The River and Its Resources: An Action Plan for the Upper Reach of the Connecticut River in Massachusetts

THE RIVER AND ITS RESOURCES:

AN ACTION PLAN FOR THE UPPER REACH
OF THE CONNECTICUT RIVER IN MASSACHUSETTS

A Terminal Project Presented
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Foreword

The Connecticut River Valley has long been appreciated for its many outstanding natural and scenic values. As a result of this recognition, the Valley has accumulated a vast reservoir of cultural resources through the centuries, complementing the area's already rich resource base. Within the Valley, fertile farmland, significant wildlife habitats, known and undiscovered Native American artifacts, and diverse recreational opportunites all coexist, culminating in an excellent representation of the natural and cultural heritages of New England.

Seeking to protect the many resources of the Connecticut River Valley for future generations, the Commonwealth of Massachusetts, through its Department of Environmental Management and with assistance from the National Park Service, created the Connecticut Valley Action Program in 1984. The goal of the Action Program is to provide a framework for long-range planning and protection of natural and cultural resources throughout the 19 communities within Massachusetts bordering the Connecticut River. Originally funded by a $2 million legislative bond appropriation, the Action Program was appropriated another $12.5 million in late 1987, reaffirming the State's commitment to protecting the many resources of the Connecticut River Valley.

In order to efficiently formulate and implement its plans, the Action Program divided the River into four segments, or Reaches of similar character (see Figure 1). These are:

- Reach 1, the Upper River, begins in the north at the New Hampshire/Vermont border and ends at the Turners Falls dam. This area has a predominantly wooded shoreline, much of which is owned by Northeast Utilities, a large electric power company.

- Reach 2, the Natural/Recreational Section , extends from the Turners Falls dam south to the Northampton line. The water is shallow here and the shores are a combination of agricultural fields and woods. This is the most natural reach of the River and contains some of the most important fish and wildlife habitats.

- Reach 3, the Oxbow Section, continues as far south as the

Holyoke dam. Deeper and more heavily used by power boats, this reach has a mixture of agricultural, wooded, and developed land along its shoreline.

- Reach 4, the Urban Riverfront, includes the heaviest populatin concentration along the river corridor in Massachusetts. It stretches from the Holyoke dam south to the Connecticut border.

The 33-member Connecticut Valley Action Program Coordinating Committee, made up of representatives from each of the towns along the river as well as interested public and non-profit resource agencies then began to identify issues and formulate plans for the four reaches. The goal of the Action Program is to complete and implement Action Plans for each reach, containing general and specific recommendations.

Two of these Action Plans have been completed. In 1986, a Regional Planning Studio in the Department of Landscape Architecture and Regional Planning at the University of Massachusetts at Amherst, working closely with the Action Program, developed a Plan for Reach 2. In 1987, the Action Program completed the Plan for Reach 4. This report focuses on Reach 1, the Upper River, and combines the formats of the previous two reports.

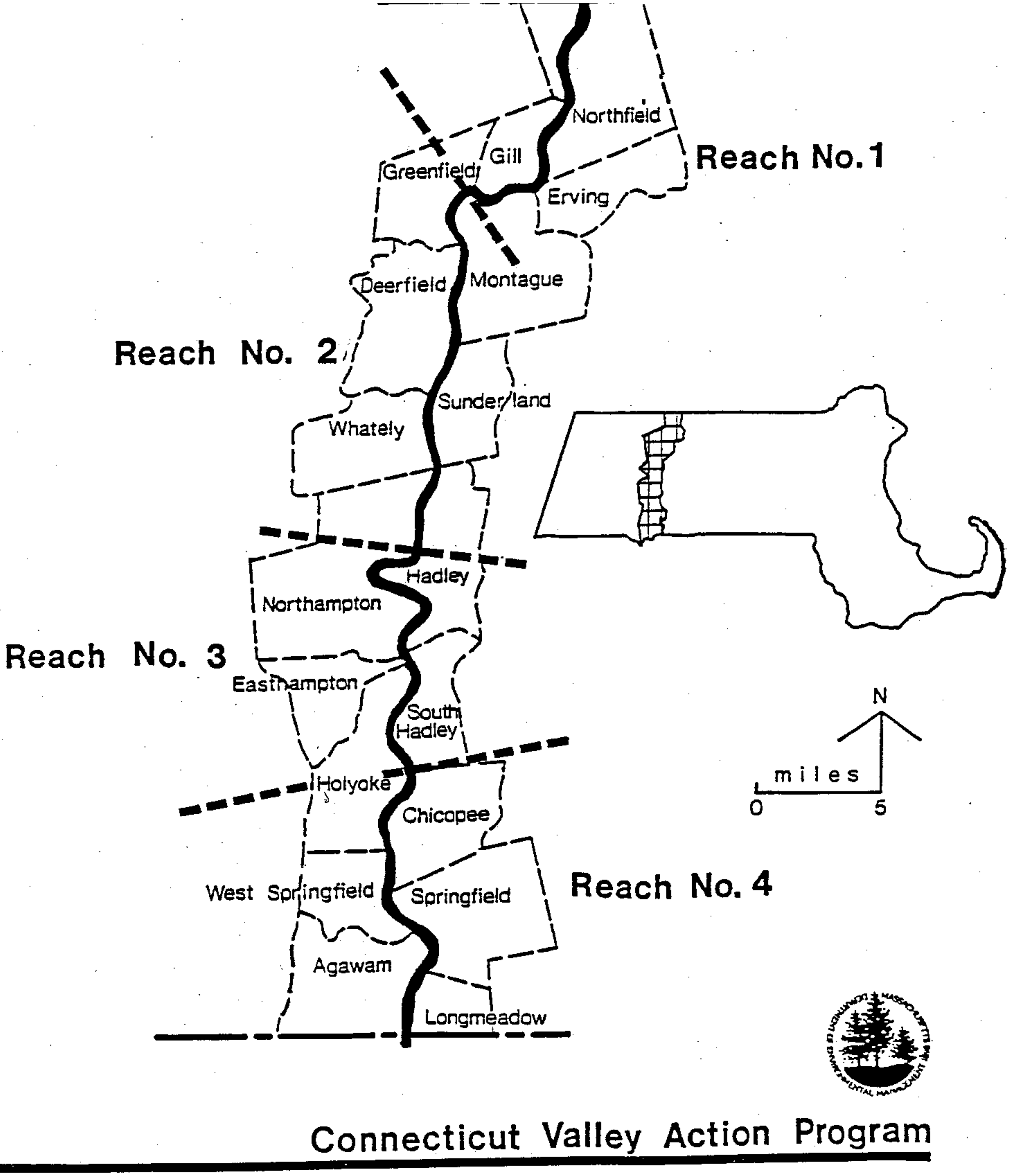


Figure 1. The Connecticut River in Massachusetts

Part 1:
The River and Its Resources

The Upper Reach of the Connecticut River in Massachusetts extends from the Vermont/New Hampshire border to the Turners Falls dam. This section is comprised mainly of the towns of Northfield and Gill, and includes small portions of Erving and Montague. These communities are predominantly rural in character and this is reflected in the undeveloped nature of the shoreline.

The Upper Reach has many natural and cultural attributes. Lovely views, rich habitats, fertile farmland, and the wealth of the river have drawn human settlements to the area for thousands of years. The history of these settlements is woven into the landscape through both archaeologic artifacts and existing land use patterns.

Currently, as in other sections of the river valley, times are changing in the Upper Reach. In 1972, a 1,000,000 megawatt pumped storage facility began operation on Northfield Mountain. This facility is capable of removing 5.9 billion gallons of water from the Connecticut River at the speed of 20,000 gallons per second. Due to the extensive impacts on the shoreline resulting from water level fluctuations, Northeast Utilities, owner of the operation,was required to purchase the majority of the shoreline in Reach 1. Though public benefits were developed as part of Northeast Utilities plans, local residents, town officials, and state agencies could no longer directly plan the future of the river shoreline.

In addition to the Northfield Mountain Project, other changes are occurring. Until recently, the towns of the Upper Reach were relatively isolated from the economic boom of the rest of the state. No major state or interstate highways bisected the area, and little growth or change occurred. Now, as acceptable commuting distances expand and a rural lifestyle is in vogue, these communities are experiencing unprecedented growth pressures.

The towns in the Upper Reach are slowly taking steps to deal with these changes. Historically, the townspeople have been extremely independent, vehemently opposing any government intervention on land use decisions. However, as the changes in town character become more and more apparent, planning projects aand government regulations are more readily accepted.

This report is intended to be a guide for local communities as well as the Connecticut Valley Action Program when planning for the Connecticut River and its associated resources. Its recommendations are intended to be flexible and modifications should be made as needed. However, the river is an exceptional resource and plans should be implemented for protecting it.

Through a series of extensive discussions, a list of key issues regarding Reach 1 were targeted by the Connecticut Valley Action Program's Coordinating Committee in 1984-85. These issues guided the development of this Action Plan. The key issues addressed in this report are:

1) Protection of the natural and scenic resources of the French King Gorge;

2) Encouragment of farmland preservation;

3) Protection of archaeologic resources;

4) Acceleration of efforts to control soil erosion; and,

5) Improvement of recreation access and facilities.

The comprehensive list of these issues can be found in Appendix A.

In order to adequately address these issues, a detailed inventory of the Upper Reach was carried out. The following sections of this report summarize the results of that inventory. The issues listed above were used as a guiding factor in the development of the inventory and Part 2, the Action Plan. Town residents and officials, state and federal resource agencies, and private, non-profit groups assisted in the development of the Action Plan and Recommendations. Only through a coordinated effort such as this can the Connecticut Valley remain the special place it is. The early Native American inhabitants called the valley "the Smile of God." This Plan is striving to keep it that way.

Natural Resources

Geography

The Connecticut River originates in the mountains of New Hampshire and Vermont and travels 410 miles south to the Atlantic Ocean (see Figure 2). The river drains an area of 11,250 square miles within four states. There are 68 river miles in the State of Massachusetts, passing through 19 communities.

The Upper Reach is comprised of the towns of Northfield, Gill, Erving, and Montague. Northfield is unique in that it is the only town in the state to occupy both sides of the river. These communities are predominantly rural and woodlands and agricultural fields are the primary land uses along the shoreline. There are 15 river miles in Reach 1.

Geology

The Connecticut River Valley has been shaped by natural forces for more than one-half billion years. Originating as a shallow inland sea, a period of volcanic activity and mountain building during the Cambrian period left thousands of feet of depositions in the area (Bain and Meyerhoff, 1963). More recently (10,000 years ago), the Wisconsonian glacial retreat caused the formation of a large lake, Lake Hitchcock, within the valley. The river's present course was established on the deposits of this lake (Goldberg,1979).

The Turners Falls dam is now located at the site where the river poured over the banks of Lake Hitchcock and into the channel of the Falls River. Above this site, the river washed away the glacial deposits and encountered a weak contact zone between Triassic conglomerates on the west bank and metamorphic rock on the east. As the river eroded the parent materials, a deep channel was formed, creating what is known as the French King Gorge (Bain and Meyerhoff, 1963).

Above the Gorge, the floodplain widens considerably. Deposits from the glacial lake still cover much of the underlying bedrock and have served as the parent material for most of the soil in the valley. The combinations of sand, silt, clay, and rubble have produced soils extremely well-suited for agriculture.

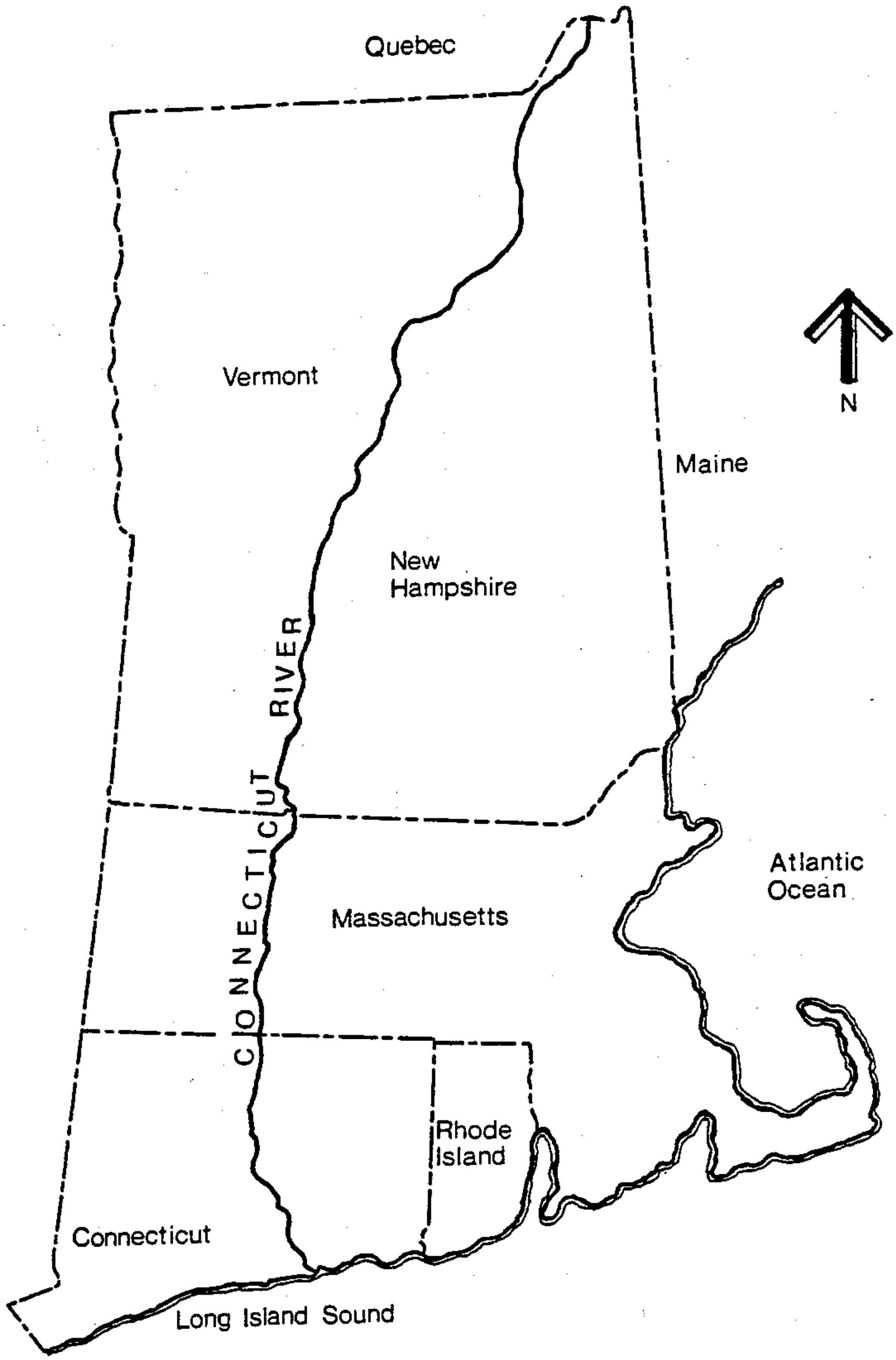


Figure 2. From Source to Sea: The Connecticut River

Water Quality

The quality of water in the Connecticut River has improved to Class B, fishable and swimmable, as a result of extensive cleanup efforts over the last few decades. Over 750 million dollars of public funds have been spent to improve the once heavily polluted river. Problems still exist in the Upper Reach, however.

The Mt. Hermon campus of the Northfield-Mt. Hermon School is located near the river in Gill. The school currently uses two large, open lagoons adjacent to the river to deal with sewage disposal. Unfortunately, during heavy rains and high water, raw sewage flows directly into the river. The school has acknowledged the problem after being fined by the Massachusetts Department of Environmental Quality Engineering (DEQE), and has proposed to build a third lagoon to supplement sewage capacity. The townspeople are vehemently opposed to a third lagoon, and the issue is currently unresolved.

Another potential problem involves the water quality of the Millers River. In 1987, DEQE's Division of Water Pollution Control conducted an extensive study of the river, which flows into the Connecticut just below the French King Bridge (Maietta, 1988). The goals of the study were to update existing water quality data and to document the extent of polychlorinated biphenol (PCB) contamination in fish, invertebrates, and sediments. The results of the study were alarming.

Unfortunately for this report, the closest sampling station was Farley Flats in Erving, 7.4 miles from the Connecticut River confluence. At this station, 10 white suckers (*Catostomus commersi*), 8 smallmouth bass (*Micropterus dolomieui*), and 1 brown trout (*Salmo trutta*) were captured and analyzed. The brown trout contained 2.24 mg/kg PCB, exceeding EPA's action level for PCB by .24 mg/kg. A composite analysis of the white suckers revealed an average of 1.60 mg/kg PCB. One smallmouth bass showed a concentration greater than 1.5 mg/kg PCB. These levels are considered relatively high.

The study indicated that the PCB levels were due at least in part to contaminated wastewater discharge. Monitoring found PCBs in six wastewater treatment plant sludges and one effluent sample. River basin sediment sampling and invertebrate testing implied that PCBs are present in the aquatic food web, thus explaining the high levels found in the fish.

After reviewing the data, the Massachusetts Department of Public Health issued a public health advisory on the Millers River. The advisory recommended that:

1) The public should refrain from eating all brown trout and eels from the Millers River below the confluence with the Otter River;

2) Consumption of all other fish species from the Millers River and its tributaries should be limited to two meals per month; and,

3) Pregnant women and nursing mothers should not eat any fish from the Millers River and its tributaries in order to prevent exposure to infants and developing fetuses (Maietta, 1988)

The seriousness of the situation in the Millers River is unquestionable. However, the possibility of contamination in the Connecticut River needs to be addressed, especially below the confluence. This area is extensively used by fishermen in all seasons, and considerable amounts of fish are consumed regularly. If contamination has occurred, the public should be informed. The Division of Water Pollution Control is planning to carry out a similar study on the Connecticut River this summer (1988). Recommendations regarding this issue have been incorporated into the Action Plan.

Fisheries

The Connecticut River has provided excellent habitat for many species of resident and anadromous fish for thousands of years. Unfortunately, along with European settlement came dams and pollution, virtually eliminating anadromous species and severely reducing resident populations. Prior to the construction of the Turners Falls dam in 1793, Atlantic salmon were so abundant that laws were passed requiring settlers to vary the diet of slaves and hired help to break the monotony of eating salmon! After the construction of the dam, no salmon were found in the Upper Reach.

The cleanup of the river and anadromous fish restoration projects have made progress in reestablishing native populations. Table 1 gives examples of resident fish species and their abundance from 1971-75, before, during, and after the construction of the Northfield Mountain Pumped Storage Facility. This information was gathered to analyze the effects of water level fluctuations on resident fish species. The only species that suffered drastic population reductions was walleye (Brigham and Jonasch, 1976). Recommendations in that report called for continued monitoring of populations, especially walleye.

Table 1. **Comparison of abundance of selected fish species by year in Turners Pool, Connecticut River, 1971-1975** (Brigham and Jonasch, 1976.)

	Total Fish Sampled by Year				
Species	1971	1972	1973	1974	1975
Largemouth bass	257	308	173	144	146
Smallmouth bass	673	366	234	138	196
Walleye	203	111	38	27	16
Yellow perch	970	356	511	274	614
White perch	40	37	52	35	46
Pumpkinseed	559	344	486	195	206
Bluegill	385	168	165	95	82
Rock bass	108	46	19	18	18
Black crappie	75	40	49	63	34
White sucker	250	118	63	23	61
Spottail shiner	367	125	91	45	102
Golden shiner	100	33	22	30	95
Chain pickerel	25	23	21	3	9
Brown bullhead	21	47	57	19	186

*Includes 106 young-of-the-year **Includes 150 young-of-the-year

The anadromous fish passage facilities at Turners Falls opened in 1980. Table 2 lists species and abundance of fish that utilized the facilities from 1980-86. The U.S. Fish and Wildlife Service is preparing to build a Northeast Anadromous Fish Laboratory below the dam in Turners Falls. The facility is scheduled for completion in 1990, and hopefully will aid in increasing the numbers of anadromous species in the Upper Reach.

Table 2. **Anadromous fish passage at the Turners Falls fish passage facilities, Connecticut River, Massachusetts** (O'Leary, 1987).

Year	Location	American shad	Blueback herring	Striped bass	Atlantic salmon	Sea lamprey
1980	Spillway	5	0[1]	0	0	14
	Cabot	687	0[1]	7-11	0	187
	Gatehouse	298	0[1]	1	1	66
1981	Spillway[2]	--	--	--	--	--
	Cabot	224	0[1]	0	7	1,622
	Gatehouse	200	0	14	8	935
1982	Spillway[2]	--	--	--	--	--
	Cabot[2]	--	--	--	--	--
	Gatehouse	11	4	0	0	210
1983	Spillway	263	1	1	0	649
	Cabot	26,697	106	6	0	859
	Gatehouse	12,705	28	7	0	703
1884	Spillway	4563	12	0	1	851
	Cabot	1831	4	0	1	334
	Gatehouse	4333	21	0	1	683
1985	Spillway	843	243	0	3	3,185
	Cabot	31,000	1726	0	2	3,198
	Gatehouse	3,855	301	0	3	1,809
1986	Spillway	5857	6248	0	4	2,230
	Cabot	22,144	7091	0	5	1,424
	Gatehouse	17,858	9578	0	10	1,961

[1]Observed at the entrance gallery and in the ladder
[2]Not monitored

One serious concern of the Massachusetts Cooperative Fisheries Research Unit at the University of Massachusetts is the impact of the Northfield Mountain pumped storage facility on mortality of young anadromous fish migrating downstream. Salmon smolts migrate in late April and early May, just after spring flooding. More importantly, they migrate at night, while Northfield Mountain is pumping large quanities of water from the river up to the reservoir. Preliminary reports have shown that mortality rates of smolts are related to the amount of water being pumped from the river (Kynard, 1988). These mortality rates could have a major impact on the success of anadromous fish restoration projects for the northern Connecticut River. For more information on salmon and the Connecticut River, see Appendix B.

Vegetation

Much of the shoreline in the Upper Reach is forested, as the view from the French King Bridge illustrates (see Figure 3). The majority of the area is classified as transitional between the southern oak-dominated forests and the hemlock/northern hardwoods of the north. Wet areas and the riverbank support black willow, sycamore, cottonwood, red maple and silver maple. At slightly higher elevations are basswood, slippery elm, and white ash.

The diversity and abundance of forest cover in Reach 1 has led to the development of many natural amenities. In addition to providing a variety of wildlife habitats and scenic views, these forests help stabilize the shores and minimize erosion on both the hills and riverbank. It is very important that activities resulting in negative impacts, such as clearcutting, be strongly discouraged.

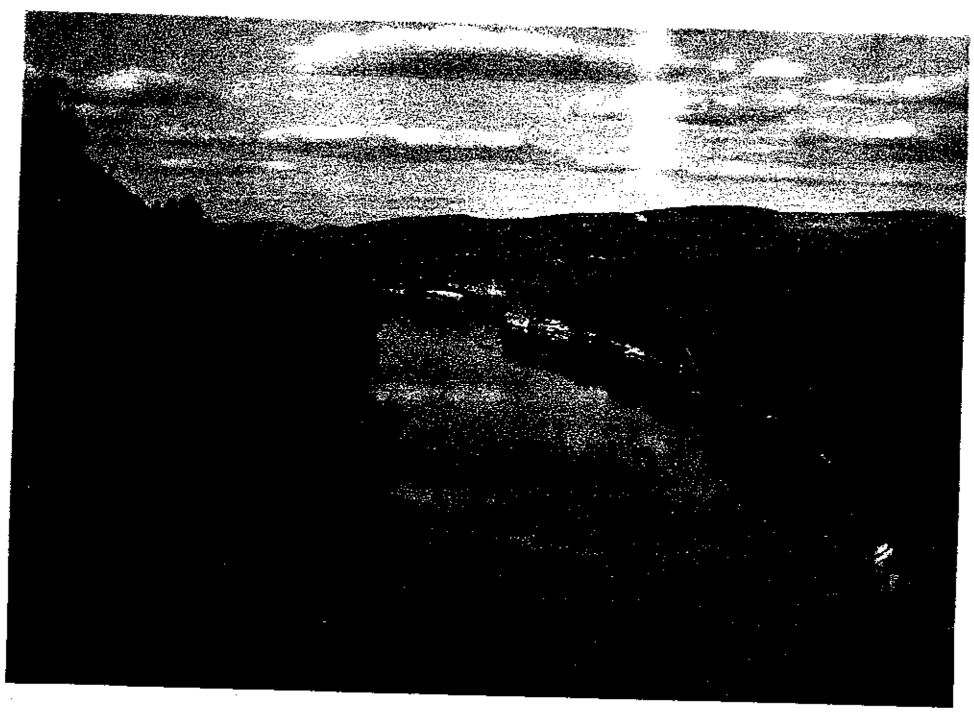


Figure 3. **French King Gorge.**

Birds

The Connecticut River Valley provides a natural flyway for migratory birds and waterfowl. Historically, peregrine falcons and eagles were common sites (Randall, 1971). Unfortunately, as with the other natural resources, European settlement proved detrimental to native bird populations. Peregrine falcons have been virtually eradicated from the northeast and are on the verge of extinction. Both bald and golden eagles are rare, though sitings are increasing. Osprey sitings are also on the rise.

The variety of forest cover in the region has led to a diversity of resident bird populations. Most species common in northern New England are found in the Upper Reach of the Connecticut River. One favorite, the Eastern bluebird, has been on the decline in recent decades due to out-competition for habitat by starlings, an introduced species. Efforts by local environmental groups, such as the construction of special bird houses, are becoming effective in increasing numbers of these lovely birds.

Mammals

Most of the large mammals indigenous to this area either have been extirpated or are extremely rare. By 1840, the cougar and eastern timber wolf had been eliminated from the area through hunting or habitat destruction. Beaver also disappeared due to overtrapping for their pelts. Moose and American elk were driven north and west. Moose were so abundant in the eighteenth century that Moose Plain in Northfield was named for the mighty herds that gathered there.

Fortunately, in1698 a law was passed in Massachusetts to protect deer populations, and these animals flourish today. Beaver have been reintroduced and are proliferating rapidly. Black bears exist in small numbers, and an occasional moose wanders down from the north. The grey fox, eastern coyote, and opposum are accidentals to this area, but are adapting well and their populations are on the rise (Randall, 1971).

Agriculture

The soils of the Upper Reach are similar to those in the rest of the

Valley, rich and fertile. The extensive floodplains in Northfield and Gill have been farmed for centuries, both by Native Americans and European settlers and their descendants. Recently however, these agricultural lands are being lost to development, and the character of these historically agrarian towns is changing. The following quotation from a retiring Gill Selectman aptly describes the current situation:

> Years ago, there used to be a pulp mill and a logging industry and the rest of it was just farms. That's all gone now. It's all developed. There's just one working farm now to speak of. It will be too bad if the two or three farms that are left get divided and built upon (*The Recorder*, 1988).

Since farmland cannot be restored once it is developed, and the Upper Reach has such prime soils, the Massachusetts Department of Food and Agriculture's Agricultural Preservation Restriction (APR) program has taken a special interest in Reach 1. Extensive efforts by state officials are slowly making progress toward protecting the farmland in the northern valley. However, the APR program has limited funding and the application and approval processes take considerable lengths of time. Other potential methods of protection need to be investigated.

The Reach 2 Action Plan, Planning for a Special Place, outlined some of the most effective methods for preserving farmland. That information is included in Appendix C, and specific recommendations are included in the Action Plan.

One problem especially common to the Upper Reach regarding agriculture is rapid erosion. The erosion rate in Reach 1 is high due to the fluctuations in water level resulting from the Northfield Mountain pumped storage facility. The few farmers left along the river have complained without success to Northeast Utilities, which owns most of the shoreline. Northeast Utilities has stated that erosion problems in Reach 1 are not caused solely by the water level fluctuations. This issue is further discussed in the Action Plan and Recommendations section.

Cultural Resources

Native Americans

The northern Reach of the Connecticut River in Massachusetts has a fascinating cultural history. The abundant natural resources and scenic beauty of the area have attracted human settlements for thousands of years. To Native Americans, the Upper River valley was known as ' the Smile of God ' (Pollen, 1971).

The river provided a multitude of resources for the early inhabitants of the valley. Salmon and other large fish were plentiful and easily dried and stored for the winter months. Mammals and birds were frequent visitors to the water's edge, supplementing the diets of early hunters. In addition to food, the river provided a constant source of water for drinking and bathing.

Native Americans took advantage of the inorganic material the river offered as well. The shores and river bottom contributed the materials necessary for making stone tools-- quartzite, schist, and basalt. These stones made fine hammers, scrapers, and axes (Thomas, 1972). Stones from the river were also used to line granaries, or underground food storage areas.

There are many archaeologic signs of Native Americans along the river in the Upper Reach. One known site in particular, in Riverside, Gill, was thoroughly excavated in 1971-72. The site revealed remains from as early as the Middle Archaic (7,000-4,000 years before present). The majority of the artifacts were representative of the Woodland period (3,000-500 years before present). For a more detailed analysis of the site, see "The WMECO Site: An Archaic and Woodland Site in Gill (Riverside), Massachusetts" (Thomas, 1972).

Prior to the westward migration of European settlers, the Upper reach was inhabited by a sub-tribe of Algonquin River Indians known as Squakheags (Pollen, 1971). The Squakheags were an agricultural people and took advantage of the fertile valley soil. The Algonquins, which included the Agawams, the Norowottucks, and the Pacomtucks in addition to the Squakheags, were relatively peaceful, fearing only the Mohawks to the west. It is said that the River Indians protected themselves from the Mohawks by paying them wampum, or shell money. This is substantiated by the depth of the original Mohawk Trail. Engineers constructing the modern trail found that the soil had been packed several feet deep by Native American runners over the years (Pollen,1971).

Many Native American terms have been adopted as modern names for places along the river in the Upper Reach. Northfield was originnally called Squakheag after the indigenous tribe. The tribe did not refer to their settlement as Squakheag, however, as the name applied to fishing places. Pauchaug Meadow was historically used for recreational purposes. The term pauchaug means 'dancing place,' and the broad plain was the site of much festivity. Interestingly, the meadow is currently set aside as a public recreation area, although dancing is not a common activity at the site today (Pollen, 1971).

European Settlement

The first Europeans to view the Upper Reach were a four-man committee sent to explore the unknown regions north of Springfield and west of Worcester. When they reached the top of Old Crag, one of the area's great hills, they viewed what one of them later described as "a favoring region." Below them was a broad valley of green meadows, with a great river flowing through them. The four men, Daniel Gookin, Daniel Henchman, Thomas Prentice, and Richard Beers had discovered the 'Smile of God ' (Bacon, 1906).

In 1671, two years after the first sighting, a deed for 10,560 acres was signed by the Squakheags, representing the first Northfield land purchase. Two years later the village of Squakheag was settled by European pioneers, and within 100 years all but a few Native Americans had either fled or perished.

The Native Americans of the region experienced a growing unrest during the next couple of years. Continual maltreatment by the European settlers created an atmosphere of resentment and hostility. In the spring and summer of 1675, over 2000 warriors converged in the Upper Reach, led by the infamous King Philip. A hill along the river was alledgedly used as a camp and a look-out point by Philip and his men (Stoughton,1978), though this claim has been disputed recently by professional archaeologists (Dincauze and Eldrdge, 1984). This hill is now known as King Philip Hill and is a publicly-owned historical landmark.

In early September of 1675, Philip and his warriors attacked the settlements of Deerfield and Squakheag. Eight residents of Squakheag were killed and the remaining sixteen families took refuge in the small stockade. They were trapped inside for five days.

Captain Beers, one of the original four explorers, was at the Hadley military headquarters when he received word of the Deerfield Massacre. Unaware of the subsequent attack on Squakheag, he and 36 mounted soldiers set off to warn the settlement of possible attack. Unknown to Capt. Beers, a group of Native Americans lay in wait to ambush his small troop. As the soldiers crossed a small stream, they were attacked. All but one soldier were brutally slain. To honor Capt. Beers, the hill where he died was named Beers Mountain, and Beers Plain marks the area where he was buried (Pollen, 1971).

The settlers of Squakheag were eventually rescued by a force of 100 men led by a Major Treat. Thus ended the first attempt to settle Northfield.

One year later, a bloody battle took place at Peskeompscut, a favorite Native American fishing site at the Great Falls. A group of 160 soldiers led by a Captain Turner launched a surprise attack on the hundreds of Algonquins resting and fishing there. The battle was a European victory, though Capt. Turner lost his life. Peskeompscut was later named Turners Falls to honor him (Stoughton,1978).

Northfield was formally settled for a second time in 1685, when a fort was completed and a grist mill established. This attempt was also doomed to fail. In 1690, the outbreak of the French and Indian Wars forced the settlers south to Springfield for safety.

In 1714 a third attempt at settlement proved successful and the Town of Northfield was officially incorporated in 1723. Gill, originally part of Greenfield, was first settled in 1776 and incorporated in 1793. In 1795, the Grassy Hill section of Northfield was officially annexed to Gill (Stoughton,1978).

As European settlement increased in the Upper Reach, the river's potential as a mode of transportation improved. In 1792, a company was formed to develop a transportation route by Turners Falls. The first dam was completed at the Great Falls in 1793 under the direction of Captain Elisha Mack. Construction of the adjacent canal soon followed. A second dam and lock were built just below the mouth of the Millers River in 1806 to ease the passage through the French King Rapids. A major flood in 1824 destroyed both of these dams, and only the dam at Turners Falls was reconstructed (Pressey, 1910).

The river was used extensively during the eighteenth and early part of the nineteeth centuries for transportation. Flatboats dominated the scene until 1826, when the first steamboats were put into use. River traffic declined in the 1840's as a result of the expanding rail system. The last boat passed through the Turners Falls canal in 1856.

In 1865, a successful industrialist named John Alval Crock bought out the canal company and changed its name to the Turners Falls Company. He recognized the value of the canal as a power source, and built a planned industrial community adjacent to the site. The village of Turners Falls was first inhabited in 1867 (Pressey, 1910).

The Turners Falls Power Company supplied power at a low cost to lure industry to the area. Early industries included Green River Cutlery, John Russell Cutlery, and several pulp and paper mills. The growth of Turners Falls was slower than that at Holyoke due the decline in industrial demands after the close of the Civil War (Hazelton, 1926).

Logging also played a substantial role in the early economy of the Upper Reach. Begun in 1726 after the final defeat of the Native Americans, the early logs floated down river were used as masts for the English Royal Navy. Some of the better 'King's Mast Pines' were appropriated for use in house construction in the lower valley. Later drives grew in size and delivered logs as far south as Holyoke. The last drive took place in 1910 (Pollen, 1971).

Current Cultural Features

Many individual sites and landmarks along the river in the Upper Reach have interesting histories. French King Rock, visible from the bridge today, is one such landmark. Prior to increasing the height of the Turners Falls dam, 16-18 feet of rock was exposed, jutting out of the center of the river. Tradition has it that during the French and Indian Wars, a French officer was so impressed with the rock that he took possession of it in the name of the French King. The name stuck, and today, the entire area is known as French King Gorge (Stoughton,1978).

Kidds Island also has an interesting history. Apparently, one of Captain Kidd's sailors swore on his deathbed that he had buried treasure with Kidd on the first island above the Great Falls on the Connecticut River (Stoughton, 1978). The island was much larger in those days, however. The flood of 1862 submerged the island and reduced it to half its original size. No treasure was ever found, and people are still known to dig for it today. Northeast Utilities currently owns the island, though it is actively managed by the Franklin County Sportsmen's Association.

The area known as Horserace, between 'deep hole' and ' the narrows,' received its name based on an optical illusion. When standing above the area, it appears that the many protruding rocks in the river are moving, rather than the water. The effect is that one is watching a line of horses in a race (Stoughton, 1978).

Another historical area along the river is Durkees Point. In the mid-1800's, Lauriston Durkee built a summer home on a knoll in South Northfield known as Point Pleasant. He operated the first scenic tour boat in the area from a sandy point on the river, now known as Durkees Point. The boat had one of the first kerosene engines in the valley.

Durkee's wife died at a relatively young age and was buried on Durkees Point. A 50'x 50' section of the property is still listed under tax exempt status as a cemetary. Durkee himself died in 1894 and was buried up on the knoll by the house. A fire in 1840 destroyed the house and many of the accessory buildings. New England Power Company Purchased the site in order to gain access to the river.

Since New England Power's acquisition of the property, Durkees Point has become an extremely popular fishing spot. People come from all over locally, and some even set up summer camps on the beach. Though the utility has not granted formal permission for such activities, relatively few problems occurred until a few years ago. Apparently some of the local youth discovered the amenities the Point offered and began have large parties there. The Chief of Police in Northfield threatened to bulldoze the area, but fortunately this action was vetoed by the Board of Selectmen, who suggested replanting the area. Problems with litter and misuse still exist, and this issue is addressed in the Action Plan.

The Schell Memorial Bridge in northern Northfield was constructed in 1903 with funds provided by Francis R. Schell, a local businessman. Prior to its construction, East and West Northfield were connected by a covered bridge suspended under a railroad bridge. Crossing this structure at the same time as a train was an unnerving experience. Mr. Schell entertained quite frequently, and when the railroad bridge was closed by the state, he donated nearly 50,000 dollars for the construction of a new bridge (Winn, 1949).

The bridge was used quite often by residents of Northfield until it was closed by the state for being unsafe. Local residents would like to see it repaired and reopened, though the town is not willing to pay repair costs. The state is unwilling as well, though a proposal is in the works to incorporate the bridge as part of the proposed Franklin County Bikeway.

French King Gorge is the dominant scenic landmark in the Upper Reach. In 1932 the bridge spanning the gorge was completed and passersby have stopped to take in the breathtaking views ever since. To the north, the forested hills look much as they did when the Native Americans inhabited the area. French King Rock can also be seen from the bridge, though it is not as majestic as it once was. The Millers River confluence is visible to the south, and here again forested hills dominate the landscape.

As a result of the significant natural and cultural attributes of the French King Gorge area, many resource agencies have begun work directed at protecting the area from change. The Connecticut Valley Action Program has initiated several acquisition efforts with apparent success. The Massachusetts Department of Public Works Open Space Program (see

Appendix D) is very interested in preserving the scenic character of Route 2 as it passes through Gill, Millers Falls, and Turners Falls. The Nature Conservancy and the Millers River Watershed Council are also strong proponents of protecting the area.

One of the main concerns regarding the viewshed of French King Gorge is a proposal by New England Power Services (NEPS) to build a 300-750 megawatt "base load" power plant just north of the bridge (see Figure 4). This site was one of four that underwent preliminary siting analyses by NEPS. The proposed plant would either have been a combined cycle plant that has the potential of being fired with gasified goal in the future, or Fluidized Bed Combustion units. In either case, a 400' stack is required.

Obviously, the construction of the plant would have a significant negative impact on the viewshed looking north. Additionally, 5.5 million gallons per day of Connecticut River water would be required, negatively affecting an already stressed river system. For these reasons, there is growing interest both locally and statewide to avert such construction. Fortunately, NEPS recently announced that plans for the Erving Site are "on the backburner." However, the possibility of power plant development still exists. The Action Plan and Recommendations section provides a framework for protecting the special qualities of the French King Gorge.

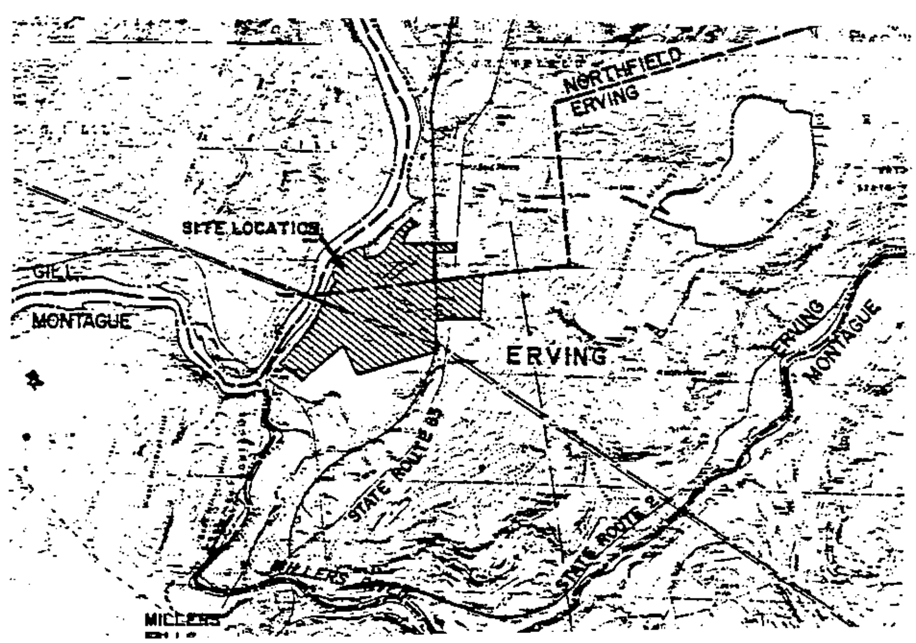


Figure 4. **Potential Power Plant Site Near French King Bridge**

Recreation

The undeveloped character of the Upper Reach and naturalness of the shoreline promote recreational activities which utilize these features: hiking, fishing, picnicking, and primitive camping. In addition, the Turners Falls dam provides a deep, stable reservoir that is ideal for many types of water-based recreation. Water quality in the upper reach has been improved to Class B, suitable for fishing and swimming.

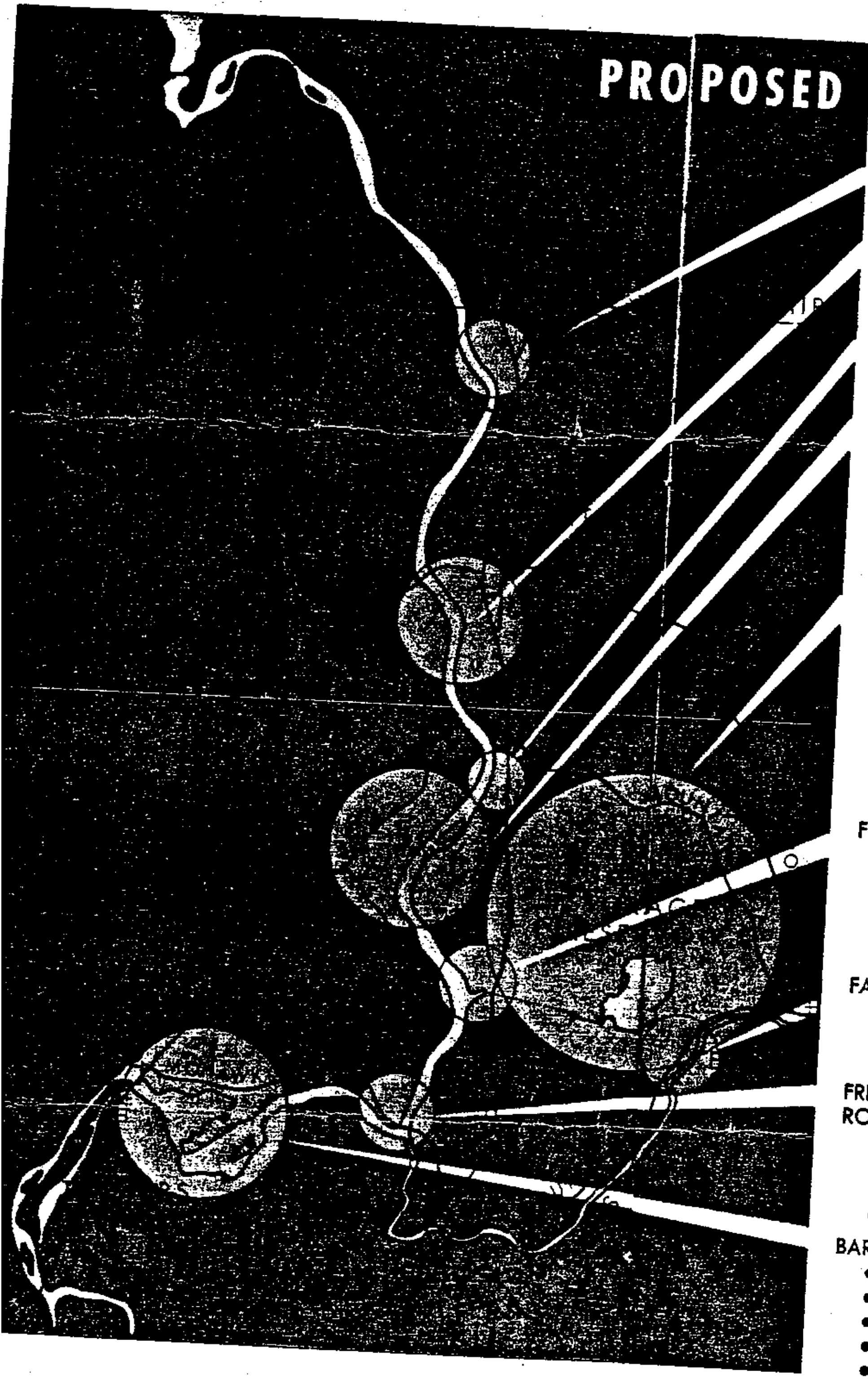
Most of the recreation sites in Reach 1 have been provided by Northeast Utilities as a result of their extensive impacts on the river and its shoreline. The Utility developed the Exhibit R Recreation Use Plan in order to gain licensing for the Northfield Mountain pumped storage facility. Exhibit R has been considerably revised since its inception.

The original Exhibit R proposed nine different recreation areas along the river (see Figure 5). Of these, four have been developed in some capacity and are described in following sections of this report. Two additional sites, Riverview Picnic Area and Bennett Meadow Wildlife Area, were later developed. Grassy Hill State Park, originally a state proposal, was vehemently opposed by local residents and therefore never pursued.

Northfield

There are currently seven existing recreation sites in Northfield, with activities ranging from cross-country skiing to dancing to jazz aboard a sunset cruise. Two of the five sites, Bennett Meadow and Pauchaug Brook, are Wildlife Management Areas, operated by the Massachusetts Department of Fisheries and Wildlife. A boat launch area is located at Pauchaug Brook. This launch is heavily used by New Hampshire and Vermont residents in the summer months. Recreational activities at these sites include fishing, hunting, cross-country skiing, and observing nature.

King Philip Hill, a town-owned historical landmark, offers hikers a chance to step back in time to when indians still inhabited the area. The trail is a short, easy hike, ideal for younger children or those with limited physical capabilities. The view at the top is still very similar to what it was over 200 years ago, when King Philip allegedly chose it as a camp and look-out point.



PROPOSED RECREATION AREAS

PAUCHAUG BROOK BOAT LAUNCH
- Fish & Waterfowl Habitat

TEN-MILE HILL & MILLERS BROOK RECREATION AREA
- Boat Picnicking & Camping
- Boat Launch

MUNN'S FERRY BOAT CAMPING AREA
- Boat Picnicking

GRASSY HILL STATE PARK
- Camping
- Swimming
- Picnicking
- Boat Picnicking & Camping
- Marina
- Fishing

NORTHFIELD MOUNTAIN RECREATION AREA & TRAIL SYSTEM
- Riding Stables
- Ice Skating
- Sled & Toboggan Runs
- Snowmobile Skiing & Racing
- Trails — Horse, Snowmobile, Hiking
- Trailside Camping
- Hunting & Fishing
- Nature Study
- Historical Markers

FOUR-MILE BROOK RECREATION AREA
- Swimming
- Picnicking
- Boat Picnicking
- Overlook
- Fishing

FARLEY ROADSIDE REST AREA
- Rest Rooms
- Picnicking
- Scenic Waterfalls

FRENCH KING BRIDGE ROADSIDE REST AREA
- Rest Rooms
- Picnicking
- Overlooks
- Historical Marker

BARTON COVE RECREATION AREA
- Swimming
- Vacation Cabins
- Marina
- Picnicking
- Boat Picnicking
- Water-Ski Facilities

Figure 5. Original Exhibit R Recreation Proposals

Northeast Utilities Recreation and Environmental Center also offers many types of recreational activitites. The Center itself is a mini-museum, with exhibits and historical displays. Fifteen hundred acres of Northfield Mountain is criss-crossed with 25 miles of trails maintained for hiking in the summer and cross-country skiing in the winter. The 1985-86 season, from December to March, saw a record-breaking 23,000 skiers at the Mountain.

Across the road from the Environmental Center is Riverview Picnic Area. This site is directly adjacent to the river, and has a number of picnic tables and related accessories. It is available for use on a first-come, first-serve basis.

Northeast Utilities also offers an interpretive river boat ride aboard the *Quinnetukut II* from June to mid-October. Though this activity provides an excellent opportunity to observe the scenic beauty of the area, the quality of historical interpretation has been questioned. Approximately 10,000 to 14,000 people annually take advantage of this event, and an excellent opportunity exists to accurately portray the fascinating natural and cultural history of the valley. The river boat ride is especially popular during peak foliage in autumn. Sunset cruises on weekends in July and August offer a different type of river recreation.

Munn's Ferry is a primitive camping and picnicking facility that is accessible only via the river. Over 750 canoeists and fishermen use this site annually. It is also operated by Northeast Utilities.

Gill

The major accessible river recreation site in Gill is Barton Cove Nature and Camping Area, owned and operated by Northeast Utilities. Barton Cove offers many opportunities, including boat docking facilities, canoe rental, tent sites, sanitary facilities, self-guided hiking trails, and picnicking. Swimming is prohibited. The area is relatively heavily used by both passive and active water users. Over 10,000 people visit Barton Cove each year to camp or use the boat facilities.

A state boat ramp just west of the Barton Cove facilities provides easy access for power boats. During spring, summer, and fall fishing, water-skiing, and wind-surfing are popular activities in the Cove.

Montague

There are currently two existing recreation areas along the river in the Upper Reach in Montague, both in Turners Falls. Northeast Utilities operates a fish ladder viewing area and adjacent picnic area at the fish ladder at the Turners Falls dam. This facility opens in early to mid-May, and is free to the public. Exhibits and informational pamphlets are available at this site.

The second site is town-owned Unity Park. This park offers a playground, basketball and softball facilities, and extensive open areas for other activities. Directly adjacent to the Turners Falls pool, Unity Park is very popular among townspeople.

In addition to the existing sites, the Massachusetts Department of Environmental Management has initiated the development of a Heritage State Park in Turners Falls. The focus of the Park will be the role of the Connecticut River in the settlement of the Upper Reach and Turners Falls, emphasizing the area's rich Native American History.

One component of the proposed Park is a non-powered boat docking facility near Unity Park. The site would include a boat training facility and 20 small sailboats used for lessons. Also, additional dock space will be provided for the general public. No launching area has been proposed due to the availability of the nearby state launching facility in Gill

Northeast Utilities also offers a portage service around the Turners Falls dam by arrangement. This service is free and available on request.

Though Northeast Utilities has provided many of the recreation sites and activities, several question arose when reviewing the Revised Exhibit R. Discrepancies in what was proposed and what has actually been developed existed on virtually every site. For example, cabins for Barton Cove Nature Area and a roadside picnic area for French King Gorge were proposed but never were built. The Manager of Northeast Utilities Environmental and Recreation Center, George Brosky, blamed rising oil costs in the 1970's for the company's revised recreation plan.

Though the revised Exhibit R deleted several important recreation facilities, Northeast Utilities has provided relatively extensive river-related recreational opportunities within the Upper Reach. In addition, the Environmental and Recreation Center offers many educational programs in nature study. Workshops in wildflower identification, birdwatching, compass and map reading, and mountaineering are offered on a regular basis. This public service is very popular and the Center is visited by large numbers of people each season.

Several concerns regarding river recreation have been voiced by local residents. One issue is that of bass-fishing tournaments held in the Upper Reach. Bass boats travel at very rapid speeds and disrupt other activities both on the shores and in the river. Local opposition to these tournaments is strong, and recommendations have been included in the Action Plan regarding this issue.

The Franklin County Boat Club is a local organization that actively uses the Connecticut River in the Upper Reach. In a letter to the Connecticut Valley Action Program, the Club noted several issues that they would like to see addressed. These include channel marking, some dredging around dock areas, better river to shore access along the river, and better river law enforcement. These concerns have been incorporated in the Recreation section of the Action Plan.

Part 2: The Action Plan and Recommendations

French King Gorge

The widespread interest in the fate of the French King Gorge should generate success toward the protection of its natural and scenic resources. However, initiatives by state agencies such as DEM's Connecticut Valley Action Program and DPW's Open Space Program and private non-profits such as the Nature Conservancy must continue to work in concert to protect the area in perpetuity.

Attempting to protect an area such as the French King Gorge from land use alterations is a complex task. The diversity of interested public and private resources agencies, each with a different focus and different methods, can lead to a situation of bureaucratic overlap and/or oversight. Add to this the many private landowners with varying attitudes toward conservation, and a fairly complicated situation can develop.

In order to avoid potential overlap or oversight, the resource agencies involved have created and should maintain a communication network relating current activities. In addition, each agency should compile an outline of their goals and objectives and methods for achieving them. These should be distributed among the groups and, providing no sensitive information is included, to Conservation Commissions of local communities.

The Massachusetts Executive Office of Environmental Affairs has publicly stated its opposition to the construction of a power plant on land owned by New England Power Services. Efforts should be initiated through this Office to permanently protect this site from development.

Farmland Preservation

The Massachusetts' Department of Food and Agriculture's Agricultural Preservation Restriction Program should continue targeting farmland in the Upper Reach. One strategy that has proved effective in the past is a combination acquisition effort through the Connecticut Valley Action Program and the APR Program. The section of a property in agricultural use is acquired by DFA and the forested or shoreline sections are acquired by DEM. These combination efforts should continue to be pursued in the

Upper Reach.

However, due to the funding limitations of these programs, towns themselves should also pursue agricultural land protection strategies. Most of the agricultural lands in the Upper Reach are in Northfield and Gill. Though these towns are not financially capable of protecting large tracts, methods other then acqusisition should be implemented.

Most of the tools available to the towns are listed in Appendix C. Technical assistance regarding these methods is available through the Franklin County Planning Office, the Center for Rural Massachusetts at the University of Massachusetts, APR representatives, and private groups such as the American Farmland Trust.

Protection of Archaeologic Resources

Protection of the Upper Reach's archaeologic resources is dependent on the interest and commitment of local residents and officials. Though state and federal laws exist protecting these resources, lack of education on the local level has had a serious detrimental effect on most of the known sites in Reach 1. A report entitled *Prehistoric Cultural Resources in Norhtfield: A Conservation Handbook* (Dincauze and Eldridge, 1984) outlines several steps communities should take toward site protection.

The first step involves recognition of archaeological resources. These resources are divided into three classes-- sites, collections, and skeletal remains. All three of these classes have been identified in the Upper Reach. The Department of Anthropology at the University of Massachusetts has records of most of the known occurrences of these resources; however, it is extremely probable that there are many sites that are as of yet undiscovered. In order to address this issue, DEM has requested funding for 1988-89 to do a Geographic Information System (GIS) inventory of the Upper Reach.

The second step requiries a community-wide commitment to archaeological preservation. Residents, town officials, and special interest groups including developers must become aware of the existence and significance of archaeologic resources and the impacts their activities have on the research value of sites. Land use conflicts can be avoided in many cases with intelligent planning and adequate forethought.

Educating the public of the significance of archaeologic resources should take place on several levels. School programs, workshops for town officials and developers, and exhibits at public places such as libraries and the proposed Turners Falls Heritage State Park would be effective in reaching fairly large audiences. Specific site location information should not be included in such programs to protect landowner rights and the integrity of individual sites.

In addition to education, land use planning can assist in the preservation of significant archaeologic sites. One immediate step towns in the Upper Reach should take involves those areas in town identified by the Dincauze and Eldridge report as potential archaeologic sites. Development in these areas should be preceded by a survey of the area to determine archaeologic significance. Overlay zoning is one method of achieving this. It is possible to avoid damaging a site simply by adjusting building location by a few feet. Once the GIS inventory is completed, the towns will have much more reliable data upon which to base such requirements.

Many federal, state and institutional historical agencies will assist communities with developing educational programs and land use plans which address archaeologic preservation. The towns in the Upper Reach have and should continue tapping these resources, which include:

Advisory Council for Historic Preservation
1100 Pennsylvania Avenue, N.W. #809
Washington, D.C. 20004

Department of Anthropology
Machmer Hall
University of Massachusetts
Amherst, MA 01003
(413) 545-2221

Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202
(617) 727-5830

Maasachusetts Historical Commission
80 Boylston Street
Boston, MA 02116.

Soil Erosion

The first step toward addressing this problem should be a preliminary survey to determine the extent and seriousness of the erosion problem within the Upper reach. This survey could be carried out by the Soil Conservation Service, the University of Massachusetts, or through a joint effort of the two. Northeast Utilities should be encouraged to assist in the effort through financial support. Once the extent of the problem has been documented, a committee consisting of representatives from NU, the farming community, state agencies, and the SCS should be established to work out solutions to the problem.

Water Quality

The completion of DEQE's proposed fish toxics monitoring project early next year should document the extent of pollutant contamination above the Turners Falls dam. The results of this study will determine the extent of action needed to rectify the situation.

According to officials at the Northfield Mt. Hermon School, that institution is now in compliance with state regulations regarding sewage discharge. Since 1986, a chlorination device has been installed, and the school has employed an engineering firm to research methods of eliminating the potential problems. It is recommended here that the school pursue the construction of a small sewage treatment facility. Such a facility would eliminate the lagoons altogether, and the improve the quality of treated water considerably.

Fisheries

There are two major issues involved in planning for protection of fisheries in the Upper Reach. The first involves the impacts of pollutants on the health of resident species. The fish toxics study planned by DEQE should aid in documenting the extent of contamination of resident fish above the Turners Falls dam.

A more pressing issue regarding fisheries in the Upper Reach is the impact of the Northfield Mountain pumped storage facility on populations of both resident and anadromous species. The Commonwealth has devoted much time and money to improve the quality of the river and re-establish anadromous fish populations. These efforts should not be undermined by the operation of any private industry.

The first step in resolving an issue such as this is to document the actual impacts of the pumped storage facility on resident populations and the migration efforts of anadromous species. This study should be prepared by the Massachusetts Cooperative Fisheries Research Unit at the University of Massachusetts and partially funded by Northeast Utilities. The study should contain, at a minimum, the following information:

1) A comparison of current resident fish populations with those documented in the Brigham and Jonasch study.
2) The number of immature salmon and shad destroyed during migration as a direct or indirect result of the pumped storage facility.
3) The magnitude of impact these mortality rates have on return rates of salmon and shad to the Upper Reach.

Should there prove to be serious impacts, Northeast Utilities should be required by the Commonwealth to propose and implement methods to minimize or eliminate the impacts.

Another recommendation regarding fisheries is the posting of no fishing signs near the fish ladder entrances and exits at the Turners Falls dam. Fish congregate at these areas and should not be hindered in their progress upstream. Northeast Utilities should be responsible for placing the signs and the Massachusetts Division of Fisheries and Wildlife for enforcing the policy. The Connecticut Valley Action Program should act as mediator for accomplishing this.

Recreation

In order to determine the extent of recreational demand and deficiencies in the Upper Reach, a needs assessment should be carried out. This can be accomplished relatively inexpensively through a studio project in the Department of Landscape Architecture and Regional Planning at the University of Massachusetts. The study should address the following issues:

- Extent of use of existing facilities
- Condition of existing facilities
- Adequacy of current access to the river
- Adequacy of access to the shore from the river
- Types of recreational uses of the river
- Need for increase in facilities and what types of facilities are lacking.

The completion of such an assessment would specify where need exists and how it relates to current efforts to improve recreation along the river in the Upper Reach. One such effort proposes the development of a self-guided canoe trail along the river, which has been suggested by several different groups. An excellent opportunity exists for interpretation of the natural and cultural history of the area through the identification and marking of landmarks along the river. Even the publication of a pamphlet detailing a route and the landmarks would be effective. The Action Program should begin planning for the development of this trail.

In conjunction with this effort, Northeast Utilities should be encouraged by local residents, town officials, resource specialists, and the Action Program to improve the quality of the interpretive narrative aboard the *Quinnetuk II*. Suggestions for accomplishing this include approaching local professional naturalists to compose brief narratives covering the different aspects of natural and cultural history. These could be combined to produce an interesting, informative dialogue for the boat tour.

In addition, the scheduling of guest speakers to focus on topics such as anadromous fish restoration or Native American cultures would be in keeping with the educational focus of the Utilities' Environmental and Recreation Center. Thousands of people use this service each year, and the history of the area is a fascinating topic for such a river tour.

Steps to deal with the several areas of concern regarding river and shoreline recreation can be initiated immediately. For example, several approaches can be attempted to maximize amenities and discourage problems at the site known as Durkees Point. Local officials, together the the Connecticut Valley Action Program, should approach New England Power Services (NEPS) and request that a management strategy for Durkees Point be developed. This stategy should provide at a minimum a program for litter clean up and trash removal.

There are several methods for implementing such a plan. NEPS could hire a local youth as a summer helper to assist in maintaining the area. The provision of a few trash receptacles and picnic tables could improve the quality of the site considerably. A second alternative is to suggest that NEPS make financial arrangements with Northeast Utilities Environmental and Recreation Center to upgrade and maintain the property. Incorporating Durkees Point into the maintenance schedule for nearby Riverview Picnic Area would require minimal investment for either company. Should the Commonwealth acquire the property, an excellent opportunity exists to increase picnic and camping facilities along the river.

One issue identified by the Coordinating Committee calls for increased monitoring of bass tournaments and fishing derbies. The towns of Northfield and Gill should enact regulations regarding these tournaments. Suggestions for such regulations include the following requirements:

1) The filing of a public notice in *The Recorder* thirty (30) days in advance of the scheduled tournament;
2) The posting of a public notice at both state boat ramps;
3) Registration fifteen (15) days in advance with the local police;
4) Notification of Environmental Police fifteen (15) days in advance; and,
5) Notification of the Coast Guard Auxillary fifteen (15) days in advance.

The concerns of the Franklin County Boat Club should also be investigated. A small amount of dredging and channel marking near the two state boat launches may improve the access situation substantially. Increasing river patrolling by the Environmental Police would undoubtably discourage boaters from exceeding speed limits and harassing non-powered craft.

In addition, the Town of Northfield should petition the Public Access Board of the Massachusetts Division of Fisheries and Wildlife for the placement of an informational kiosk at the Pauchaug Meadow boat launch. Such a structure would significantly assist in the dessimination of pertinent information regarding:

- Speed limits (identify no-wake areas and publicize 45-mile/hour overall limit)
- Bass tournament regulations (if enacted)
- Salmon and shad restoration information (discourage fishing during spawning season, no fishing around fish ladders)
- Phone number of Environmental Police Dispatch (1-800-632-8075)
- Water and boating safety instructions

Through the identification of needs and the initiation of actions, the few recreation problems in the Upper Reach can be solved with a minimum of expense.

Conclusions

The Upper Reach of the Connecticut River in Massachusetts will continue to evolve naturally and culturally with the rest of the river valley. Changes are inevitable, yet they can be guided in such a way that the local residents and other concerned citizens can protect the features of the area that are considered valuable. This Plan is an attempt to aid citizens and public officials in recognizing those features and suggest methods for resolving problems associated with them.

It is hoped that this report will be of assistance to many people, and not just gather dust on a shelf. The Upper Reach tends to be neglected due to several factors- its location and relative inaccessability, the presence of Northeast Utilities, and the apparent apathy of many residents. Without addressing specific issues now, before crisis situations develop, the character and amenities of the Upper Reach could be permanently destroyed.

There is much interest on many levels to help protect Reach 1 from drastic change. These efforts simply need to be coordinated and pursued to achieve success. After all, the land called 'The Smile of God' deserves special attention.

Acknowledgements

I would like to thank all of those dedicated people who assisted in the compilation and development of this plan. I would especially like to thank Terry Blunt, Manager of the Action Program, and Hugh C. Davis, my Project Chair, for their patience and understanding during this tulmultuous period.

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Boyd Kynard, Cooperative Fisheries Research Unit, University of Massachusetts.

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Susan Quateman, Massachusetts Department of Public Works Open Space Program.

Steve Rideout, Fisheries Biologist, United States Fish and Wildlife Service.

Charlotte Schepp, Resident, Town of Northfield.

Frank Smith, Principal Engineer, New England Power Services.

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APPENDIX A

Connecticut Valley Action Program's

Action Plan Objectives

Reach 1- Vermont/New Hampshire line to Turners Falls

Miles of River: 15

County: Franklin

Towns: Northfield, Gill, Montague, Erving

Target Issues:

* Protect natural and scenic resources of the French King Gorge
* Encourage farmland preservation
* Protect archaeologic resources
* Accelerate efforts to control soil erosion
* Preserve rare species habitats
* Increase non-motorized boat access
* Improve parking and access for power craft
* Increase law enforcement on-river
* Develop better monitoring of fishing derbies
* Develop a multi-town bikeway circuit
* Increase on-river camping sites
* Improve river safety and education
* Encourage low key tourism
* Oppose Connecticut River diversion

APPENDIX B

Fisheries Information

It's 'go' for lab in Turners

By JIM PAULIN
Recorder Staff

TURNERS FALLS — The Northeast Anadromous Fish Laboratory planned for Turners Falls should be completed in 1990, the project's manager told a Tuesday meeting of the Connecticut River Atlantic Salmon Commission.

"Everything looks like 'go.' The money is there, the design is 'go,'" said project manager Donald Greenland of the U.S. Fish and Wildlife Service. He predicted that construction will begin in May or June.

The fish lab, for the study of migratory fish including salmon and shad, is seen as fitting into a multimillion dollar, tourist-oriented redevelopment of downtown Turners that would include the Northeast Utilities fish ladders, construction of a state Heritage Park, conversion of the Shea block into a civic center, and creation of a bike trail along the power canal.

The fish lab was delayed when two bids opened in September were substantially above the $7 million budgeted, at about $13 and $15 million. But the new bids could be lower because of a more attractive construction schedule. The projected 18-month schedule involves only one winter. If September's bids were accepted, the project would have spanned two winters.

And an increased federal financial commitment means no "down sizing," or building a less expensive facility, Greenland said. He said that his "instructions from up above are 'don't change a thing.'"

A spokesman for U.S. Rep. Silvio Conte, R-Pittsfield, said Tuesday that the 1988 federal budget contains

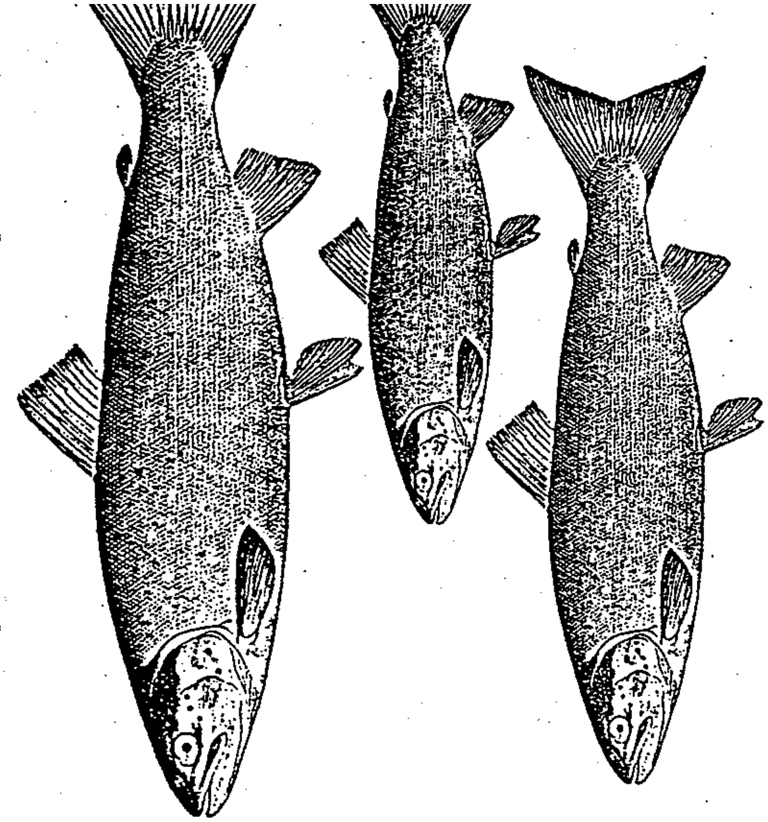
See FISH Page 10

Fish

not only an additional $2 million for the project, but also a requirement that the 1989 budget contain "the funds necessary to complete the facility."

Conte has been a powerful supporter of the project in Congress.

ATLANTIC SALMON



HISTORY AND RESTORATION

CONNECTICUT RIVER FISHWAYS

Name of Dam	River	Owner	Distance From Sea	Height of Fish Lift	Type of Fishway	Year Compl.
Leesville	Salmon River	State of Connecticut	26 mi.	12 ft.	1 ladder	1980
Rainbow	Farmington River	Stanley Tools	64 mi.	60 ft.	1 ladder	1975
Holyoke	Connecticut River	Northeast Utilities	86 mi.	30 ft.	2 elev.	1955
Turners Falls	Connecticut River	Northeast Utilities	122 mi.	36 ft.	3 ladders	1980
Vernon	Connecticut River	New England Electric	142 mi.	35 ft.	1 ladder	1981
Bellows Falls	Connecticut River	New England Electric	173 mi.	70 ft.	1 ladder	1984
Wilder	Connecticut River	New England Electric	217 mi.	55 ft.	1 ladder	1987

Northfield Mountain Recreation and Environmental Center
RR1, Box 377, Northfield, MA 01360

NORTHEAST UTILITIES
The Connecticut Light and Power Company
Western Massachusetts Electric Company
Holyoke Water Power Company
Northeast Utilities Service Company
Northeast Nuclear Energy Company

Atlantic salmon do a lot of traveling—which the biologists wrap up in one word "anadromous". The salmon spawn in freshwater, grow to maturity at sea and return to their home rivers to spawn sometime between May and November. While at sea, the salmon eat and grow continuously, but upon entering freshwater they stop eating and so depend totally on their fat as a source of energy for their upriver spawing migration.

As the late fall spawning season approaches and river temperatures drop to 40°F, the female salmon seeks out a gravelly river bottom area to create her "redd", the nest where she will lay between 700 and 800 eggs per pound of her body weight. As she deposits her eggs they are fertilized by the male. Then she covers them with gravel. Unlike the Pacific species which die after spawning, Atlantic salmon can spawn two or even three times. In fact, approximately 10% of the adult Atlantics may survive to become repeat spawners. Whether they do or not depends upon how much of their energy reserves they spent during their upstream migration.

After spawning, the survivors (called *kelts*), either migrate directly back to the ocean or remain in the stream until spring. Under the gravel the eggs develop slowly—the rate depending on the water temperature. They generally hatch as river temperatures begin to rise between mid-April and mid-May. Remaining in the gravel redd, the young salmon feed on their yolk-sacs, and finally emerge in May or June, at which time they can eat microorganisms in the water. At first the young salmon are "fry" graduating to "fingerling" rank at 3-4 inches. At 4-5 inches, striped with dark vertical bars, they become "parr", so called because of their parr-marks. It is at this stage they begin to look very like young brook trout, distinguishable because their tail fin is more sharply forked than that of the brook trout. The brook trout also has spots on its back fin where the salmon has none.

As the salmon grow to 5-10 inches, during their second or third year, they become "smolts" undergoing a tremendous physiological change, which prepares them for sea life. The most visible effect of the change is that they lose their stripes, turn bright silver and migrate to the ocean. Once there, they become big feeders eating shrimp and such small fish as herring and capelin which are abundant off the coast of Greenland where most of the salmon winter-over.

By the end of their first year at sea, salmon weigh 3-6 pounds. After two sea years they average 10-12 pounds and sometimes weigh as much as 20 pounds. While some salmon return to freshwater after one winter at sea, most remain for two years or more before returning home to spawn and to begin the salmon life cycle again.

In the early days of the Commonwealth there were large runs of anadromous fish in both the Connecticut and Merrimack Rivers and impressive harvests of both shad and salmon. This ended with the industrial revolution and the need to use the rivers for transportation and power. Both uses involved the construction of dams which blocked the rivers to returning fish. On the Connecticut River the first major barrier was the dam at Turners Falls, built in 1798. Shortly thereafter salmon stopped trying to migrate upstream. A final blow came with the construction of a dam at Holyoke in 1849 (rebuilt in 1900) which totally cut salmon off from their traditional spawning grounds.

In 1870 the Fish Commissioners of Massachusetts, Connecticut and Maine signed a pact to restore salmon to the Connecticut and other New England rivers. They shared the cost and labor of obtaining and hatching salmon eggs from Maine rivers and, in Massachusetts, a wooden fishway was constructed over the Holyoke Dam. Over 1,350,000 fingerlings were released into the Connecticut River and its tributaries. 800,000 salmon fingerlings were stocked and an additional 2.9 million fry were released. There were returns of about 800 adult salmon, but because of poor management and inadequate fishways this program was ended.

The current restoration of Atlantic salmon began in 1967 with the passage of the Anadromous Fish

Act which provided Federal
restoration programs. Since
time approximately 2,500,00
mon smolts and 3,400,000 fr
parr have been released into
Connecticut River through 1
The first adult salmon return
in 1974 with increasing num
since then.

Ultimately the success
restoration program depend
development of a native str
Atlantic salmon. At first this
opment requires the releas
numbers of non-native fish
number of returning adults
increases, more and more
smolts and fry can be relea
Much of the original spawn
nursery habitat still exists
produce high quality smol
access to these areas rema
problem. Now there are fis
facilities at Holyoke, Turne
Vernon, Bellows Falls, and
Additional fish passage fa
planned for Wilder Dam a
Massachusetts Division of
and Wildlife has reconditi
Palmer State Hatchery to
hatchery for salmon smol
U.S. Fish and Wildlife Ser
completed an adult salmo
facility in Sunderland,
Massachusetts.

With State, Federal a
sectors (and salmon) coo
looks as though Massach
mon are well on their wa

these goals seem very realistic. It will be another example of successful management, a bonanza for sport fishermen and possibly the beginning of a new commercial fishery.

CONNECTICUT RIVER FISHWAYS

Name of Dam	River	Owner	Distance From Sea	Height of Fish Lift	Type of Fishway	Year Compl.
Leesville	Salmon River	State of Connecticut	26 mi.	12 ft.	1 ladder	1980
Rainbow	Farmington River	Stanley Tools	64 mi.	60 ft.	1 ladder	1975
Holyoke	Connecticut River	Northeast Utilities	86 mi.	30 ft.	2 elev.	1955
Turners Falls	Connecticut River	Northeast Utilities	122 mi.	36 ft.	3 ladders	1980
Vernon	Connecticut River	New England Electric	142 mi.	35 ft.	1 ladder	1981
Bellows Falls	Connecticut River	New England Electric	173 mi.	70 ft.	1 ladder	1984
Wilder	Connecticut River	New England Electric	217 mi.	55 ft.	1 ladder	1986 (Planned)

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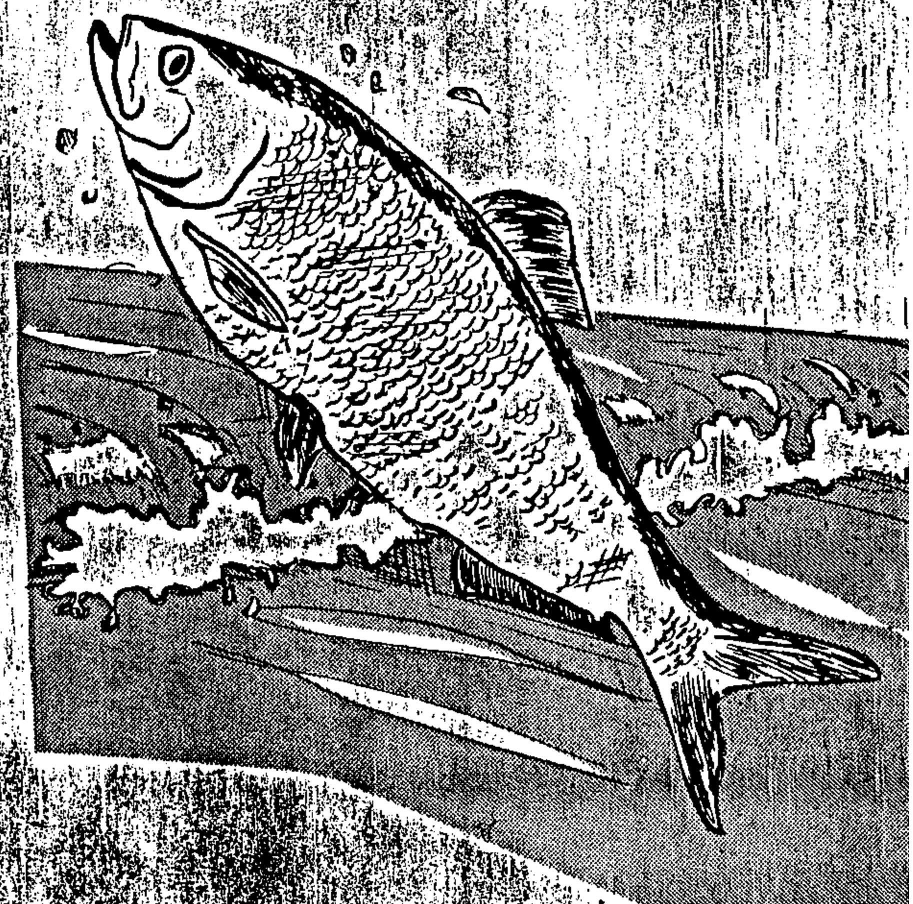
SHAD
IN MASSACHUSETTS



Springtime is shad time in New England. The so-called "shad bush" blooms and the American shad *(Alosa sapidissima)*, often called "poor man's salmon," start up the rivers to their spawning grounds. In fact, these 1½ to 8 lb. game fish are not salmon at all but the largest members of the herring family. Like salmon, however, they are anadromous, spending most of their life in salt water and returning to fresh water to spawn. And like salmon they are excellent eating—the very name "sapidissima" means "most delicious."

Shad are native to the Atlantic coast; those in the Pacific are descended from stock introduced there in the mid-1800s. They are found from the coast of Maine to Florida which serves as a wintering area for most of the Atlantic shad. During late winter the shad begin their northward migration arriving at the latitude of Massachusetts around mid-April. Here they ascend the Merrimac, Palmer, Indianhead, Taunton and Charles Rivers and most importantly the Connecticut River. Each year, as more fish return to their natal waters the "run" increases.

Shad begin their lives in fresh water, feeding on insects and plankton through the summer months and migrating to the sea when the water temperature drops in the fall. In the Connecticut this takes place during October.

Once in the ocean shad adapt to "adult" feeding patterns straining marine plankton out of the water. After four to six years in the sea, they mature and begin the journey back to their spawning areas. On this voyage they do not eat, traversing dams, falls, and fishways until they reach suitable spawning habitat. Enroute they are irritable and, although they are not to be tempted with bait they snap at shiny lures and shad darts. Should they survive the natural hazards of passage and the fishermen who have been waiting all year for the shad run, the shad in Massachusetts waters will lay their eggs and return to the sea.

The history of the shad in Massachusetts is one of neglect. Early estimates indicate that the shad population of the Connecticut River may have been as high as six million per "run." At that time colonists took large quantities of shad at Hadley Falls, Turners Falls and Bellows Falls, Vermont. Shad were indeed th[e] "poor man's salmon." Large numbers were harvested to feed colonial troops. But gradually the area became industrialized. B[y] 1797, after the construction of the Turners Falls Dam, both sha[d] and salmon stocks began to decline. They were dealt a more serious blow in 1849 with construction of a dam at Holyoke. Additional dams, pollution, and over-fishing made the passage increasingly difficult and even impossible.

Efforts to restore the shad and salmon began in the mid-1800s and in the late 1800s a fishladder was installed at Holyoke but the technology for fishway construction at high dams was not developed and the result was an ineffective fishway. In 1955 a fish lift was put into operation at Holyoke. More than twenty years of refinements on the lift have brought it to the point whe[re] it now transports hundreds of thousands of fish across the dam without handling. As the fish pass through the flume that crosse[s] the dam they are observed by Division fisheries biologists who note numbers and species of fish passing up-river. There is even trapping facility which allows the biologists to single out individual fish for study. They may measure the fish to determin[e] growth rates, take scale samples to determine age or capture sha[d] for transport to other suitable rivers. During the past several years the number of shad passing over the Holyoke Dam has increased to a record setting 530,000 and Division biologists are preparing plans to handle 1,000,000 shad with the fish lift.

Additional fishways have been completed at Turners Falls (1980), Vernon (1981), and Bellows Falls (1984) opening up new areas of spawning habitat. With this access to the upper reaches of the rivers, shad numbers should increase even further. The installation of these facilities allow shad to their historic range. These projects are cooperative ventures among private industries and state and federal Fish and Wildlife Agencies. In fact Division fisheries biologists look forward to a time when two million shad will run up the Merrimack. There is still work to be done mitigating the effects of pollution and improving fish passages but the strides made during the past ten years make

APPENDIX C

Agricultural Land Preservation Tools and Techniques

VoluntaryLand Trusts - private or community vehicles for acquiring and/or holding land or rights on the land

Landowner Master Plans- land use planning methods for private landowners

Agricultural Land Preservation Committee- local clearinghouse for information and action on preservation techniques and opportunities

Chapter 61A - voluntary program of deferred taxation on farmland remaining in active use

Acquisition:

Acquisition may be of two types:

Fee Simple- outright purchase of property or the rights to property

Less-Than-Fee - purchase of only some of the rights on a property (i.e. development rights or conservation or scenic easements

Acquisition may be accomplished by state, county, town or private interests or by a combination of any of the above.

State -Agricultural Preservation Restriction, the Department of Food and Agriculture purchases and holds development rights on prime farmland

County -might apply for special land bank legislation to generate funds, more likely to contribute from existing funds to aid other purchasers, such as the state Departments of Environmental Management, Fisheries and Wildlife, and Food and Agriculture.

Town - should apply for land bank legislation establishing a small real estate transfer tax (on the order of 2%) to fund town acquisition.

Private- land trusts and other philanthropic organizations or individuals buy property or rights and hold them or convey them to fiscally stronger appropriate holding institutions.

Regulation:

Agricultural Zoning- Exclusive: agricultural development only

Overlay: agricultural preferred, but development permitted if it meets performance standards

Sliding Scale: agriculture preferred but, residential development permitted with density determined by parcel size

Incentive Area: voluntary inclusion, town has right of first refusal

Floodplain Zoning - if strictly enforced, will protect farmland in the zone from development for non-agricultural uses

Large Lot Zoning -decreases the density of residential development but, does not halt or restrain it any other way

Performance Zoning-development permitted in compliance with measurable standards

Limited development, Planned Unit Development, Mandatory Cluster Zoning- leave more land open than conventional development methods by using space more efficiently and provide for more efficient municipal services delivery

Service Districts-restrict development by defining boundaries of municipal water and sewer services

Transfer of Development Rights-development rights are sold and transferred from sending area farmland to designated receiving areas

Transfer of Development Credits-owners of more than one parcel may transfer development rights from one property to another

Land Bank - legislation allows towns to establish real estate transfer tax to fund town acquisition for land preservation

APPENDIX D

Massachusetts Department of Public Works Open Space Program

Why Is There a D.P.W. Open Space Program?

"Our Commonwealth has a number of special places which give residents and tourists alike a sense of location and pride. The views and natural landscapes along our highway daily reinforce this feeling about our state. It is this sense of place that the Massachusetts Department of Public Works is seeking to preserve and enhance through the newly created **Open Space Program**," said Robert Tierney, Commissioner, Massachusetts Department of Public Works, describing the origin of the **Open Space Program.**

Increased economic development in the state has brought renewed prosperity to many cities and towns. As more land is built upon along our highways, the traditional New England landscape is in danger of disappearing. Through the **Open Space Program**, the Massachusetts Department of Public Works (D.P.W.) is attempting to restore the balance between growth and scenic beauty, by acquiring scenically and environmentally important parcels along public ways.

1985 Transportation Bond Issue

Upon the request of Governor Dukakis, the Legislature enacted the 1985 Transportation Bond Issue which established the **Open Space Program.** The Bond Issue provides for:

> "a sum not to exceed ten million dollars for the acquisition by eminent domain under the provisions of chapter seventy-nine, or by purchase or otherwise, of land or rights in land within or adjacent to public ways for the purpose of restoring, preserving, or enhancing areas of scenic beauty or special environmental value."

Open Space Program Criteria

The D.P.W. **Open Space Program** will consider acquisition of land where a parcel, as viewed from the public way, clearly forms a part of a discernable natural landscape of outstanding quality. The parcels of land should contain a substantial proportion of the following criteria.

- Provide scenic vistas from the road of either man-made or natural features which are of local or statewide significance.
- Be adjacent to well-travelled public ways.
- Possess one or more of the following characteristics, so that there is a possibility of joint acquisition with other agencies:
  - -coastal and/or inland wetlands
  - -aquifer recharge areas
  - -agricultural land
  - -land containing rare and endangered plants, animals or ecosystems
  - -rare or unique geologic features
  - -historic structure, landscapes or archaeological sites
  - -other special features
- Protect scenic land under threat of development.
- Provide a maintenance and management plan by a conservation commission, local group or state agency.
- Provide access for all Commonwealth residents and visitors, consistent with highway safety.

Land Protection

Interests in land acquired with funds allocated to the **Open Space Program** are protected from future development in the same manner as other conservation and scenic lands held by the Commonwealth. Any change of use may be effected only through legislation by a two-thirds vote of the House and Senate.

Who Will Own the Land?

The 1985 Transportation Bond Issue authorizes the D.P.W. to acquire land for the **Open Space Program** by fee-simple eminent domain takings and negotiated purchases, or by non-fee-simple conservation restrictions, easements or gifts. The Bond Issue does not authorize the transfer or sale of any land acquired by the **Open Space Program.**

The Commonwealth of Massachusetts will own title to the land where fee-simple acquisitions are made. A non-fee-simple conservation restriction or easement, however, would mean that the landowner retains title to the property, while the Commonwealth owns certain rights, thereby conserving the land.

How Is the Land Maintained?

Since maintenance funds are not provided by the 1985 Transportation Bond Issue, all parcels acquired by the **Open Space Program** must be maintained by a local group, conservation commission or state agency. Where easements or restrictions are acquired, the landowner retains maintenance responsibilities.

How Can One Apply to the Program?

Application can be made by completing the **Open Space Program Application Form** and enclosing 10-20 color slides or photographs of the parcel(s) you would like to have considered.

For further information contact:
Susan Quateman
Director, Open Space Program
Bureau of Transportation Planning and Development
Massachusetts Department of Public Works
10 Park Plaza
Boston, Massachusetts 02116
Tel: (617) 973-7323

MASSACHUSETTS DPW DEPARTMENT OF PUBLIC WORKS

P R O D U C E D B Y T H E M A S S A C H U S E T T S D E P A R T M E N T O F P U B L I C W O R K S