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THE ENVIRONMENTAL QUALITY OF  
THE MYSTIC RIVER BASIN

Including  
Reports from the  
Mystic River Symposium  
May 2, 1970

Volume I

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Experimental College

Tufts University

Medford, Mass. 02155

## FOREWORD

The present effort by Tufts students to understand and improve the environment of the Mystic River Basin began in the winter of 1969-70. This report is the first in a series intended to inform the local community and its governmental officials of the information obtained so far.

A symposium was given for the benefit of the community on May 2, 1970. Much of the proceedings of that symposium were reproduced and handed out to members of the audience. Later, additional copies were made and mailed on request to interested persons. The enthusiasm with which these were received by local citizens' groups led us to update and rewrite that document and to include more technical data. The results are contained herein.

Our group is continuing its efforts, and will have other reports available soon. We maintain a library on the campus, and will act as a central clearing house for community activities. We invite you to participate in this effort, to use our facilities, and to inform us of activities of which you are aware.

For further information, or to obtain copies of this report, write to us through the Experimental College, or call Professor Kroesser at 628-5000 extension 307.

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## Introduction and Historical Background

EXP 84 was created and run by Dr. Richard M. Dowd. The course was called "Environmental Quality: A Problem-Oriented Seminar." The project chosen was the quality and use of the air, water, and land along the Mystic River and its tributaries.

Enough enthusiasm was generated in January 1970 that approximately twelve students put in considerable time on it during the Winter period. When the Spring semester began in February, the course, like many others of this type, had an excess of applicants. The original participants were allowed to choose who would join the team on the basis of interest and background. About 25 students were enrolled, to form a very heterogeneous group; all classes and majors were represented.

The course was very loosely run to allow students to pursue their own interests. The class met as a whole once a week. During this period the students divided into five committees and planned their research and studies. The committees were: Land Use (Winnie Bates, Don Capone, Midge Chestnut, Corvis Catsouphes, Fred Geisel and Gene Zimon), Water (Paul Arell, Mark Chudzik, Jayne Falicon, Suellen Gryk, Eugene Hornsby and Evy Picker), Air Pollution (Jane Fisher, Chester Goldberg, Tom Jones, Susan Rothstein and Pat Swain), Recreation (Anne Cheney, Jonathan Fuerbringer, Nancy Hustvedt and David Maitland), Legal (Dave Anderson, Steve Ettlinger, Pat Kinsman, Laura Knecht and Wyley Robinson).

The wide diversity of knowledge and experience allowed a great deal of information sharing. Senior engineers helped to teach Jackson Freshmen how to take water samples and test them for fecal coliforms. Political Science majors helped write legal proposals for controlling noxious gas emissions into the atmosphere.

The committees did the majority of their work outside class. Students attended citizens' meetings in the towns, administrative meetings in the town halls and regional meetings in agencies such as the MDC. Groups studied the problems first hand; water samples were taken and tested, auto emissions were studied and land misuse was discovered.

Weekly meetings of the class generally were used by the students to report on their actions and discoveries. Guest speakers were invited to speak on their special interests. Dr. Hume spoke about the geology of the basin, Dr. Nickerson spoke about the ecology of the region, Mr. Greff and Mr. Burack from the NERBC also spoke on the Commission's place in the environment of New England.

The students had very little trouble gathering information. Dr. Dowd was available for consultation and the towns were very helpful in providing information. The information that was gathered is being kept as a beginning for an environment library.

The results of the data discussions and conferences of the groups were presented to the public at a symposium held on May 2, 1970, from 1:30 to 4:30 P.M. Lectures and slides were shown in Robinson 253, with discussion and refreshments in the Physics Library. The audience numbered 27 people and covered seven towns and five agencies or institutions.

Each student group made a written summary of their results, and copies were given to those in attendance. Later, a summary was written which included also the talks given by several governmental officials on the panel. A revised and updated form of that material comprises the bulk of that report.

Since the Symposium in May, many of the students have continued to work on the problems of the Basin. Since Professor Dowd was not returning in the Fall, Professor F. William Kroesser agreed to act as the group's advisor. Work continued during the Fall semester, and new recruits were found to replace those students who had graduated. Many students are spending their full time during the 1971 Winter Study Period on this effort, and a new course, EXP 85, is being planned for the Spring of 1971. The results of these studies will be put in the form of reports similar to this one, and will be available on request.

The enthusiasm created at this Symposium was remarkable. As the last question period ended, several local residents jumped up to exclaim, "We should not stop now! Let us form an association to continue what the students have done so well!" It was agreed then that a group would seek at least one representative from each town, hopefully from the towns conservation council.

The group was formed the next month and called the Mystic River Watershed Association. At the last meeting, the attendance was 12, and seven towns were officially represented.

Those who created the Association were quite interested in having it reside at Tufts. They felt that the campus was "neutral ground" in that Tufts has no political ties to any of the town governments. Professor Kroesser became the Moderator and Miss Nancy Hustvedt, E'72, became the Secretary. The Association is now in the process of defining its goals.

It should be pointed out here that one of the original purposes of the Experimental College was to help Tufts become involved in the community. EXP 84 has accomplished that goal in providing the organization, information and climate for the creating of the Mystic River Watershed Association.

Synopsis of the Mystic River Basin Symposium  
May 2, 1970  
Tufts University

Mr. Max Straw of the Metropolitan District Commission gave a brief history of his organization and told about some of its purposes, including maintenance, policing, and planning of roads and recreation areas.

Miss Mildred Chestnut from Tufts discussed the misuse of land in the Mystic River Basin. There are many available plans from individual towns and the MAPC: they should be put into effect as soon as possible for the use of land, and money is available in the form of federal and state grants for beautification and acquisition of open space. Conservation Commissions should be formed in Medford, Somerville, and Chelsea to protect what open space there is at present and to acquire any that may become available in the future.

Mr. George Gove of the National Council for Air and Stream Improvement spoke on the laws concerning water pollution and the permissible levels of pollution for water quality standards.

Mr. Eugene Hornsby from Tufts reported that the Alewife Brook is the prime cause of pollution in the Mystic River. The frequent raw sewage outfall at the Massachusetts Avenue MDC-Cambridge sewer connection causes high coliform counts, stagnation, and a health hazard. The brook should be cleaned out, flow increased, and outfall stopped. A great volume of water is removed from the Aberjona River while only a small amount is returned. Removing this water lowers the flow, reduces aeration and oxygen supply necessary for river life, and causes sedimentation. Excessive salt use on roads in winter is causing a chloride concentration on the bottoms of the Mystic Lakes due to drainage into them. The brackish environment created is killing freshwater plants. He suggested the use of other methods of snow removal and also that plans be made for flushing salt water from the bottoms of the lakes. Landfills are taking a large amount of vital wetlands, particularly along the Lower Mystic. These wetlands act as natural flood control and water storage areas, as well as serving as a natural breeding ground for animals and birds.

Medford Representative George Sacco of the House Ways and Means Committee explained how money is appropriated to the MDC and to pollution cleanup campaigns.

Mr. Thomas Jones of Tufts cited automobile emission of carbon monoxide, nitrogen oxides, hydrocarbons, and particulates including lead, incinerator emission of particulates, and sulfur emissions from burning fossil fuels as major air pollution sources in the Mystic River Basin.

New Laws to control air pollution are going into effect soon. After July 1, 1970 all fuel must have a sulfur content of 1.0% or less, and after July 1, 1971, the sulfur content must be 0.5% or less. Fuel companies must register with the Department of Public Health. Consumers of high sulfur fuel must prove that they will maintain a low level of pollution.

Mr. David Maitland of Tufts spoke on the shortage of recreation areas in general and the specific shortage in Somerville. There are many spaces available for recreation use and they can be developed using neighborhood resources with the cooperation of the necessary government agencies.

Mr. Jeff Zucker from the Harvard Environmental Law Society spoke about citizen concern and what citizens can do to control the environment around them.

### Mystic River Basin Reports

The reports which follow were prepared by the five student committees in EXP 84. These reports, originally distributed at the Symposium, are now updated with more recent information. Also, much of the technical data which was not available earlier has been added in the Appendix.

#### Land Use

The committee on land use feels that, on the whole, there has not been a constructive program of land use in the Mystic River Basin. Unfortunately we see our mistakes in retrospect.

The following areas illustrate some of our points.

- 1) Millbrook in Arlington shows an extreme misuse of a potentially attractive area.
- 2) J. M. Fields, (Wellington Circle) parking lot is typical of the many neglected areas on the Mystic's banks that destroy all inherent beauty of the river.
- 3) The view from route 60 looking toward Medford Square is good because it is open but like most land along highways it could be improved by landscaping.
- 4) The band shell on the Mystic shows good planning, however, it has not been followed up with maintenance.
- 5) The open area between Winthrop St. and Boston Ave. could be improved with bicycle paths, benches, and a small playground to encourage active enjoyment of the area.
- 6) Medford Square is the largest commercial area on the Mystic. The river bank is lined with dirty parking areas and the backs of stores. According to the MAPC report on open space and recreation Volume 3 "The view from the western bank of the river is one of chainlink fence, auto bumpers, and trash barrels above a debris-littered river." We support the report's recommendations for landscaping of the parking lots and the establishment of simple parks and walkways along the river's edge. We also feel that these plans could be implemented through the sponsorship of local merchants, the city of Medford and the MDC as part of an urban beautification program.
- 7) The hi-rise apartments for the elderly in Medford Square are an example of efficient use of land. Necessary housing is provided, but it is concentrated leaving more open space for local parks.
- 8) Winchester Center shows successful planning resulting in an attractive commercial area.

We feel that there has been sufficient study of existing land use, and that problems are well-defined as evidenced by comprehensive town plans and the MAPC<sup>1</sup> plan. We would like to emphasize, however, that action must be taken to get these plans off paper and on land. Towns should take advantage of existing federal grants for urban beautification and the purchase or creation of open space. We urge that conservation commissions be organized in Medford and Somerville to exert pressure, to make the town aware of the consequences of various actions and to communicate with the public. The significance of such communication can be illustrated by the following survey which we conducted in the Medford Square area. Out of 100 people interviewed we received these responses:

- 1) Would you sacrifice some convenient parking (and perhaps walk an extra two blocks) to have a more attractive Medford Square? 70% yes 30% no
- 2) Which do you consider the most important land use:

Recreation-open space	51%
More industry	4%
More housing	45%
- 3) Would you pay 10¢ more a month to get rid of all above-ground telephone lines? (This amount would be matched by the phone company) 81% yes 19% no
- 4) Is the city government responsive to the mood and wishes of the community? 54% yes 46% no
- 5) Do you feel that there is a need for more recreation areas in Medford? 82% yes 18% no

An example of an area where pressure should be exerted to save a large piece of land in danger of being misused exists in West Medford. The adjoining Oak Grove Cemetery and the Brook's Estate on Grove Street both belong to the city of Medford. At the present time the cemetery department is in charge of all this land. They have no plans for its development except to expand the cemetery as the need arises. A town planner feels that less than 1/4 of the wooded and grassy area will be saved unless pressure is applied. This could be a very important recreation area being large and wild enough for camping, fishing and the organized recreation for which citizens feel a need. Some of the area is already being littered with piles of rubbish. The so-called sanitary landfill that is raising the level of an "unsightly" low area near one of the ponds contains bottles, garbage and old stoves. Some of this garbage is falling into the pond and thereby starting to pollute a relatively clean body of water. There is room to expand the cemetery along Grove St. next to the railroad tracks on city land. We feel that there should be some way to order priorities, and to insure that this spot is kept intact for future generations. Let's not continue making the mistakes we see in retrospect.

## Recreation

In his struggle for survival in a world of ever-increasing competition, men must have occasion for achievement in their work. Conversely, there must be opportunity for relaxation and recreation in order that stresses and competition not detract from maximum working efficiency. Recreation, then, is an integral part of existence for every individual. Its importance is immediately evident in the urban environment. By virtue of the frantic pace in the city and the inevitable overcrowding, it has become increasingly necessary to have some area in which both adults and children can engage in sports of varying sorts or even just walk. In a word, recreation areas should provide an escape from work in the form of either exercise or relaxation.

For children, recreation is clearly important for physical health. Likewise it plays a role in the development of mental well-being, in terms of providing exposure to the other children and opportunity for contact with the environment.

Along with the need for recreation is an ever-increasing need for places to recreate. The immediate population trend indicates an out-flow of individuals from the cities to the suburbs (see appendix, Table 7, item 3). Thus, although there is a less pressing shortage of recreational facilities in suburban areas, the expectation is that their needs will become more severe. At present, Somerville is far and away the most densely populated of the communities covered in this study (see same table, item 2). By the same token, Somerville has the highest ratio of individuals to recreation area. Quantities of land presently used for recreational purposes are listed in item 5. There is, however, additional open and unused land in each of the communities studied (item 6), which if converted to play areas would bring the totals up significantly. In the case of Chelsea, for example, the total recreation area could be elevated to three times the present area used for that purpose (item 7).

According to recommendations of the NBA<sup>2</sup>, play space should be provided in the following dimensions:

Ages 3-6 years: tot lots within one-quarter mile from home, not crossing any main arteries. Facilities should include concrete sculptures, swings, sandboxes, and the like.

Ages 6-10 years: play lots within one-quarter mile from home, with swings, jungle gyms, and other such play apparatus.

Ages 10-16 years: play fields one-half mile or more from home if public transportation is available. These fields should provide area for football, soccer, and other team sports, as well as ice hockey rinks and tennis courts.

Ages 16 years and up: pools, indoor courts and the like, with no distance limit.

Recommended ratios are 100 children per acre for tot lots, 800 children per acre for large fields serving more than one neighborhood, and overall, 300 children per acre.

In Somerville, the one community with an available (current) comprehensive plan, there are only two fields providing extensive recreational facilities. Many "parks" provide benches and are designated "sitting areas," but otherwise provide no recreational opportunities. If these areas could be converted to play lots, or perhaps, if too small, to tot lots, the amount of recreational area would be increased. Supposedly such a situation exists in the other communities studied. Thus, converting small areas of land presently unused may be a real means of procuring extra recreation spaces. Further, existing open spaces could be cleaned, landscaped if necessary, and supplied with recreation equipment for youngsters. In addition, the possibility of obtaining more unused open space cannot be overlooked. Purchase of vacant land for recreation rather than for housing is one method. Use of land presently allocated as cemeteries is another alternative. Wherever plausible, the use of eminent domain should be exercised, possibly by acquisition of school playground areas.

This committee thought that the best approach to the problem was to create a recreational space inexpensively, and in doing so, show that all communities can make good use of what available space they have. We chose a rather large piece of MDC land between Shore Drive and the Mystic River in the Ten Hills area of Somerville. The plan was that the land along the river be cleaned up so it could be used for recreation. The problem was that the person, or group, such as Tufts, to whom the permit was issued had to accept legal responsibility during and after the cleanup, since it was to be used as a recreational area. The MDC could sponsor a drive to clean up, or to have the residents of the area clean up the land along the Mystic River so it will be a pleasant area.

At the moment, the existing recreational facilities are not critically lacking, but the situation is doubtless getting worse. Hopefully in the future there will be an emphasis on community-organized programs of park development. This appears to be the brightest of avenues in achieving the sort of recreational standards needed in such a heavily-populated area as the Mystic River Basin.

#### Water Quality

The watershed of the Mystic and Aberjona Rivers which comprise the Mystic River Basin, covers an area of 69 square miles containing a population of roughly 460,000. The Basin can be divided into six distinct sections: the wetlands, the Aberjona River, the Mystic Lakes, Alewife and Mill Brooks, the Upper Mystic River (which is the Mystic above where the Alewife enters), and the Lower Mystic River, from the Alewife to the Amelia Ehrhardt Dam.

The wetlands play a vital role in the ecology of the Basin. Acting as a sponge to the water table, they serve as a safety valve for natural flood control and water storage. They also serve as a breeding ground for animals and birds, and support a variety of plant life. The filling in of marshes can intensify the flood control problem and destroy an important natural resource. Legislators have recognized the value of wetlands by instituting bills such as the Hatch Act and the Inland Wetlands Act, but enforcement is hard because of the difficulty of defining the wetlands' boundaries. We suggest that a greater effort be exerted by the towns to utilize these existing laws to protect these vital areas.

Another problem, farther downstream, in the Aberjona, is the great volume of water removed from the river. Six industries, the town of Woburn, and the Parks Department of Winchester remove 14.1 million gallons per day and return only 1.8 million, as stated in the 1967 report of Camp, Dresser and McKee, Consulting Engineers<sup>3</sup>. Taking this water out lowers the flow, which reduces aeration and the oxygen supply essential for river life. This also causes sedimentation, and can lead to a general stagnation of the river.

Towns of the Mystic River Basin use large quantities of salt to clear their roads in winter. Rain and melting snow wash salt from the land into the streams. From there it is carried into the lakes where it sinks to the bottom. This chloride concentration, which is presently occurring in the Mystic Lakes causes fresh water plants to die in a brackish environment. We recommend more research directed toward ecologically improved methods of snow removal with the ultimate goal being cessation of salt use. As well, plans should be considered to flush the saline bottoms of the Mystic Lakes.

Mill Brook runs through the town of Arlington emptying into the lower Mystic Lake. Certain sections of the brook, as exemplified at Mill Street in Arlington, are full of trash. We think that with a little effort this could be removed and the beauty of the brook restored.

The Alewife, which starts at Little Pond in Belmont, picks up large amounts of storm drainage and litter on its way to the Mystic. The flow of the Alewife is unusually low, which causes a stagnant condition. There is also an overflow from the MDC Cambridge sewer connection at Massachusetts Avenue which pours RAW SEWAGE into the brook. This is not an uncommon occurrence. This location has been observed repeatedly and 80% of the time there is an outfall going into the brook. Coliform tests have been made both above and below the outfall and confirm that it is raw sewage.

Coliform tests which show the high amount of sewage in the brook are included in the Appendix, Table 1. We ran all coliform tests ourselves, using the millipore method as described in Standard Methods<sup>4</sup>.

To solve the problems of the Alewife, we suggest that it be cleaned out and the sewage outfall stopped. In addition an increased flow to the Alewife would alleviate the stagnant condition. If plant and animal

life could be returned, the citizens who live near the Alewife in Arlington, Cambridge, and Somerville, would be able to derive its benefits rather than live with it as an eyesore.

Coliform counts taken above and below the place where the Alewife enters the Mystic reveal that the foul Alewife exerts a pronounced detrimental effect on the Mystic itself. Samples taken during January through April 1970 at the Harvard Avenue Bridge, which is above the entrance of the Alewife, and Boston Avenue, which is below the Alewife, reveal that the average counts below were 17 times greater than those at Harvard Avenue.

Landfills such as the one at the MDC Hormel Stadium in Medford have taken a large amount of the marshlands along the Lower Mystic. The chloride level in the basin of the river near the dam is high. There are also a number of oil slicks, and oil residue can be seen on the Amelia Ehrhardt Dam.

In conclusion, we feel that the Alewife Brook is the prime cause of pollution in the Mystic. If this brook could be cleaned up and the flow increased, the whole lower Mystic River would benefit. To preserve the beauty of the Mystic Lakes and other ponds in the upper watershed region, the towns should try to use less salt and clean their streets by ecologically sound methods. We also must not forget the wetlands which naturally regulate water flow.

#### Air Quality

In December, 1952, a thick pall hung over London. When the smoke lifted five days later, 4000 extra deaths, directly attributed to air pollution, were recorded. In fact, Mr. A. Sayer, of the Dept. of Health and Hospitals, reports that air pollution is the fastest growing cause of death, having jumped from 1.5 to 8.0 deaths per total thousand deaths. Air pollution is reaching a crisis all across the country. Breathing in New York City for one day is equivalent to smoking two packs of cigarettes. Air pollution kills plants, damages materials, and costs everyone money. It has been estimated that the per capita cost of air pollution for a resident of Boston runs between \$65 and \$200 a year. The Mystic River Basin is not isolated from this air pollution problem.

In the Mystic River Basin, automobiles act as the major cause of pollution. Automobiles emit carbon monoxide, nitrogen oxides, hydrocarbons, and particulate matter, especially lead. Because of the expense and unavailability of measuring devices, no exact figures on CO, NO<sub>x</sub>, or hydrocarbon pollution are available. However, judging from the traffic patterns of the basin, it is safe to assume that pollution from automobiles is indeed present.

Other pollution in the basin comes from the destruction of solid wastes. There are two municipal incinerators in our area of study, one in Winchester and one in Somerville. Both of the incinerators are reportedly poorly run. In fact, the MAPCD has presently filed with the Attorney General for an injunction to be brought against Somerville's incinerator because of their repeated air pollution violations. There is also extensive on-site destruction of solid wastes in the area, mainly at apartments, schools, hospitals, and commercial businesses. Incineration of solid wastes is one of the largest causes of particulate emissions. In referring to the fact sheets, appendix Table 6, you will notice that the level of particulates in parts of the study area is above the level at which adverse effects on health are noticed.

The burning of fossil fuels is another major cause of air pollution in the Mystic River Basin. In the study area, fossil fuels are burned mainly for heat. Coal is no longer a major energy source in the area and the principle fuel in the area is oil. One-half of the oil used is the distillate type, which is used in small dwelling units. This oil is rather clean and, for the most part is pollution free. However, the rest of the oil used is of the heavy, residual type. This oil is generally dirtier and has a higher sulfur content. It is used in apartment houses, schools, commercial buildings, and other buildings of the same sort.

Smog is generally not a problem in the Basin as the area is well ventilated, with winds from the northwest in the winter, and the southwest in the summer. However, in times of an inversion, involving a stable air mass, warm air forms an upper layer that traps pollution below it. During Thanksgiving of 1966, most of the east coast of the United States was subjected to such an inversion and the pollution was most noticeable.

The past laws on air pollution in the metropolitan area have been quite poor. However, in July, 1970, new laws were instituted which improved the situation. As of July 1, 1970, all fuel in the metropolitan Boston area was required to have a sulfur content of 1.0% or less. After July 1, 1971, the sulfur content must be 0.5% or less. All fuel companies must register with the Department of Public Health, and higher sulfur content fuel can only be sold when the purchaser can prove that he will provide adequate treatment so as to maintain a level of pollution that is no higher than the level produced by low sulfur oil without treatment. With the new law, all incinerators and all plans for the building of new incinerators must be inspected and approved by the Dept. of Public Health. Open burning of leaves in the area will also be prohibited. As part of the Air Quality Act of 1967, Massachusetts has put out standards for suspended particulates and sulfur dioxide. These can be found in the appendix. These adopted standards are actually rather high (poor) as the Health Council failed to act upon the tremendous public pressure to lower these standards. The state's plans as to how it proposes to enforce these air quality standards will probably not be out for another half a year, so it is hard to make any criticism. It can only be hoped that

there will be an expanded air monitoring system and strict enforcement against all violators. Enforcement is presently more or less effective. First air pollution offence is \$10 - \$50 fine, which is no more than a slap on the wrist for any major pollutor. However, if pollution continues, fines of \$50 - \$100 a day and even later of \$200 - \$500 a day can be brought. If pollution continues, an injunction from the Attorney General can be brought to shut down the pollutor. Enforcement is rarely brought past the first stage. It is more profitable to pollute than to clean up. Pressure must be brought to bring about stricter enforcement of antipollution laws. Perhaps with the new laws, enforcement will be stricter. Maybe an even better method of enforcement would be that provided for in S. 907 in the Massachusetts Senate. An enumeration of the bill is provided. This bill would allow for private citizens to sue anyone in court who pollutes the air.

An increased use of mass transit and corresponding improvements in the mass transit system would greatly reduce the automobile caused pollution in the area. Pollution from automobiles collectively is not something that can be solved on a strictly regional basis. Automobile manufacturers must be forced to improve the emission control devices that are now put in cars. Often, after a year or so, the emission device is completely clogged and ineffective. The lead in gas is one of the main causes of this. If gasoline companies were to refine gas so as to remove the need for lead, it is estimated that the price per gallon of gas would rise by approximately 2½ cents. It is a rather small price to pay to reduce pollution.

This is in no way a complete and totally comprehensive study of the Mystic River Basin. It can only act as a starting place for increased research and increased public awareness. People must put pressure on the government and the pollutors themselves to clean it up. Time is getting short.

#### Legal Study

So far we have dealt with specific problems of the Mystic River Basin, i.e. we have considered specific sources of water and air pollution and we have considered areas where poor land use has lead to undesirable conditions. What we hope to do is analyze a framework within the government through which improvements can be made. This framework is the conservation commission. We will consider how it is outlined in the general laws, how it has been put into specific use, and also we will consider suggestions of a feasable framework to deal with the problems we have discussed. It is our belief that these suggestions can play a very important role in eliminating the problems of the Mystic River Basin.

In 1966 the Mass. State Government passed the Conservation Commission Act: to promote and develop the natural resources and to protect the watershed resources in each commission's district. The state government granted cities and towns in the Commonwealth the power to establish a conservation commission which would: 1) research land areas; 2) coordinate their activities with those of private organizations concerned with its projects; 3) keep an index of open space areas including open marsh areas and wetlands under their jurisdiction and to research proper land use; 4) recommend to the city council, selectman, Dept. of Natural Resources, state reclamation board, etc. a program of better land utilization; and 5) adopt rules to govern reclaimed land and waterways.

The commission may also receive gifts of property in the name of the city and the commission will manage and control these gifts of land. The commission may also obtain land through a purchase, lease, grant, etc. so that it may protect land areas from improper utilization and so that it may conserve land areas in their natural state. The commission may also suggest to the city or town that a tract of land be taken by eminent domain.

By selecting the Winchester Conservation Commission as our case study we are by no means saying that it is the only conservation commission that exists along the Mystic. There are several other towns in which conservation commissions have been organized. Winchester represents a good example from them all.

Winchester Conservation Commission (WCC) was based on the state's Conservation Commission Act. It was set up to promote and develop Winchester's natural resources and to protect its watershed areas. These goals are taken directly from the Conservation Commission Act but Winchester added several corallaries which we think are especially important. The Commission's goal is to preserve the suburban character of Winchester by acquiring strategically located undeveloped areas. The Commission places the highest priority on the protection of wetlands and woodlands, the preservation of water resources being vital. Irreparable damage to these two areas results from misuse and irresponsible development of these areas.

To us this part of the Winchester Conservation Commission outline shows a great deal of insight into the ecological problems that the community faces. It shows an understanding that open spaces are a necessary part of the community, if for no other reason than to maintain proper ground water levels. Of course, we realize that there are many other reasons for maintaining the open spaces which are implied above.

So far we have considered a plan organized by the state. We have seen what a city has done with this plan. Now let's look at some suggestions.

Our suggestion is to extend the idea of the Conservation Commission along two lines: 1) The Conservation Commission Act does not specifically consider the pollution problem. It is more concerned with land

use i.e. maintaining the land in its natural state. We feel that to include in this act a powerful plan whereby the Conservation Commissions can control the pollution in their areas, then action could be taken more quickly against offenders. After all, when it is your town that is being polluted, the town itself is more likely to bring about fast results than is a state government. 2) We do believe though that towns and cities cannot work independently from each other in solving their environmental problems. This idea is especially understood in terms of the Mystic River Basin. Each community along the Mystic adds to the problem. If one community cleans up and no one else follows, the river does not benefit any considerable amount. Therefore, we suggest that the Conservation Commission be set up on a regional basis with all communities working together to bring about "an environment showing due and intelligent appreciation of a civilized relationship between Man and Nature."

We do not believe that it matters whether this regional Conservation Commission be established through an act of the state government or if cities decide to band together on their own. Either way, the important thing is that such a regional Commission be established to promote intelligent land use policies and to control pollution problems.

Since an increase in flow is one of the necessary features in lowering the concentrations of pollutants in the Mystic River, we propose a change in the laws concerning ground water. At present Massachusetts law, like the English Common Law, gives each individual and owner the right to take as much water as he wants from the ground directly below his property. Obviously the man with the deeper well will get more, as will the man with the stronger pump. There is no provision made to protect the public right to ground water or to safeguard the supply against depletion. We therefore offer the following revision of the law:

I. The water of underground streams, channels, artesian formations, reservoirs or lakes, having reasonable ascertainable boundaries, are hereby declared to be public waters and to belong to the public.

II. No person shall withdraw water from any underground source in the Commonwealth of Massachusetts for use in any other state by drilling a well in Massachusetts and transporting the water outside the State.

III. The Water Resources Commission of the Dept. of Natural Resources shall require that no person, persons, or corporation shall divert subsurface or any percolating waters where such a diversion threatens to impair or would impair the natural replenishment of such waters.

IV. Hereafter no person, persons, corporation, or agency of the public shall divert or obtain by any other means water from subsurface or percolating sources in excess of 100,000 gallons per day for any purpose unless such person, corporation, or agency of the public shall first have obtained a permit from the Water Resources Commission of the Dept. of Natural Resources.

V. The price of such a permit shall not exceed 200 dollars and shall be renewed every second year. Any person, corporation, or agency of the public that uses in excess of 100,000 gallons per day from subsurface sources shall be required to pay a fee not to exceed fifty dollars per hundred thousand gallons for all water used in excess of 100,000 gallons per day.

a. All licensing fees and payments for water usage shall be made to the Comptroller of the Commonwealth and shall be thereafter added to the operating capital of the Water Resources Commission for use as the director may feel necessary.

VI. Such a permit may be refused or if granted, may include such stipulations as may be necessary to conserve the subsurface or percolating waters of the Commonwealth and prevent their exhaustion. The Commonwealth shall have the right to revoke the permit for any violation. The Commissioner of the Water Resources Commission and the Attorney General of the Commonwealth or the various District Attorneys are directed to use any legal means necessary to enforce the provisions of the act.

REFERENCES

1. Open Space and Recreation Program, Volume 3,  
Metropolitan Area Planning Council, 44 School Street  
Boston, Mass.
2. National Recreation Association  
Bureau of Outdoor Recreation, Room 4125, Interior  
Building, Washington, D.C. 20240
3. Aberjona River Watershed Committee Report, November, 1967  
by Camp, Dresser and McKee, Boston, Mass.
4. Standard Methods for the Examination of Water and Wastewater  
American Public Health Association, Inc.  
1740 Broadway, New York, New York 10019
5. Transportation Facts for the Boston Region, 1968-69 Edition  
Boston Redevelopment Authority, Boston, Mass.

**APPENDIX**

Table 1

## COLIFORM COUNTS FOR MYSTIC RIVER BASIN

<u>Date</u>	<u>Coliforms per 100 ml</u>	<u>Remarks</u>
<b>Station 0.</b>		
	Aberjona River, Shore and Skillings Rd., Winchester	
2/20/70	80	36° F.
3/27/70	64	
4/ 4/70	880	44° F. pH=6.2
4/ 8/70	460	45° F. pH=6.4
4/18/70	20	52° F.
<b>Station 9.</b>		
	Sandy Beach, Mystic Lakes, Winchester	
2/13/70	30	
2/20/70	10	37° F.
3/27/70	60	
4/ 4/70	480	45° F. pH=6.2
4/ 8/70	285	47° F. pH=6.2
4/18/70	165	52° F.
<b>Station 8.</b>		
	High Street, Medford	
1/27/70	1,250	
2/13/70	810	
2/20/70	2,100	
3/27/70	1,100	
4/ 4/70	1,600	44° F. pH=6.2
4/ 8/70	1,000	46° F.
4/18/70	1,000	52° F.
<b>Station 7.</b>		
	Harvard Avenue, Medford	
1/27/70	4,900	
2/13/70	650	
2/20/70	3,100	
3/27/70	1,200	
4/ 4/70	7,300	44° F. pH=6.2
4/ 8/70	1,700	50° F.
4/18/70	1,650	50° F.
<b>Station 13.</b>		
	Alewife Brook near Little Pond, Belmont	
3/ 7/70	332	
4/ 4/70	7,000	45° F. pH=6.4
4/ 8/70	200	48° F.
4/18/70	70	54° F.
11/13/70	4,700	50° F.

<u>Date</u>	<u>Coliforms per 100 ml</u>	<u>Remarks</u>
Stations 6 A-E Alewife Brook		
2/28/70	55,660	
11/13/70	101,000	A. Near entrance to the Mystic River
2/28/70	80,000	B. 200 yards downstream from Broadway
2/28/70	166,500	C. Across from Murray Hill Rd.
3/ 2/70	1,190,000	D. Just below Mass. Ave.
3/ 2/70	22,000	E. Just above Mass. Ave.

Station 6. Henderson Street, Alewife Brook, Arlington Side

2/13/70	21,500	
2/20/70	49,000	
2/28/70	100,500	Sewage-Mass. Ave.
3/27/70	17,000	
4/ 4/70	79,666	48° F. pH=6.2
4/ 8/70	103,500	48° F. pH=6.4
4/18/70	263,333	
11/13/70	660,000	

Station 5. Boston Avenue, Medford

1/27/70	86,500	
2/13/70	25,500	
2/20/70	9,950	
3/27/70	25,500	
4/ 4/70	46,000	46° F. pH=6.4
4/ 8/70	37,000	47° F.
4/18/70	135,000	52° F.
11/13/70	26,500	52° F.

Station 4. Auburn Street, Medford

1/27/70	91,000	
2/13/70	6,500	
3/27/70	4,000	
4/ 4/70	13,650	43° F. pH=6.2
4/ 8/70	23,000	
4/18/70	95,000	

Station 3. Brook entering Mystic downstream of Winthrop St., Medford

1/27/70	83,000	
2/13/70	440	
2/20/70	20	
3/27/70	380	
4/ 4/70	460	44° F. pH=6.2
4/ 8/70	150	44° F.
4/18/70	240	48° F.

<u>Date</u>	<u>Coliforms per 100 ml</u>	<u>Remarks</u>
Station 2.	200 Yards downstream from Winthrop Street, Medford	
2/13/70	5,000	
2/20/70	45,000	36° F.
3/27/70	360,000	
4/ 4/70	130,000	46° F. pH=6.2
4/ 8/70	250,000	46° F. pH=6.2
4/18/70	87,000	52° F.
Station 1.	Medford Square, Municipal Parking Lot	
1/27/70	75,500	
2/13/70	6,350	
2/20/70	8,850	
3/27/70	34,000	
4/ 4/70	15,000	43° F. pH=6.2
4/ 8/70	31,000	46° F. pH=6.2
4/18/70	112,000	51° F.
Station 11	Hormel Stadium, Medford	
2/13/70	10,500	
2/20/70	21,000	34° F.
4/ 4/70	8,000	pH=6.2
4/ 8/70	21,500	
4/18/70	98,000	
Station 12	Shore Road, Melville Road, Somerville	
2/13/70	20,000	
3/27/70	51,000	
4/ 4/70	36,000	47° F. pH=6.4
4/ 8/70	23,000	46° F. pH=6.2
4/18/70	9,450	54° F. pH=6.2

All Samples taken and analyzed by Eugene Hornsby with assistance from Carol Fiore.

Table 2

COLIFORM BACTERIA:

Microscopic one-celled plants that live in intestines. Most are harmless, but in water they prove the presence of raw sewage. So the coliform count is simply a convenient measure, like degrees Fahrenheit; the higher it gets, the more polluted the water is.

Water Quality Standards - Commonwealth of Mass.

WATER RATINGS: March 6, 1967

Class A - Any use including drinking water. (Only a few miles of river in all New England qualify.) Coliform bacteria per 100 milliliter not to exceed an average value of 50 during any monthly sampling period.

Class B - Fit for drinking after chemical treatment, fit for swimming and irrigating vegetables that are eaten raw. Coliform count should not exceed an average value of 1000 during any monthly sampling period, nor 2400 in more than 20% of samples examined during such period.

Class C - Fit for boating (not swimming) and for irrigating crops that are cooked. Coliform bacteria should not exceed concentrations that would impair any usages specifically assigned to this class.

Class D - Suitable for transportation of sewage and industrial wastes without nuisance. Coliform count same as C.

Class E - Open sewer.

Table 3

TONS OF SALT REQUIRED PER SEASON  
(Based on 4 applications per storm per 2-lane mile)

Number of Storms	100	200	300	400	500	600	700
4	400	800	1200	1600	2000	2400	2800
6	600	1200	1800	2400	3000	3600	4200
8	800	1600	2400	3200	4000	4800	5600
10	1000	2000	3000	4000	5000	6000	7000
12	1200	2400	3600	4800	6000	7200	8400
14	1400	2800	4200	5600	7000	8400	9200
16	1600	3200	4800	6400	8000	9600	10200
18	1800	3600	5400	7200	9000	10800	11600
20	2000	4000	6000	8000	10000	12000	14000

These figures are recommended by the Salt Institute. We feel that they are high, yet when compared to actual tonage spread by some towns, they are low.

Table 4

Salt Use by Local Towns - 21 storms 1969-1970

Town	Miles of Road	Salt Used	Recommended Amt.
Lexington	138.2	1179.63 tons	2900 tons
Cambridge	125	2650	2615
Somerville	101.45	950 since 1/70	2130
Arlington	100	2400	2100
Medford	113.28	3000-4000	2380
Stoneham	70	879	1470
Winchester	80	5000	1680

Table 5

Place	How	WATER USE		Diverted to Sewers mg/d	Returned to Watershed
		Daily Use mill. gal/day			
<b>Woburn:</b>					
Stauffer Chem.	1 well	1.0		1.0	-
Riley Leather Co.	1 well	.3		.3	-
City-Salem St.	2 wells	1.0		1.0	-
City-Horn Pond	6 wells	4.30		4.30	-
Gold Ribbon	from river	.1		-	.1
Atlantic Gel.	4 wells	3.0		2.9	.1
<b>Winchester:</b>					
Park Dept.					
Leonard Field	2 wells	.2		-	.2
Parkview Apt.	2 wells	1.2		-	1.2
J. Whitten Gel.	well field	3.0		2.8	.2
<b>TOTALS:</b>		14.1		12.3	1.8

Table 6

AMBIENT AIR QUALITY STANDARDS - March 11, 1970

Total Suspended Particulates

- Annual average not to exceed 75 ugm/M<sup>3</sup>
- Daily amount not to exceed 180 ugm/M<sup>3</sup>

Sulfur Dioxide

- Annual average not to exceed .025 parts per million
- Daily average not to exceed 0.105 parts per million
- Hourly concentration not to exceed 0.280 parts per million

HEW Warnings

Particulate Matter

- Adverse health effects if over 80 ugm/M<sup>3</sup>
- Visibility reduction to about 5 miles at 150 ugm/M<sup>3</sup>
- Adverse effects on materials if over 60 ugm/M<sup>3</sup>

Sulfur Dioxide

- Adverse health effects if over .11 ppm for 3 to 4 days  
(or if annual level exceeds .04 ppm)
- Visibility reduction to about 5 miles at .10 ppm
- Adverse effects on materials if annual mean exceeds 0.12 ppm
- Adverse effects on vegetation if annual mean exceeds 0.03 ppm

AIR QUALITY READINGS (1966 Survey)

Total Suspended Particulates

- Arlington: average value -- 54 ugm/M<sup>3</sup>
- Somerville: average value -- 84 ugm/M<sup>3</sup>

Sulfur Dioxide (Somerville)

- Above .10 ppm 10% of the year
- Average value -- .043 ppm
- Summer: .025 ppm
- Fall: .068 ppm (temperature inversion)
- Winter: .042 ppm
- Spring: .037 ppm

Carbon Monoxide: no figures for Mystic River Basin

Table 7 (Data from Reference 5)

Item	A R E A N G T O N	E L M O N T	G S T U N	C A M B R D G E	C H E L R E T	M A L D E N	M E D F O R D	S O M E V L E	W H I S T E R	T O T A L	
1 POPULATION	52,482	38,794	616,324	92,677	27,098	43,410	56,142	60,429	86,322	21,634	1,005,322
2 DENSITY POPULATION/MI <sup>2</sup>	9,405	6,179	13,575	12,980	12,488	11,576	10,944	6,930	20,954	3,423	10,845
3 POPULATION TREND	↑	↑	↓	↓	↓	↓	↓	↓	↓	↑	
4 TOTAL LAND AREA (ACRES)	3,320	2,940	28,000	4,000	1,190	2,150	3,225	5,225	2,518	3,800	56,368
5 RECREATION AREA (ACRES)	397	627	6,596	772	71	256	474	1,668	192	649	11,692
6 OPEN SPACE (ACRES)	193	305	1,684	138	129	56	373	474	28	878	4,258
7 TOTAL OPEN AND RECREATION AREA (ACRES)	590	932	8,280	910	200	312	850	2,142	220	1,527	15,950
8 % TOTAL AREA USED FOR RECREATION	11.9%	21.3%	23.5%	19.3%	5.96%	11.9%	14.7%	31.9%	7.62%	17.0%	20.%
9 # RESIDENTS PER ACRE REC. AREA	132	61.7	93.7	120	382	170	119	36.2	449	33.4	81
10 # RESIDENTS PER AREA TOTAL SPACE AVAILABLE	88.8	41.6	74.5	108	135	139	67.3	28.1	392	14.2	63