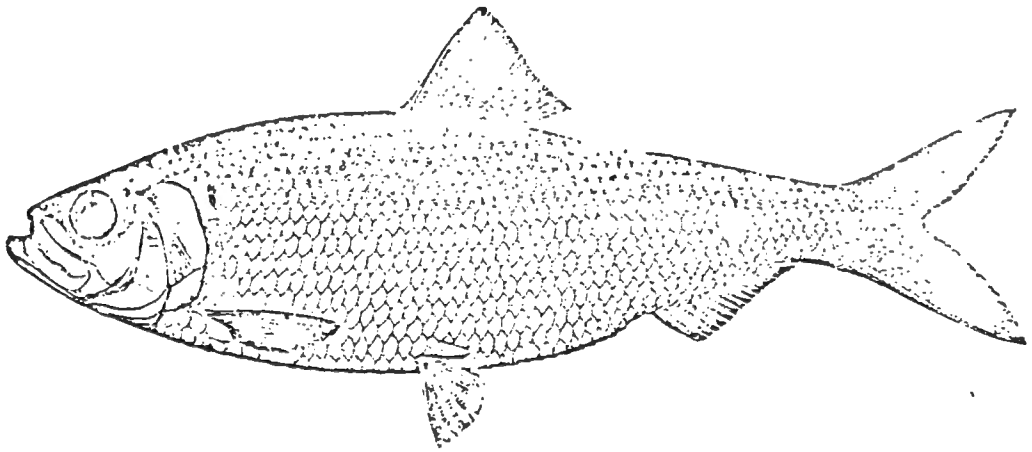
AN ASSESSMENT OF THE ALEWIFE MIGRATION FROM THE WEYMOUTH BACK RIVER TO WHITMAN'S POND IN WEYMOUTH, MASSACHUSETTS

BRIAN DONAHOE

MARINE BIOLOGIST



LIST OF TABLES

LIST OF FIGURES

Section 1.

Introduction

Weymouth's Mill River/Back River system supports an annual spring migration of a species of herring known as "the alewife run." This annual event has a dubious historical distinction as noted in the following short verse quoted to the author on numerous occasions while conducting the study;

> Cohasset for its beauty.
> Hingham for its pride.
> If it wasn't for the herring
> Weymouth would have died!

Due to a combination of decreasing numbers of alewives returning each spring, weak local control and understanding of the "herring run" and continuing developmental pressure along the river-bank, the Weymouth Conservation Commission retained the author to study and assess the alewife migration of 1978.

The following report outlines the historical and present conditions of the "herring run" in Weymouth and suggests recommendations as to some methods and procedures which can improve the run in terms of aesthetics, biological productivity, and as a resource for the Town of Weymouth and its residents and neighbors to enjoy and utilize.

I would like to thank the Weymouth Conservation Commission for their assistance in funding this study. Special thanks to John Carota and Claire Aizenstahdt for their help in initiating the study and to the many volunteers who each year attempt to clean and improve the Mill River.

Finally, it is hoped that the study will be <u>used</u> and not shelved.

The objective of the study was to assess and categorize the physical and biological parameters which led to the gradual decrease in alewives in spite of a large spawning pond and apparently good water quality.

Specifically, the following areas were assessed:

1. Structural and hydrologic integrity of each of the five fish ladder systems,
2. Ability of fish to negotiate the entire river bed from
   a. Back River to Whitman's Pond, and
   b. Whitman's Pond upstream to Great Pond and Swamp River,
3. Spawning sites along the river and in Whitman's Pond,
4. Water quality including gasoline and oil sources, and other point sources, low dissolved oxygen as the result of stagnation and temperature,
5. Obtain an estimate of the numbers of alewives returning, year classes and status,
6. Estimate number of juveniles that reach the estuary,
7. Tag adults to assess return rates in years 1979 and 1980, and to assess the upstream migration rate of certain sub-populations and individuals,
8. Affect of culverts as hindrances to upstream migration,
9. Any other observations which could indicate problem areas,
10. Assess potential to increase and re-establish the "run" upstream of Whitman's Pond.

Sections 2 through 4 will provide an understanding by describing the run historically and presently. This in turn allows for a discussion of what needs to be accomplished to maximize and protect the resource for the future.

Section 2.

Historical Review

The decline of anadromous fishes on the Atlantic Coast from colonial settlement to present, is fairly well documented. Construction of dams without fish passage facilities, deterioration of water quality, overfishing and poor management were primary factors in the reduction of this resource.

The annual alewife catch in Massachusetts averaged between 4 and 5 million pounds from 1880 to 1896, but dropped to an average of 1 million pounds between 1933 and 1943 (Rounsefell and Stringer, 1943). While this reduction may reflect reduced demand, especially in later years, an overall decline in abundance is indicated. In 1921, 46 streams supported commercial fisheries while public fisheries existed in many others.

However, the fisheries in most streams have been discontinued because of reduced catches. In 1970, only five streams were fished commercially, yielding a catch of only 44,319 pounds. The major cause for the recent decline in alewife populations can be attributed to inadequately designed or deteriorating fish passage facilities.

An alewife committee was established in Weymouth in 1724 to protect and utilize the alewife. The town owned the fishery but the committee was empowered to sell or lease the rights. The alewife committee purchased all fish caught by the lessee and resold them to neighboring towns for profit. Weymouth town records for 1816 and 1818 indicate that the proceeds were used to support the school system.

The alewife committee also had the power to pass and enforce protective legislation. Laws passed included: a fine of five shillings for blocking the passage of alewives (1724): reimbursement for building fishways (1724): [illegible] exemption for mill operators allowing for the passage of fish (1743): [illegible] daily

and yearly catch limits (1760, 1762, 1767, 1793, 1838) (Weymouth Town Meeting Records, 1624 -- 1938)

In 1846, the committee sold the alewife rights to the Weymouth Iron Company, "for a sum of money, the interest on which at six percent was equivalent to the average yearly income from the fishery for the previous thirty years" (Belding, 1921). A dam erected by the iron company on Whitman Pond prevented the passage of alewives. Each year alewives were netted over the dam, but too few fish were passed to maintain the fishery. In 1919 the selectmen of Weymouth bought back the alewife fishery. Obstructions and polluted water greatly reduced the number of alewives. Belding (1921) recommended that a fishway be built at the Whitman Pond dam.

Inspection of Back River in 1970 revealed that five fishways, including 3 newly reconstructed fishways by the Massachusetts Department of Public Works, at Iron Mill, Whitman Pond and lower Jackson Square, provide passage to Whitman's Pond. All of the fishways are located in a one-half mile stretch of the Bac.) River from below Broad Street to Whitman's Pond.

Mill River begins at Great Pond (300 acres) in Weymouth and flows 3.5 miles to Whitman's Pond (188 acres). (See Figure 7.) Below Whitman's Pond the stream is called Back River and continues for 3 miles to Hingham Bay. (See Figure 3.)

Whitman's Pond affords the major spawning area for alewives. Historically, prior to settlement of Weymouth and construction of Whitman's Pond Dam, the major spawning area of this system was Weymouth Great Pond.

Before 1900 there existed a dam southeast of the corner of Middle and Washington Streets on the site of Howe & French plant which apparently was built for the purposes of providing water power to the plant. Just 400 feet upstream of the dam is an old wooden fishway constructed some years ago and seems to have

been built for reestablishment or continuance of the alewife fish run. Many residents in the area of the dam can remember fish passing over the dam or at least the existence of a fish run upstream of the dam. The dam today is broken and is maintaining some control on tail water levels in an existing culvert under Angelo's Market. However, today alewives are still trying to go upstream of the broken dam. The open channel downstream of the dam has been completely filled with alewives through 1978. As late as February 28, 1972, the Weymouth Board of Selectmen voted unanimously against filling in Mill River and replacing the Howe & French dam, fish ladders, and pond with a 9 foot diameter pipe and stilling basin although this system exists today. It is evident from an historical point of view that the Town of Weymouth has in the past taken an active roll in establishing and protecting alewives and other anadromous fish within the Back River system.

"A Study of The Marine Resources of Hingham Bay" by the Division of Marine Fisheries in March, 1973, recommends that a feasibility study be conducted on the development of anadromous fish passage facilities to Great Pond. It is clear that alewives once did spawn within Great Pond and had been hindered from continuing to do so as man extended development within the river. Historical evidence has established the existence of an anadromous fish run and that any development which precludes the passage of fish within the river is in violation of town practices and possible violation of existing laws.

Laws such as the U.S. Anadromous Fish Act of 1965 and Sections 93, 95, 17A, and 19 of Chapter 130 of the Massachusetts General Laws, and Regulations under Chapter 131 of Section 40, Massachusetts General Laws, prohibit the interuption of fish passage. These will discussed further in Chapter 5.

Section 3.

Life History

The alewife, Alosa pseudoharengus, is an anadromous herring common to the western North Atlantic from Nova Scotia to South Carolina. (Bigelow & Schroeder 1953)

Adults migrate into fresh water during the spring from April through May to spawn in ponds, lakes and slow moving portions of brooks and streams. Spawning takes place when water temperatures reach 55° - 60°F.

The adults immediately return to the sea and it is not uncommon to see up and downstream migrants passing in opposite directions during the spawning run. In Weymouth, this is apparent in upper Jackson Square.

The eggs of the alewife are adhesive and demersal. After hatching, the young fish begin to school in the shallow edges of the spawning areas in search of the return route to the sea. The downstream migration of juveniles begins near mid-June and has been reported to continue into late October. (Kissil 1974)

It has been reported that juveniles can overwinter and return to the sea if water levels are too low to exit from the pond or lake during the summer or fall.

In Weymouth, downstream migrant juveniles were observed from early June through August in 1978. A large seaward movement of juvenile alewives has been correlated with heavy water outflows usually associated with precipitation. (Cooper 1961) (Kissil 1974)

In passing from Weymouth Back River to Whitman's Pond, alewives pass through no less than six (6) culverts. The first is a 100 foot long pair of pipes underneath the Old Colony Railroad track bed east of Jackson Square. These pipes are approximately 6 feet in diameter, (See figure 1.) and drain an open ditch constructed as part of the flood control project for Jackson Square by the Massachusetts Department of Public Works (See figure 2.) The second culvert

is just upstream of the first fish ladder below Jackson Square passing underneath Broad Street and a gasoline station and is 120 feet long. The third culvert is 40 feet long and passes under Commercial Street just above the second fish ladder at upper Jackson Square.

Parallel to Water Street is a fourth culvert which is 190 feet long. The fifth passes underneath Pleasant Street south of the Police Station and is 60 feet long. The sixth and last culvert passes under Iron Hill Road and is approximately 120 feet long. All totaled there are approximately 590 feet of culvert in a 3/4 mile stretch of the Weymouth Mill River/Back River Herring Run.

It has been suggested the alewives which presently travel at least as far as the dam on the Mill River just south of Washington Street could not pass through the 435-foot culvert under Angelo's parking lot. However, as shown above, culverts do not appear to be a deterant to the alewife population downstream. All that need be done to improve the situation under Angelo's parking lot is to construct intermittant drop inlets covered by bridge decking approximately every 50 feet to add a natural light source. This would improve the ability of the alewives to orient themselves and continue on to Great Pond.

Alewives are planktivores, meaning they feed on plankton, microscopic plants and animals. Weymouth Great Pond has an algae problem during the spring and summer months. Excessive expense is spent to correct this problem yearly by the Weymouth Water Department. The application of chemicals such as copper sulfate is the method presently used to kill the algae. However, copper compounds are extremely toxic to fish and other aquatic wildlife. In re-establishing the alewife run up to Great Pond, the town could partially eliminate the algae problem naturally and avoid the use of algaecides. This

would have to include a better watershed management. Juvenile alewives which would remain during the summer would continue to feed on algae as they attempt seaward migration. In addition, the alewives would act as forage to the indigenous freshwater species such as pickerel and the basses and ecologically stabilize the pond. Historically, the alewife fishery which exists through Whitman's Pond extended up to Great Pond and Whortleberry Pond. When the dam was built on Mill River at the old Howe and French site, two fish ladders were installed, one to pass fish up over the dam and a second to pass fish up to Washington Street.

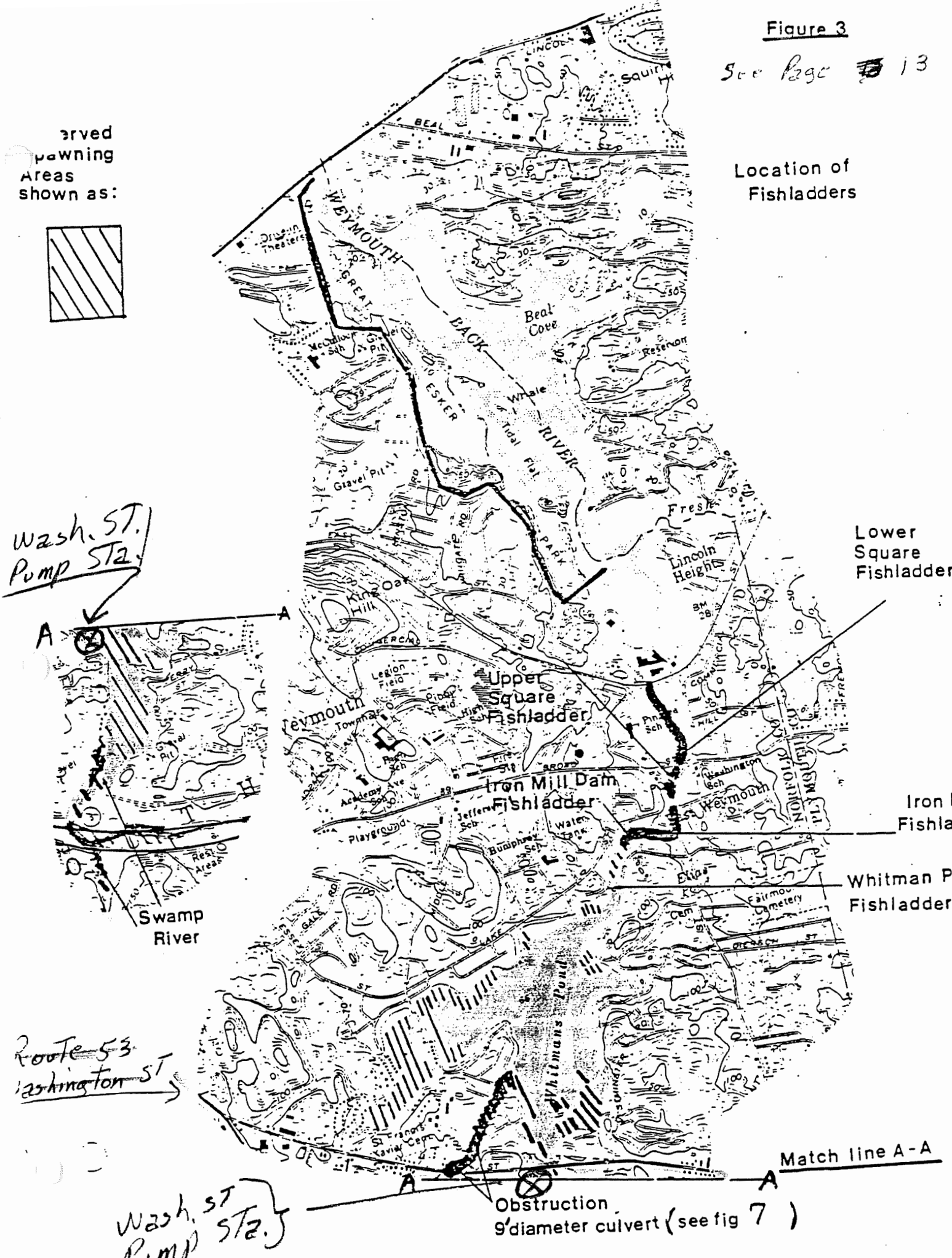
The construction of a 9-foot diameter pipe at the new shopping mall southeast of Washington and Middle Streets is the major obstacle to passage of fish up to Great Pond in the future. A design could have been incorporated into the system during construction but townwide apathy to the project in 1978 encouraged the present system. The pipe is too steep to accommodate the passage of alewives. Alewives pass through no less than five fishways in the 3/4 mile migration from Back River to Whitman's Pond. (Figure 3 shows the location of the fish ladders and spawning areas.)

Moving upstream, the first fish ladder is below Broad Street and east of a gasoline station. This is a concrete fishway of pool/weir design with a spillway built as part of the flood control project for Whitman's Pond. The second ladder consists of four weirs at upper Jackson Square just below Commercial Street. This ladder system requires the most maintenance and new work. (See Maintenance Section 5 and Figure 3A and B.) It is the only ladder and pool system which has not been rebuilt in the past 20 years.

Moving upstream, the next fish ladder is at the Iron Mill Pottery Shop. (See Figure 4.) Note the Spillway, which should be included in all fish ladder

Figure 3

See Page 13



systems to accommodate excess water. The next fish ladder, and the largest, is below the Iron Mill Dam. (See Figure 5.) A Denil design ladder consisting of wooden slats angled downstream and rising up approximately 34 feet vertically and 220 feet horizontially.

The last fish ladder is at the Whitman Pond dam. It is of Denil design, but is not nearly as extensive as the Iron Mill Dam fish ladder.

Alewives are able to continue upstream from Whitman's Pond to spawn in Old Swamp River by passing under Route 53 via a twin box culvert. In fact, the area beyond Route 53 is one of two major spawning areas, the other being upstream of Middle Street.

Continued upward migration in the Mill River is obstructed as of 1978 by the placement of a 9-foot diameter culvert southeast of Washington and Middle Streets at the former Howe and French Dam and Mill Pond. This pipe is much too steep for alewives to negotiate. In order for the town or others allow for the passage of alewives beyond this point, a fish ladder system would have to be constructed.

Figure 6 shows the remains of a wooden fish ladder constructed when the Mill Pond Dam was placed by Howe and French approximately during the 1920's. Alewives had been observed upstream of this point as late as 1975 by residents along the Mill River as far upstream as West Street. During 1978, fish were only observed below this broken Mill Pond dam.

Along the entire run, evidence of man's disregard for the alewife resource is evident. Litter, dumping, sewage and oil enter the stream from point and non-point sources. For example, immediately after a rainstorm begins, oil and grease from roadways enter the river. This can affect the fish by disrupting their olfactory sensing mechanisms by which they locate the upstream spawning areas.

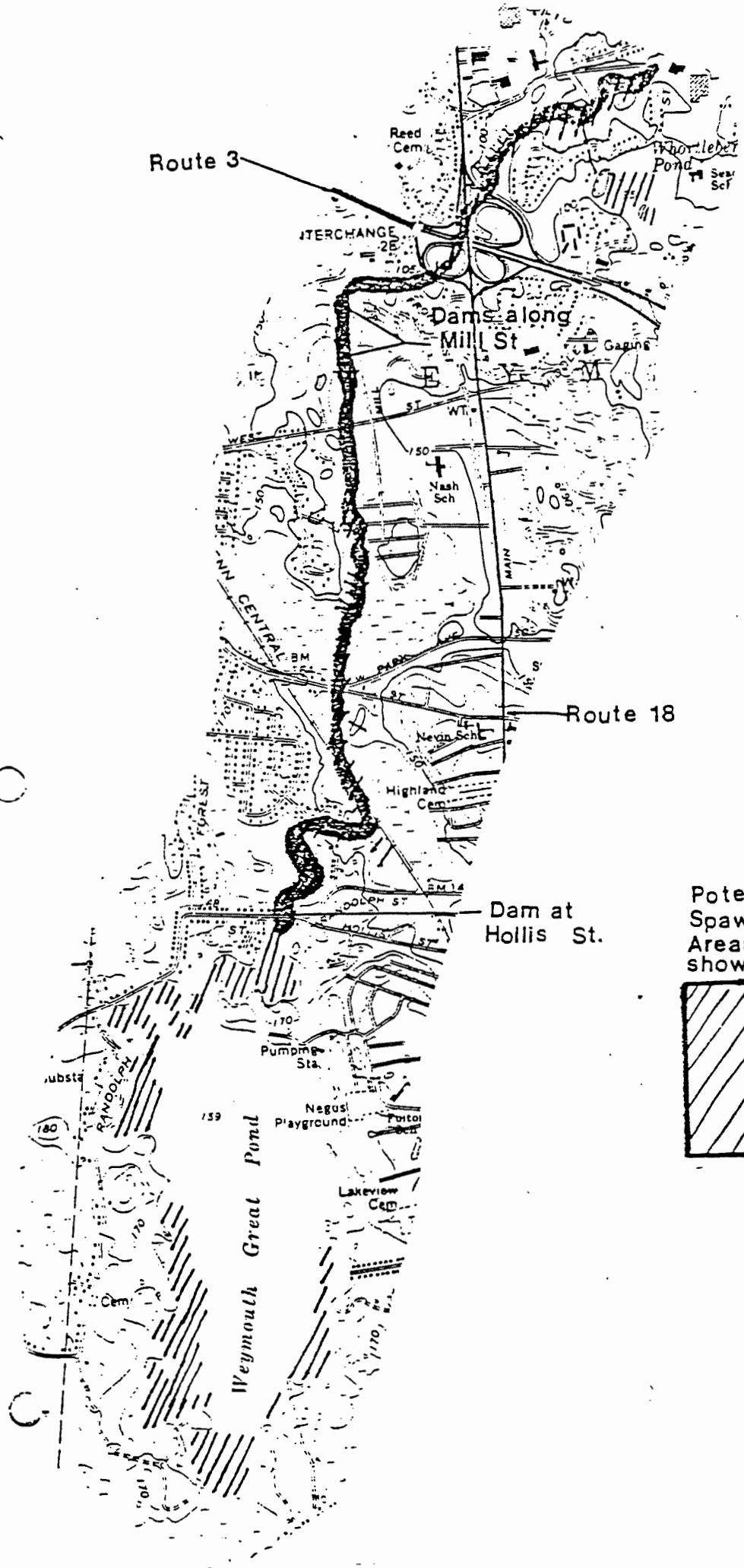


Figure 7

Major Obstructions to Alewife Passage above Whitmans Pond

Potential Spawning Areas shown as:

In Figure 8, illegal refuse and trash has been dumped beside the flood control culvert behind Pingree School. All kinds of refuse including bottles, cans, and the like litter the riverway especially below Jackson Square.

Raw sewage is infiltrating into the river just below the Iron Hill Dam Fishway from a pipe in a granite retaining wall. Oil and gasoline leaks into the Back River below the first fish ladder from a weep hole in the concrete wall just east of the former Quincy Oil Gasoline Station.

Figure 7 indicates the potential herring run and spawning sites available if passage beyond Washington Street were possible.

The dams at Mill Street and Hollis Street would require some modification to allow passage of alewives. At Mill Street, three to six-foot fish ladders would need to be constructed. The Hollis Street dam controls water levels at Great Pond and a fish ladder would have to bypass this control gate.

Other modifications to this portion of Mill River would include some channelization and improvements to the river bed. Clearing of refuse and overgrowth in partially-developed sections of the stream would require some manpower and costs.

The area below the Great Pond/Hollis Street dam would afford a great deal of additional spawning area even if fish were not able to pass into the Great Pond. The slow moving portions of the river in this part of Weymouth are adequate for successful reproduction.

Section 4

Biological Descriptions of the Run and Results.

Alewives were counted as they schooled below the lower Jackson Square fish ladder daily. Numbers were approximated most easily at this point because of a confined area and the observer was above the fish. In addition, the two nine foot diameter culverts below Jackson Square provided a control to the time at which alewives could enter the Mill River. Approximately 1.5 hours after high tide the level of the tide fell below the invert of the pipe culverts and alewives were unable to negotiate the pipe until the next high tide. This situation also seemed to regulate upstream migrating alewives to daylight high tides. The greatest number of new alewives entering the Mill River always corresponded to an early morning high tide.

Table 1 shows the approximate daily and cumulative numbers of fish entering the run in 1978. The final total number of 31040 fish should be assumed to be a high average total. Information obtained by analyzing the tagged fish indicated that as many as 25% of the fish at Jackson Square do not continue farther upstream than that point. This may indicate that as few as 22,000 fish actually attempted to migrate beyond Jackson Square.

Based on conversations with the Division of Marine Fisheries and other fishery biologists, the Whitman Pond spawning population, if healthy, could be from 60-100,000 individuals. This would indicate that the present runis at one-third to one-half of its potential. Fish were tagged one day per week to assess migratory behavior within the run, time elapsed to traverse the Mill River and return during subsequent spawning seasons. Color coded flourescent Dennison inter-

nally anchored three inch plastic tags were used. The tags were injected with a Dennison hypodermic applicator gun in the dorsal muscle to the rear of the dorsal fin just below the skin. The rejection rate of tags was less than 2%. No mortality was observed with tagged fish. As mentioned earlier, 25% of the fish tagged at the pool at upper Jackson Square moved downstream and out to sea from that point. This could be as the result of shock due to the tagging but was more likely the result of spawning taking place in the river or some other metabolic reason.

Most upstream movement took place late in the day when water temperatures were highest. Water temperatures were found to fluctuate as much as three degrees Fahrenheit in only five minutes. This usually initiated a rapid surge of alewives through a fish ladder system. If the temperature droppped sharply upstream migratory activity slowed considerably. The relatively rapid water temperature changes could be the result of different lenses of water entering the fish ladder at the Whitman Pond Dam. Water in the Pond was subject to wind and sun regimes capable of affecting the river water in this fashion.

Table 2 provides a sample of the lenght and weight characteristics of alewives in the 1978 run. A total of 134 fish were weighed and measured. The oldest fish found was age VI representing year-class 1972 the youngest fish were prococious females age II from year class 1976. 62% of the returning fish sampled were age III. This year class should be the most highly represented as they are the youngest fish of sexual maturity which would return. Although more data from future spawning years is necessary the present ratios tend to indicate a higher mortality of age IV and older fish.

Blueback herring, Alosa aestivalis, a close relative of the alewive was not positively identified in Mill River. However, a few fish observed late in the alewife run were tentatively thought to be bluebacks. This could result,if true, in a extended migratory period. The blueback herring begin their spawning run approximately 3-4 weeks later than alewives and end as late. A healthy spawning population of both species could provide 8-10 weeks of upstream migration.

Juvenile downstream migrants from the 1978 spawning year were first observed on June 2, 1978 and last observed on October 7, 1978. The largest schools were observed in early July. The movement of juveniles downstream in 1978 was never hampered by low water levels in Mill River.

See Page 8+ for Figr 3

Figure 3 indicates observed spawning areas of alewives. Major areas were south of Route 53 in Whitmans Pond and west of Middle Street in Whitmans Pond. Some spawning took place along the east side of Middle Street and in the downstream end of Old Swamp River where it joins Whitmans Pond. Spawning activity took place predominantly in the early morning after sunrise. The lowest tempertaure found during spawing was 56°F. The highest temperature was 64°F. It would be important therefore to be sure that temperatures in the river or Whitmans Pond be carefully watched to avoid rapid increase from riverside development which could raise the water temperatures in early spring to quickly so as to adversely impact the alewive spawning period. Clayton et. al. 1978 suggest that the introduction of warm water into nursery or spawning areas may result in high mortalities.

This is where the pumping sta. is located

Random daily samples of upstream migrants were sexed to gain some information of relative strength of each sex. Based on the

information collected from 300+ fish the male-female ratio was 0.8 to 1.0.

The only serious problem related to the spawning of alewives during 1978 was the blockage of the culvert under Middle Street. This was cleared during the run and a large number of alewives eventually made their was to the other side of Middle Street.

Another potentially serious problem which can be corrected by proper engineering and awareness of the regulatory boards in the town relates to street runoff. During the spawning run of 1978, resurfacing of the area in front of the Weymouth Police station resulted in a large oil discharge after a rain into catch basins directly into Mill River. This in turn caused the 2500 or so alewives in the river to lose their orientation to the river. They immediatly swam downstream and did not return. This problem could be averted by properly timing resurfacing projects until after the run is over or by absorbing the oily water in nearby catch basins with oil absorbent materials.

Fish entering the lower Jackson Square fishladder generally divided into two schools. One would orient itself below the ladder and the other would pass into the terminal end of the flood control culvert. Although some fish were found dead in this area it is not the result of fish being injured in the culvert but most likely the result of downstream migrants falling over the entrance to the flood control siphon at the Iron Mill Dam. No fish were observed dead at the bottom of the flood control culvert until later in the run. In addition tagged fish that entered the flood control area were later found back in the Mill River migrating upstream the proper way.

The 1979 run provided some information as to the return rate of individuals from one year to the next. In 1978, approximately 400 fish were tagged. in 1979, 7 tags were identified as those placed in fish fromthe previous year. Although this is low in percentage it represents a high return when compared with similar studies in Massachusetts.

Table 1. Approximate daily and cumulative numbers of alewives that entered Mill River below Jackson Square during 1978 migratory run with corresponding air and water temperatures by date.

Date	Total Daily	Total Cumulative	°F Temperatures Air	°F Temperatures Water
4/13	25	25	44-54	46-49
4/14	35	60	44-54	46-48
4/15	500	560	44-54	46-48
4/16	630	1190	51-62	45-51
4/17	-	1190	44-59	46-51
4/18	250	1440	47-60	49-51
4/19	-	1440	59	48
4/20	300	1740	58-61	50-52
4/21	-	1740	-	-
4/22	3500	5240	44-51	50-53
4/23	1150	6390	48-67	50-56
4/24	600	6990	42-50	46-56
4/25	1000	7990	45-56	47-54
4/26	600	8590	58	56
4/27	1200	9790	54-62	52-54
4/28	400	10190	54-58	52-54
4/29	1300	11490	64-67	50-58
4/30	-	11490	-	-
5/1	1800	13290	36-40	50-51
5/2	100	13390	35-42	50-51
5/3	800	14190	55	52
5/4	400	14590	61	52
5/5	-	14590	-	-
5/6	400	14990	58-64	52-58
5/7	2400	17390	54-65	51-60
5/8	1000	18390	53	54
5/9	1600	19990	55	59
5/10	1300	21290	60	58
5/11	2300	23590	61	59
5/12	400	23990	58	62
5/13	4000	27990	69-78	64-66
5/14	-	27990	60-63	62-63
5/15	500	28490	50	57
5/16	-	28490	55	56
5/17	400	28890	57	56
5/18	500	29390	57	56
5/19	1200	30590	54-66	57-61
5/20	400	30990	60	62
5/21-25	-	30990	68	64
5/26	50	31040	58	62
End of run 1978				

Table 2. Length and Weight Information of Samples of Alewives collected during the 1978 fish run. Age, year-class and sex information is included.

Total Length (mm)	Weight (gm)	Age	Year-class	Sex
298	386.3	5	1973	F
279	299.8	3	1975	M
273	289.5	3	1975	F
270	310.6	3	1975	F
276	274.8	3	(2?)1975	F
271	268.4	3	1975	M
284	320.4	6	1972	F
292	348.5	6	1972	F
298	387.6	5	1973	F
271	307.5	4	1974	M
290	337.7	5	1973	F
277	304.3	4	1974	M
274	268.2	3	1975	F
285	342.7	3	1975	M
282	286.7	3	1975	F
300	275.4	3	1975	F
307	228.6	3	1975	M
320	300.7	4	1974	F
321	348.7	4	1974	F
334	273.1	3	1975	F
312	277.2	3	1975	M
305	290.4	4	1974	M
314	240.1	3	1975	M
308	247.9	3	1975	F

Section 5.

Recommendations

The following recommendations are based on actual observations recorded during the study period from April 1, 1978 through August 30, 1978, by the researcher and his volunteer staff.

Any modifications which occur to the physical or biological conditions of the Mill River watershed may result in changes being required to one or more of the recommendations. Therefore, careful review of all proposed activities along the Mill River should be made to insure adequate protection has been incorporated in all development in the watershed. Serious problems can result, for example, if bank erosion, poor water quality, or uncontrolled channelization of the Mill River is allowed.

The addition of road drainage into the Mill River degrades water quality by adding road induced oils, gasoline and sand at intervals related to hea downpours and precipitation.

Channelization causes rapid flow of water making it impossible for upstream migration if steps or weirs are not included into the design. Also, channelization induces developmental interest along the river bank. The loss of a greenbelt or buffer zone along the river bank induces water levels to become more erratic and significant and reduction in water quality, aquifer recharge, and rates of runoff will occur.

The recommendations are organized into three subcategories:

1. Maintenance

   Development, Redevelopment and Construction
2. Legal, Legislative and Enforcement
3. Educational and Public Relations

Each subcategory will be discussed separately. A final section of the report will bring together the recommendations from each category and the body of the report to describe a realistic potential for the Weymouth Herring Run.

It is hoped that if these recommendations are adopted a significant improvement to the quality and quantity of the alewife population in Mill River could be realized within three to six years.

If Weymouth citizens are willing to allocate funds to improve this natural resource then it is imperative that adequate planning and review accompany each dollar spent.

1. Maintenance

The single most important concept to be established in regard to the Herring Run is Maintenance. The only reason alewives have been able to negotiate the steps of the fish ladders and pass relatively unobstructed from the Back River to Whitman's Pond is due to volunteer repair of fish steps by people such as Jim Plumb, Bob Magiore, Bob Guerstal and others who have taken an active yet unknown interest in 'the run'.

A maintenance program should be designed to incorporate town departments including the Conservation Commission or subcommittee, the Department of Public Works, the Weymouth Selectmen and the appointed Herring Warden. The program should include at the least a thorough inspection of the run from the Back River to Whitman's Pond. Any broken weirs or steps in fish ladders should be replaced before the run begins on or about April 15. An inspection of the system in late fall would provide time to organize manpower and funds where necessary.

Volunteer groups have in the past provided support in cleaning debris from the river bed and banks. Although this effort has been in good intention, serious harm has come from overzealous individuals removing trees and other bank shading and stabilizing vegetation. The volunteers should be first organized through an established group in the town, such as an alewife sub-committee of the Conservation Commission, and supervised to clean trash which accumulates in the river over the year.

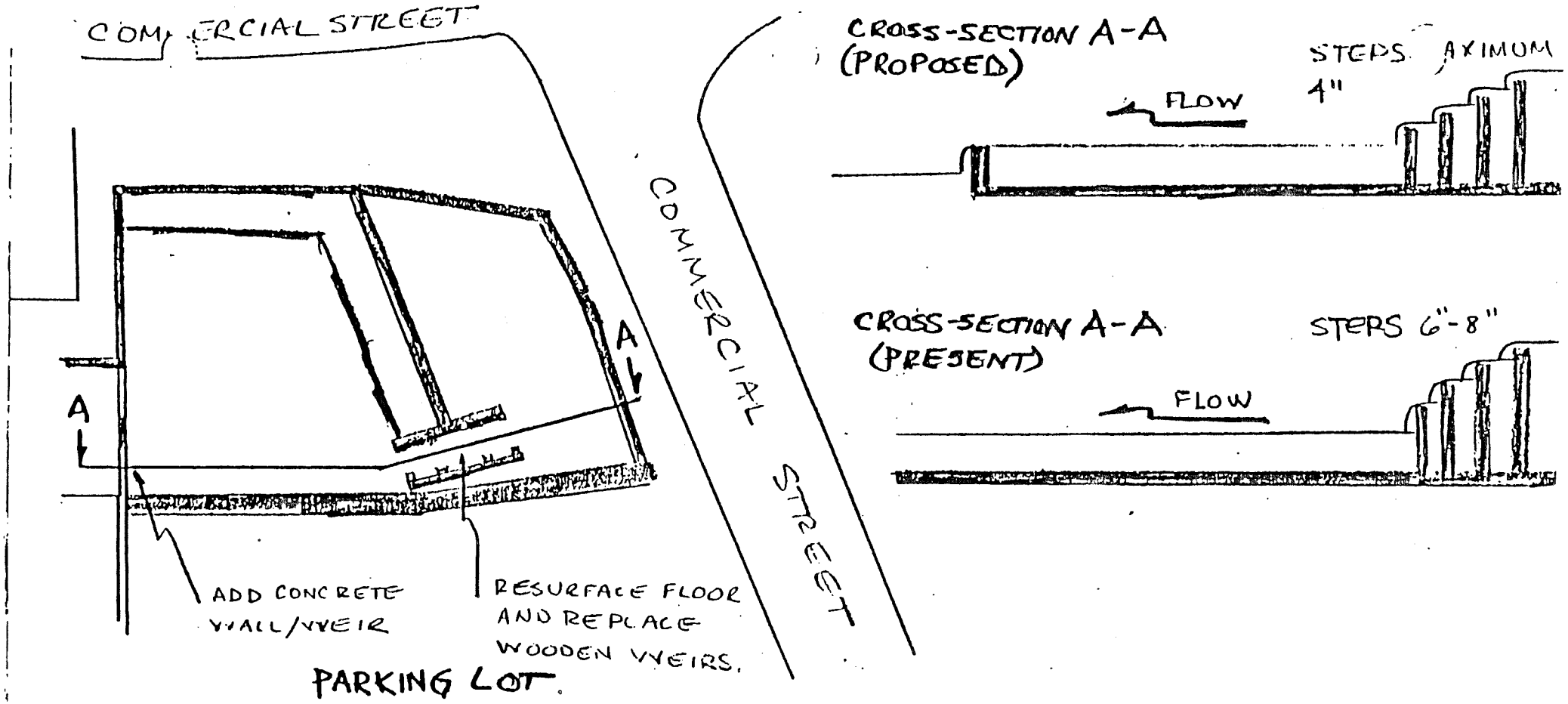
It is important that the Conservation Commission or whatever group assumes responsibility for the herring run be well known to avoid parallel efforts which could potentially harm the integrity of the river.

The organization of volunteer and town departments will be further discussed in the education and public relation sub-category.

At this time the important maintenance which is seriously required involves replacement of the wooden steps at the Whitman Pond Dam. Seven of the steps in that ladder were virtually nonfunctional during the past 1978 alewife run. Figure 10 is a schematic obtained from the Massachusetts Department of Public Works which designed the ladder. The schematic shows how the steps of the ladder are built and provides the needed information to carry out the construction and replacement by April 1979. Ice damage during the winter of 1978-79 may result in further damage to other steps in the meantime.

The fish ladder at upper Jackson Square is also in need of immediate repair. The third step upstream is the most critical obstruction to fish passage on the entire length of the present herring run. (See Figure 9.) A large piece of concrete at the base of the ladder has been knocked out. This causes a strong current of water to undermine the wooden step. As stated earlier fish negotiate the steps one at a time and then sound to the bottom of the pool to rest temporarily. Fish which pass over the second step sound to the bottom of the second pool only to be forced up to the surface and back into the next downstream pool. Those fish which pass directly through and over the second and third steps sound and find that a strong current pulls them back into the pool downstream and over the weir into the first pool.

Unlike any of the other fish ladders on the river the upper Jackson Square ladder does not have a functional spillway running parallel to it. This is the result of removal or damage to the wall which holds water in the large pool at the base of the fish ladder. Figure 9 shows the present water elevation and the elevation as it should be operating to result in proper flow through the fish ladder. By constructing the wall and weir between the base of the restaurant foundation and the basin wall directly across stream from it the



UPPER JACKSON SQUARE
FISHLADDER AND POOL

FIG. 9

water level in the basin could be raised six to eight inches. This would allow a readjustment of each of the four steps and force water over the spillway during all but the lowest of flow periods. By reducing the flow through the fish ladder more fish would pass upstream and improve the total numbers reaching suitable spawning sites.

Two areas along the river require erosion/slope stabilization measures. Between the lower and upper Iron Mill fish ladders the slopes have been denuded of all but a sparce amount of grass. This area should be seeded and planted with natural vegetation. A landscaping scheme including willows, red osier, crown-vetch and winter rye would be an inexpensive way of providing shade and erosion protection quickly.

The area around the Weymouth Youth Office is also a source of sediment and easy access to the fish. At the very least grass should be planted to hold the sand and gravel. Other vegetation in the form of shrubs and small trees would help to hold the slope as well as discourage access to the river from Water Street.

In summation, a maintenance program involving all interested or responsible town departments should be organized under common leadership. Repairs to the fish ladders at Whitman's Pond and Upper Jackson Square should be done immediately. The slopes of the river at the Iron Mill and Youth Office should be stabilized to provide shade and erosion protection.

Laws protecting the alewife and other anadromous fish resources can be grouped or categorized into two general types, regulatory laws and funding or improvement legislation.

In Massachusetts, the primary law which protects and regulates activities which may impact an andromous fish run is the Wetlands Protection Act MGL Chapter 131 Section 40. This law requires a permit for any project which will alter, dredge, fill or remove within a wetland. Under this law regulations have been promulgated which specifically address anadromous fish. Regulation 35 defines the resource and details the interests of the Wetlands Act relative to this resource. Any projects which will or may impact an anadromous fish run must meet certain 'performance standards' which will adequately protect the resource.

For example, siltation resulting from construction activities must be controlled by sedimentation basins or other method so as not to increase the turbidity in the fish run. A condition could be applied which would restrict work within the river during the fish run. Another possible condition could require special catch basins that would remove oil and grease from runoff before it reaches the river or pond. A more complete and specific discussion of these and other potential impacts which could result from a project is found in "A Guide to the Coastal Wetlands Regulations of the Wetlands Protection Act (G.L. 131 section 40).

Two other state laws, the Coastal Restrictions Act (MGL Ch 130 s 105) and the Inland Wetlands Restriction Act (MGL Ch 131 s40A) are designed to place certain developmental and land use restrictions on important wetlands. Both of these laws are administered through the

the Department of Environmental Management. A step by step process including aerial mapping of the specific wetlands and public hearings are set up by the DEM and deeded restrictions are recorded against the properties. In weymouth these programs could greatly benefit the protection of wetlands adjacent to the alewife run and in turn provide for a continuation of the run in the future.

Many laws under Chapter 130 and 131 relate to the management and control of anadromous fish resources. Most of these laws are the responsibilty of the Massachusetts Division of Marine Fisheries. Legally, the Town of Weymouth has the responsibility to maintain the fish ladders of the herring run. However , it is still the DMF which excercise control of the run. As a first step to gainning control of the herring run the Selectmen must vote to assume jurisdiction of the run as outlined in respective laws.. Discussion with the Division of Marine Fisheries can facilitate this process. It is imperative that the town show continued and practical concern for the fish run in order to gain both funding and technical support from the state.

Funding legislation for fish run projects is provided under PL 86-304, The Anadromous Fish Act. The law is designed to allocate monies to various states to improve the anadromous fish resources. This law is administered in Massachusetts by The Division of Marine Fisheries and as such goes along with state legislation also under DMF control.

Section 5 (3)
Education and Public Relations

At the outset it is very important to realize that the improvement or even the continuation of the run is based on public awareness and concern. Elected officials will address those priorities brought to their attention by their constiuents. In this respect Weymouth can learn a great deal from other towns in the eastern Massachusetts area. Many communitiies such as Brewster, Pembroke, Marshfield and Sandwich have prosperous herring runs. These towns and others have civic groups and governmental boards responsible for the herring resources.

The news media is a potent and effective tool in all facets of making the public aware. They can be utilized to begin the process of civic involvement and can also continue the education process once the community becomes organized.

Local fishermen, historian and naturalists can be invitied to speak on the various subjects related to the alewife fishery. Many people who regularly visit the run in Jackson Square each spring would be willing to become involved in a yearly event such as a fish fry, or half-day lecture discussing the run and its history and importance today.

Coordination with area schools would bring the awareness of the resource to school age children.

Equal to the poorly maintained ladders on the run is the indiscriminate harvesting and waste of fish each spring. This aspect must be addressed by the town through education. Signs informing the public of daily bag limits and harvest dates are important. Weymouth is one of the only towns with a herring run which does not post

this type of information.

In conclusion, it appears most important to this author that a citizen group must be formed in Weymouth which can focus its attention on the numerous problems associated with this alewife run. They must gain the support of the town, it officials and finally the state to obtain funding and maintenance agreements. They must be able to educate the general public and coordinate and manage the resource.

References

Burbidge, Richard G.,

"Distribution, Growth, Selective Feeding and Energy Transformations of Young of the Year Blueback Herring, Alosa aestivalis (Mitchill) in the James River, Virginia", Trans. Am. Fish. Soc., 103(2) April 1974

Cooper, Richard A.,

"Early Life History and Spawning Migration of the Alewife Alosa pseudoharengus", M.S. Degree Thesis, Biological Oceanography University of Rhode Island 1961

Edsall, Thomas A.,

"The Effects of Temperature on the Rate of Development and Survival of Alewife Eggs and Larvae", Trans. Am. Fish. Soc., 99(2) April 1970

Harvey, Keith A.,

"Production of Juvenile Alewives Alosa pseudoharengus at Love Lake, Washington County, Maine", Trans. Am. Fish. Soc., 102(2) April 1973

Harvey, Keith A.,

"Restoration of Anadromous Alewives at Long Pond, Maine", Trans. Am. Fish Soc., 90(3) July 1961

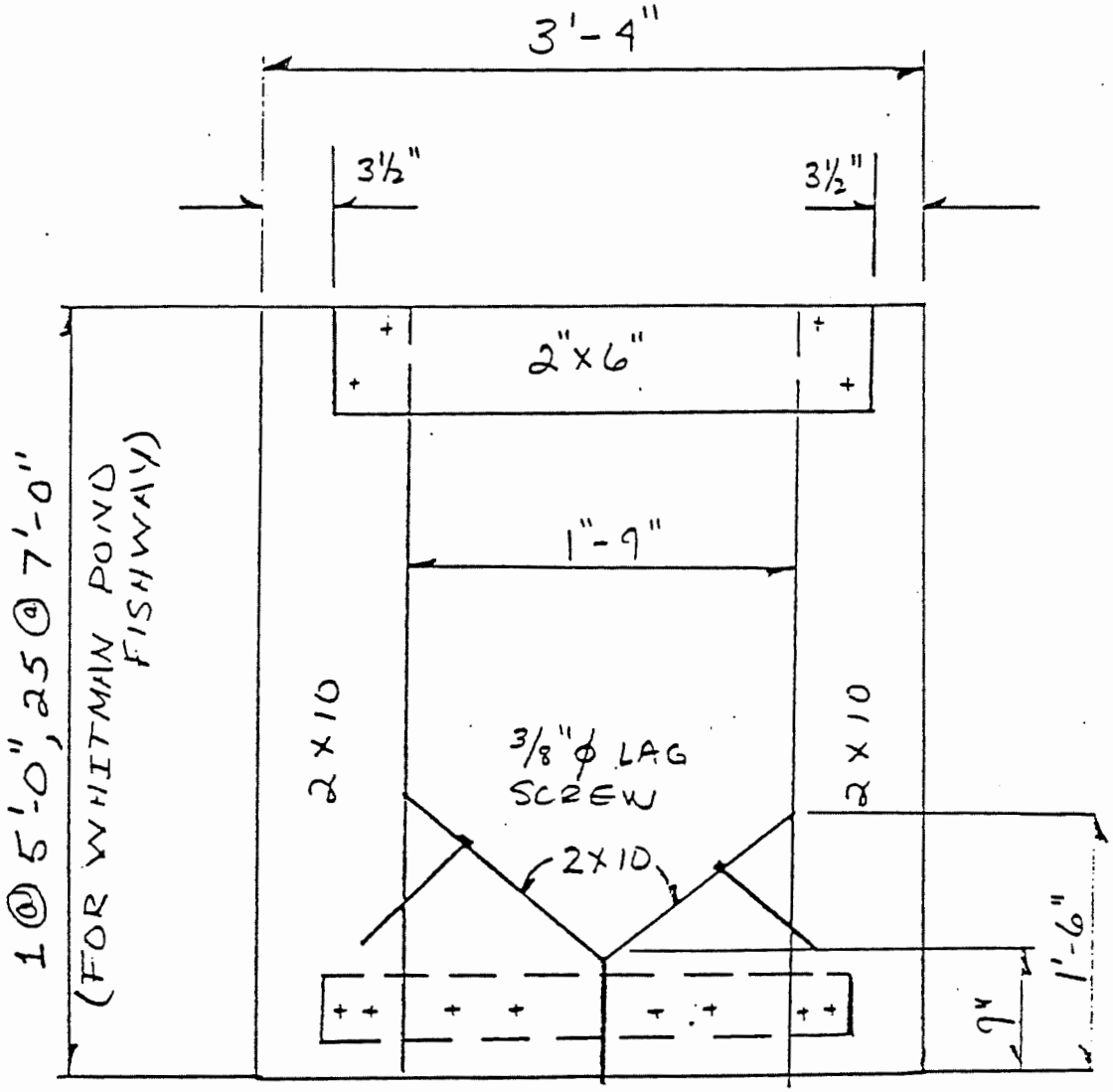
Huber, Mary Ellen,

"A Study of Age and Growth in the 1974 Spawning Population of Alewives (Alosa pseudoharengus) from the Parker River in Massachusetts",

Kissil, George William,

"Spawning of the Anadromous Alewife Alosa pseudoharengus in Bride Lake, Connecticut",

FRONT VIEW



NOTE: WOOD BAFFLES SHALL BE NO.2 SOUTHERN PINE AND SHALL BE UNTREATED.

NOTE: IRON HILL FISHWAY REQUIRES 1@5'-0", 81@7'-0"

FIG. 10

From Metcalf & Eddy
Oct. 1969 Rev. Sept.

SIDE VIEW

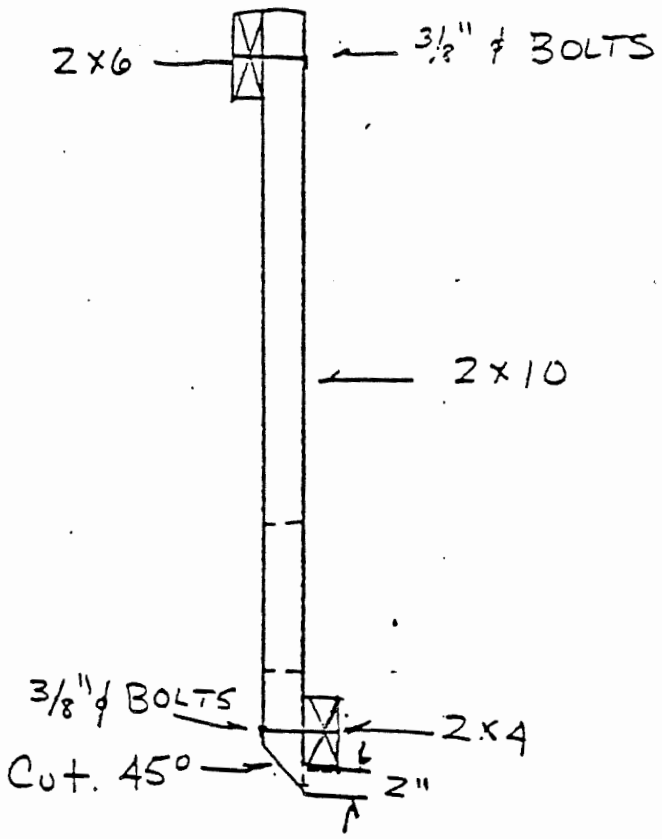


FIG. 10b.

September 6,1979

Weymouth Conservation Commission
Town Hall
Weymouth, Massachusetts 02189

Dear Commissioners,

Please find attached "An Assessment of the Alewife Migration from Weymouth Back River to Whitman's Pond in Weymouth, Massachusetts." This copy is the final and complete report for the 1978 and 1979 alewife runs.

I would like to take this opportunity to clarify what I felt was the scope, intent, duration and reason for this report.

Initially, the report was intended to address two points. First, why were fewer alewives returning each spring. Secondly, how canthe whole Mill River fish run be improved and managed as a resource. The history of the run, however, prior to the idea for the study was the real reason for the study. Chronic poor maintenence of the existing fish ladders and river itself after considerable amounts of money were spent for new fish ladders in the early 1970's resulted in the Division of Marine Fisheries refusing to support the town in its desire to impose strict conditions on a proposed project which would block the run from continuing to Great Pond.

Subsequent to this,the conservation commission voted to appropriate funds for materials, and not labor, to conduct a preliminary assessment of the entire run in its' present state and begin management procedures for the future. I offered to do this work, free of charge, as a local, concerned citizen professionally qualified to do such analyses. I then solicited support from town citizens to assist me in my work.

During the 40+ days of the run in 1978, I spent 340 hours of my time observing, measuring, collecting and documenting various aspects of the run. An additional 180 hours of time were spent researching literature, discussing the run with other professionals and preparing this and previous reports. Section 5 of this report, submitted to your commission a year ago was meant to address the serious problems existing in the run so as to provide a goal for the 1979 migration.

In September of 1978 I explained that a more comprehensive report would be prepared and that I would also follow-up with a final report. In late spring of this year you received a copy of the final report minus the biological section which was being prepared to include information gathered during the 1979 migration.

All of the information presnted in this reoprt has been discussed orally with the commission on a number of occasions. No less than four meetings were held at regular commission hearings to bring you up-to-date on the information I was finding. The report was presented orally to the Weymouth Back River Study Committee at the request of Senator MacKinnon. I have also spoken to the Hingham Conservation Commission. I spoke at the request of the commission at hearings related to the Weymouth Savings Bank branch office on Pleasent Street and on the impact of the proposed Water Street elderly housing project on the Alewife run. Additionally, I have provided information of this run to interested persons concerned with future development projects for Jackson Square and Libbey Industrial Park as early as two years ago.

This report is not addressed nor was it intended to address the environmental impact of any given project. It is a summation, an assessment, of the resource and how Weymouth can restore and keep it healthy. Whether or not alewives pass through the Libbey Industrial Park has no real consequence to that project. Long before this study was conceived it was a point of public knowledge that alewives spawned in Whitmans Pond. The same environmental controls required to protect the pond apply to Old Swamp River. The value of the wetlands adjacent to Old Swamp River and Whitmans Pond are intimately related to the protection of water quality, flood control and sedimentation control.

In conclusion, this report is an initial attempt to document the overall ecological health of the alewife population that Weymouth is so fortunate to have entirely within its boundaries. It provides a basis for a continuing understanding of the resource and sets a goal of improvement for the future.

Very truly yours,

Brian Donahoe

Brian Donahoe

I. Goals/Purpose of Sub-committee - primarily implementation and amplification of Donohoe Report

A. Maintenance

1. Periodic reviews of condition of Run

2. Coordination of maintenance and/or clean-up program

B. Long-term improvements

1. development of plans for major (non-maintenance) improvements

2. investigations of possible funding sources for projects

3. bank stabilization/erosion control

C. Education/Publicity

1. Spread knowledge about the fish themselves as a natural phenomenon, resource, value to town, etc.

2. Publicize activities of Committee to attempt to create a broad base of public support and appreciation

D. Research; into various apsects of the fish and the Run

1. numbers and ages of fish in run

2. prime spawning areas

3. information on alewives in general and state of anadromous fish runs in other areas

4. other associated anadromous fishes, i.e. blue-back herring, smelts, etc.

5. History of Run in Weymouth

E. Protection/Control

1. review conditions of "ownership" of run and make reccommendations on state vrs. home rule for control

2. investigate means of protection of run and better implementation both through enforcement of existing regulations and cooridination with involved groups, ConsCom, Planning Board, etc.

Marcy, Barton C., Jr.,

"Age Determinations from Scales of Alosa pseudoharengus (Wilson) and Alosa aestivalis (Mitchill) in Connecticut Waters", Trans. Am. Fish. Soc., 98(4) October 1969

Richkus, William A.,

"Migratory Behavior and Growth of Juvenile Anadromous Alewives Alosa pseudoharengus, in a Rhode Island Drainage", Trans. Am. Fish. Soc., 104(3) July 1975

Richkus, William A.,

"Factors Influencing the Seasonal and Daily Patterns of Alewife (Alosa pseudoharengus) Migration in a Rhode Island River", Jour. Fish. Res. Bd. Con. 31(9) 1974

Saila, S.B., T. Polgar, D.J. Sheehy and J.M. Flowers.,

"Correlations between Alewife Activity and Environmental Variables at a Fishway", Trans. Am. Fish. Soc., 101(4) October 1972

Stanley, Jon G. and Peter J. Colby,

"Effects of Temperature on Electrolyte Balance and Osmo Regulation in the Alewife Alosa pseudoharengus in Fresh and Sea Water", Trans. Am. Fish. Soc. 100(4) October 1971