R	158
Ware	F, C, R	102

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS (Cont'd)

TOWN FORESTS

Project & Ownership	Purpose	1962 Total Acreage Inc. Water
Warren	F, C, R	8
Warwick	F, C, R	96
Westfield	F, C, R	5,887
Winchendon	F, C, R	609

(Source - Mass. Forest & Parks Assoc. Bull. #179 - A Guide for Town Forest Committees and Conservation Commissions 1962)

PURPOSE: F - Forestry; C - Conservation; R - Recreation

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

SURFACE WATER SUPPLY SOURCES - MUNICIPAL

Location	Project	Surface Acreage	Usable Capacity m. g.	Safe Yield m. g. d.	Towns Served
Ashfield	Highland Spring Res. (2 Res)	33	--	--	Ashfield
Ashburnham	Upper Naukeag Lake	243	--	--	Ashburnham, Winchendon
Athol	Newton Reservoir	15	--	--	Athol
Athol	Lake Ellis	52	--	--	Athol
Athol, Phillipston	Thousand Acre Reservoir	1	--	--	Athol
Barre	Allen Hill Reservoir	6	--	--	Barre
Blandford	Long Pond	84	--	--	Blandford
Becket	Horn Pond	25	--	0. 10	Chester
Blandford	Huntington Reservoir	--	--	0. 2	Huntington
Blandford, Granville	Cobble Mt. Reservoir & Borden Brook	1, 043	--	35. 0	Springfield, Southwick system
Colrain	Mountain Brook Reservoir	--	--	--	Colrain
Gardner	Crystal Lake	158	--	--	Gardner
Gardner	Perley Brook Reservoir	--	--	--	Gardner
Gardner	Cowee Pond	10	--	--	Gardner
Granville	Granville Reservoir	77	--	4. 0	Westfield
Granville	Winchell Reservoir	--	--	--	Westfield

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

SURFACE WATER SUPPLY SOURCES - MUNICIPAL (Cont'd)

Location	Project	Surface Acreage	Usable Capacity m. g.	Safe Yield m. g. d.	Towns Served
Hadley	Parker Reservoir	--	--	E. S.	Hadley
Hadley	Upper & Lower Hadley Res.	--	--	E. S.	Hadley
Hatfield	Running Gutter Brook Res.	--	--	--	Hatfield
Holyoke	Whiting Street Reservoir	54	--	1. 6	Holyoke, Southampton
Holyoke	Ashley Pond	217	--	2. 6	Holyoke
Holyoke	Hugh McLean Reservoir	--	--		
Whatley, Hatfield, Williamsburg	West Whately Reservoir & Mountain St. Reservoir	78. 9	--	3. 40	Northampton
Northampton	Robert Meadow Brook Res. (2 Reservoirs)	37. 0	--	2. 50	Northampton
Leicester	Shaw Pond	80	--	0. 48	Spencer
Leyden	Glen Brook Upper Reservoir	7	--	--	Greenfield
Leyden	Glen Brook Lower Reservoir	6	--	--	Greenfield
Ludlow	Ludlow Reservoir & Knights Pond	448	--	7. 0	Springfield, Ludlow Agawam, Southwick, East Longmeadow, Longmeadow & Westfield

E. S. - Denotes Emergency Supply

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

SURFACE WATER SUPPLY SOURCES - MUNICIPAL (Cont'd)

Location	Project	Surface Acreage	Usable Capacity m. g.	Safe Yield m. g. d.	Towns Served
Monroe	Phelps Brook Reservoir	--	--	.023	Monroe
Monson	Ingalls Brook	--	--	.148	Monson
Monson	Conant Reservoir	--	--	--	Monson
Montague	Lake Pleasant	54	--	1.62	Turners Falls, Montague
Montague	Green Pond	36	--	--	Turners Falls, Montague
Montgomery	Tekoa Reservoir	2	--	1.51	Westfield
Montgomery	Montgomery Reservoir	38	--		
No. Brookfield	Doane Pond	31	--	--	No. Brookfield
No. Brookfield	North Pond	70	--	--	No. Brookfield
No. Brookfield	Cooley Hill Reservoir	--	--	--	Brookfield
Northfield	Minot Brook Reservoir	--	--	--	East Northfield, Northfield
Northfield	Louisiana Brook Upper Res.	--	--	--	East Northfield, Northfield
Orange	Collidge Brook Reservoir	1	--	--	Orange
Palmer	Graves Brook Upper Res.	5	--	.45	Palmer
Palmer	Graves Brook Lower Res.	1	--		

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

SURFACE WATER SUPPLY SOURCES- MUNICIPAL (Cont'd)

Location	Project	Surface Acreage	Usable Capacity m. g.	Safe Yield m. g. d.	Towns Served
Pelham	Amethyst Brook (3 Res.)	13.7	--	0.9	Amherst
Pelham	Atkins Reservoir	51	--	1.2	Amherst
Phillipston	Phillipston Reservoir	17	--	--	Athol
Russell	Black Brook Reservoir	1	--	.18	Russell
Shelburne	Fox Brook Reservoir	--	--	.18	Shelburne
Southampton	White Reservoir	128	--	13.0	Holyoke, Southampton
Westhampton	New Intake Reservoir	--	--		
Southampton	Manham Reservoir	--	--		
South Hadley	Leaping Well Reservoir	--	--	--	South Hadley
Sunderland	Saw Mill Brook Reservoir	--	--	.1	Sunderland
Westhampton	Mountain Brook Reservoir	--	--	--	Westhampton
West Cummington	Deer Hill Reservoir	--	--	--	Cummington
West Springfield	Bear Hole Brook Reservoir	15	--	0.9	West Springfield
Whately	Roaring Brook Reservoir	1	--	--	Deerfield, South Deerfield
Williamsburg	Unguemonk Brook Reservoir	3	--	0.4	Williamsburg

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

P.L. 566 STATUS - OCTOBER 1968

Watershed	Area (Sq. Mi.)	Surface Acres	Storage (Ac. Ft.)	Location (City or Town)	Status	Total Structures	Multi Purpose Structures
Clam River - Hampden & Hampshire Counties							
Hemlock Lake	2.88	74	1110	Sandisfield	P	1	1 (FC, R)
Clam Lake	4.23	47	980	Sandisfield	P	1	1 (FC, R)
North Silver Lake	3.71	38	985	Sandisfield	UC	1	1 (FC, R)
West Lake	1.46	72	852	Sandisfield	C	1	1 (FC, R)
Abbey Lake	1.75	45	546	Sandisfield	C	1	1 (FC, R)
South Silver Lake	1.08	28	265	Sandisfield	UC	1	0 (FC)
Lower Spectacle Pond	3.33	269	1915	Sandisfield	P	1	0 (FC)
Upper Quaboag River - Worcester County							
Shaw Brook	4.73	90	1514	Leicester, Spencer	P	1	0 (FC)
Turkey Hill Brook	9.79	160	3878	Spencer	P	1	0 (FC)
Horse Pond Brook	4.07	90	1370	No. Brookfield	C	1	1 (FC, F, W)
Kittridge Rd. Site	1.74	63	437	Spencer, No. Brookfield	C	1	1 (FC, F, W)
Rice Reservoir	3.36	80	1000	Brookfield	UC	1	1 (FC, R)
Meadow Brook	6.34	157	2395	No. Brookfield, New Braintree	P	1	0 (FC)
Sucker Brook	1.63	62	603	West Brookfield, New Braintree	C	1	0 (FC)
Lamberton Brook	4.42	86	803	West Brookfield, Warren	C	1	0 (FC)

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

P. L. 566 STATUS - OCTOBER 1968 (Cont'd)

Watershed	Area (Sq. Mi.)	Surface Acres	Storage (Ac. Ft.)	Location (City or Town)	Status	Total Structures	Multi Purpose Structures
Powdermill Brook - Hampden and Hampshire Counties							
Arm Brook	3.4	56	731	Westfield	C	1	1(R, FC, F, W)
Powdermill Brook	4.6	56	981	Westfield	C	1	0 (FC)
West Branch Westfield River - Hampden, Hampshire & Berkshire Counties							
Cherry Tree Hill Site	2.4	56	1110	Chester	P	1	1(FC, F)
Upper Factory Brook Site	3.9	101	2320	Peru, Middlefield	P	1	1(LF, F, FC)
Factory Brook Site	4.0	176	5706	Middlefield	P	1	1(FC, R)
Upper Coles Brook Site	2.9	154	3267	Middlefield, Washington	P	1	1(FC, LF)
Middle Coles Brook Site	1.4	26	567	Middlefield	P	1	1(FC, F)
Blandford Road Site	0.8	72	247	Chester	P	1	0 (FC)
Brooker Site	2.4	42	650	Becket, Washington	P	1	0 (FC)
Cushman Brook Site	1.0	59	462	Becket	P	1	1(FC, W)
Rudd Pond Brook Site	2.3	84	1103	Becket	P	1	1(FC, LF, W)
Shaker Mill Brook Site	3.6	102	1915	Becket, Washington	P	1	1(FC, LF, F)
Walker Brook Site	7.0	105	2550	Becket	P	1	1(FC, F)

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

P. L. 566 STATUS - OCTOBER 1968 (Cont'd)

Watershed	Area (Sq. Mi.)	Surface Acres	Storage (Ac. Ft.)	Location (City or Town)	Status	Total Structures	Multi Purpose Structures
Broad Brook - Hampshire and Hampden Counties							
Summit Street Site	2.2	93	672	Easthampton	P	1	1 (FC, R)
White Brook	6.1	94	1560	Easthampton	P	1	0 (FC)
Bradley Brook - Hampden County							
Black Brook Site	2.78	47.4	942	Russell	P	1	1 (FC, WS)
Freeland Brook Site	3.22	28.7	762	Russell	P	1	0 (FC)
Proposed Projects under Preliminary Investigation							
Cold River - Berkshire County							

STATUS: P - Proposed, C - Completed, U - Uncompleted
PURPOSE: FC - Flood Control, R - Recreation, F - Fishing, W - Wildlife, WS - Water Supply

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

Project & Ownership	Purpose	Status	Total Acreage Inc. Water
Conservation Commission Acquisitions (Mass. Self-Help Program)			
Amherst	C	C	212.633
Athol	C	C	502.25
Athol	C	P	86.
Ludlow	C	C	29.16
Paxton	C	C	36.2
Shutesbury	C	C	41.
Spencer	C	P	8.5
Springfield	C	P	245.15
South Hadley	C	C	22.5
Warren	C	C	3.7+
Wilbraham	C	C	111.01
Wilbraham	C	P	28.5
Worthington	C	P	8.

STATUS: P - proposed; C - completed
PURPOSE: C - conservation

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

Project and Ownership	Purpose	Location (City or Town)	Total Acs. Inc. Water
Massachusetts Audubon Society Wildlife Sanctuaries			
Arcadia Wildlife Sanctuary	C, E	Easthampton, Northampton	372
Cooks Canyon Wildlife Sanctuary	C, E	Barre	40
Laughing Brook Wildlife Sanctuary	C, E	Hampden	84
Rutland Brook Wildlife Sanctuary	C, E	Petersham	98

PURPOSE: C - conservation; E - education

INVENTORY OF NON-FEDERAL PROJECTS - MASSACHUSETTS

Project and Ownership	Purpose	Location (City or Town)	Total Acs. Inc. Water
Trustees of Reservations			
Notchview	C, R	Windsor	3,000
Chapelbrook	C, R	Ashfield	128
Chesterfield Gorge	C, R	Chesterfield	161
Dinosaur Footprints	H, C, R	Holyoke	8
Glendale Falls	C, R	Middlefield	60
Petticoat Hill	C, R	Williamsburg	60
Wm. Cullen Bryant Homestead	H, C	Cummington	189
Doane Falls	C, R	Royalston	12
Elliot Laurel Reservation	C, R	Phillipston	25
Royalston Falls	C, R	Royalston	205

PURPOSE: H - historical, C - conservation, R - recreation

HYDROELECTRIC PROJECTS - MASSACHUSETTS

Station	Location	Total Kilowatt Capacity	Type of Utility	Ownership	Total # Units in Station	Stream
Cabot	Montague	51,000	PU	WMEC	4, 2	Conn. - canal
Cobble Mountain	Granville	33,000	PU	WMEC	3	Little River Westfield
Deerfield #5	Florida	15,000	PU	NEPC	7	Deerfield R.
		9,000	PU			
Hadley Falls	Holyoke	15,000	PU	HWPC	1	Conn. River
Riverside Station	Holyoke	7,640	PU	HWPC	5	Conn. - canal
Sherman	Rowe	7,200	PU	NEPC	1	Deerfield R.
Indian Orchard	Springfield	4,900	PU	WMEC	4	Chicopee R.
Turners Falls	Montague	4,840	PU	WMEC	6	Conn. River
Deerfield #2	Conway	4,800	PU	NEPC	3	Deerfield R.
Deerfield #3	Buckland	4,800	PU	NEPC	3	Deerfield R.
Deerfield #4	Buckland	4,800	PU	NEPC	3	Deerfield R.
Gardners Falls	Buckland	3,980	PU	WMEC	5	Deerfield R.
Red Bridge	Wilbraham	3,600	PU	WMEC	2	Chicopee R.
Putts Bridge	Ludlow	3,200	PU	WMEC	2	Chicopee R.
Boatlock	Holyoke	2,900	PU	HWPC	3	Conn. - canal
Dwight	Chicopee	1,440	PU	WMEC	3	Chicopee R.
Beebe & Holbrook	Holyoke	516	PU	HWPC	2	Canal - Conn.
Skinner	Holyoke	300	PU	HWPC	1	Conn. - Canal
Chemical	Holyoke	1,600	PU	HWPC	2	Conn. - canal
Oakdale	West Boyleston	3,500	MU	MDC		Quabbin
Wachusett	Clinton	3,200	MU	MDC		Nashua (SB) R.
#1 Hydro Unit	Cabot St. Holyoke	1,056	MU	HG & E	4	Conn. - canal

HYDROELECTRIC PROJECTS - MASSACHUSETTS (Cont'd)

Station	Location	Total Kilowatt Capacity	Type of Utility	Ownership	Total # Units in Station	Stream
#2 Hydro Unit	Sargeant St. Holyoke	800	MU	HG & E	1	Conn. - canal
#3 Hydro Unit	Race St. Holyoke	450	MU	HG & E	1	Conn. - canal
#4 Hydro Unit	Cabot St. Holyoke	600	MU	HG & E	2	Conn. - canal
Winsor	Belchertown	1,200	MU	MDC		Swift River
All Mills	Holyoke	3,510	I	American Writing Paper Company		Conn. - canal
Woronoco	Russell	2,690	I	Strathmore Paper Company		Westfield R.
Holyoke	Holyoke	1,600	I	Standard Packaging Company		Conn. - canal
West Springfield	West Springfield	1,400	I	Strathmore Paper Company		Westfield R.
Millers Falls	Millers Falls	1,000	I	Millers Falls Paper Company		Miller River
Ware	Ware	1,045	I	Ware Industries Inc.		Ware River
Turners Falls	Turners Falls	937	I	Strathmore Paper Company		Conn. - canal
Holyoke	Holyoke	732	I	Parsons Paper Co.		Conn. - canal
Russell	Russell	700	I	Westfield River Paper Company		Westfield R.
Holyoke	Holyoke	600	I	Crocker McElwain Co.		Conn. - canal
Holyoke	Holyoke	382	I	Geo. W. Prentiss & Company		Conn. - canal
Holyoke	Holyoke	300	I	Livingston Worsted Mills		Conn. - canal

HYDROELECTRIC PROJECTS - MASSACHUSETTS (Cont'd)

Station	Location	Total Kilowatt Capacity	Type of Utility	Ownership	Units in Station	Stream
Holyoke	Holyoke	300	I	Holyoke Industrial Prop. Inc.		Conn. - Canal
Athol	Athol	240	I	Athol Mfg. Co.		Millers River
South Barre	South Barre	150	I	Barre Wool Combing Co., Ltd.		Ware River
West Springfield	West Springfield	150	I	Southworth Paper Co.		Westfield R.
Easthampton	Easthampton	80	I	Hampton Mills Inc.		Broad Brook (Manhan R.)
Athol	Athol	112	I	L. S. Starrett Co.		Millers River
Orange	Orange	200	I	Rodney Hunt Machine Company		Millers River
Griswoldville	Colrain	180	I	Kendall Company		North River
Russell	Russell	800	I	Texon, Inc.		Westfield R.

Type of Utility: MU - municipal utility; PU - public utility; I - industrial utility
Ownership: MEC - Massachusetts Electric Company; MDC - Metropolitan District Commission; WMEC - Western Massachusetts Electric Company; NEPC - New England Power Company; HWPC - Holyoke Water and Power Company; HG & E - Holyoke Gas and Electric Company

BIBLIOGRAPHY

1. Abbot, Edwin H. Jr. "Ways and Waters in Massachusetts." 28 Harvard Law Review 478

2. Camp, Dresser and McKee, "Report on Water Resources Management." Division of Water Resources, Massachusetts Water Resources Commission. 1968. 72 p.

3. Ebasco Services, Inc. "Power Supply for New England 1973-1990 (Preliminary)." New York. 1967. 38 p.

4. Edwards and Kelcey, Inc. "Massachusetts Outdoor Recreation Plan." Boston. 1966. 147 p.

5. Kendall, James H. "Water Law: Streamflow Rights in New England and New York State." Boston. New England Water Poll. Cont. Comm. 1967. 47p.

6. Kingsbury, Francis H. and Toole, Harold J. "Water Supply of Boston Metropolitan Area." Vol. 79, No. 1. Boston. Journal of the New England Water Works Association. March, 1965.

7. Legislative Research Council. "Rights to Surface and Sub Surface Water in Massachusetts." Commonwealth of Massachusetts, Senate #695 of 1957. 128 p.

8. Trustees of Reservations. "Annual Report, 1968." Milton, Mass.

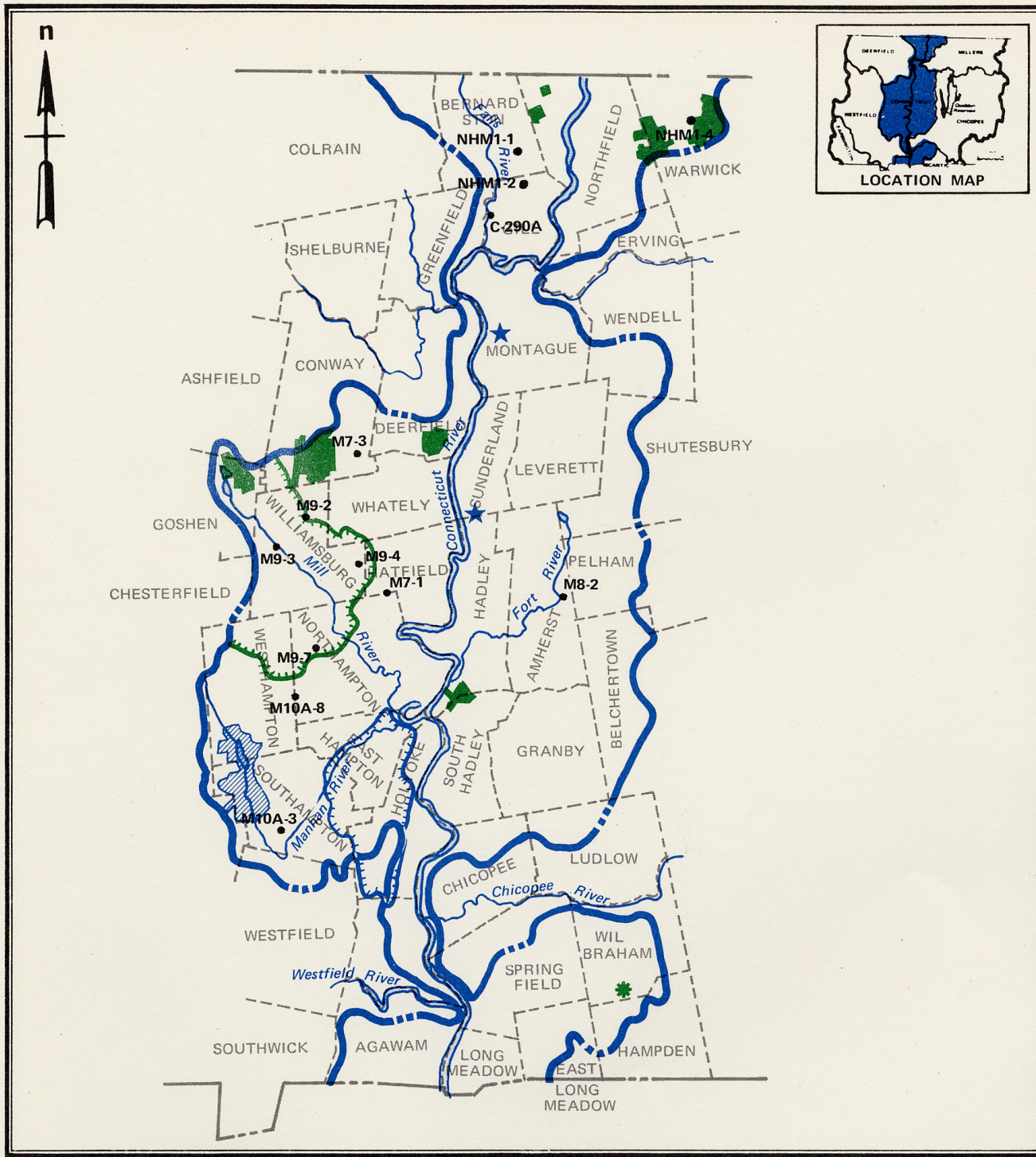
9. Willard, Howard S. "Compilation and Summarization of the Massachusetts General Laws, Special Laws, Pertinent Court Decisions, etc. Relating to Water and Water Rights." Massachusetts Water Resources Commission. in press.

10. Massachusetts General Laws Annotated

11. The Massachusetts Reports

12. U.S. Department of Health, Education and Welfare, "Municipal Water Facilities", 1963. 74p.

PLATES



LEGEND

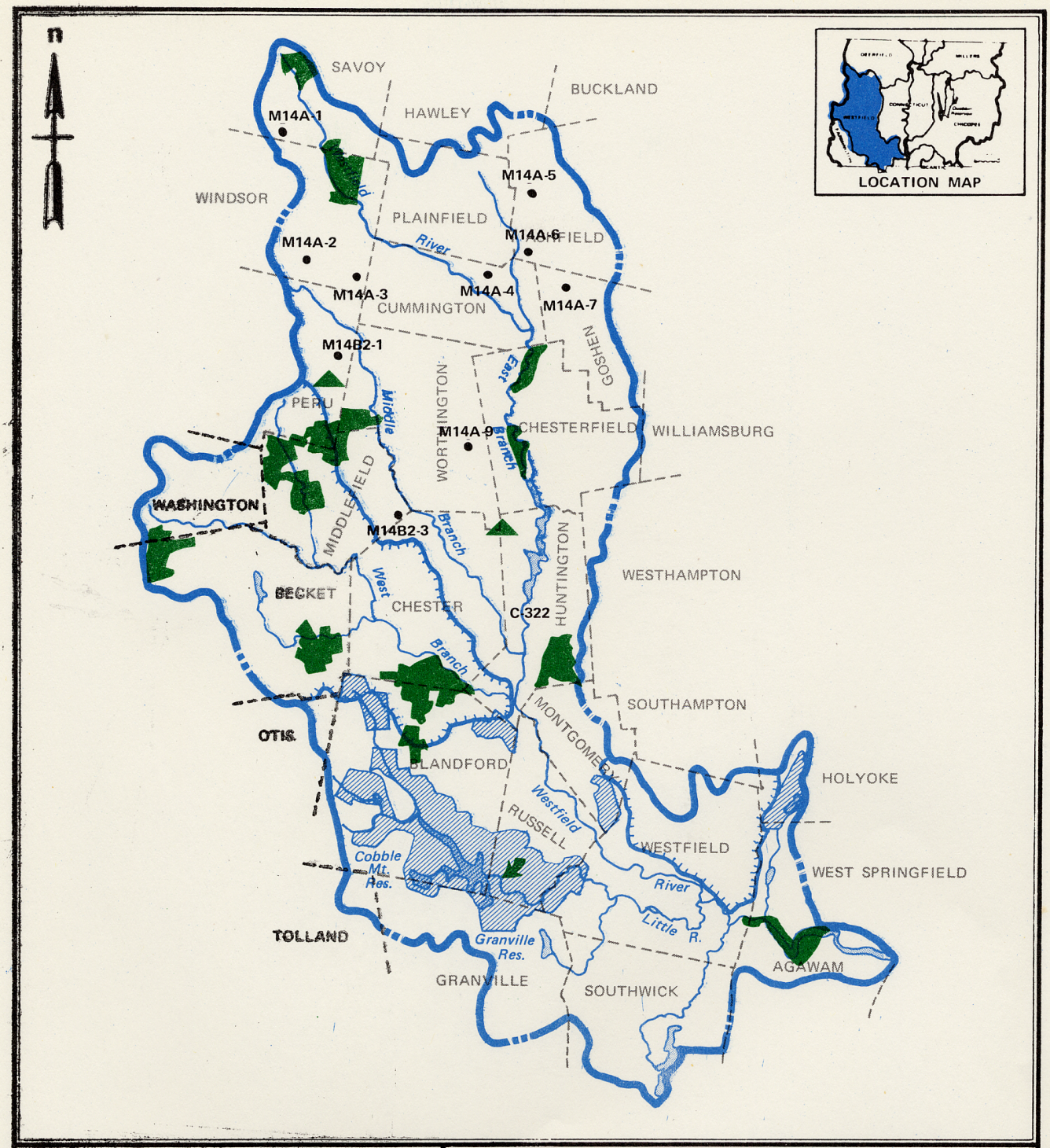
- Watershed Boundary
- State Forest or Park
- Municipal Watershed
- Significant Non-Federal Impoundment
- CRB Study Proposed Dam Site
- Future PL 566 Watershed Project
- Wildlife Management Area
- Fish Hatchery
- Game Farm

Massachusetts Water Resources Commission
Division of Water Resources

CRB V
CONNECTICUT RIVER WATERSHED
Major Non-Federal Water Developments & Outdoor Recreation Areas

SCALE
0 1 2 3 4 5 Miles

PLATE NO. I



LEGEND

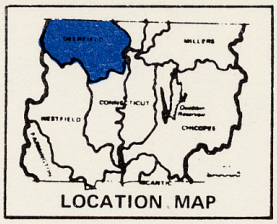
- Watershed Boundary
- State Forest or Park
- Municipal Watershed
- Significant Non-Federal Impoundment
- CRB Study Proposed Dam Site
- PL 566 Small Watershed Project
- Wildlife Management Area
- Fish Hatchery
- Game Farm

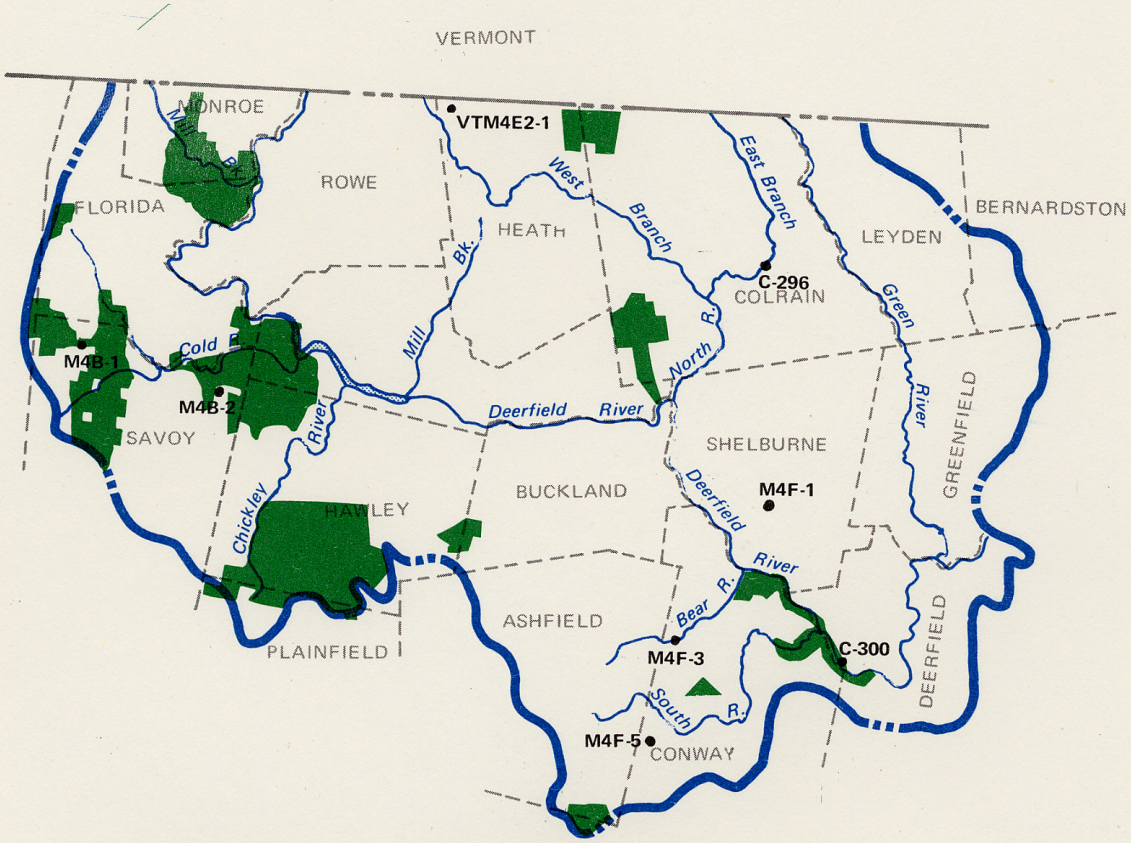
Massachusetts Water Resources Commission
Division of Water Resources

CRB V
WESTFIELD RIVER WATERSHED
Major Non-Federal Water Developments & Outdoor Recreation Areas

SCALE
0 1 2 3 4 5 Miles

PLATE NO.2





LEGEND

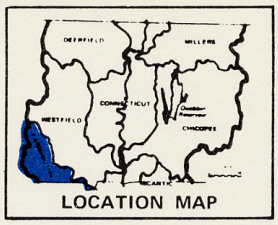
- Watershed Boundary
- State Forest or Park
- Municipal Watershed
- Significant Non-Federal Impoundment
- CRB Study Proposed Dam Site
- PL 566 Small Watershed Project
- Wildlife Management Area
- Fish Hatchery
- Game Farm

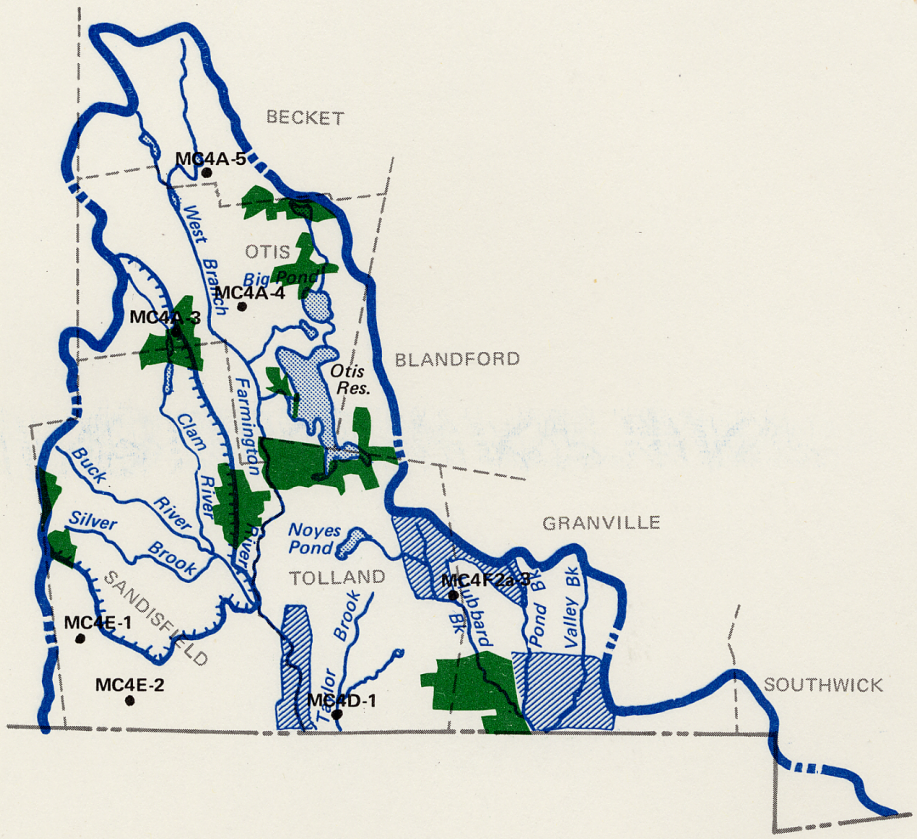
Massachusetts Water Resources Commission
Division of Water Resources

CRB V
DEERFIELD
RIVER WATERSHED
Major Non-Federal Water Developments & Outdoor Recreation Areas

SCALE
0 1 2 3 4 5 Miles

PLATE NO. 3





LEGEND

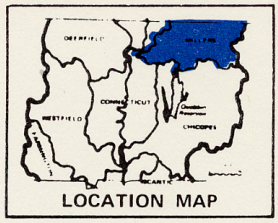
- Watershed Boundary
- State Forest or Park
- Municipal Watershed
- Significant Non-Federal Impoundment
- CRB Study Proposed Dam Site
- PL 566 Small Watershed Project
- Wildlife Management Area
- Fish Hatchery
- Game Farm

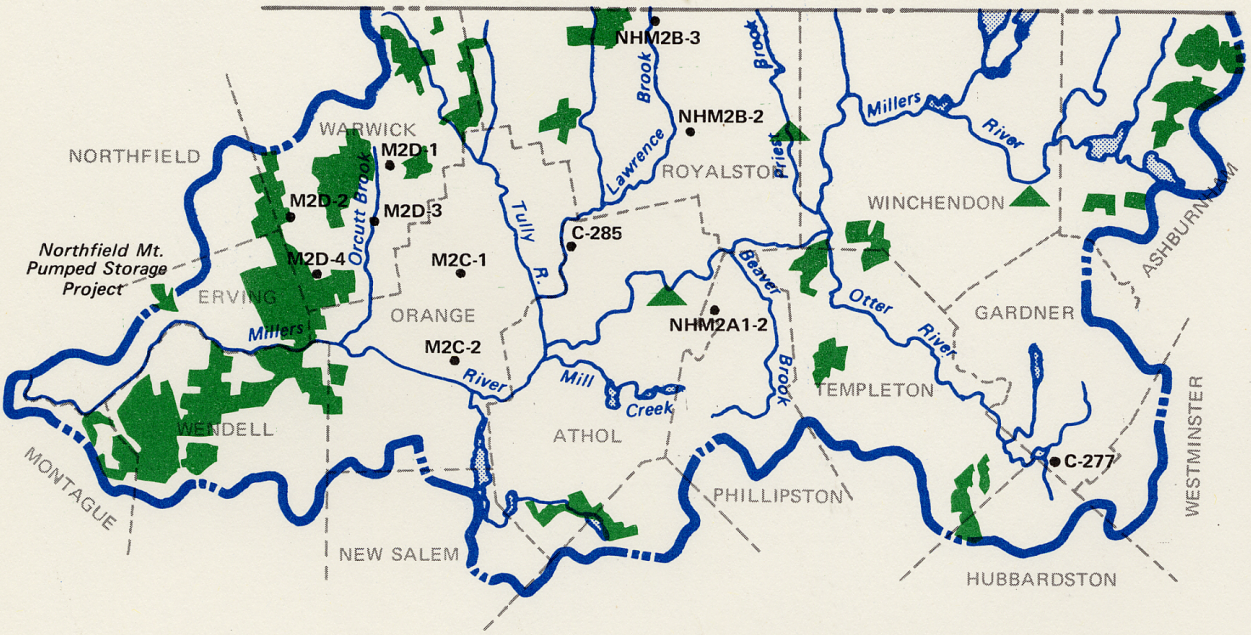
Massachusetts Water Resources Commission
Division of Water Resources

CRB V
FARMINGTON RIVER WATERSHED
Major Non-Federal Water Developments & Outdoor Recreation Areas

SCALE
0 1 2 3 4 5 Miles

PLATE NO.4





LEGEND

- Watershed Boundary
- State Forest or Park
- Municipal Watershed
- Significant Non-Federal Impoundment
- CRB Study Proposed Dam Site
- PL 566 Small Watershed Project
- Wildlife Management Area
- Fish Hatchery
- Game Farm

Massachusetts Water Resources Commission
Division of Water Resources

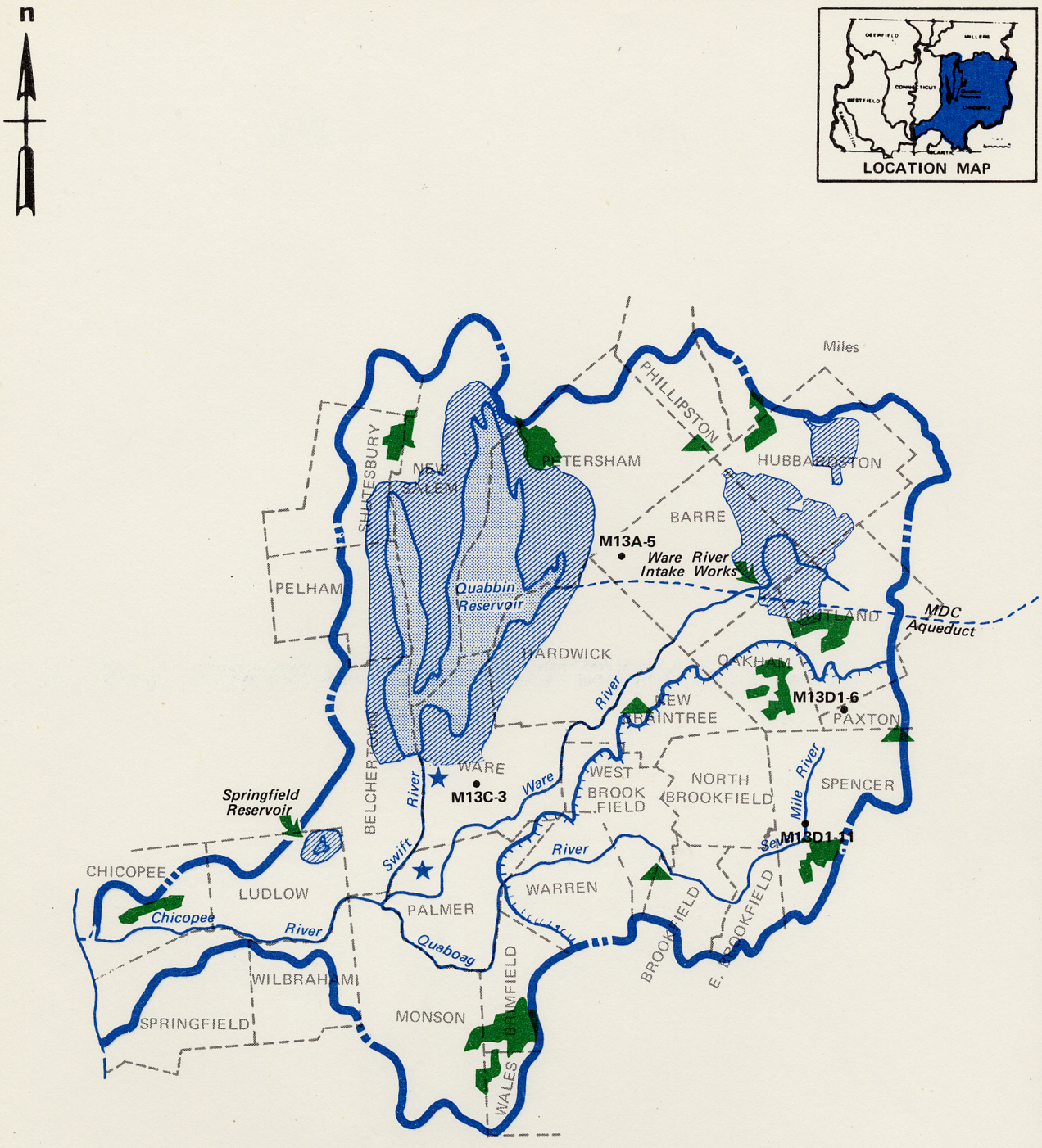
CRB V

MILLERS RIVER WATERSHED

Major Non-Federal Water Developments & Outdoor Recreation Areas

SCALE
0 1 2 3 4 5 Miles

PLATE NO.5



LEGEND

- Watershed Boundary
- State Forest or Park
- Municipal Watershed
- Significant Non-Federal Impoundment
- CRB Study Proposed Dam Site
- PL 566 Small Watershed Project
- Wildlife Management Area
- Fish Hatchery
- Game Farm

Massachusetts Water Resources Commission
Division of Water Resources

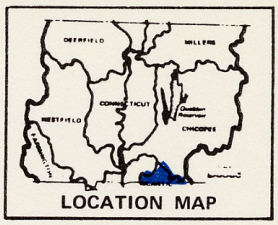
CRB V

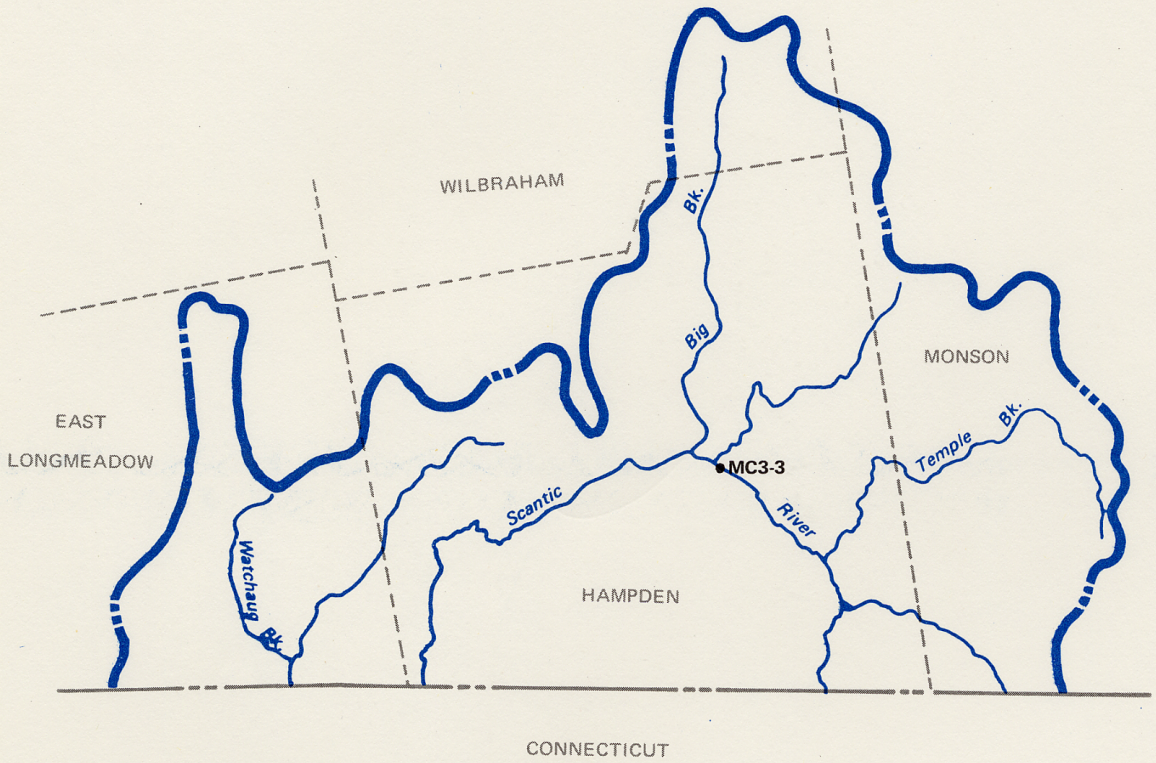
CHICOPEE RIVER WATERSHED

Major Non-Federal Water Developments & Outdoor Recreation Areas

SCALE
0 5 10 15 Miles

PLATE NO.6





LEGEND

- Watershed Boundary
- State Forest or Park
- Municipal Watershed
- Significant Non-Federal Impoundment
- ● CRB Study Proposed Dam Site
- PL 566 Small Watershed Project
- Wildlife Management Area
- Fish Hatchery
- Game Farm

Massachusetts Water Resources Commission
Division of Water Resources

CRB V
SCANTIC
RIVER WATERSHED
Major Non-Federal Water Developments
& Outdoor Recreation Areas

SCALE
0 1 2 Miles

PLATE NO.7

COMPREHENSIVE WATER AND RELATED LAND RESOURCES

CONNECTICUT RIVER BASIN

APPENDIX Jc

STATE OF CONNECTICUT

PREPARED BY

CONNECTICUT DEPARTMENT OF AGRICULTURE
AND
NATURAL RESOURCES
HARTFORD, CONNECTICUT

JUNE 1970

APPENDIX Jc

STATE OF CONNECTICUT

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APPENDIX Jc

STATE OF CONNECTICUT

I INTRODUCTION

We have seen the culmination of many years of work in the long-awaited Comprehensive Water and Related Land Resources Investigation of the Connecticut River Basin. With this comprehensive report in hand, we now can begin to decide what actions should be taken in Connecticut to make optimal multi-purpose use of the river and its surrounding areas.

This brief appendix to the report lists some pertinent data concerning key public and private efforts to protect the environmental quality of the basin. Specific mention is made of (1) agencies and organizations involved in water and land resource issues, (2) discussion of water resource management responsibilities assigned the Water Resources Commission by State Statute, and (3) a listing by location of existing State open space holdings and action programs in the valley.

We hope that this report will help spark increased interest in the many issues and opportunities present in the Connecticut River Basin. Connecticut has a number of such issues of priority concern. For example, we hope that the Connecticut River National Recreation Area concept becomes a reality, in a form compatible with the desires and needs of the local residents. We also hope to see the protection of the remaining tidal wetlands and the successful completion of the proposed restoration of Salmon runs in the valley. Furthermore, we trust the issue of diversion of water out of the watershed can be resolved satisfactorily without detriment to the needs of downstream users.

Beyond these currently-recognized issues, we hope that there will be perception of future problems and opportunities. For example, can the spoil from necessary channel improvement projects serve as a source of needed cover in sanitary land fill operations? Or can the complex of problems relating to thermal pollution and cooling towers be resolved? We feel that many such issues will emerge, but are confident that proper analysis and study can produce the needed answers.

II SELECTED STATE STATUTES RELATING TO WATER RESOURCES MANAGEMENT

A. GENERAL

In the area of common law, Connecticut is typical of New England States in utilizing the doctrine of riparian rights with regard to water in natural watercourses. This of course demonstrates the influence of historical tradition derived from medieval England which was both water-rich and with a legal tradition of slowly evolving common law. Over the last three centuries, a body of law based on court decisions has been developed. As might be expected, this body of law is essentially the same as that of other states in the valley and has been summarized by Clyde O. Fisher, Jr. ("Connecticut Law of Water Rights") and others.

However, primary emphasis in this discussion will be placed on those State Statutes which directly influence the management of Connecticut's water resources. Particular emphasis will be given to those statutes which are the responsibility of the State Water Resources Commission to enforce or carry out. By major function these are as follows:

1. Flood Control and Prevention of Flood Damages

This is accomplished by:

(a) Channel Encroachment Line Program: The Water Resources Commission has hearings and establishes encroachment lines beyond which in the direction of a waterway no obstruction to flood waters may be constructed without a permit. This program prevents the accumulated reduction in the flood carrying capacity of our waterways. As a supplement the statutes require that the Highway Department comply with this principle even at locations where encroachment lines have not yet been established.

(b) Local Flood Control Projects: The State can enter into cooperative agreements with local communities to design and construct flood control projects under financial arrangements within the capability of communities.

(c) Major Flood Control Projects: The Water Resources Commission is designated to act as the cooperating agency with the Army Engineers to accomplish the construction of larger flood control projects. Similar authority to work with the Soil Conservation Service has been given to the Department of Agriculture and Natural Resources.

(d) Floodplain Information Program: The Water Resources Commission cooperates with the Army Engineers in the floodplain information program, involving preparation of floodplain reports on designated rivers or parts thereof.

2. Dam Inspection Program

The Water Resources Commission must review and grant permits on the safety of all existing or new dams, dikes, or similar structures.

3. Shore Erosion Projects Program

The Water Resources Commission is directed by statute to develop, plan, and construct in cooperative agreement local community projects to alleviate shore erosion.

4. Control of Navigable Waters

The Water Resources Commission reviews all plans for structures or dredging in navigable waters and issues or denies permits on considerations outlined in the statutes.

5. Eutrophication Problems

The Water Resources Commission also studies problems of algae and weed control and approves and helps to finance projects for alleviation.

6. State Water Resource Planning

The Water Resources Commission is also directed by statute to carry out a water resources inventory of the entire state and to cooperate in the development of a state plan for pollution abatement, water supply, and recreation (Interagency Water Resources Plan).

7. Pollution Control

A new pollution control act passed in 1967 provides the authority to bring about the treatment of every discharge in the state to the degree that it is technologically feasible by the end of 1974. The facilities are being constructed to handle the anticipated increase in each discharge for a period of 20 years. The statute divides the existing problems into five categories.

First, the statutes outline the authority against any municipality causing pollution and it provides that instead of ordering a completed project, the Commission may order at least 7 steps leading to the placing in operation of proper facilities with a time schedule for the accomplishment of these steps. The State does not have to wait two or three years to bring action for non-compliance. The statute actually requires that the Commission ask for action by the Attorney General on any missed step. There are other features which provide a method of avoiding dead ends which were previously experienced. The Commission does not have to prove that a municipality itself is causing pollution. It only has to provide that a community pollution problem exists within that municipality or that such a community problem can be reasonably anticipated in the future. Another important dead end is avoided by giving the Commission authority to decide which municipality has the responsibility for abatement if the problem occurs within the geographical limits of more than one municipality. It can also issue Orders to two municipalities to jointly treat their wastes or require a municipality to provide capacity for a problem in a neighboring municipality. These powers enable the Commission not only to coordinate proper regionalization but to actually require it. The proper plan is determined in the engineering report and the plans and specifications and construction must be in conformance with this report to receive approval or the financial grants. The report itself is only approvable if it covers all the items which were set forth by the Commission in a pre-report conference with the engineer.

The second type of administrative problem is handled through the issuance of Orders to any private individual or corporation who was polluting at the time that the statute became effective and permits the state to require the accomplishment by scheduled steps.

The third type applies to situations which arise after the passage of the Act and requires that any new discharge, polluted or not, receive a permit. If the Commission finds, upon investigation, that the discharge would cause pollution then it must approve the proposed system of treatment. If a permit is denied the applicant has a right of court appeal, but he cannot discharge until a decision on the appeal is rendered. The permits are for a period of five years and are for a specific type and volume of discharge and assume the proper operation and maintenance. Against one who does not comply the action of the Commission is to enjoin the discharge rather than bring a violation action in a minor court.

The fourth type of administrative problem is covered by providing that the Commission shall periodically investigate those discharges which are operating under a permit and if it finds that the permitted facilities no longer insure against pollution, it may issue another Order against the previously permitted discharge.

There is a fifth type of administrative problem in pollution abatement referred to as accidental, seasonal, occasional, or incidental, which is difficult to act against because the situation generally does not exist when the action is finally brought to court. On the assumption that accidental discharges arise for a potential condition, the statute allows the Commission to issue an Order against any person who is maintaining a condition which can be reasonably expected to create pollution.

The statutes provide a bond issue of $250 Million Dollars to provide a state grant of 30 percent to municipalities and to advance the federal grant if monies are not available. The law also provides that no new discharge, even a clean discharge, can be established without a permit.

III AGENCIES & ORGANIZATIONS PERFORMING ENVIRONMENTAL PLANNING, RESEARCH, AND REGULATORY FUNCTIONS

A. STATE AGENCIES

1. College of Agriculture - University of Connecticut

Helps promote orderly development of the State's resources through teaching, research (Storrs Agricultural Experiment Station), and extension work (Cooperative Agricultural Extension Service).

2. Connecticut Agricultural Experiment Station

Carries out research to advance our knowledge of plants, their pests and environment and to apply this knowledge for the welfare of citizens, their plants, and their lands.

3. Connecticut Development Commission

Collects, compiles, and disseminates information to the natural and economic resources of the state. Promotional efforts to strengthen the State's economy include encouragement of location of new business and industry in Connecticut, encouragement of vacation-travel business, and foreign trade, revitalization of Connecticut's marine commerce, and assistance to local communities and organizations.

4. Connecticut Transportation Department

Coordinates highway planning with area planning objectives and other state departments. In coordination with the Bureau of Public Roads carries out roads beautification practices. Also maintains liaison with the Connecticut Historical Commission in order to minimize damage to the historical heritage of Connecticut through highway construction.

5. Connecticut Historical Commission

Studies and investigates historical sites and places and recommends their official marking and preservation. Also authorized to set guidelines for establishment of historic districts and promote historic heritage of Connecticut. Has completed state-wide inventory of key historic landmarks and properties.

6. Office of State Planning

Serves as a focal point for the preparation and sponsorship of a long-range statewide comprehensive plan to cope with the problems and exploit the opportunities of Connecticut's indicated growth and development. Basic to the operations of its planning program is the coordination of the planning activities of the state's planning regions, the individual department of state government, and related federal agencies.

7. Department of Agriculture and Natural Resources

Coordinates the activities of a number of existing natural resource-oriented agencies to provide a unified program of action for the conservation of Connecticut's natural resources. A major function assigned to the Council on Agriculture and Natural Resources (composed of the constituent agencies of the Department of Agriculture and Natural Resources plus the Connecticut Development Commission) is the administration of the State Open Space Grant-in-Aid Program.

Its major constituent agencies and their primary duties include:

(a) Department of Agriculture: Promotes soil conservation in collaboration with the U.S. Soil Conservation Service through such mechanisms as the Soil and Water Conservation District Program and the Small Watershed Protection and Flood Prevention Program. Also promotes municipal conservation commissions and carries out functions relating to the production and marketing of the agricultural sector of the economy.

(b) Park and Forest: Performs functions relating to the development, operation, and maintenance of state-owned recreation areas. In addition, manages state forests, protects public and private woodlands, and provides technical and professional forestry services.

(c) Board of Fisheries and Game: Manages the Fish and Game resources of the state including the restocking of such resources for recreational use through lease, purchase, and treatment of suitable game habitat, plus programs of law enforcement and information and education.

(d) Water Resources Commission: Performs many important functions relating to the maintenance and control of water resources. Its functions include responsibility for flood control work and the establishment of channel encroachment lines, beach erosion control, inspection of dams and marinas, control of dredging activities, allocation of federal funds for sewerage facilities, and pollution abatement.

(e) Boating Safety Commission: Administers the state's boating safety program on both state waters and federal waters within the state's jurisdiction. These responsibilities include registration of motorboats, encouragement of safe boating, and study and recommendations of boating facilities.

(f) Shellfish Commission: Functions as a service to the public and industry in the administration of franchised, leased, and public shellfish areas, including supervision of activities and reviewing permits for dredging or construction within tidal areas.

(g) Geological and Natural History Survey: Carries out mapping of the surficial and bedrock geology of the state in cooperation with the U.S. Geological Survey. Also aids in the publication of other manuscripts of geological, botanical and zoological interest.

(h) Wetlands Program: Regulates the use of and encourages the preservation of the state's tidal wetlands and estuarine systems.

(i) Open Space Program: Provides Grants-in-Aid to assist Connecticut towns with the purchase of land and water for conservation and recreation. Also assists towns in the preparation of applications for Federal Open Space Grants.

8. Department of Health

Serves as regulatory agency to control air pollution. Also concerned with public health aspects of water pollution, including inspection of water supplies, sewage treatment plants, camps, and swimming areas. Also regulates development utilizing septic tank systems.

B. INTER-STATE AGENCIES

1. The New England Interstate Water Pollution Control Commission.

Carries out a coordinated interstate program for pollution abatement through classification of interstate rivers and establishment and acceptance of desirable standards which serve as guidelines to be followed by the states concerned.

STATE FORESTS	ACRES	TOWN	FACILITIES
Algonquin	2,933	Colebrook	F
American Legion	782	Barkhamsted	F H P C
Cockaponset	14,957	Haddam *	F H P C
Massacoe	380	Simsbury	
Mattatuck	4,369	Watertown *	H P
Meshomasic	6,648	Portland *	F H P
Massahegan	1,226	Burlington *	H
Nehantic	3,655	East Lyme *	F H
Nepaug	1,198	New Hartford *	H
Paugnut	2,067	Torrington	H
Peoples	2,954	Barkhamsted *	F H P S
Salmon River	6,102	Colchester *	F H P
Shenipsit	6,245	Stafford *	F H S
Tunxis	8,692	Hartland *	F H
Total	62,208	(Grand Total in Acres) = 70,439.8	

* And adjacent Town or Towns

** All Forests are open to public uses including hiking and horseback riding, nature study, collecting of wild fruit & mushrooms, and primitive camping with Ranger permission.

F = Fishing - under regulations
H = Hunting-Bow & Gun under regulations
P = Picnicking
C = Camping
S = Snowmobile

project, and carry out all other specified provisions of the compact with respect to both flood control alone and the utilization of the water resources of the Connecticut River Valley.

5. Atlantic States Marine Fisheries Compact

Promotes the better utilization of the fisheries, marine, shell, and anadromous, of the Atlantic seaboard by the development of a joint program for the promotion and protection of such fisheries, and by the prevention of the physical waste of the fisheries from any cause. It also has the "power to recommend to the States ... the stocking of the waters of such states with fish and fish eggs."

C. OTHER AGENCIES AND PROGRAMS (PRIVATE AND SEMI-PUBLIC)

1. Soil and Water Conservation District Program

Offers a program of financial and technical assistance to the people of Connecticut for many types of conservation plans and actions with the involvement of locally elected County Supervisors. Services provided include planning, land acquisition, maintenance and operation of the various projects.

2. Regional Planning Agencies

Develop and maintain regional plans of development. Are involved in all aspects of regional planning including water supply (present and potential) sewerage, open space and recreation, and more general land use considerations.

3. Farmington River Watershed Association

A private organization of local citizens and groups dedicated to the wise use of natural resources of the Farmington Valley. Areas of concern include control of water pollution, provision of more recreation areas, flood protection, and conservation and preservation of the scenic beauty of the valley.

4. Connecticut River Watershed Council

A private organization dedicated to the promotion of the reservation and preservation of the Connecticut River Valley's water, land,

and forest resources for the purposes of recreation, watershed protection, and fish and wildlife management. Also concerned with preservation of natural areas and retention of scenic values.

D. MISCELLANEOUS STUDIES AND PROGRAMS OF ENVIRONMENTAL INTEREST

1. Connecticut Comprehensive Statewide Outdoor Recreation Plan: 1965-1970

Prepared with the assistance of the Land and Water Conservation Fund Act of 1965. The Plan's purpose was to propose a five-year program for action to provide outdoor recreation facilities of all types for the State of Connecticut.

2. The Green Land

Prepared as part of the Planning Phase of the Connecticut Interregional Planning Program and also to update the Connecticut Comprehensive Statewide Outdoor Recreation Plan. It discusses the broadly defined area of concern called "open space," including the functions of production, water resource management, preservation and environmental design. Key features include discussion of open space goals and objectives and development of action recommendations.

3. Connecticut Statewide Outdoor Recreation Plan: 1968 Revision

Provides further updating of this plan with particular emphasis on needed action by area of responsibility and development of a priority system for evaluating such actions.

4. Coginchaug-Mattabesset River Study

A feasibility study to determine the need for the conservation, preservation and protection of the Coginchaug and Mattabesset River drainage systems and the optimum multi-use development of these natural resources.

5. The Scantic Valley: Its Future

A comprehensive study to determine the feasibility and suitability of creating a state park along the Scantic River, a major tributary of the Connecticut River. This park, if created, would provide much needed multi-purpose recreation in an area with a serious deficit of recreational opportunity.

6. Clean Water for Connecticut, An Action Program (Clean Water Task Force)

Provides four principal recommendations to clean up Connecticut's water over a seven year period:

(1) A $150 million bond issue to finance an accelerated program of waste treatment.

(2) A revision of state business taxes to encourage the treatment of industrial waste.

(3) A general review of all state laws and codes pertaining to water as well as a study of how these laws and codes can best be administered.

(4) A vigorous support of Federal Pollution Control Legislation.

7. The Governor's Committee on Environmental Policy

Composed of a cross-section of Connecticut citizens called upon to consider a possible environmental policy for Connecticut which includes diagnosing the causes of and devising remedies for an environmental illness, including specific and comprehensive recommendations to achieve a quality environment.

8. Connecticut Inter-Agency Water Resource Study

The State's Departments of Health, Agriculture and Natural Resources, and Office of State Planning are conducting a water study of the State's water resources to determine the present and potential supply of and demand for water for recreational, domestic, and industrial and commercial uses.

9. Connecticut River Study

This study was undertaken to measure any environmental effects caused by thermal pollution from the Connecticut Yankee Atomic Power Company nuclear power plant at Haddam Neck. A number of monitoring stations have been established and infra-red photography utilized to measure the effect of this heated discharge. Further studies have analyzed its impact on the resident and migratory aquatic fauna, especially on the valuable shad run.

APPENDIX

APPENDIX

State Agency Property and Activities

in the Connecticut River Watershed

The constituent agencies of Connecticut's Department of Agriculture and Natural Resources have considerable holdings in this watershed. These are primarily under the control of the Park and Forest Commission and the State Board of Fisheries and Game. In addition other properties involved in the Small Watershed (PL #566) Flood Control Projects also are found. Other key state agency activities include the Channel Encroachment Line and the Water Pollution Control Programs of the Water Resources Commission. By agency these holdings and programs can be detailed as follows:

1. Park & Forest Commission: Holdings in Connecticut River Watershed

The State Park and Forest Commission presently administers and controls 70,440 acres of park and forest lands within the Connecticut River Basin, of which 7,786 acres are designated as park lands (27), 62,208 acres are administered as state forests (14), 428 acres are under resource management, and 17.8 acres are classified as state monument (Saybrook Fort Site). The total frontage along the banks of the Connecticut River total 51,200 linear feet. Park attendance at the park areas within the river basin during 1969 was 763,912 visitors, broken down to 752,958 day visitors and 10,954 campers. As listed by major category, these facilities include:

STATE PARKS	ACRES	TOWN	FACILITIES												
			Boating	Camping	Concession	Fishing	Hiking	Historic	Museum	Picnicking	Picnic Shelter	Swimming	Winter Sports	Connecticut River Frontage (Ft.)
Bolton Notch	70	Bolton					x							
Brainard Homestead	25	East Haddam								x				
Campbell Falls	102	Norfolk				x	x			x				
Dart Island	2	Middletown												2000
Day Pond	180	Colchester				x	x			x	x	x		
Dennis Hill	240	Norfolk					x			x	x			
Devil's Hopyard	860	East Haddam		x		x	x			x				
Dinosaur	30	Rocky Hill			x			x						
Gay City	1514	Hebron			x	x	x			x		x		
George D. Seymour	222	Haddam												4800
Gillette Castle	171	Lyme			x		x			x	x			3200
Haddam Island	14	Haddam												6400
Haddam Meadows	165	Haddam	x			x				x			x	8000
Haystack Mt.	225	Norfolk				x	x			x				
Higganum Reservoir	147	Haddam				x	x							
Horseguard	146	Avon												
Hurd	810	East Hampton		x			x			x	x			6800
Lamentation Mt.	47	Berlin					x							
Millers Pond	261	Durham												
Penwood	787	Bloomfield					x			x	x			
Platt Hill	81	Winchester												
Selden Neck	528	Lyme												12000
Stratton Brook	145	Simsbury			x	x	x			x	x	x		
Sunset Rock	15	Plainville					x							
Talcott Mt.	557	Bloomfield					x			x				
Trimountain	157	Durham					x							
Wadsworth Falls	285	Middlefield			x	x	x			x		x		
Total	7,786													
RESOURCE MANAGEMENT AREAS														
Conn. Valley R.R.	300	Essex					x							
Windsor Meadows	128	Windsor	x			x	x							8000
Total	428													
STATE MONUMENTS														
Saybrook Fort	17.80	Old Saybrook												

STATE FORESTS	ACRES	TOWN	FACILITIES
Algonquin	2,933	Colebrook	F
American Legion	782	Barkhamsted	F H P C
Cockaponset	14,957	Haddam *	F H P C
Massacoe	380	Simsbury	
Mattatuck	4,369	Watertown *	H P
Meshomasic	6,648	Portland *	F H P
Massahegan	1,226	Burlington *	H
Nehantic	3,655	East Lyme *	F H
Nepaug	1,198	New Hartford *	H
Paugnut	2,067	Torrington	H
Peoples	2,954	Barkhamsted *	F H P S
Salmon River	6,102	Colchester *	F H P
Shenipsit	6,245	Stafford *	F H S
Tunxis	8,692	Hartland *	F H
Total	62,208	(Grand Total in Acres) = 70,439.8	

* And adjacent Town or Towns

** All Forests are open to public uses including hiking and horseback riding, nature study, collecting of wild fruit & mushrooms, and primitive camping with Ranger permission.

F = Fishing - under regulations
H = Hunting-Bow & Gun under regulations
P = Picnicking
C = Camping
S = Snowmobile

STATE PARK ATTENDANCE - 1969

PARK	VISITORS	CAMPERS	TOTAL
Campbell Falls	7,059		7,059
Day Pond	42,035		42,035
Dennis Hill	12,178		12,178
Devil's Hopyard	84,807	7,860	92,667
Dinosaur	104,289		104,289
Gay City	50,789	81	50,870
Gillette Castle	169,765		169,765
Haddam Meadows	41,515		41,515
Haystack Mt.	8,890		8,890
Hurd	43,839	2,813	46,652
Penwood	66,883	200	67,083
Platt Hill	6,187		6,187
Stratton Brook	56,369		56,369
Talcott Mt.	10,445		10,445
Wadsworth Falls	47,908		47,908
Total	752,958	10,954	763,912

Future plans within the basin are primarily to expand and to promote for public passive use, with all reasonable dispatch, those areas presently administered by the Commission. It is the Commission's proposal to initiate the establishment of new areas which fall within its established acquisition program, and adhere to the Commission's overall policies of acquisition. Mindful of the importance of water-oriented areas, this Commission, since it was established in 1913, has stressed the acquisition of scenic banks along the Connecticut River. In fact, the second purchase of land for a State Park in Connecticut was Hurd Park, bordering the river in the town of East Hampton. The Commission will, in the future, continue to place in public ownership any and all lands that it deem worthy of State purchase.

Two exhaustive State-financed planning studies have been effected. The original State Comprehensive Outdoor Recreation Plan (1965) and its recent updating and revision incorporate effectively and quite adequately this agency's goals and objectives for recreational development within the river basin. Now that the entire Connecticut River is being more prominently recognized by the Federal Government, State guidance as to what happens within its confines is of the utmost importance to the Park and Forest Commission. As in-depth corridor research, evaluation and directive development plan, particularly from an overall recreational study, should be programmed.

Only then can each individual recreational interest define and develop its own program in relationship to the whole basin.

The recent study of the Potomac River is a fine example of what might well be proposed for our Connecticut River, and this was piloted by a reputable and talented firm, knowledgeable of environment, ecology, and people. While the Commission recognizes that many studies have already been made by the Army Engineers, BOR, University of Connecticut, National Park Service, etc., nevertheless it is felt that in all of these reports, emphasis has been placed primarily upon one particular resource, namely water, rather than on an in-depth study of the whole scale of the social concept within the valley. Consideration should be given to the part to be played by each individual community, each individual State operation, and/or each individual private segment, and also any federal involvement.

2. BOARD OF FISHERIES AND GAME:

Holdings in Connecticut River Watershed

Town	Location	Acreage	Type
Avon	Farmington River (See Burlington & Canton)	94.	Access, flowage and river bottom
Barkhamsted	West Hill Pond	2.	Access
Berlin	Silver Lake	144.	" & Pond Bottom
	Kensington Hatchery	42.	Fish Hatchery
Bloomfield	Barbers Pond (See Windsor)	65.	Access & Pond Bottom
Burlington	Burlington Hatchery	35.	Fish Hatchery
Chester	Cedar Lake	2.	Access
Colchester	Pickerel Lake	85.	" & Pond Bottom
	Salmon River	32.	" & River "
	Hayward Lake	6.	" & Pond "
Cromwell	Sebethe River	.30	"
	Cromwell Meadows	487.	Tidal Marsh
Durham	Durham Meadows	556.	" "
East Haddam	Bashan Lake	279.	Access, flowage and dam site
	Chapman Pond	1.5	Access
	Haddam Neck Area	32.5	Tidal Marsh
	Hayward Lake	6.7	Access & Pond Bottom
	Moodus Reservoir	454.5	Access, flowage and dam site
	Pickerel Lake (See Colchester)		
	Wopowog Management (See E. Hampton & Haddam)	473.	Wildlife Management Area
	Rich's Island	10.	Island
East Hartford	Connecticut River	2.	Access
East Windsor	Pelton's Pasture (AKA Flaherty's)	261.	Field Trial Area

Town	Location	Acreage	Type
Ellington	Crystal Lake	.6	Access
Essex	Thatch Bed Marsh	4.	Tidal Marsh
Farmington	Shade Swamp	500.	Inland Marsh
Glastonbury	Glastonbury Meadows	2.	Tidal Marsh
Haddam	Haddam Neck Area	61.5	" "
	Bible Rock Brook	.33	Access
	Higganum Reservoir	.3	Access
	Higganum Meadows	56.5	Tidal Marsh
Hartland	Farmington River	4.	Access
Lyme	Joshuatown Pond	3.4	"
	Hog & Norwich Ponds	100.	Flowage rights
	Lord's Cove	266.7	Tidal Marsh
	Nott Island	82.	" "
Marlborough	Blackledge River	2.63	Access
Meriden	Black Pond	15.8	" and Pond Bottom
Middlefield	Beseck Lake	124.	" " " "
	Black Pond	20.	" "
	Durham Meadows	15.	Tidal Marsh
Middletown	Crystal Lake	40.	Access & Flowage
	Cromwell Meadows	36.	Tidal Marsh
	Dooley Pond	30.	Access & Flowage
New Hartford	Farmington River	7.2	"
	Spring Brook	.4	"
Norfolk	Wood Creek Pond	50.	" and Pond Bottom
Old Lyme	Four Mile River	7.5	"
	Blackhall River	3.	"
	Blackhall River Marsh	3.	Tidal Marsh

Town	Location	Acreage	Type
Old Lyme (cont'd)	Rogers Lake	1.	Access
	Great Island	510.	Tidal Marsh
Old Saybrook	Connecticut River	2.	Access
	Ferry Point Marsh	24.	Tidal Marsh
	Plum Bank Marsh	216.6	" "
	Ragged Rock Creek	202.	" "
	South Cove	28.	" "
Portland	Pequsett Meadows	10.8	" "
	Connecticut River	2.8	Access
	Wangunk Meadows	506.	Tidal Marsh
Simsbury	Farmington River	90.6	Floodplain and river bottom land
Suffield	Connecticut River	4.6	Access
Winchester	Winchester Lake & Park Pond	381.8	" & Pond Bottom
	Highland Lake	1.2	"
Windsor Locks	Windsor Locks Hatchery	58.	Fish Hatchery
Windsor	Barber's Pond	14.6	Pond Bottom
	Connecticut River	4.	Access
	Rainbow Reservoir	2.	"
	Total	6,567.5	Acres

3. SMALL WATERSHED PROJECTS (P.L.#566)

To date two #566 projects have been undertaken in the Connecticut Basin portion of Connecticut. By project and site these include the following acreage:

Project	Site	Acres in Fee	Acres in Easement
North Branch-Park River	Bloomfield	367.00	12.30
	Cold Springs	110.00	25.00
	Blue Hills	329.00	24.60
	Wintonbury	291.80	11.96
Total		1,097.80	73.86
South Branch-Park River	Talcott	47.25	86.40
	Bugbee	101.73	37.26
	South	107.64	
	Burnt Hill	49.89	
	Deadwood Swamp	322.20	
Total		628.71	123.66
Grand Total (Acres)		1,726.51	197.52

4. Water Resources Commission: Projects in Connecticut River Watershed

a. Channel Encroachment Lines (as of July 1, 1970)

Established Encroachment Lines

1. Winchester--Mad River, and Still River, from Gilbert Clock Company Dam to the Mad River Dam
2. Farmington and Avon--Farmington River, from the Railroad Bridge at River Glen to the former Conn. Power Co. Dam
3. Vernon--Hockanum River, from Route 83 to Shenipsit Lake Dam
4. Wethersfield--Connecticut River
5. Windsor Locks-- " "
6. Suffield -- " "
7. Cromwell -- " "
8. Middletown -- " "
9. Rocky Hill -- " "
10. Hartford -- " "
11. Windsor -- " "
12. Enfield -- " "
13. So. Windsor -- " "
14. East Windsor -- " "
15. Portland -- " "
16. East Hartford-- " "
17. Glastonbury -- " "
18. Hartford and Bloomfield--North Branch Park River, from Asylum Avenue to Bloomfield Avenue
19. Bloomfield--Beamans Brook, from Wash Brook to the Flood Control Dam
20. Bloomfield--Wash Brook, from Bloomfield Avenue to the Flood Control Dam
21. Bloomfield--Tumbledown Brook, from Wash Brook to the Flood Control Dam

22. Winchester--Highland Lake Stream, from Highland Lake to the Mad River

23. West Hartford--Trout Brook, North Branch Brook, Hart Meadow Brook and Water Supply Brook

24. Newington--Piper Brook

25. New Britain and Farmington--Sandy Brook, Bass Brook and Batterson Brook

26. Bristol--Pequabuck River, from Middle Street to Jacobs Street

Proposed Encroachment Lines

1. Manchester--Hockanum River

2. East Hartford--Hockanum River

3. Vernon--Hockanum River, from Manchester to Ellington

4. Bristol and Plainville--Pequabuck River, from the Railroad Bridge to Middle Street.

b. Status of Water Pollution Control Program:

Terminal Dates for Outstanding Work Orders

Town	Name	Date of Final Step	* Comments
Avon	Ensign Bickford Co.	6/68	C
	" " "	"	C
	Avon Old Farms School	9/68	C
	Town of Avon	12/73	
	Town of Avon	8/71	
	Ensign Bickford Co.	4/70	C
Barkhamsted	No Orders		
Berlin	Town of Berlin	1/72	
	Stanley Works (Chem.Div.)	7/71	R
	G.E. Prentice Mfg. Co.	12/70	
	Lower Lane Dairy	12/69	C
	Stanley Works	10/71	R
Bloomfield	Bass Plating Co.	2/71	
	Allen Mfg. Co.	1/69	C
	Bass Plating Co.	12/68	C
	Blue Hills Chrome Co.	9/67	C
	Chris Nielson & Sons	3/71	
	Savin Bros., Inc.	1/71	
	Valco Machine Co.	1/71	
	J.M. Ney Co.	8/70	
	Maple Hills Farms, Inc.	3/70	C
	Ernest Carpenter	7/69	C
Bristol	Sessions Clock Co.	4/68	C
	Bristol Brass Corp.	4/71	
	Stanley Plating Co.	9/70	
	Bedus & Stanke Plating Co.	9/68	
	General Motors Corp. Plant A	8/70	
	Comerford Spring Div.	12/71	
	J.H. Session & Son	9/69	C
	Elco Beverage Co.	2/69	C
	General Motors, Plant B	8/70	
	Hayward Printing Plate Corp.	12/68	C
	Stanley Ind. Components Div.	7/68	C
Burlington	Conn. Sand & Stone Corp.	3/71	
Canton	Town of Canton	4/69	C
	T.M. Perry Co.	12/68	R
	T.M. Perry Co.	4/69	C
	Collinsville Co.	3/69	AG

*Legend
C - Project Completed
R - Order Revoked
AG - Referred to Attorney General

Terminal Dates for Outstanding Work Orders (cont'd)

Town	Name	Date of Final Step	Comments
Chester	Town of Chester	10/72	
	C.J. Bates & Sons	6/68	C
	C.J. Bates & Sons	11/69	C
Colchester	Borough of Colchester	10/72	
	Spaulding - Norton, Inc.	3/69	R
Colebrook	No Orders		
Cromwell	The Mattabassett District	12/72	
	Ridgeview Rest Home	8/70	
	Aluminized Finish Co.	1/69	C
Deep River	Town of Deep River	10/72	
	White Way Laundry	11/72	
	White Way Laundry	11/72	
	Shoreline Gravel Co.	1/69	C
Durham	No Orders		
East Granby	Roncari Industries	5/69	C
East Haddam	Brownell Co.	5/68	C
	Orchard Mansion	6/68	C
	Banner Lodge	5/68	C
	Francis Shenkman	12/70	
	Joseph Budka	12/70	
	Levine Estate	12/70	
East Hampton	Town of East Hampton	12/70	
	L & W Plating Co.	12/72	
	Youngs Electrical Appl. Co.	12/72	
	Belltown Wash-Ette	12/72	
	Bevin Bros. Mfg. Co.	12/72	
	Gong Bell Mfg. Co.	12/72	R
	Newconn Corp.	12/72	
	Carpentier-Hayer Pap. Box	9/71	R
	Corson Electric Mfg.	12/72	
	Planeta Real Estate	12/72	
	Bevins Bros. Mfg.	9/70	
	L & W Plating	9/70	C
	Belltown Wash-Ette	12/72	
	Bevin Wilcox Line Co.	12/72	
	East Hampton Laundromat	12/72	
	Gong Bell Mfg. Co.	4/69	R
	Youngs Electrical Appl. Co.	7/69	C
East Hartford	Metropolitan Dist. Commission	10/72	
	" " "	11/70	
	Doll Paper Co.	10/70	
	Burnside Co.	8/70	
	Case Bros., Inc.	6/70	
	Republic Steel Corp.	9/70	
	Doll Paper Co.	1/71	

Town	Name	Date of Final Step	Comments
(cont'd)			
East Hartford	United Aircraft (P&W)	6/72	
	Endacom Graphics, Inc.	8/70	R
	65 Incorporated	8/70	R
	Leitao's Minit-Car Wash	10/70	AG
East Windsor	Town of East Windsor	9/69	C
	Broad Brook Sewer Dist.	9/71	R
	Town of East Windsor	9/71	
Ellington	Moser Farms Dairy	8/70	C
	Spielman Dairy	5/69	R
	Cordtsen Dairy	5/69	R
Enfield	Town of Enfield	6/72	
	Thompsonville Fire&Sewer Dist. 2	5/69	R
	Debell & Richardson	11/68	C
	Rainbows, Inc.	1/70	C
	Smyth Farm Dairy	12/67	C
	United States Envelope	8/70	
	Debell & Richardson	11/68	C
	Enfield Dairy	12/67	R
	Rainbows, Inc.	3/70	C
	Smyth Farm Dairy	12/67	C
	United States Envelope	8/70	
Essex	Town of Essex	10/72	R
	Verplex Co.	3/69	C
Farmington	Town of Farmington	8/71	
	" " "	9/68	C
Glastonbury	Town of Glastonbury	8/71	
	Herman Roser & Sons	12/69	R
	" " "	12/70	R
	Glast. Dyeing & Finish	5/68	C
	Arbor Acres Farm	10/70	
Granby	Town of Granby	8/70	
Haddam	Frismar, Inc.	6/68	C
	Sibley Co.	11/70	
Hartford	Metropolitan Dist. Comm.	5/72	
	" " "	8/70	
	Kilian Steel Ball Corp.	9/69	C
	Suisman & Blumenthal, Inc.	4/71	
Hartland	No Orders		
Hebron	No Orders		
Lyme	No Orders		

Town	Name	Date of Final Step	Comments
Manchester	Case Brothers, Inc.	9/69	C
	Town of Manchester Utl.	12/70	
	Dari-Maid Milk Co.	11/69	C
	Manchester Sand & Gravel	5/70	C
	Colonial Board Co.	1/71	
	Andrew Ansaldi Co.	5/68	R
Marlboro	No Orders		
Middlefield	M.H. Robinson Co.	8/68	R
	Dainty Maid, Inc.	10/69	C
	John B. Sibley	10/69	C
	Zemel Bros., Inc.	10/69	C
	Lyman Gunsight Corp.	7/70	
	Rogers Mfg. Co.	11/68	R
Middletown	City of Middletown	9/72	
	" " "	8/71	
	Rem. Off. Mach. Div.	9/70	
	Public Health Foundation	9/70	
	City of Middletown	6/68	C
	" " "	12/72	
	Wilfred Kaufman d/b/a RV Pac.Co.	8/68	C
	Manfred Marx d/b/a River Pac.Co.	8/68	C
	Commodore MacDonough Inn	5/69	C
	H.K. Porter Co.	10/68	C
	Htfd. Elec. Light Co.	6/68	C
	Rem. Off. Mach. Div.	9/70	
	Middletown Beef Co.	9/70	R
	Wilfred Kaufman d/b/a RV Pac.Co.	8/68	C
	Manfred Marx d/b/a River Pac.Co.	8/68	C
	Middletown Industries, Inc.	4/69	C
	Raymond Engineering Co.	5/68	C
	Wilcox-Critteden Div.	8/68	C
	H.K. Porter Co., Inc.	9/68	C
	" " " (Thermoid Div)	3/69	R
	UAC Pratt & Whitney Div.	7/71	
	Feldspar, Inc.	4/69	C
Monroe	No Orders		
New Britain	City of New Britain	6/72	
	Stanley Works	12/72	
	North & Judd Mfg. Co.	12/72	
	Fafnir Bearing Co.	12/72	
	Superior Steel Ball Co.	12/72	
	H.G. Finn Co.	12/72	
	High Production Machine	12/72	
	General Electric Co. Housewares	6/69	R

Town	Name	Date of Final Step	Comments
(cont'd)			
New Britain	New Britain Machine Co.	11/68	C
	Skinner Precision Ind.	12/72	
	Union Mfg. Co.	12/72	
	Fafnir Bearing Co.	12/72	
New Hartford	Town of New Hartford	4/68	C
	Pine Meadow Fire Dept.	9/69	C
	Town of New Hartford	7/68	C
Newington	Atrax Div. Wallace-Murray	5/70	C
	Caval Tool & Machine Co.	1/71	
	Fafnir Bearing Co.	5/71	
Old Lyme	No Orders		
Old Saybrook	Saybrook Laundry	3/68	C
Plainville	Town of Plainville	10/69	C
	" " "	6/70	
	Plainville Electro Plating	5/69	C
	Gull Metal Specialties	7/68	C
	Rayex Corp.	9/68	C
Plymouth	Town of Plymouth	6/70	
	Iseli Swiss Screw Machine	11/67	C
	Town of Plymouth	9/72	
	Gedney Electric Co.	2/71	
	Eagle Lock Corp.	9/68	AG
	Danis Chevrolet Co.	7/70	
Portland	Town of Portland	9/70	
Rocky Hill	Metropolitan Dist. Comm.	10/72	
	Connecticut Chrome, Inc.	5/68	C
Salem	No Orders		
Simsbury	Town of Simsbury	5/72	
	Ensign Bickford Co.	8/72	
	(5 orders)		
	Westminster School	8/72	
	Pharos Farm Dairy	5/69	R
Somers	Town of Somers	3/72	
	Somersville Mfg., Inc.	10/70	R
	Somers Plating, Inc.	1/71	
	AAB Platers	6/70	
South Windsor	Town of South Windsor	4/72	
	NuWay Tobacco Co.	7/71	
	Gulf & Western Industries	10/69	R
	Gerber Scientific Instr.	3/70	R
	Good Humor Corp.	8/70	

Town	Name	Date of Final Step	Comments
Suffield	Town of Suffield	6/72	
Vernon	Town of Vernon	7/70	
	Aldon Spinning Mills Corp.	1/71	
	Town of Vernon	12/72	
West Hartford	Town of West Hartford	12/72	
	Colt Ind. P&W Mach. Tool	1/69	C
	Abbott Ball Co.	5/69	C
	Jacobs Mfg. Co.	2/71	
Wethersfield	John P. Ambrose	12/70	
	Hess Oil & Chem.	12/70	
Winchester	Town of Winchester	4/71	
	Std. Cycle & Auto Sup. Co.	4/71	
	Henry Dodd	4/71	
	Hudson Wire Co., Winsted Div.	1/69	C
	Son Chief Electrics, Inc.	11/68	C
	Union Pin Co.	3/69	C
	Keratene Co.	5/70	C
	" "	5/70	C
	Std. Cycle & Auto Sup. Co.	4/71	
Windsor	Metropolitan Dist. Comm.	7/70	
	" " "	9/70	
	Windsor Mfg. Co.	12/70	
	Pepsi-Cola Bottling Co.	10/68	C
	Stevens Paper Mills, Inc.	11/68	C
	Windsor Mfg. Co.	7/71	
	" " "	7/71	
Windsor Locks	Town of Windsor Locks	12/72	
	Montgomery Co.	11/69	C
	Gabb Special Products	11/69	C
	C.H. Dexter & Sons	12/72	
	Hi-G Incorporated	7/68	C
	Montgomery Co.	1/69	C
	Hi-G, Inc., Star Plating Div.	7/68	C
	United Paper Products	1/68	R
	Avis Rent A Car Systems	4/71	
	Hertz Corp.	4/71	