TOWN OF BOURNE

WATER QUALITY MONITORING PROGRAM

1/2/1985 - 1/18/86

Prepared by the Bourne Board of Health
in Cooperation with the Selectmen's Task
Force on Local Pollution, Water Quality
Subcommittee

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I. PURPOSE - Scope of Work

In March of 1986, the Water Quality Subcommittee of the Selectmen's Task Force on Local Pollution developed a work plan (see appendix 1) to survey and identify sources of contamination to the surface and groundwaters in the Town of Bourne. The purpose of the work plan was to address the alarming rate of shellfish closures and potential beach closures within the town, due to elevated total and fecal coliform contamination. Fecal coliform bacteria are used as indicator organisms for water quality. Fecal coliforms are found in the intestinal tracts of warm blooded animals and can indicate sources of sewage contamination. The U.S. Department of Food and Drug uses the following standards for determining safe water quality levels for shellfish and bathing waters:

SHELLFISH:	14 Fecal Coliform/100 ml
	70 Total Coliform/100 ml
BATHING:	200 Fecal Coliform/100 ml
	1000 Total Coliform/100 ml

The Commonwealth of Massachusetts, Department of Environmental Quality Engineering uses the above standards for the shellfish sanitation program. If 10% of the samples collected are above the standard; the area in question is closed.

The scope of the water quality monitoring program was to:

1. Verify DEQE test results of surface waters within the Town of Bourne.

2. Work in cooperation with the EPA Buttermilk Bay Characterization Grant. Funding has been allocated by the EPA Buzzards Bay Study to research coliform input into Buttermilk Bay and the effects of nutrient input into the Bay. These studies are being conducted by the Barnstable County Health and Environment Department and Boston University.

3. Locate, and pinpoint to the best degree, the various sources of coliform contamination entering the surface waters, whether it be from on-site septic systems, road drainage and run-off, water fowl or agriculture and animal run-off.

4. Map all existing man-made and/or storm drains and drainage discharges within Bourne that directly or indirectly discharge into surface waters.

5. To establish a data base of all water quality samples taken by various agencies within the last few years.

6. Correlate rain data and specific weather conditions with water sample results.

The following sections will address these six areas of concern.

II. METHODOLOGY

All water quality samples were analized in the Bourne Board of Health Lab, using the Millipore Filter technique (MF). See Appendix 4 (page 133) for a complete review of the standard methods. All samples were analized the same day they were taken. This allowed for very little error in sampling results. Standard laboratory sterlization techniques were used to insure cross contamination was negligible. Distilled water was used for dilutions, and blanks were run for each set of samples, using distilled water, to verify technique and the absense of cross contamination. In addition, 11 split samples (22 tests) were sent to the Barnstable County Lab for quality assurance. The Barnstable Lab employs the Most Probable Number (MPN) technique for coliform testing, which is the most accurate procedure available. The Standard Deviation between the MF technique and the MPN technique is 25%. The deviation between the Bourne Lab results and the County Lab split samples was 13%, well below the standard deviation, and indicates relative accurate test results on the part of the Bourne Lab. It should be mentioned that the split samples (duplicates) were from different bottles. If duplicates were run from the same bottle, the standard deviation most probably would be even lower than 13%.All samples were taken using the grab sample procedure. Surface water bodies were taken at 3 ft. water depths approximately 6 inches from the surface of the water. There were no sediment tests conducted.

III. SAMPLING STATIONS

The Water Quality Subcommittee Workplan of March 1986 established 31 water quality monitoring stations (see appendix 2, page 12). This original plan was modified as a result of the Pollution Prevention Program (3 P's) developed by the Natural Resources Subcommittee of the Pollution Task Force and as a result of the south side sanitary survey conducted by the Board of Health.

The 3 P's program enlisted volunteers, made up of local commercial shellfishermen, to conduct a shoreline survey (see appendix 5, page 135). Each person was assigned a specific area within the town, and each person noted any source of discharge (pipe, stream, riverlet, etc.) on a map. All the suspected sources of contamination were correlated on maps and the recommendations were given to the Board of Health. In addition, the Board of Health Special Assistant conducted a complete sanitary survey of homes south of the canal within the flood plain (land below elevation 17 ft MSL).

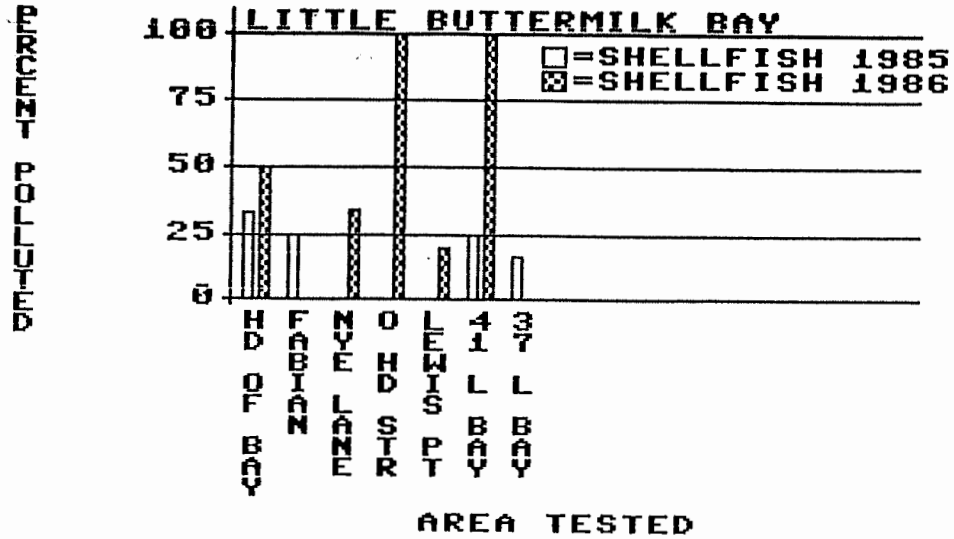
A total of 476 homes were inventoried and mapped. Of the 476 homes, a total of 201 septic systems were found and verified to be within the flood plain. Approximately 80% (160) of those 201 septic systems were not in compliance with Title V, that is the bottom of the leaching facility was not 4 ft. above high ground water.

As a result of the above two studies, the original sampling station map was modified into twelve (12) areas, for a total of 81 sampling stations. Sampling frequency ranged from a low of 2 samples per station over the sampling period to a high of 16 samples per station, depending upon demand and sampling results. Town Beaches and drainage areas received high priority. See appendix 3 (page 13) for a complete listing of sampling areas and stations.

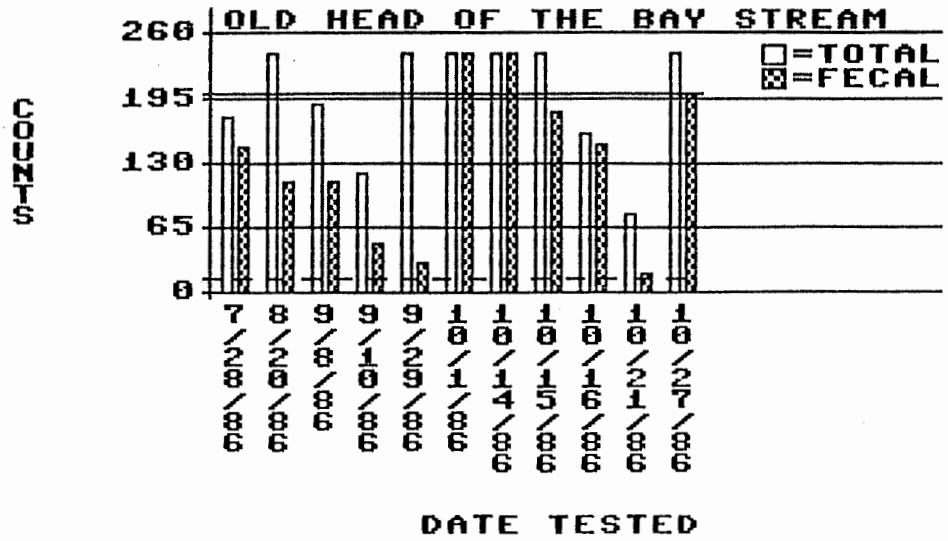
IV. RESULTS

The water quality sampling program was conducted from July 14th to November 24th, 1986. Funding was not available to start the sampling program earlier in the year. Ideally, the program should have been started in May. Currently, there is no "spring" water quality data available. Since the groundwater table is at its highest in April and May, this data would be valuable. A total of 353 water quality samples were taken by the Board of Health during this time period. A total of 706 samples were analized in the Board of Health Lab for total and fecal coliform.

Appendix 3 (pages 17-127) contains graphs of the sample results, arranged by area. Each area has several sampling stations. For each sampling area, two (2) graphs are presented. The first graph displays the shellfish water quality samples taken for the years 1985 and 1986. The second graph displays bathing water quality for 1985-1986. The two area graphs also show the percentage of pollution, i.e. the number of samples above the water quality standard. For example, in the Little Buttermilk Bay area (see below), there were 12 samples taken in 1985, of which 33% of the samples were above the standard of 14 fecal coliform per 100 milliter sample. In 1986, there were 2 samples taken at the same station, with one sample being at 14 fecal/100 ml., giving the area a 50% pollution designation.



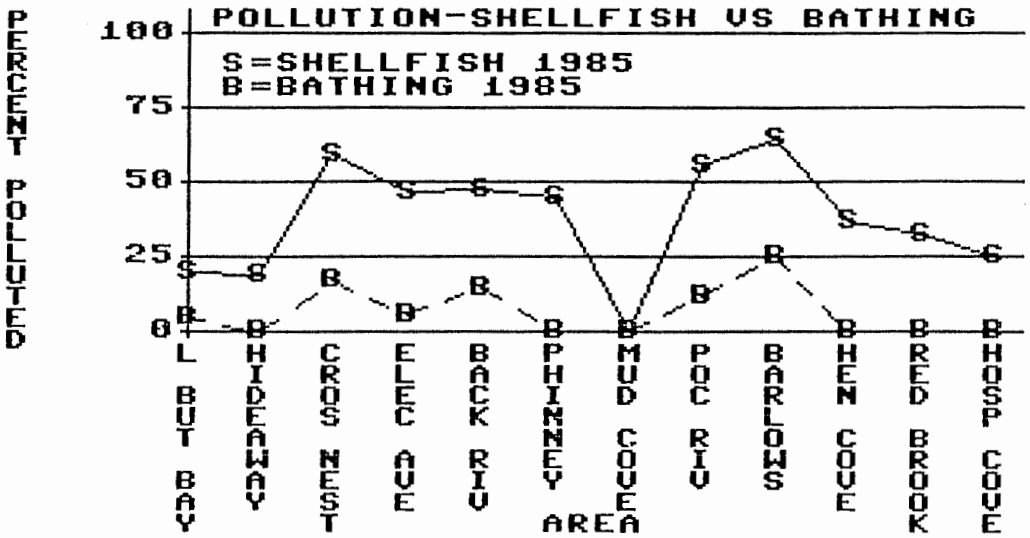
After each area graph, there are individual graphs for each sampling station within that area, displaying the test results by date. Each station graph displays the total and fecal coliform results. In addition, each station graph displays the water quality standard of 14 fecal coliform for shellfishing and 200 fecal coliform for bathing. The shellfish standard of 14 fecal is shown as a dashed horizontal line and the bathing standard of 200 fecal is shown as a solid double horizontal line. It can readily be seen the number of samples at each station that exceeds the particular standard. The table underneath each station graph gives the exact contamination count by date of sample, along with the rain data during the sampling period. It can be seen that the sample results from certain stations (pipes and streams) are directly effected by run-off. For example, the Old Head of the Bay Stream sampling station graph (see below) displays a fecal coliform count of Too Numerous To Count (TNTC) on October 14, 1986 and 180 fecal coliform on October 15, 1986. The rain data shows .78 inches of rain on October 14, 1986 and .57 inches of rain on October 15, 1986. The rain data for 1985 was obtained from the Cranberry Experimental Station in Wareham. The 1986 rain data was obtained on site at the Bourne Town Hall, where a rain gauge was installed on the roof of the building.



DATE	TOTAL	FECAL	RAIN
7/28/86	176	146	.10 7/27/86
8/20/86	260	110	.01 8/18/86
			1.41 8/19/86
			T 8/20/86
9/8/86	190	110	.06
9/10/86	120	50	.06 9/8/86
9/29/86	240	30	
10/1/86	880	510	
10/14/86	TNTC	TNTC	.78
10/15/86	520	180	.78 10/14/86
			.57 10/15/86
10/16/86	160	150	.78 10/14/86
			.57 10/15/86
10/21/86	80	20	.31 10/18/86
10/27/86	240	200	

At the end of Appendix 3 (pages 128-132), there are five (5) line graphs displaying the overall area averages for shellfish and bathing water quality samples. These line graphs display the percentage of samples over the standard. They also compare the samples taken in 1985 to those taken in 1986. Beneath each line graph are tables displaying the percent of time the samples were above the applicable standard. The percent time polluted is displayed as the number on the side of each area. For example, line graph #1 (see below) depicts the percentage of time an area was above the standard for shellfish verses bathing for 1985. An example is Crows Nest Cove (#3). Sampling in 1985 showed the area polluted 59% of the time for shellfishing and 17% of the time for bathing. Line graph #2 (page 129) gives the same data for 1986. Line graph #3 (page 130) give the percent of pollution for shellfish for both 1985 and 1986 as a comparison, while line graph #4 (page 131) does the same for bathing water quality. Finally, line graph #5 (page 132) displays the average of both 1985 and 1986 for both shellfish and bathing pollution. Line graph #5 depicts the average total results of sampling for two years. It displays the areas that should be addressed. For example, Electric Avenue, Phinney's Harbor, Barlows Landing and the Pocasset River were polluted more than 50% of the time for shellfishing. These same areas were polluted more than 10% of the time for bathing, with Electric Avenue being above the bathing standard 28% of the time.

LINE GRAPH #1



The data displayed in line graphs 1-5 have also been condensed and presented on two colored maps to be found in the pocket at the end of this report. Colored Map #1 shows areas of shellfish contamination. Colored Map #2 shows areas of bathing contamination. The key is as follows:

SHELLFISH CONTAMINATION

Green	0-25 percent time polluted (above standard)
Yellow	26-50 percent time polluted (above standard)
Red	50 percent or more (above standard)

BATHING CONTAMINATION

Green	0 percent time polluted (above standard)
Yellow	1-10 percent time polluted (above standard)
Red	11-49 percent time polluted (above standard)
Black	50 percent or more (above standard)

Please note that the colored maps display 1986 data only. The reason being that more consistant sampling was conducted in 1986 than in 1985 by both the Board of Health and DEQE.

V. CONCLUSIONS

Based on the data obtained, several overall conclusions can be formulated.

1. Sources of contamination are primarily linked to septic systems and animals, using the drainage network as the conduit for entry of contaminants to the surface waters. This network can consist of direct discharge pipes, low-lying catch basins, or streams and drainage swails. Every pipe or storm drain tested showed contamination present, most being 100% of the time. Streams and drainage swails found contamination present at least 50% of the time.

2. Surface water bodies with poor circulation and poor water flushing (Little Buttermilk Bay, Back River, Pocasset River) tend to concentrate contamination. These are also areas with a large volume of fresh water input.

3. The level of contamination is dependant on weather conditions. Contamination counts escalate immediately after rain events of .50 inches or more. Rain after long dry spells tend to release large volumes of contaminants, whereas extended long wet periods tend to keep contamination constant at lower values. This was exemplified by the summer of 1986. The weather was consistantly wet over a long period of time, thus reducing the large numbers of contaminants entering the water bodies at any given time. The summer of 1985 was the opposite, having long dry periods followed by a wet August releasing large volumes of contaminants (see Barlows Landing Beach graph 1985, page 97; and Rain Data Graph, page 16, appendix 3).

4. Bathing density is directly related to contamination counts. Good beach weather increases bather density, bathers stir-up sediments, which results in increased coliform numbers.

5. Nutrient loading from septic systems and land management provide the conditions for coliform bacteria to grow and multiply in the marine environment. This was verified through the EPA Buttermilk Bay Study conducted by George Heufelder (see appendix 6, page 136). Algal blooms caused by nutrients tend to inhibit ultra-violet light, which is a natural bactericide.

6. Septic systems in low lying areas (below elevation 12) are contaminating the groundwater. Groundwater enters the surface water bodies at the time of low tide. Groundwater monitoring wells installed in coastal areas show high degrees of fecal contamination. This data is presently being collected and correlated.

7. 1986 was an atypical year. Overall pollution counts at Town Beaches were lower in 1986 than the past several years. This can be attributed to less intense property use due basically to poor weather conditions. A survey of beach use, real estate agents, and marina operators all showed less demand on water resource use by both year-round residents and summer guests.

8. Shellfishing in Bourne is in jeapordy. Seven of the twelve areas tested show fecal contamination in excess of water quality standards. This indicates that shellfish are receiving contamination at least 60% of the time. Bathing areas while opened in 1986, show waters to be contaminated from a low figure of 11% of the time to a high of 50% of the time.

9. Data must be collected in 1987 from early spring to late fall to verify sources and conclusions. At present, only the year 1986 has complete water quality data, and as mentioned previously, water testing did not commence until July.

Water Quality Subcommittee - Work Plan 1986

1. Review and mapping of storm drainage system -

   A. Phase I - Wings Neck to Falmouth

      1. Identify and locate storm drains.

      2. Test drains for fecal contamination which appear to empty into either marsh or salt water.

         Island Drive from Shore Road, Bellbouy Road, Hill Street, bog between Island Drive and Park Street, Patuisset, Barlows Landing, Kenwood Road, Cove Lane, Barlows Landing/Shore Road (2) near church and bakery into Pocasset River, Spruce Drive from Cedar Point Drive, Elgin Road to Cedar Point Drive to Hen Cove, railroad overpass, Kingman Marina and drainage from Parker's Marina Complex (see map).

   B. Phase II - Wings Neck to Canal

      1. Identify and locate storm drains which empty into marsh or salt water.

      2. Test drains to detect fecal contamination (see map).

   C. Phase III - All sources north of canal including Buttermilk Bay (in cooperation with BCHED), Little Buttermilk Bay, Queen Sewell Pond, run-off from Ingersoll farmland.

   D. Establish constant testing stations throughout Town (see map).

2. Coordinate and confirm survey results with other subcommittees, especially findings of 3P results and Buttermilk Bay Study (EPA).

3. Analyze, graph, and map results from testing to determine problem areas.

4. Identify problem septic systems in areas indicated.

   A. Identify individual systems

   B. Determine direction of flow

   C. Develop plan for correction
      short term
      long term

5. Make recommendations to Task Force in support of Health Department's budget request for personnel and equipment.

6. Develop testing for fecal colifrom to determine source type (in cooperation with DEQE and BCHED).

   A. Human
   B. Animal

7. Develop testing plan for Bassets Island -

   A. Various locations

   B. Various times

   C. Various tides

8. Conduct survey of marine sanitation devices on board vessels in Bourne waters (in cooperation with Marina operators).

9. Coordinate information gathering with other subcommittees

   Shellfish
   Lifeguards
   Marinas

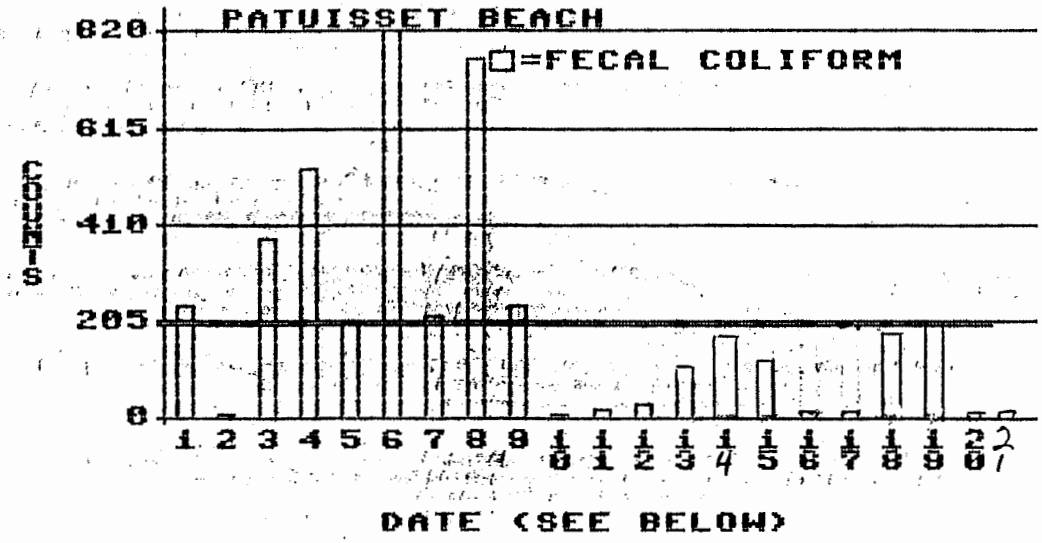
10. Develop plans for timely notification to public on status of areas when pollution is present or absent, in cooperation with education subcommittee.

11. Coordinate with other subcommittees to develop solutions

   A. Short Term

   B. Long Term

Submitted by Water Quality Subcommittee
March 12, 1986



NUMBER	DATE	COUNT
1	6/25/87	240 County
2	7/1/87	10 Town
3	7/9/87	380 Town High tide
4		530 Town Low Tide
5	7/13/87	200 County High Tide
6		820 County Low Tide
7		220 Town High Tide
8		760 Town Low Tide
9	7/14/87	240 Town High Tide
10	7/15/87	10 County High Tide
11		20 Town High Tide
12	7/16/87	30 Town High Tide
13	7/20/87	130 Left Low Tide Town
14		180 Middle " " "
15		140 Right " " "
16	7/21/87	10 Town Low Tide
17	7/22/87	10 Town Low Tide
18	7/23/87	180 Town Low Tide
19		200 + County Low Tide
20	7/27/87	10 Town Low Tide
21	7/28/87	10 Town High Tide

AREA:	STATION:
Little Buttermilk Bay:	Head of the Bay and Old Head of the Bay Fabian Way Nye Lane Stream on Old Head of the Bay Lewis Point (Gibbs Narrows) 41 Little Bay Lane 37 Little Bay Lane
Hideaway/Pine Ridge:	Knollview Stream at Hideaway Pine Ridge Bch (Head of the Bay at Fork)
Crows Nest Cove:	29 Wallace Point 11 Wallace Point
Electric Avenue:	Electric Avenue Beach Pipe on Beach
Back River:	Conservation Land off County Road Cement Pier at Cape Marine Culvert on Old Dam Road Railroad Bridge N. Beach Street (Stanely Bolles Park) 119 Old Dam Road Plow Penny Road 28 Old Dam Road East End at Dike Road Maryland Avenue Wilson's Breakwater Eel Pond at Carlton Gardner Road
Phinney's Harbor/Mashnee:	Little Bay Culvert at Monument Beach Monument Beach Mooring Road St. Johns Beach (Chester Park) S.W. end of Mashnee Pipe at St. Johns (Chester Park) N.W. end of Mashnee
Mud Cove:	Tobey Island Mud Cove Navajo Road

Pocasset River:

Culvert near Bennets Neck
Lawrence Road
Community Club
Town Parking Lot on Pocasset River
Pipe by Railroad Tracks
Raidroad Bridge
Mouth of Pocasset River
Car Bridge on Pocasset River

Barlow's Landing/Wings Neck:

Kenwood Ditch
Harborview Ditch
South Pipe on Barlow's Landing Beach
North Pipe on Barlow's Landing Beach
Culvert on Saltmarsh Lane
Massosoit Beach
Catch Basin on Barlow's Landing Road
176 Wings Neck Road
114 Wings Neck Road
Across from Holcombe 2 stone piers
115 South Road
Winnepoc
31 Harbor Drive
Stream at 47 Wings Neck Road
Cove Lane Beach
Barlow's Landing Beach

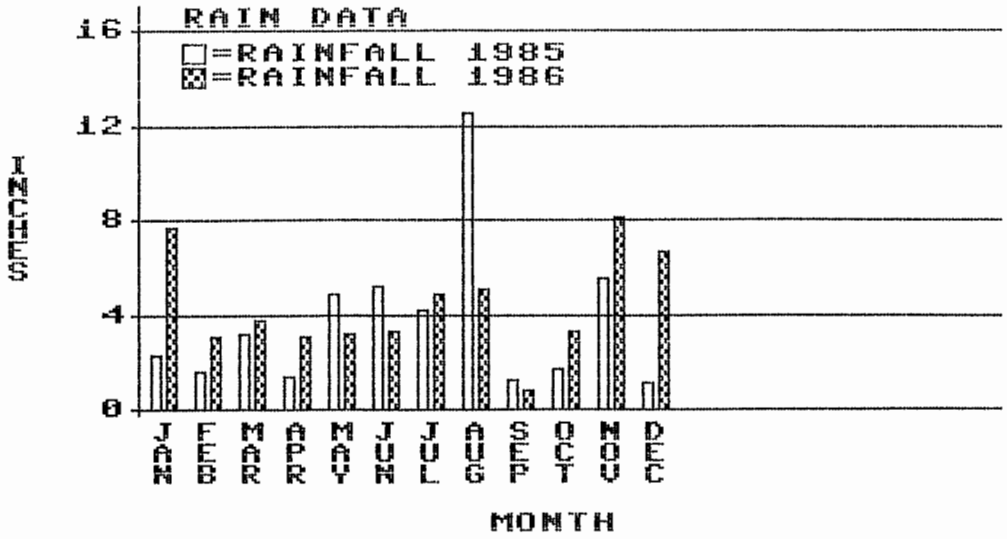
Hen Cove:

Foot of Kennebec Ave. Pocasset Harbor
Foot of Kennebec Ave. Hen Cove
Cedar Avenue
Patuisset Beach
Patuisset Pipe
110 Bell Buoy Avenue
354 Circuit Avenue
Cedar Point Beach

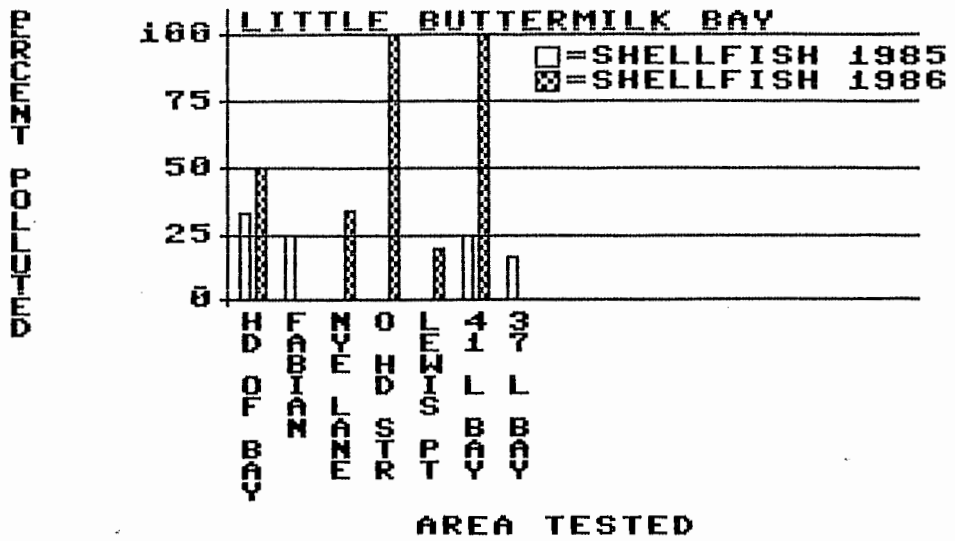
Red Brook Harbor:

Pipe at Kingman Marine
Kingman's Inner Harbor
Red Brook Pond
Pipe at Parker's Railway
Long Point
Kingman's Bulkhead
Parker's Bulkhead
Scotch House Cove
34 Elgin Road

Hospital Cove/Scraggy Neck: Dike Road, Scraggy Neck
388 Scraggy Neck Road
505 Scraggy Neck Road
Hospital Cove

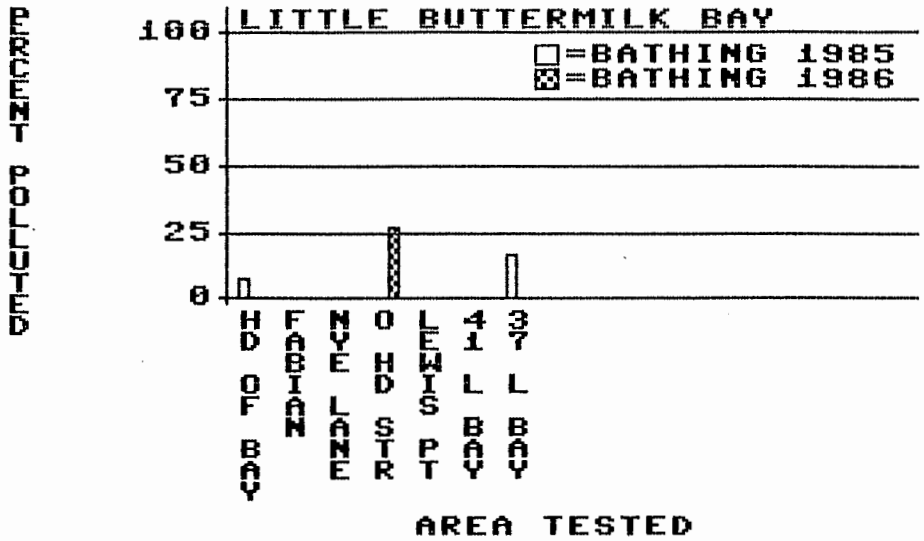


MONTH	1985 RAINFALL (IN INCHES)	1986 RAINFALL (IN INCHES)
January	2.27	7.72
February	1.61	3.12
March	3.21	3.73
April	1.36	3.12
May	4.92	3.26
June	5.25	3.31
July	4.21	4.93
August	12.61	5.13
September	1.29	.88
October	1.75	3.31
November	5.60	8.18
December	1.15	6.67



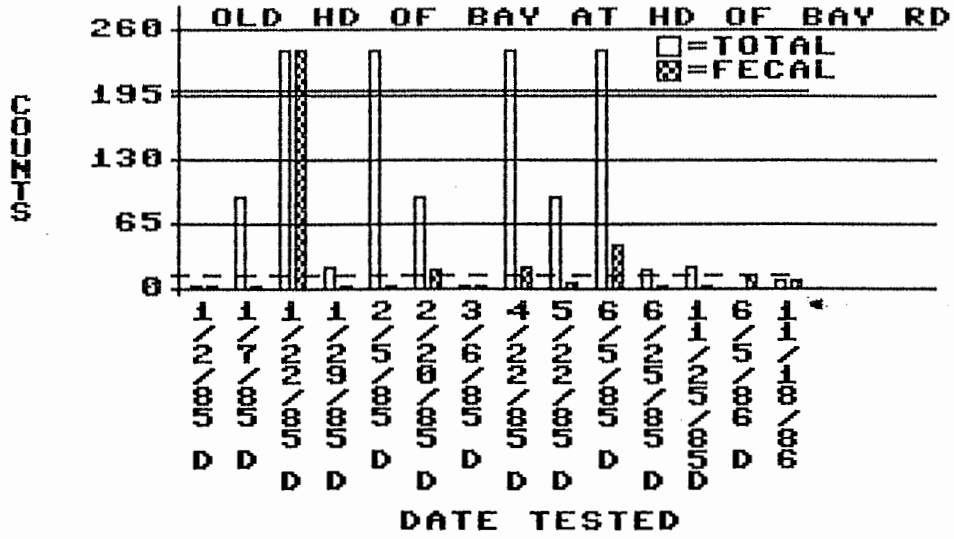
LITTLE BUTTERMILK BAY

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Head of the Bay and Old Head of the Bay	12	33%	2	50%
Fabian Way	8	25%	2	0%
Nye Lane	Not Tested		3	34%
Stream on Old Head of the Bay	Not Tested		11	100%
Lewis Point (Gibbs Narrows)	11	0%	5	20%
41 Little Bay Lane	4	25%	3	100%
37 Little Bay Lane	6	17%	Not Tested	



LITTLE BUTTERMILK BAY

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Head of the Bay and Old Head of the Bay	12	8%	2	0%
Fabian Way	8	0	2	0%
Nye Lane	Not Tested		3	0%
Stream on Old Head of the Bay	Not Tested		11	27%
Lewis Point (Gibbs Narrows)	11	0%	5	0%
41 Little Bay Lane	4	0%	3	0%
37 Little Bay Lane	6	17%	Not Tested	



DATE	TOTAL	FECAL	RAIN
1/2/85 D	3.6	3	.03 1/1/85
			.11 1/2/85
1/7/85 D	93	3	.18 1/5/85
1/22/85 D	240	240	.08 1/20/85
			.04 1/21/85
1/29/85 D	23	3.6	
2/5/85 D	460	3	.26 2/2/85
			.12 2/3/85
2/20/85 D	93	21	
3/6/85 D	3	3	.74 3/5/85
4/22/85 D	460	23	.02
5/22/85 D	93	7.3	.18 5/20/85
			.85 5/22/85
6/5/85 D	460	93	.01 6/4/85
6/25/85 D	21	3	.09 6/24/85
			.53 6/25/85
11/25/85 D	22	4.8	.64 11/23/85
6/5/86 D		14	.06 6/3/86
11/18/86	10	10	1.72

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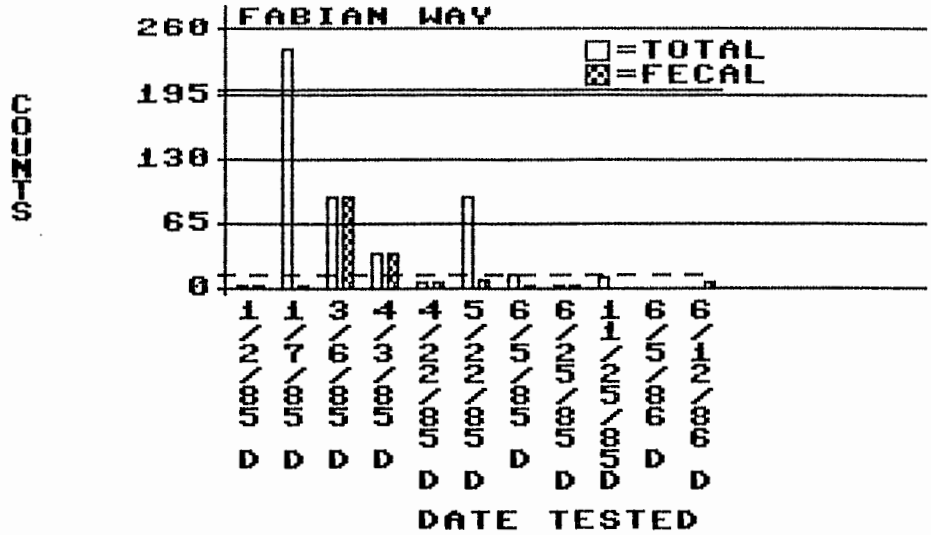

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			.53 6/25/85
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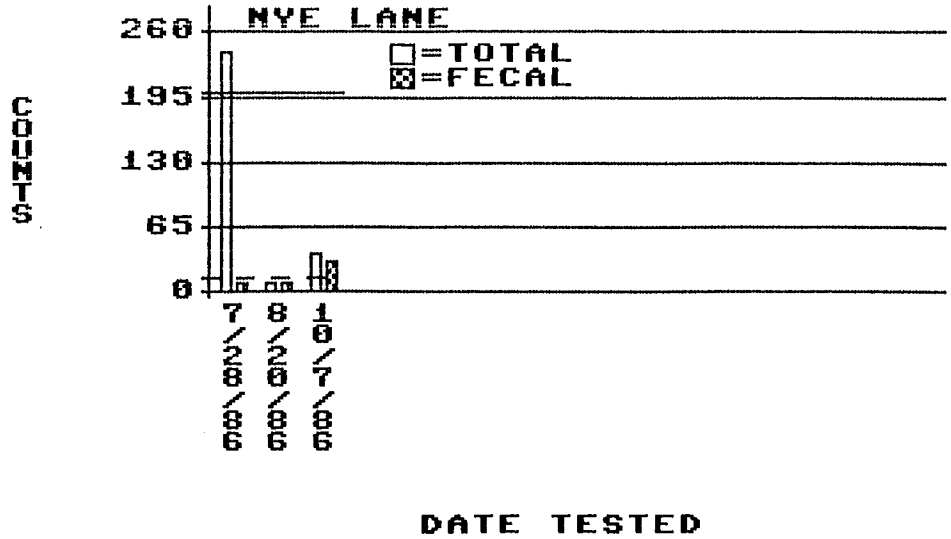
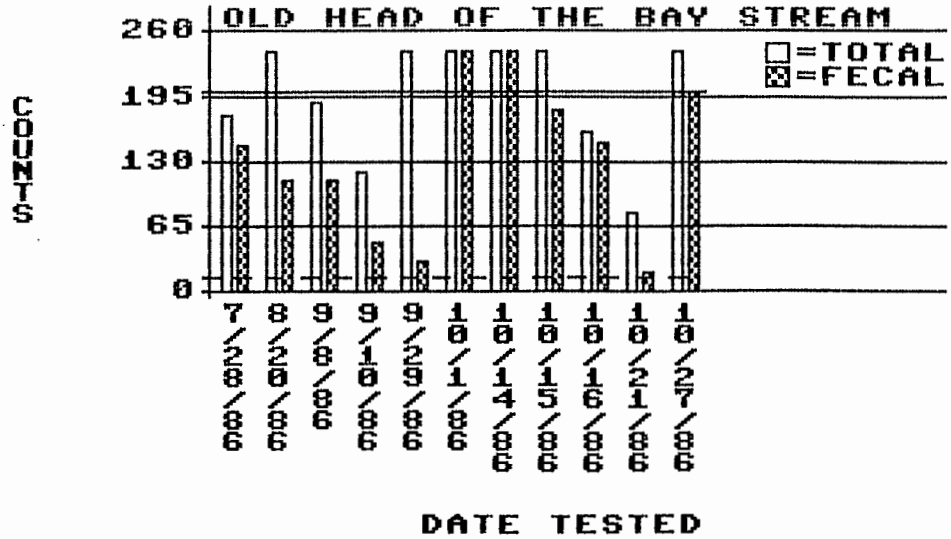
6/5/86 D		1.7	.06 6/3/86
6/12/86 D		5.8	1.23 6/8/86
			.16 6/11/86
			.87 6/12/86



DATE	TOTAL	FECAL	RAIN
7/28/86	CONF	10	.01 7/27/86
8/20/86	10	10	.01 8/17/86
			.01 8/18/86
			1.41 8/19/86
			T 8/20/86
10/7/86	40	30	.65 10/4/86
			.01 10/5 86
			T 10/6/86

Conf = confluent growth



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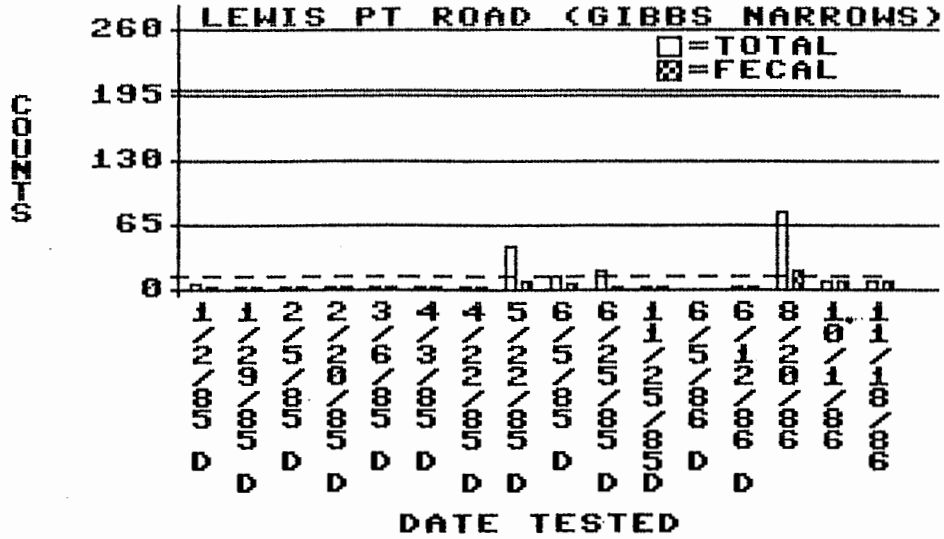
TNTC = 5000



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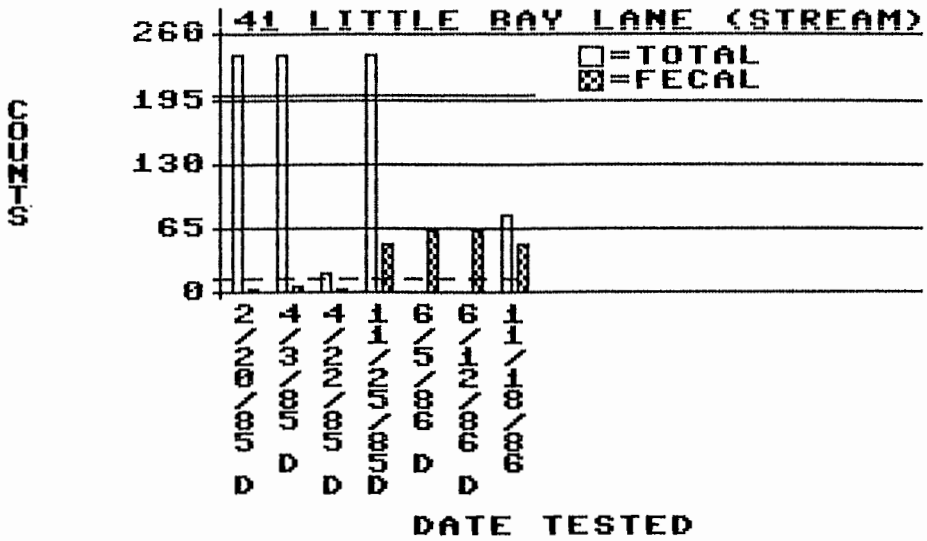
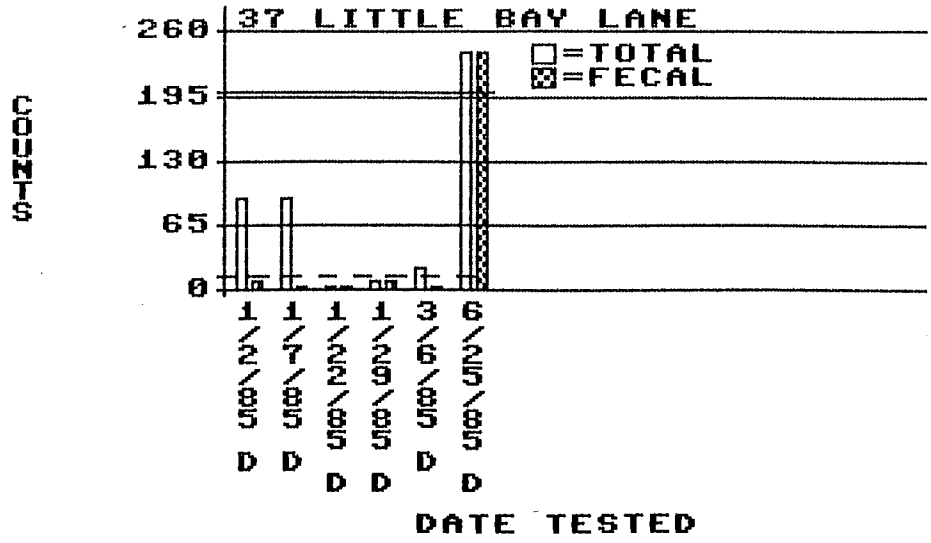
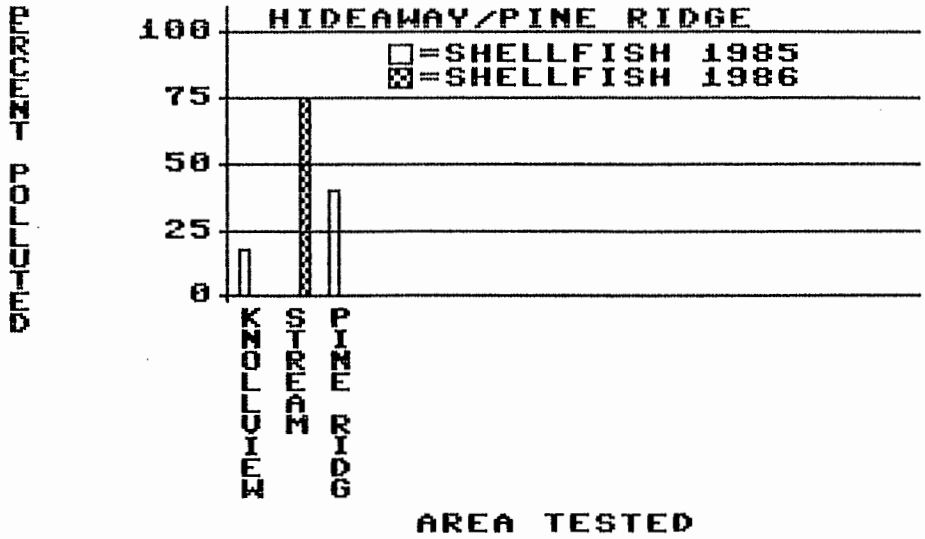
2/5/85 D	3	3	.26 2/2/85
			.12 2/3/85
2/20/85 D	3.6	3.6	
3/6/85 D	3.6	3.6	.74 3/5/85
4/3/85 D	3.6	3.6	.63 4/1/85
			.03 4/2/85
			T 4/3/85
4/22/85 D	3	3	.02
5/22/85 D	43	9.1	.18 5/20/85
			.85 5/22/85
6/5/85 D	15	7.3	.01 6/4/85
6/25/85 D	20	3	.09 6/24/85
			.53 6/25/85
11/25/85 D	4.8	4.8	.64 11/23/85
6/5/86 D		1.7	.06 6/3/86
6/12/86 D		4.7	1.23 6/8/86
			.16 6/11/86
			.87 6/12/86
8/20/86	80	20	.01 8/17/86
			.01 8/18/86
			1.41 8/19/86
			T 8/20/86
10/1/86	10	10	
11/18/86	10	10	1.72



DATE	TOTAL	FECAL	RAIN
2/20/85 D	240	3	
4/3/85 D	460	7.3	.63 4/1/85
			.03 4/2/85
			T 4/3/85
4/22/85 D	21	3	.02
11/25/85 D	350	49	.64 11/23/85
6/5/86 D		64	.06 6/3/86
6/12/86 D		64	1.23 6/8/86
			.16 6/11/86
			.87 6/12/86
11/18/86	80	50	1.72

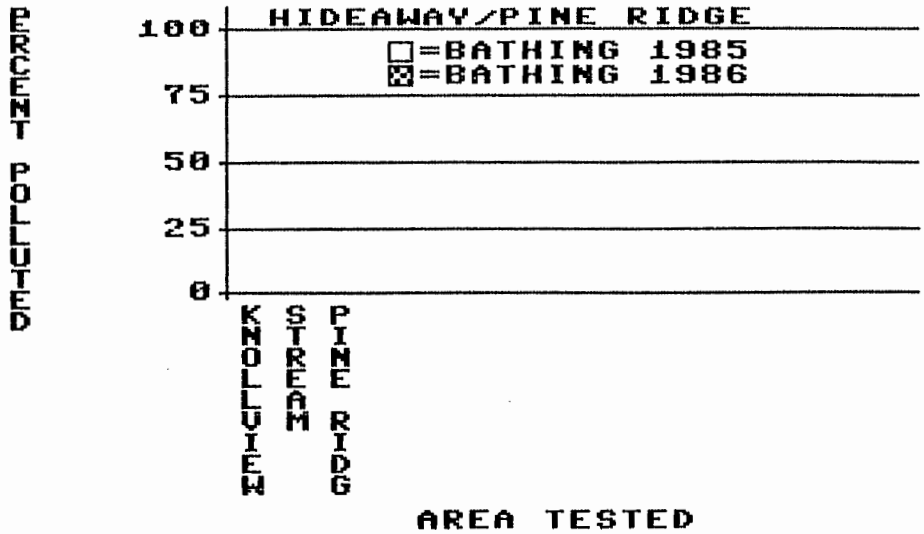


DATE	TOTAL	FECAL	RAIN
1/2/85 D	93	9.1	.03 1/1/85
			.11 1/2/85
1/7/85 D	93	3	.18 1/5/85
1/22/85 D	3	3	.08 1/20/85
			.04 1/21/85
1/29/85 D	9.1	9.1	
3/6/85 D	23	3	.74 3/5/85
6/25/85 D	2400	460	.09 6/24/85
			.53 6/25/85



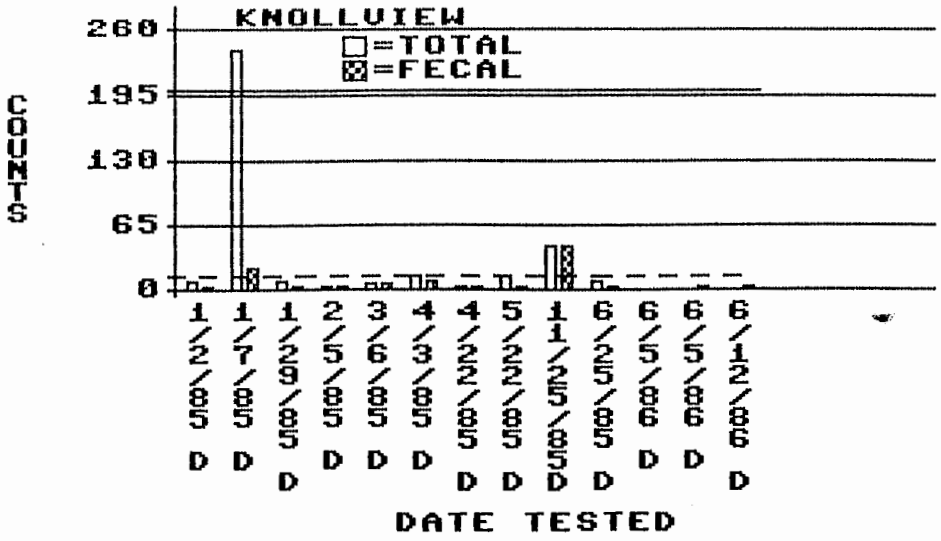
HIDEAWAY/PINE RIDGE

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Knollview	11	18%	2	0
Stream at Hideaway	2	0%	4	75%
Pine Ridge Beach (Fork on Head of the Bay)	10	40%	7	0%

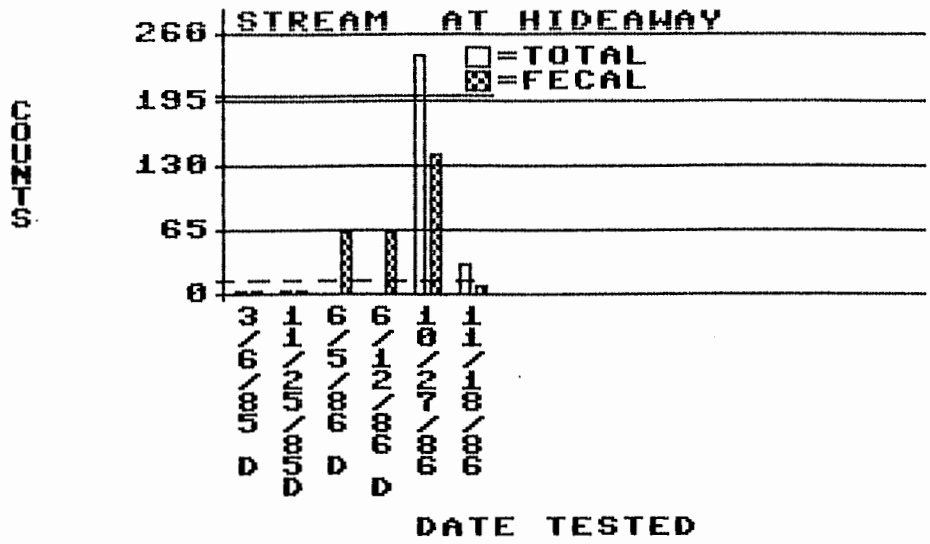


HIDEAWAY/PINE RIDGE

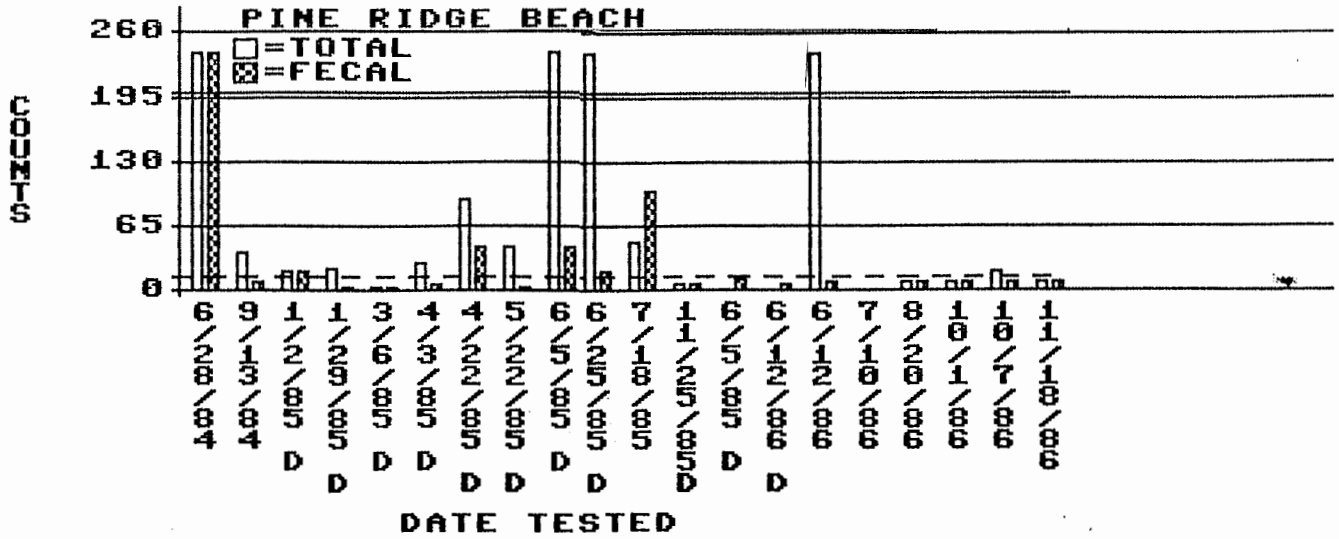
AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Knollview	11	0%	2	0%
Stream at Hideaway	2	0%	4	0%
Pine Ridge Beach (Fork on Head of the Bay)	10	0%	7	0%



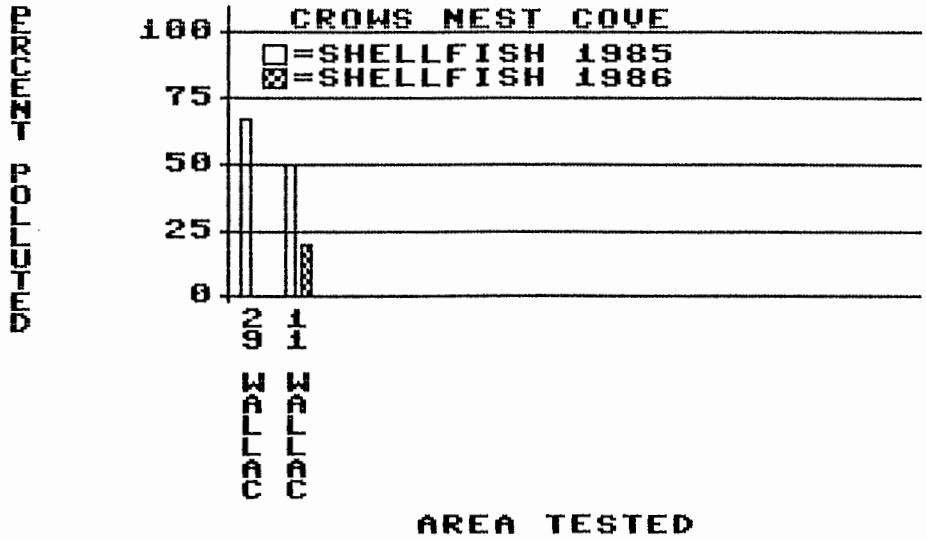
DATE	TOTAL	FECAL	RAIN
1/2/85 D	9.1	3.6	.03 1/1/85
			.11 1/2/85
1/7/85 D	2400	23	.18 1/5/85
1/29/85 D	9.1	3	
2/5/85 D	3.6	3	.26 2/2/85
			.12 2/3/85
3/6/85 D	6.2	6.2	.74 3/5/85
4/3/85 D	15	9.1	.63 4/1/85
			.03 4/2/85
			T 4/3/85
4/22/85 D	3	3	.02
5/22/85 D	15	3.6	.18 5/20/85
			.85 5/22/85
6/5/85 D	43	43	.01 6/4/85
6/25/85 D	9.1	3	.09 6/24/85
			.53 6/25/85
11/25/85 D	2	1.8	.64 11/23/85
6/5/86 D		3.6	.06 6/3/86
6/12/86 D		4.7	1.23 6/8/86
			.16 6/11/86
			.87 6/12/86



DATE	TOTAL	FECAL	RAIN
3/6/85 D	3	3	.74 3/5/85
11/25/85 D	4.8	4.8	.64 11/23/85
6/5/86 D		64	.06 6/3/86
6/12/86 D		64	1.23 6/8/86
			.16 6/11/86
			.87 6/12/86
10/27/86	500	140	
11/18/86	30	10	1.72

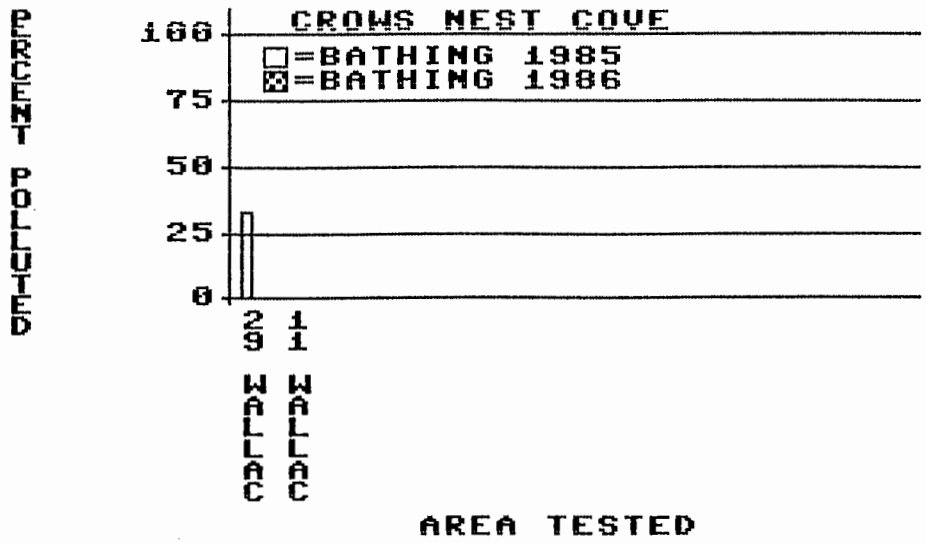


DATE	TOTAL	FECAL	RAIN
6/28/84	CONF	240	
9/13/84	40	10	
1/2/85 D	21	21	.03 1/1/85
			.11 1/2/85
1/29/85 D	23	3	.03 1/26/85
3/6/85 D	3	3	.74 3/5/85
4/3/85 D	28	6.1	.63 4/1/85
			.03 4/2/85
			T 4/3/85
4/22/85 D	93	43	.02
5/22/85 D	43	3	.18 5/20/85
			.85 5/22/85
6/5/85 D	240	43	.01 6/4/85
6/25/85 D	240	21	.09 6/24/85
			.53 6/25/85
7/18/85	50	100	T 7/15/85
			.11 7/16/85
			1.54 7/17/85
11/25/85 D	6.8	6.8	.64 11/23/85
6/5/86 D		11	.02 6/5/86
			.06 6/3/86
6/12/86 D		6.8	1.23 6/8/86
			.16 6/11/86
			.87 6/12/86
7/10/86	1		T 7/9/86
8/20/86	10	10	.01 8/18/86
			1.41 8/19/86
			T 8/20/86
10/1/86	10	10	
10/7/86	20	10	.65 10/4/86
			.01 10/5/86
			T 10/6/86
11/18/86	10	10	1.72



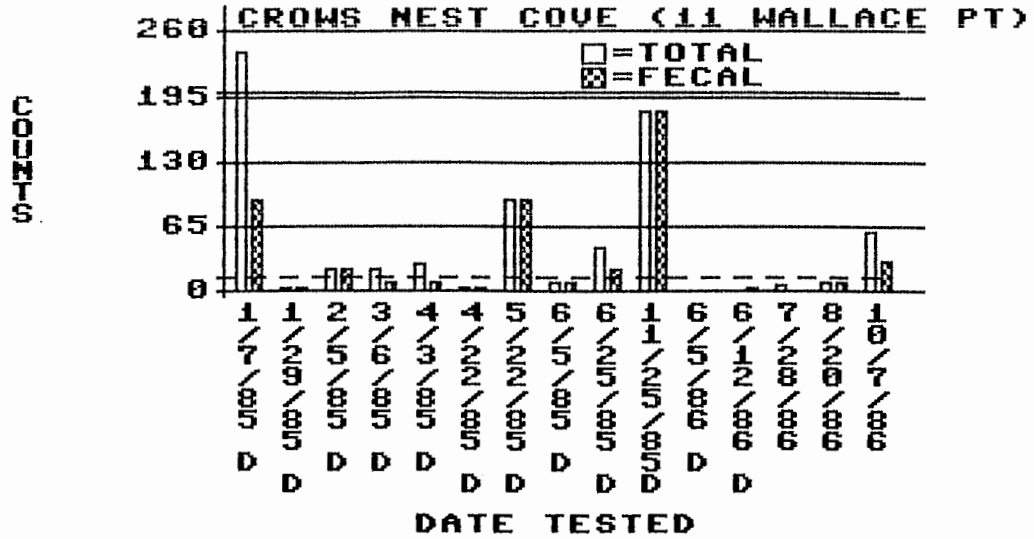
CROWS NEST COVE

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
29 Wallace Pt (Stream)	3	67%	Not Tested	
11 Wallace Point	10	50%	5	20%

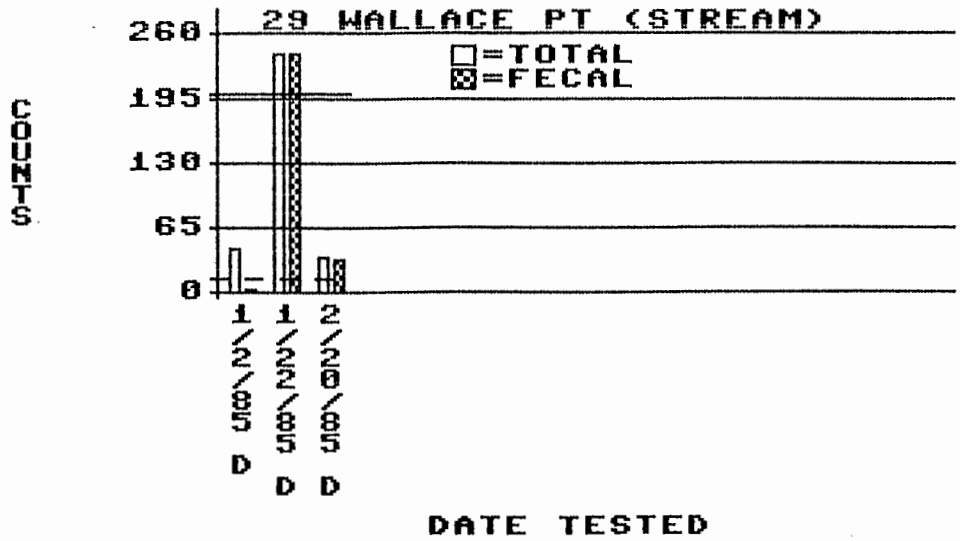


CROWS NEST COVE

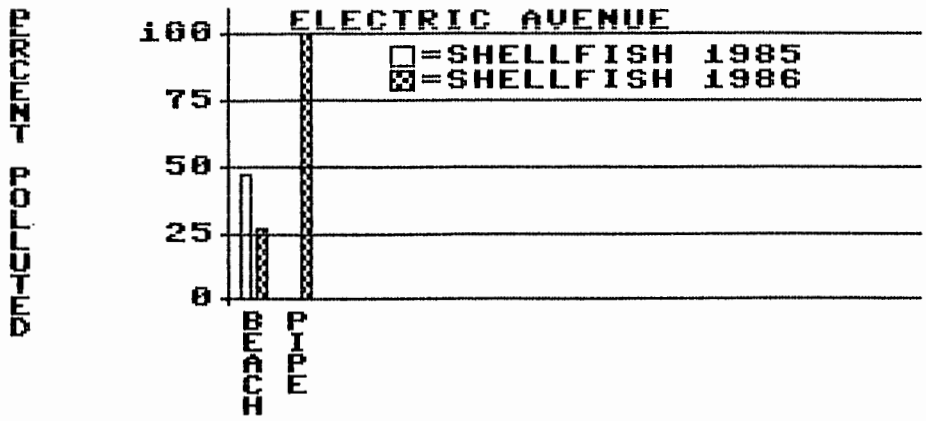
AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
29 Wallace Pt (Stream)	3	33%	Not Tested	
11 Wallace Point	10	0%	5	0%



DATE	TOTAL	FECAL	RAIN
1/7/85 D	2400	93	.18 1/5/85
1/29/85 D	3	3	
2/5/85 D	23	23	.26 2/2/85
			.12 2/3/85
3/6/85 D	23	9.1	.74 3/5/85
4/3/85 D	29	9.4	.63 4/1/85
			.03 4/2/85
			T 4/3/85
4/22/85 D	3	3	.02
5/22/85 D	93	93	.18 5/20/85
			.85 5/22/85
6/5/85 D	9.1	9.1	.01 6/4/85
6/25/85 D	43	23	.09 6/24/85
			.53 6/25/85
11/25/85 D	180	180	.64 11/23/85
6/5/86 D		1.7	.06 6/3/86
6/12/86 D		3.6	1.23 6/8/86
			.16 6/11/86
			.87 6/12/86
7/28/86	8	2	.10 7/27/86
8/20/86	10	10	.01 8/18/86
			1.41 8/19/86
			T 8/20/86
10/7/86	60	50	.65 10/4/86
			.01 10/5/86
			T 10/6/86



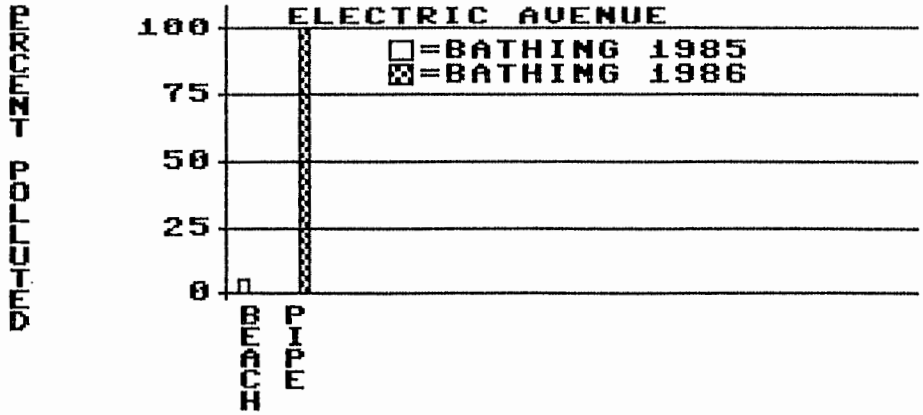
DATE	TOTAL	FECAL	RAIN
1/2/85 D	43	3.6	.03 1/1/85 .11 1/2/85
1/22/85 D	460	460	.08 1/20/85 .04 1/21/85
2/20/85 D	36	33	



AREA TESTED

ELECTRIC AVENUE

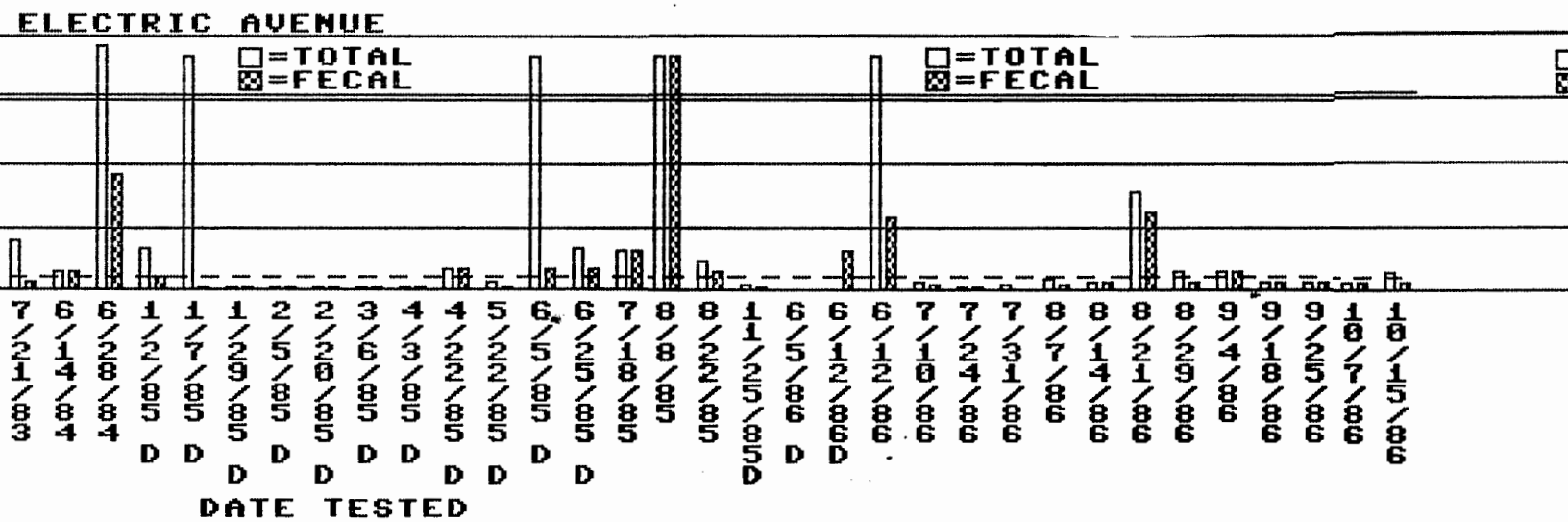
AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Electric Avenue Beach	15	47%	15	27%
Pipe	Not Tested		6	100%



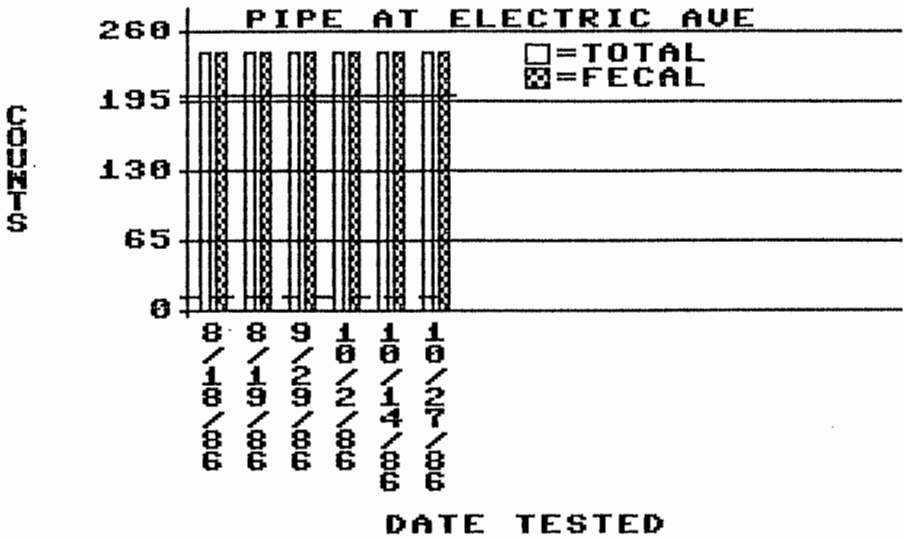
AREA TESTED

ELECTRIC AVENUE

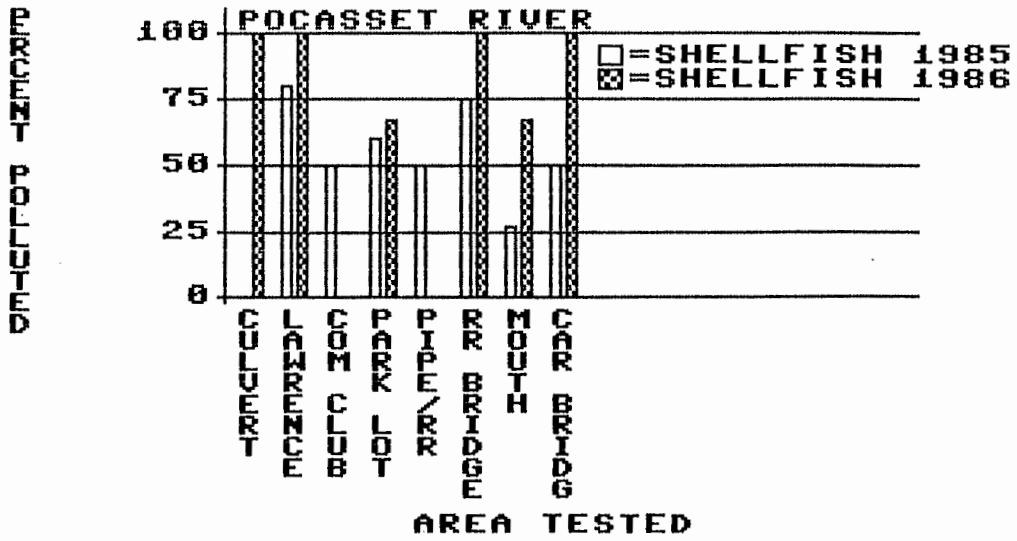
AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Electric Avenue Beach	15	6%	15	0%
Pipe	Not Tested		6	100%


ELECTRIC AVENUE
□=TOTAL
⊠=FECAL
□=TOTAL
⊠=FECAL
7/21/83
6/14/84
6/28/84
12/2/85 D
1/7/85 D
12/29/85 D
2/5/85 D
2/20/85 D
3/6/85 D
4/3/85 D
4/22/85 D
5/22/85 D
6/5/85 D
6/25/85 D
7/18/85
8/8/85
8/22/85
11/25/85 D
6/5/86 D
6/12/86 D
6/12/86
7/10/86
7/24/86
7/31/86
8/7/86
8/14/86
8/21/86
8/29/86
9/4/86
9/18/86
9/25/86
10/7/86
10/15/86
DATE TESTED

DATE	TOTAL	FECAL	RAIN
7/21/82	250	10	
7/21/83	50	10	
6/4/84	20	20	
6/28/84	250	120	
1/2/85 D	43	15	.03 1/1/85
			.11 1/2/85
1/7/85 D	460	3.6	.18 1/5/85
1/29/85 D	3	3	
2/5/85 D	3	3	.12 2/3/85
2/20/85 D	3	3	
3/6/86 D	3	3	.74 3/5/85
4/3/85 D	3.6	3	.63 4/1/85
			.03 4/2/85
			T 4/3/85
4/22/85 D	23	23	.02
5/22/85 D	9.1	3	.18 5/20/85
			.85 5/22/85
6/5/85 D	240	23	.01 6/4/85
6/25/85 D	43	43	T 6/22/85
			.09 6/24/85
7/18/85	40	40	T 7/15/85
			.11 7/16/85
			1.54 7/17/85
8/8/85	710	240	.78
8/22/85	30	20	.05 8/20/85
			.01 8/22/85
11/25/85 D	7.8	4.5	.64 11/23/85
6/5/86 D		1.7	.02 6/2/86
			.06 6/3/86
6/12/86 D		41	.16 6/11/86
			.87 6/12/86
6/12/86	CONF	75	.16 6/11/86
			.87 6/12/86
7/10/86	8	7	T 7/9/86
7/24/86	4	3	.35 7/21/86
7/31/86	6	0	.44 7/29/86
			.85 7/30/86
			.09 7/31/86
8/7/86	12	6	
8/14/86	10	10	.22 8/12/86
8/21/86	100	80	1.41 8/19/86
			T 8/20/86
8/29/86	20	10	T 8/27/86
			.11 8/28/86
			.27 8/29/86
9/4/86	20	20	.09
9/18/86	10	10	.66 9/16/86
9/25/86	10	10	.02 9/23/86
			.01 9/24/86
			T 9/25/86
10/7/86	10	10	.64 10/4/86
			.01 10/5/86
			T10/6/86
10/15/86	20	10	.78 10/14/86
			.57 10/15/86

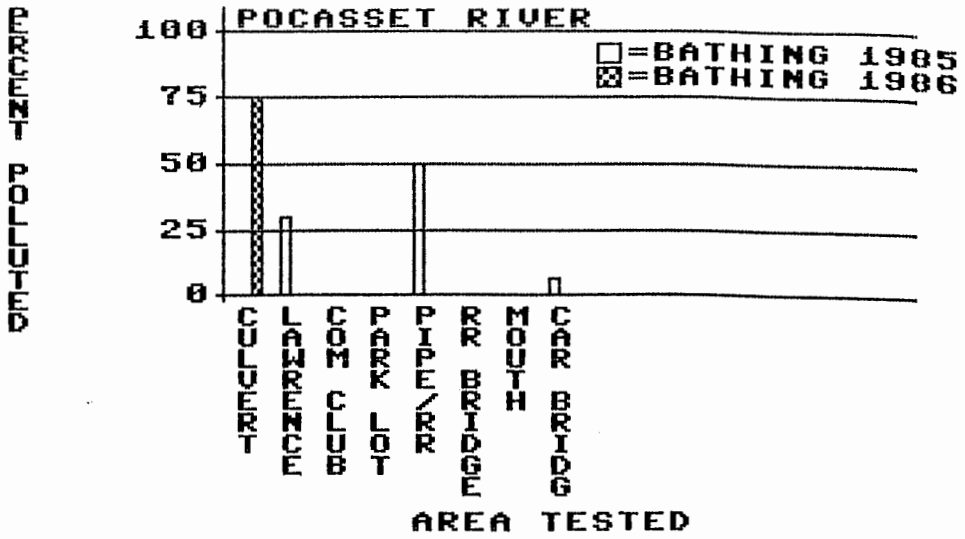


DATE	TOTAL	FECAL	RAIN
8/18/86	CONF	TNTC	.01 8/17/86
			.01 8/17/86
8/19/86	10,000	6600	.01 8/17/86
			.01 8/18/86
			1.41 8/19/86
9/29/86	1800	1230	.37 9/29/86
10/2/86	TNTC	4700	.18 10/2/86
10/14/86	TNTC	7480	.78 10/14/86
10/27/86	740	660	.71



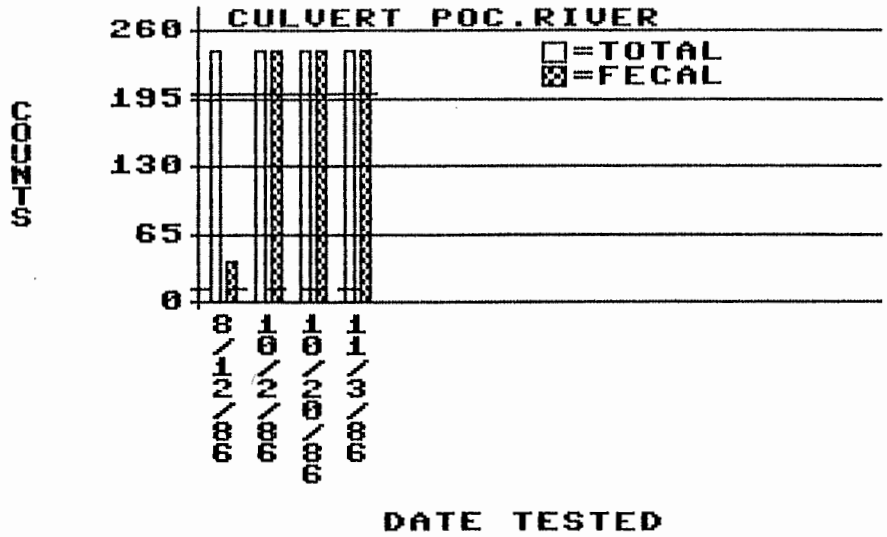
POCASSET RIVER

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Culvert near Bennets Neck	Not Tested		4	100%
Lawrence Road	10	80%	1	100%
Community Club	2	50%	Not Tested	
Town Parking Lot Pocasset River	5	60%	12	67%
Pipe by Railroad Tracks	2	50%	Not Tested	
Railroad Bridge	12	75%	1	100%
Mouth of Pocasset River	11	27%	6	67%
Car Bridge Pocasset River	14	50%	2	100%

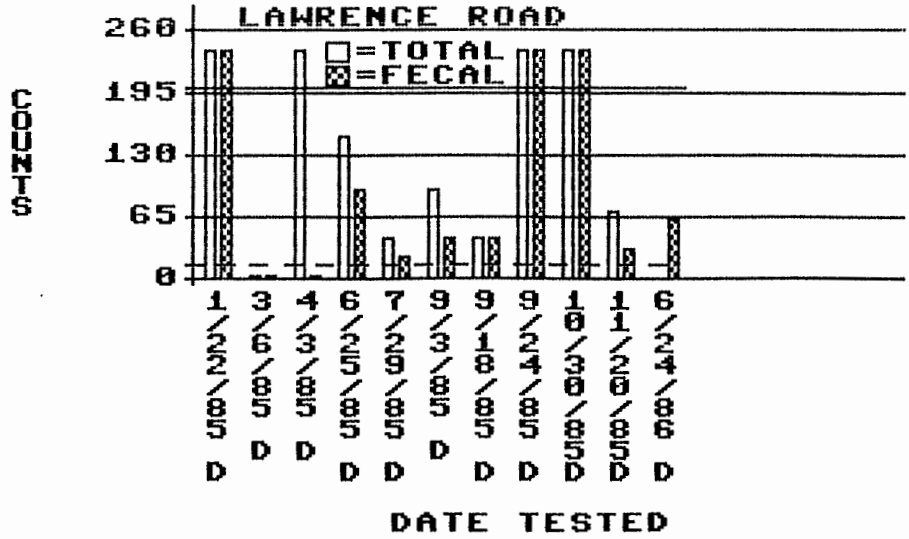


POCASSET RIVER

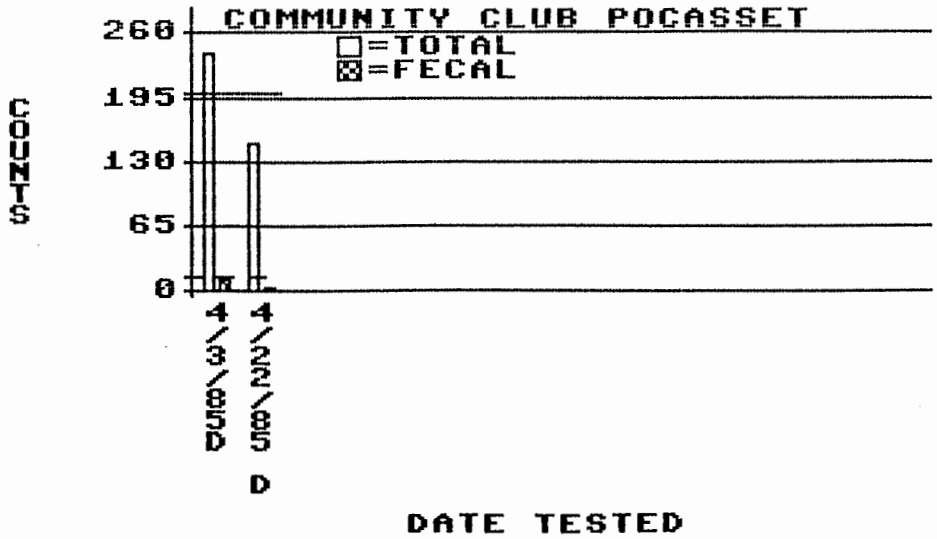
AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Culvert near Bennets Neck	Not Tested		4	75%
Lawrence Road	10	30%	1	0%
Community Club	2	0%	Not Tested	
Town Parking Lot Pocasset River	5	0%	12	0%
Pipe by Railroad Tracks	2	50%	Not Tested	
Railroad Bridge	12	0%	1	0%
Mouth of Pocasset River	11	0%	6	0%
Car Bridge Pocasset River	14	7%	2	0%



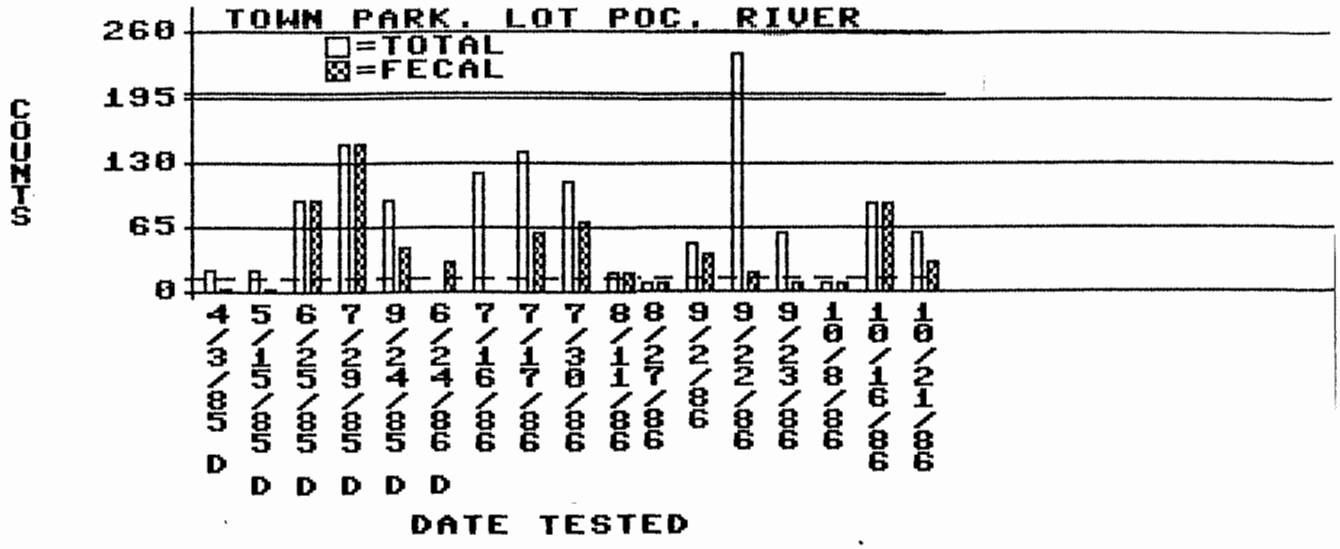
DATE	TOTAL	FECAL	RAIN
8/12/86	CONF	40	.75 8/9/86
			.57 8/11/86
			.22 8/12/86
10/2/86	TNTC	TNTC	.18
10/20/86	CONF	4900	.31 10/18/86
11/3/86	TNTC	1760	T 11/2/86
			.17 11/3/86



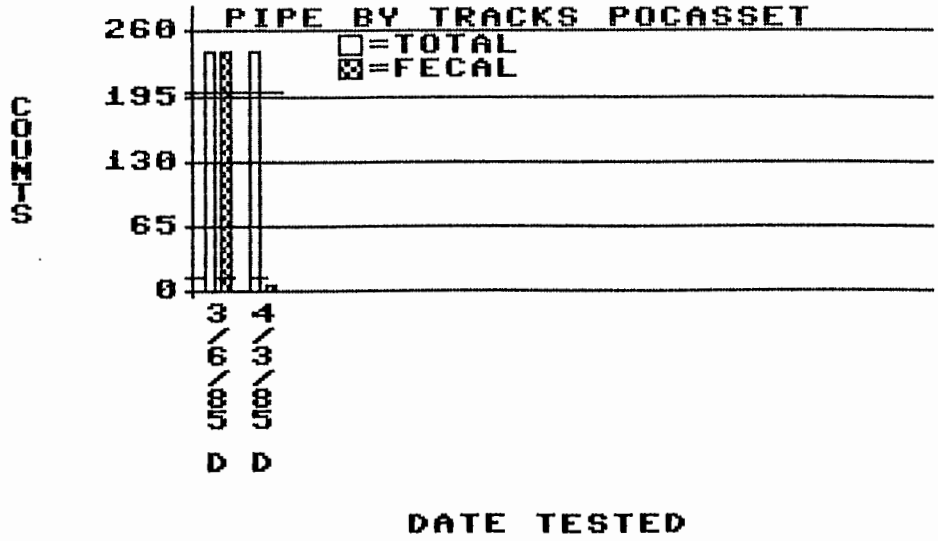
DATE	TOTAL	FECAL	RAIN
1/22/85 D	2400	2400	.08 1/20/85
			.04 1/21/85
3/6/85 D	3.6	3	.74 3/5/85
4/3/85 D	240	3	.63 4/1/85
			.03 4/2/85
			T 4/3/85
6/25/85 D	150	93	.09 6/24/85
			.53 6/25/85
7/29/85 D	43	23	1.70 7/27/85
9/3/85 D	93	43	.02 9/2/85
			T 9/3/85
9/18/85 D	43	43	
9/24/85 D	460	240	
10/30/85 D	2400	2400	
11/20/85 D	70	33	1.12 11/17/85
6/24/86 D		64	



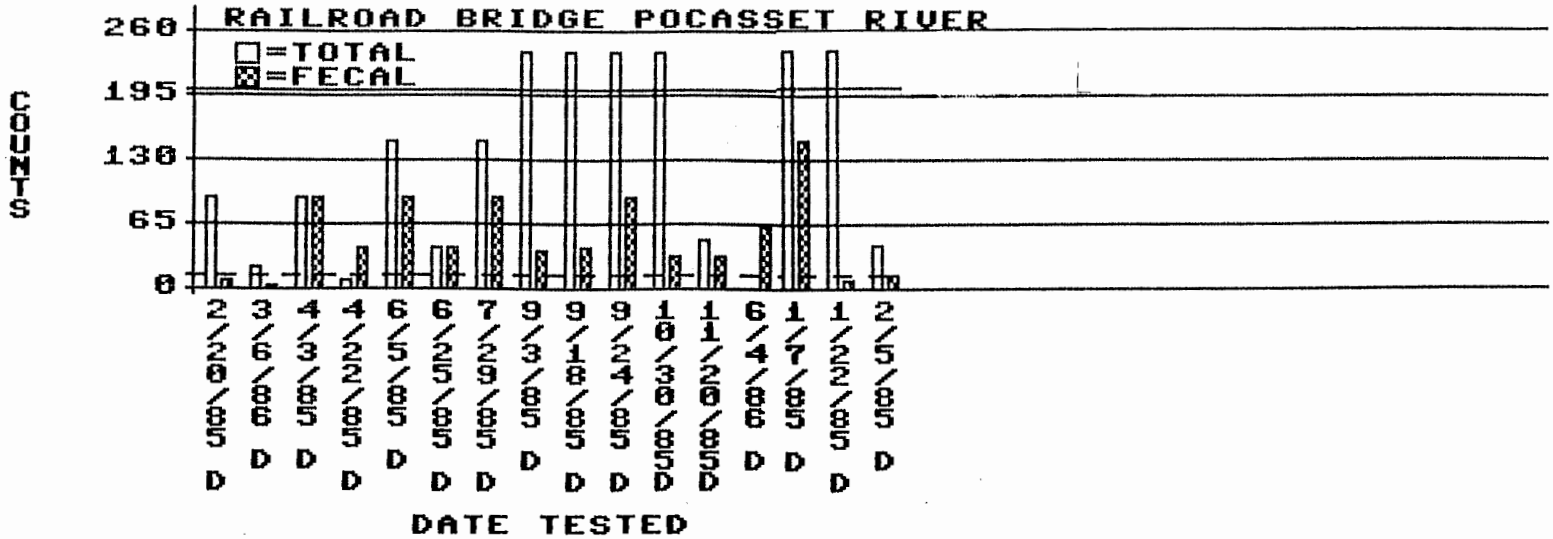
DATE	TOTAL	FECAL	RAIN
4/3/85 D	2400	11	.63 4/1/85 .03 4/2/85 T 4/3/85
4/22/85 D	150	43	.02



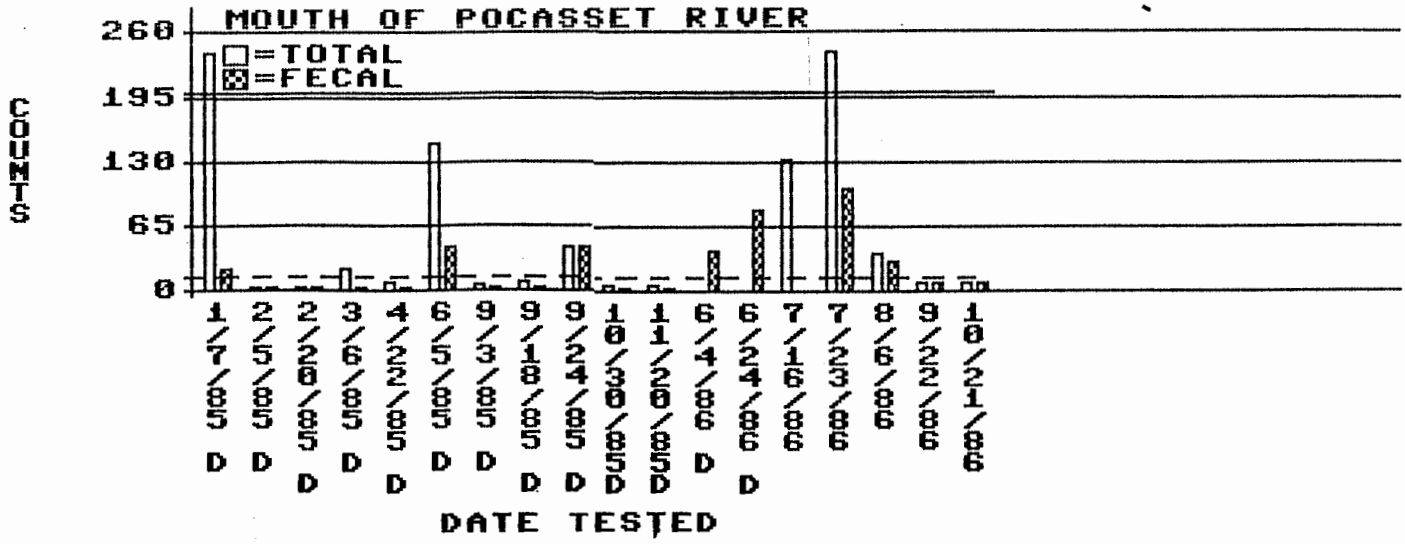
DATE	TOTAL	FECAL	RAIN
4/3/85 D	24	3	.63 4/1/85
			.03 4/2/85
			T 4/3/85
5/15/85 D	23	3	.33 5/12/85
			.45 5/12/85
6/25/85 D	93	93	.09 6/24/85
			.53 6/25/85
7/29/85 D	150	150	1.70 7/27/85
9/24/85 D	93	43	
6/24/86 D		30	
7/16/86	120		.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/17/86	140	60	.37 7/14/86
			.13 7/15/86
7/30/86	110	70	.10 7/27/86
			.44 7/29/86
			.85 7/30/86
8/11/86	20	20	.75 8/9/86
			.57 8/11/86
8/27/86	10	10	T
9/2/86	50	40	
9/22/86	CONF	20	T 9/21/86
			.04 9/22/86
9/23/86	60	10	T 9/21/86
			.04 9/22/86
10/8/86	10	10	.01 10/5/86
			T 10/6/86
10/16/86	90	90	.78 10/14/86
			.57 10/15/86
10/21/86	60	30	.31 10/18/86



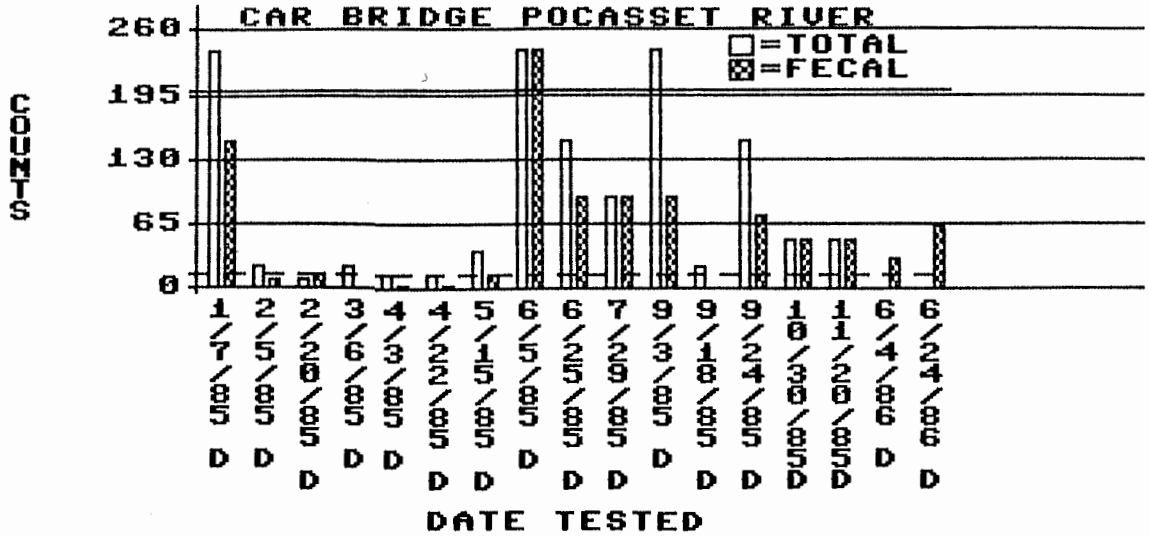
DATE	TOTAL	FECAL	RAIN
3/6/85 D	2400	1100	.06 3/3/85
			.74 3/5/85
4/3/85 D	240	7.3	.63 4/1/85
			.03 4/2/85
			T 4/3/85



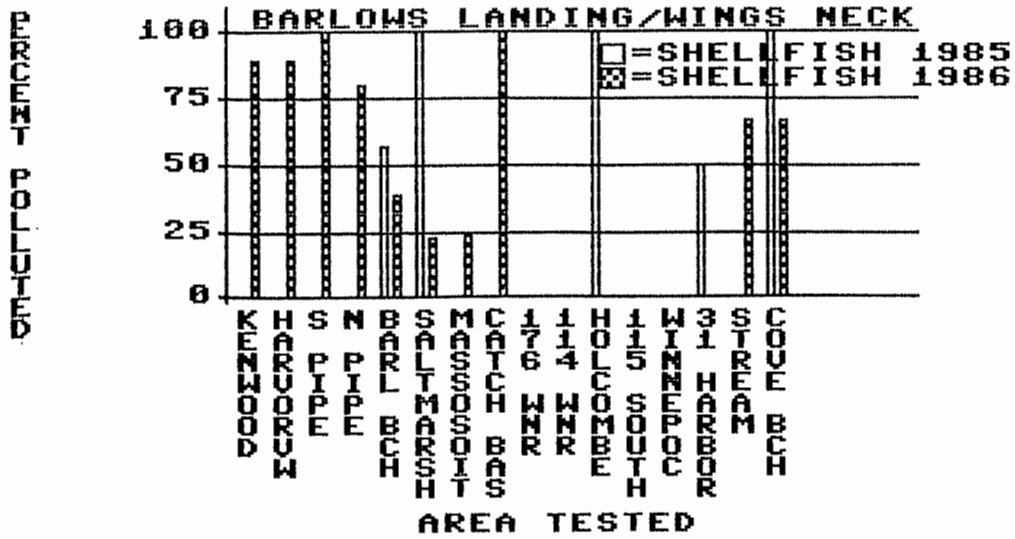
DATE	TOTAL	FECAL	RAIN
2/20/85 D	93	9.1	
3/6/85 D	23	3.6	.74 3/5/85
4/3/85 D	93	93	.63 3/1/85
			.03 3/2/85
			T 3/3/85
4/22/85 D	9.1	4.3	.02
6/5/85 D	150	93	.04 6/4/85
6/25/85 D	43	43	.09 6/24/85
			.53 6/25/85
7/29/85 D	150	93	1.70 7/27/85
9/3/85 D	1100	39	.02 9/2/85
			T 9/3/85
9/18/85 D	240	43	
9/24/85 D	460	93	
10/30/85 D	240	33	
11/20/85 D	49	33	1.12 11/17/85
			T 11/20/85
6/4/86 D		64	.15 6/1/86
			.02 6/2/86
			.06 6/3/86



DATE	TOTAL	FECAL	RAIN
1/7/85 D	2400	23	.18 1/5/85
2/5/85 D	3.6	3	.26 2/2/85
			.12 2/3/85
2/20/85 D	3	3	
3/6/85 D	9.1	3	.06 3/3/85
			.74 3/5/85
4/22/85 D	9.1	3	.02
6/5/85 D	150	43	.01 6/4/85
9/3/85 D	7.2	3	.02 9/2/85
			T 9/3/85
9/18/85 D	9.1	3	
9/24/85 D	43	43	
10/30/85 D	7.8	4.5	
11/20/85 D	7.8	4.5	1.12 11/17/85
			T 11/20/85
6/4/86 D		41	.02 6/2/86
			.06 6/3/86
6/24/86 D		82	
7/16/86	132		.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/23/86	664	104	.35 7/21/86
8/6/86	40	30	
9/22/86	10	10	T 9/21/86
			.04 9/22/86
10/21/86	10	10	.31 10/18/86

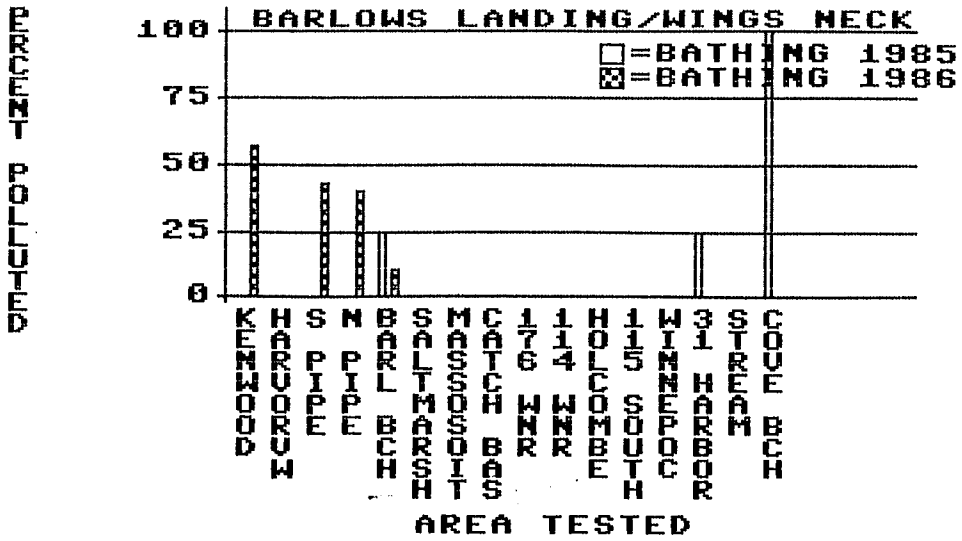


DATE	TOTAL	FECAL	RAIN
1/7/85 D	2400	2400	.18 1/5/85
2/5/85 D	23	9.1	.26 2/2/85
			.12 2/3/85
2/20/85 D	9.1	3.6	
3/6/85 D	23	3	.06 3/3/85
			.74 3/5/85
4/3/85 D	15	3	.63 4/1/85
			.03 4/2/85
			T 4/3/85
4/22/85 D	15	3.6	.02
5/15/85 D	39	14	.33 5/12/85
			.45 5/13/85
6/25/85 D	150	39	.09 6/24/85
			.53 6/25/85
7/29/85 D	93	93	1.70 7/27/85
9/3/85 D	1100	93	.02 9/2/85
			T 9/3/85
9/18/85 D	23	2.6	
9/24/85 D	150	75	
10/30/85 D	49	49	
11/20/85 D	49	49	1.12 11/17/85
			T 11/20/85
6/4/86 D		30	.02 6/2/86
			.06 6/3/86
6/24/86 D		64	



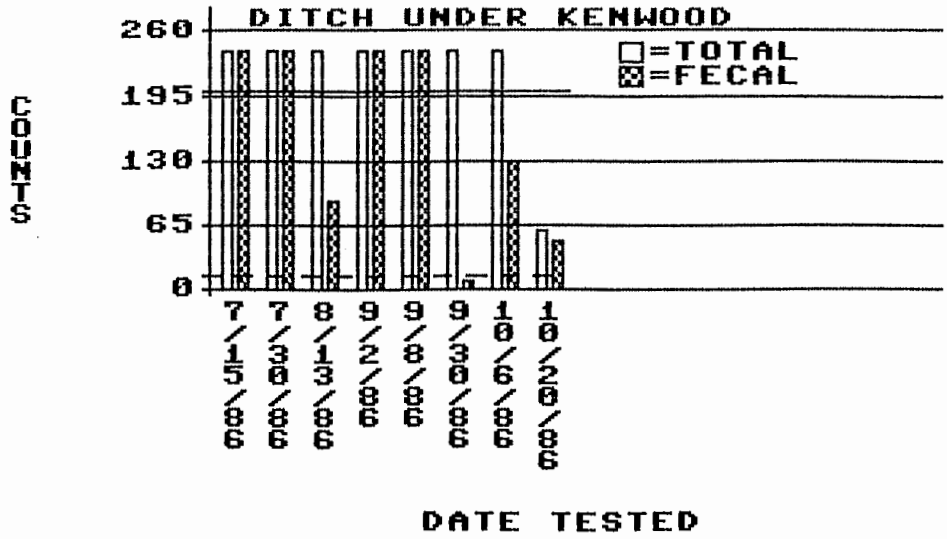
BARLOWS LANDING/ WINGS NECK

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Kenwood Ditch	Not Tested		7	89%
Harborivew Ditch	Not Tested		5	80%
South Pipe	Not Tested		7	89%
North Pipe	Not Tested		5	100
Saltmarsh Culvert	5	100%	13	23%
Massosoit Beach	Not Tested		4	25%
Catch Basin Bar. Land Rd.	Not Tested		1	100%
176 Wings Neck Road	1	0%	1	0%
114 Wings Neck Road	Not Tested		2	0%
Across from Holcombe between 2 stone piers	1	100%	3	0%
115 South Road	Not Tested		1	100%
Winnepoc	Not Tested		4	0%
31 Harbor Drive	4	25%	1	0%
Stream at 47 Wings Neck	Not Tested		6	67%
Cove Lane Beach	1	100%	6	67%

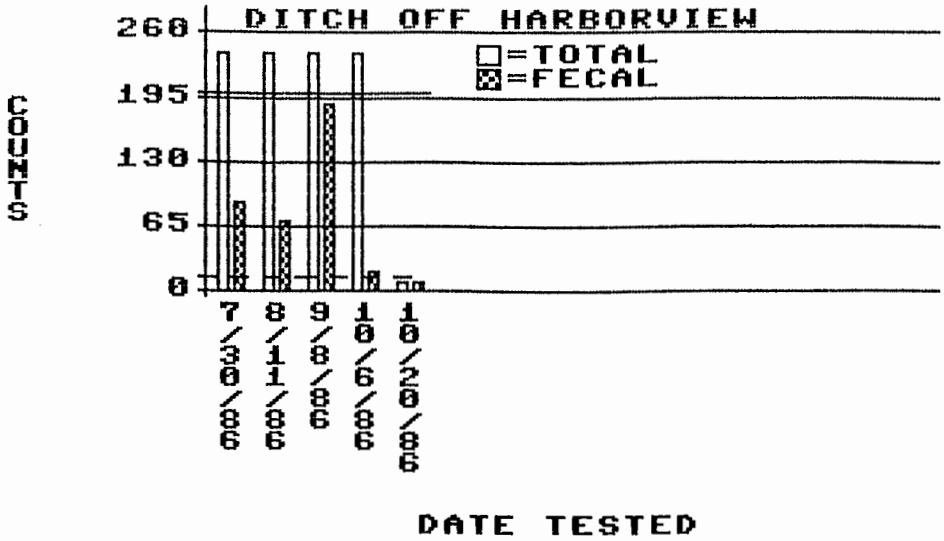


BARLOWS LANDING/ WINGS NECK

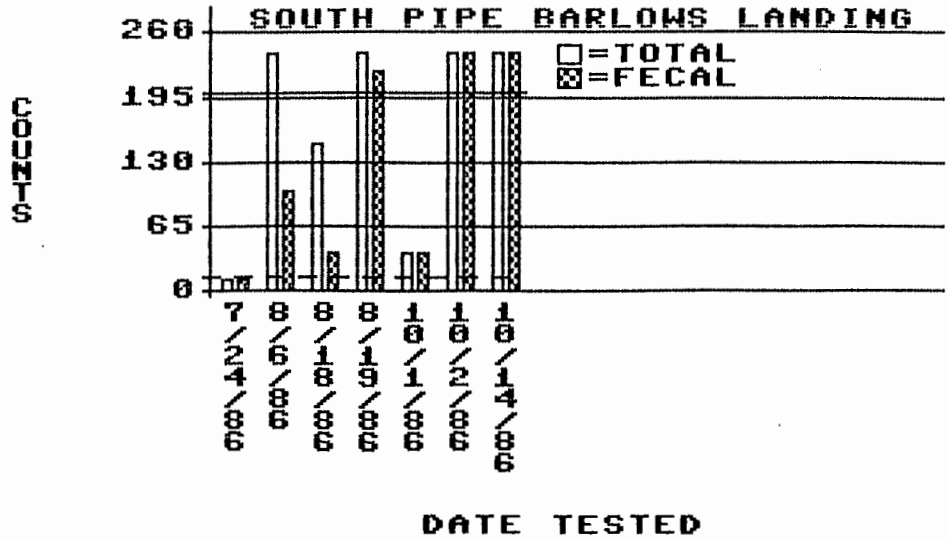
AREA TESTED:	# TESTS	% Polluted 1985	# TESTS	% Polluted 1986
Kenwood Ditch	Not Tested		7	57%
Harborivew Ditch	Not Tested		5	0%
South Pipe	Not Tested		7	43%
North Pipe	Not Tested		5	40%
Saltmarsh Culvert	5	0.	13	0%
Massosoit Beach	Not Tested		4	25%
Catch Basin Bar. Land Rd.	Not Tested		1	
176 Wings Neck Road	1	0%	1	0%
114 Wings Neck Road	Not Tested		2	0%
Across from Holcombe between 2 stone piers	1	0%	3	0%
115 South Road	Not Tested		1	0%
Winnepoc	Not Tested		4	0%
31 Harbor Drive	4	25%	1	0%
Stream at 47 Wings Neck	Not Tested		6	0%
Cove Lane Beach	1	100%	6	0%



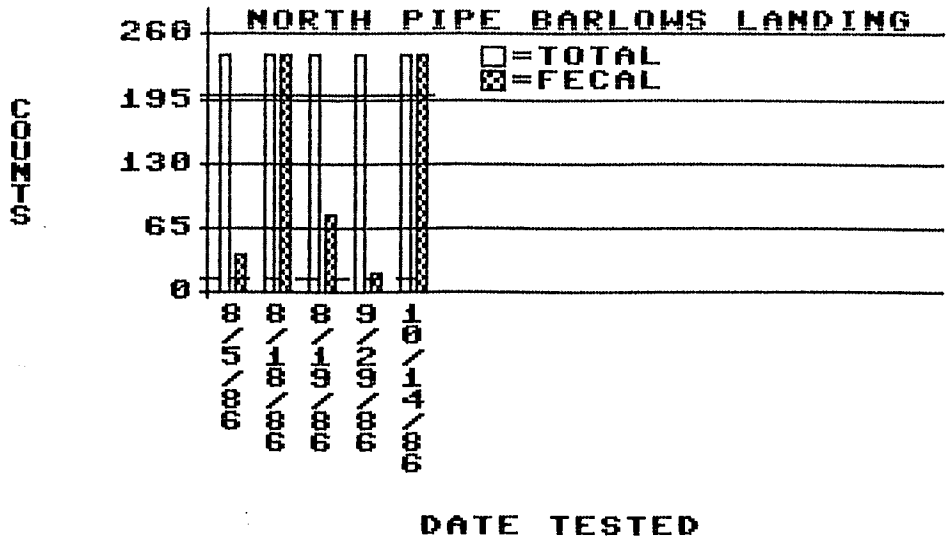
DATE	TOTAL	FECAL	RAIN
7/15/86	TNTC	TNTC	.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/30/86	TNTC	167	.44 7/29/86
			.85 7/30/85
8/13/86	470	420	.57 8/11/86
			.22 8/12/86
9/2/86	TNTC	570	.27 9/27/86
9/8/86	CONF	260	.06 9/8/86
9/30/86	CONF	10	
10/6/86	280	130	.65 10/4/86
			.01 10/5/86
			T 10/6/86



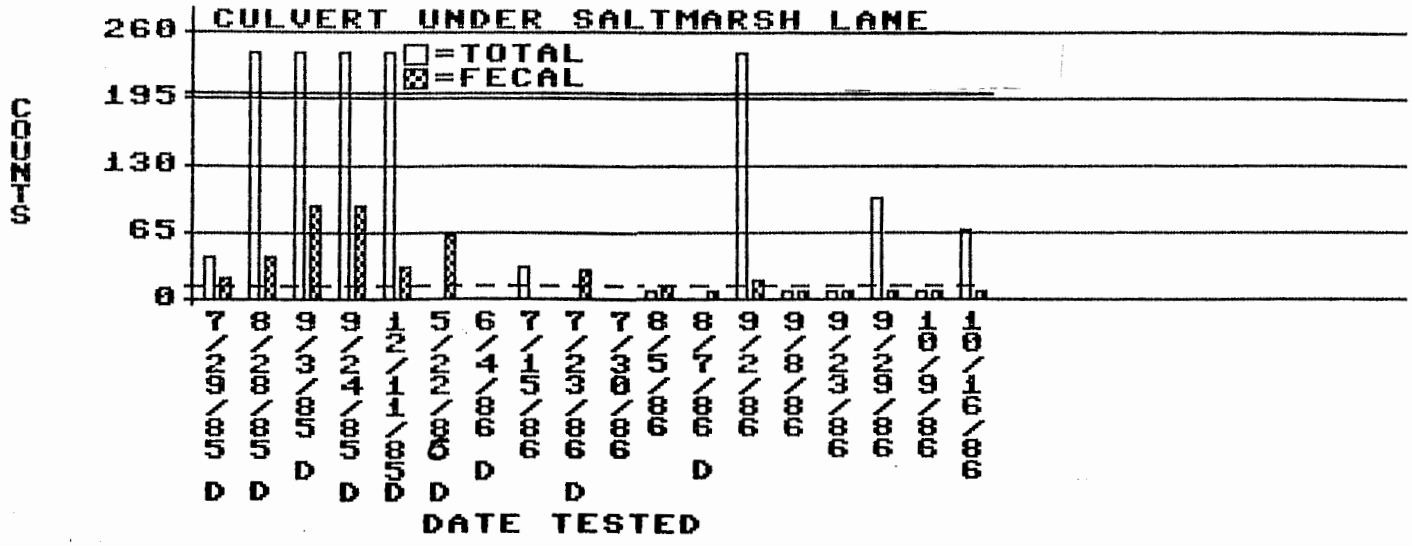
DATE	TOTAL	FECAL	RAIN
7/30/86	CONF	90	.44 7/29/86
			.85 7/30/86
8/11/86	CONF	70	.27 8/8/86
			.75 8/9/86
			.57 8/11/86
9/8/86	CONF	190	.06
10/6/86	CONF	20	.05 10/3/86
			.65 10/4/86
			.01 10/5/86
			T 10/6/86
10/20/86	10	10	.31 10/18/86



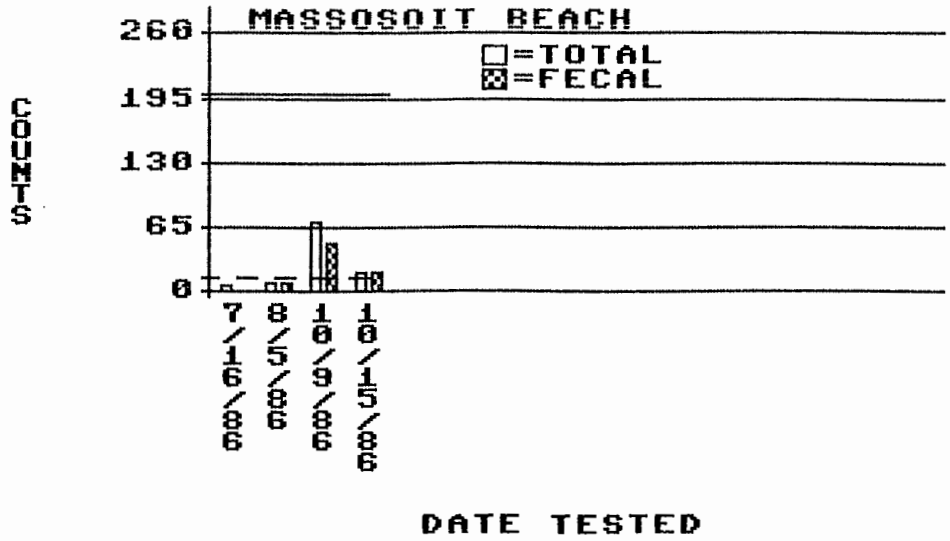
DATE	TOTAL	FECAL	RAIN
7/2486	12	11	.35 7/21/86
8/6/86	CONF	100	.58 8/3/86
8/18/86	150	40	.01 8/17/86
			.01 8/18/86
8/19/86	CONF	220	.01 8/17/86
			.01 8/18/86
			1.41 8/19/86
10/1/86	40	40	
10/2/86	TNTC	1860	.18
10/14/86	TNTC	820	.78



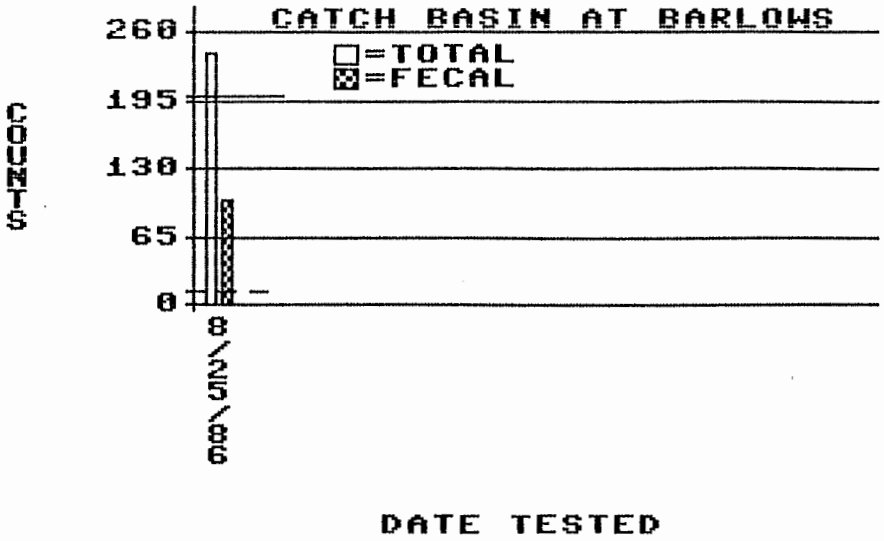
DATE	TOTAL	FECAL	RAIN
8/5/86	CONF	40	.58 8/3/86
8/18/86	CONF	TNTC	.01 8/17/86
			.01 8/18/86
8/19/86	CONF	80	.01 8/17/86
			.01 8/18/86
			1.41 8/19/86
9/29/86	CONF	20	
10/14/86	TNTC	3540	.78



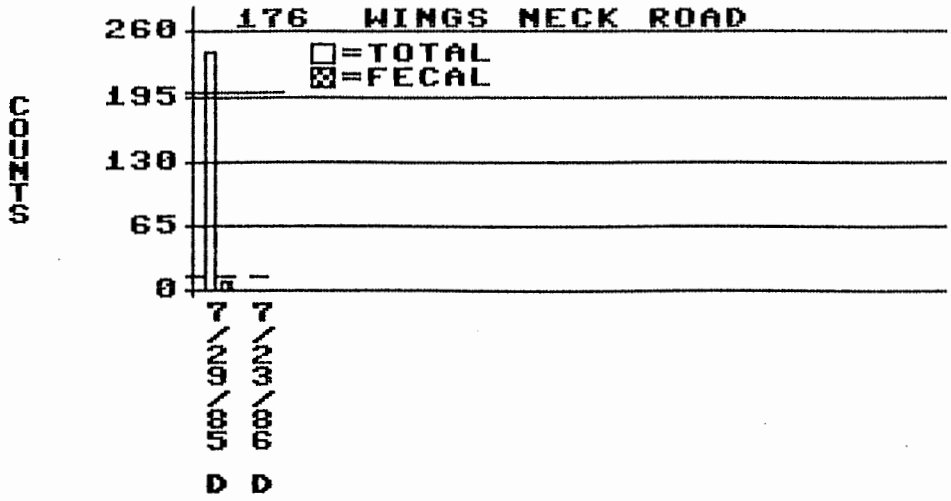
DATE	TOTAL	FECAL	RAIN
7/29/85 D	43	23	1.70 7/27/85
8/28/85 D	1100	43	.11 8/20/85
			4.19 8/26/85
			.38 8/27/85
9/3/85 D	240	93	.02 9/2/85
			T 9/3/85
9/24/85 D	2400	93	
12/11/85 D	540	33	
5/22/86 D		64	T 5/21/86
			.35 5/22/86
6/4/86 D		1.7	.02 6/2/86
			.06 6/3/86
7/15/86	32	1	.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/23/86 D		30	.35 7/21/86
7/30/86	1		.10 7/27/86
			.44 7/29/86
			.85 7/30/86
8/5/86	10	14	.58 8/3/86
8/7/86 D		10	
9/2/86	240	20	
9/8/86	10	10	.06
9/23/86	10	10	.04 9/22/86
			.02 9/23/86
9/29/86	100	10	
10/9/86	10	10	
10/16/86	70	10	.78 10/14/86
			.57 10/15/86



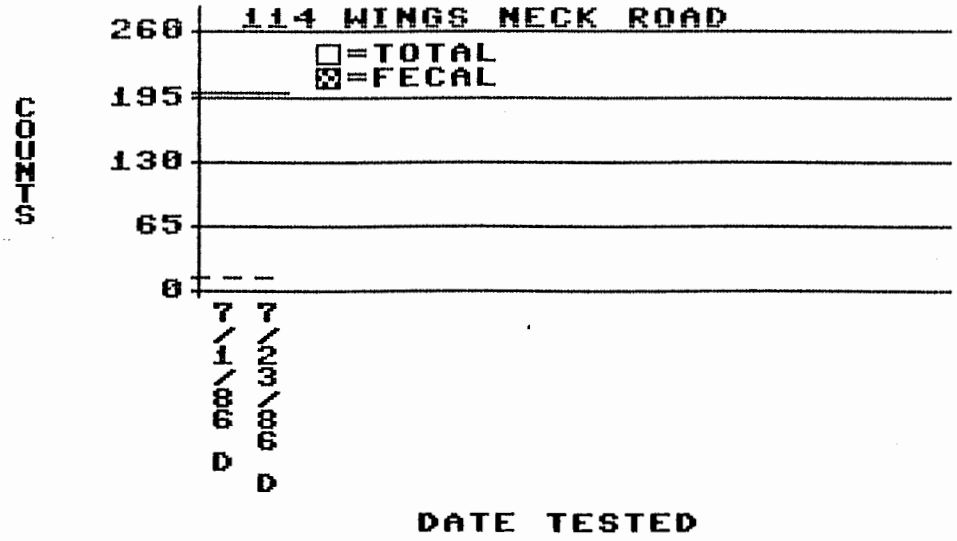
DATE	TOTAL	FECAL	RAIN
7/16/86	8	0	.75 7/13/86
			.37 7/14/86
			.13 7/15/86
8/5/86	10	10	.58 8/3/86
10/9/86	70	50	
10/15/86	20	20	.78 10/14/86
			.57 10/15/86



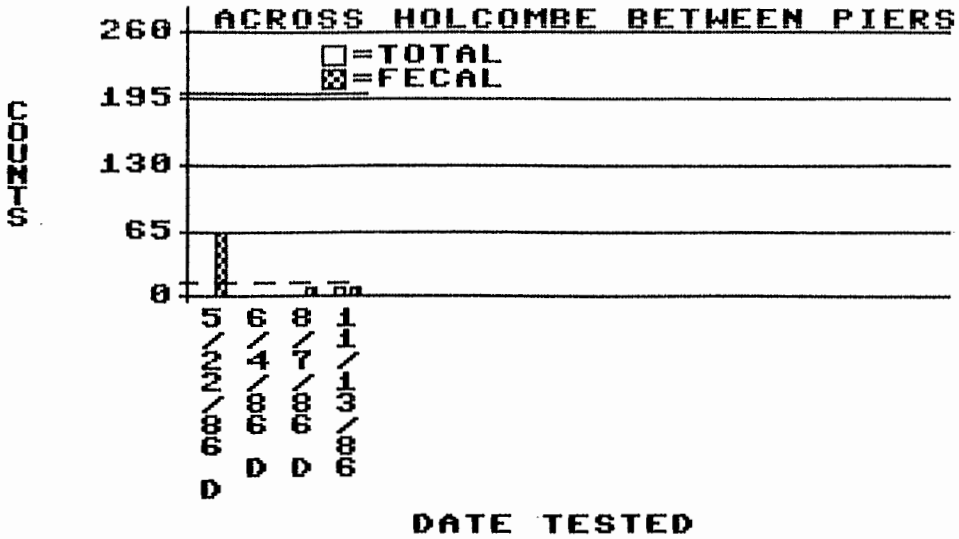
DATE	TOTAL	FECAL	RAIN
8/25/86	TNTC	100	.76 8/22/86 .17 8/24/86



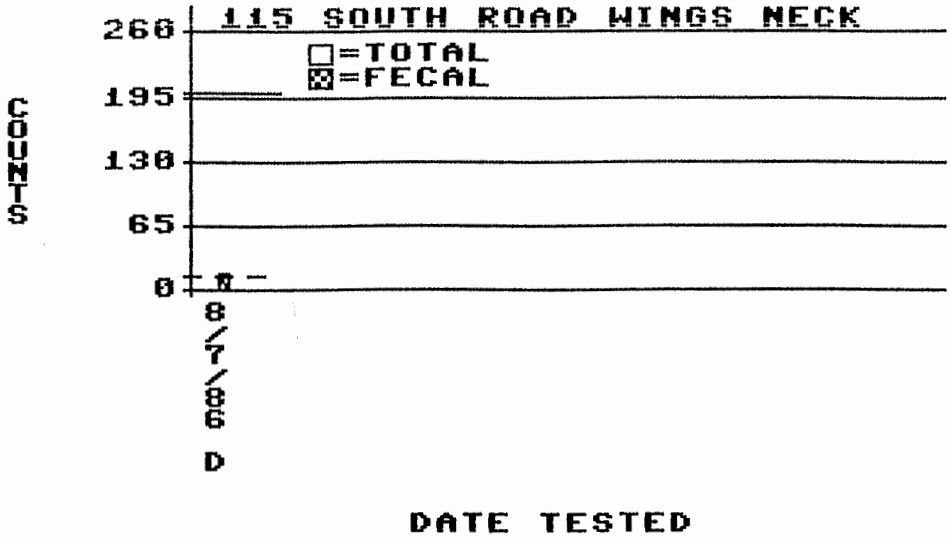
DATE	TOTAL	FECAL	RAIN
7/29/85 D	240	9.1	1.70 7/27/85
7/23/86 D		1.7	.35 7/21/86



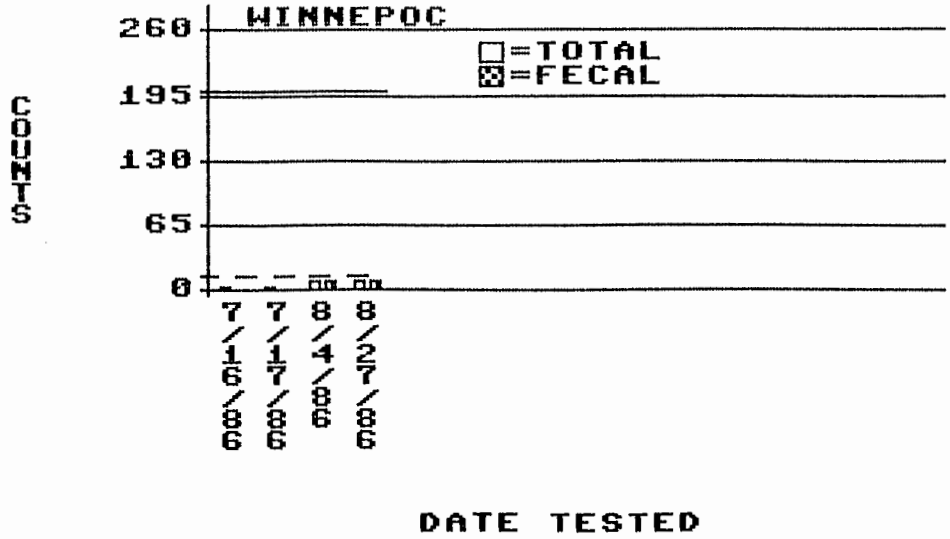
DATE	TOTAL	FECAL	RAIN
7/1/86 D		1.7	
7/23/86 D		1.7	.35 7/21/86



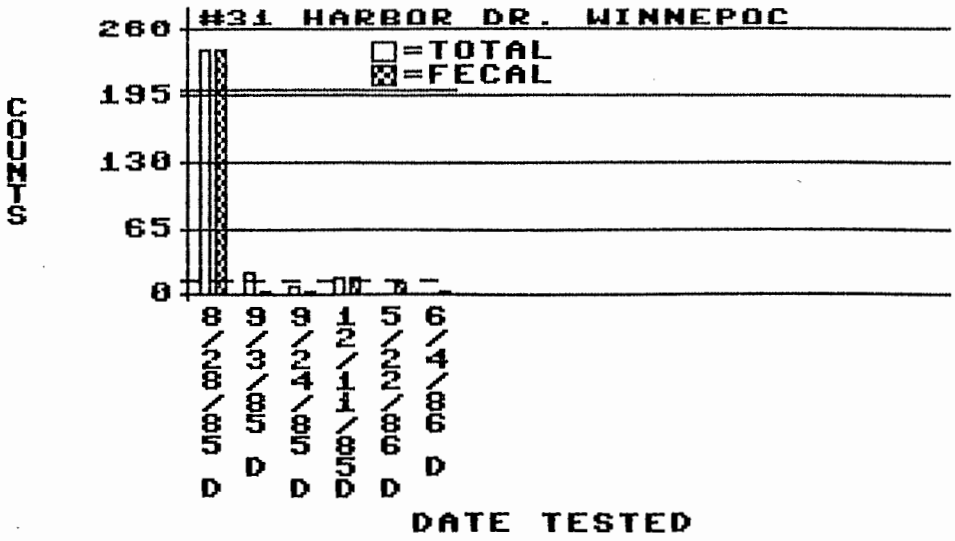
DATE	TOTAL	FECAL	RAIN
5/22/85 D		64	T 5/21/86 .35 5/22/86
6/4/86 D		1.7	.02 6/2/86 .06 6/3/86
8/7/86 D		8.2	
11/13/86	10	10	.92 11/12/86



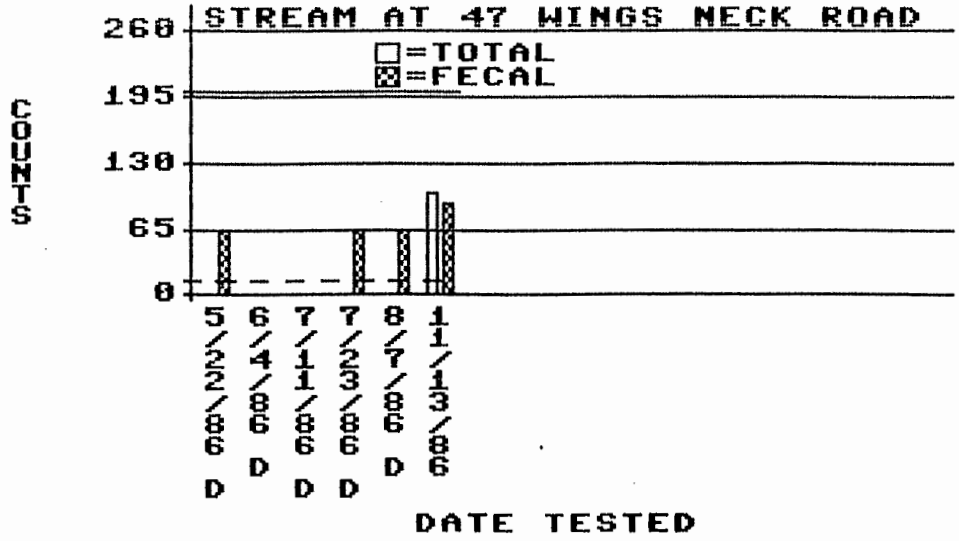
DATE	TOTAL	FECAL	RAIN
8/7/86 D		18	



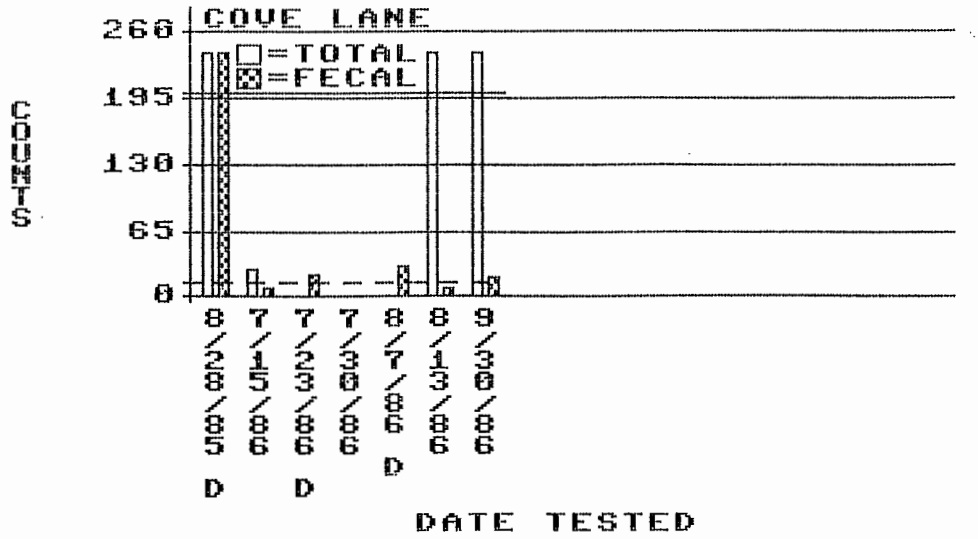
DATE	TOTAL	FECAL	RAIN
7/16/86	4		.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/17/86	4	2	.75 7/13/86
			.37 7/14/86
			.3 7/15/86
8/4/86	10	10	.58 8/3/86
8/27/86	10	10	T



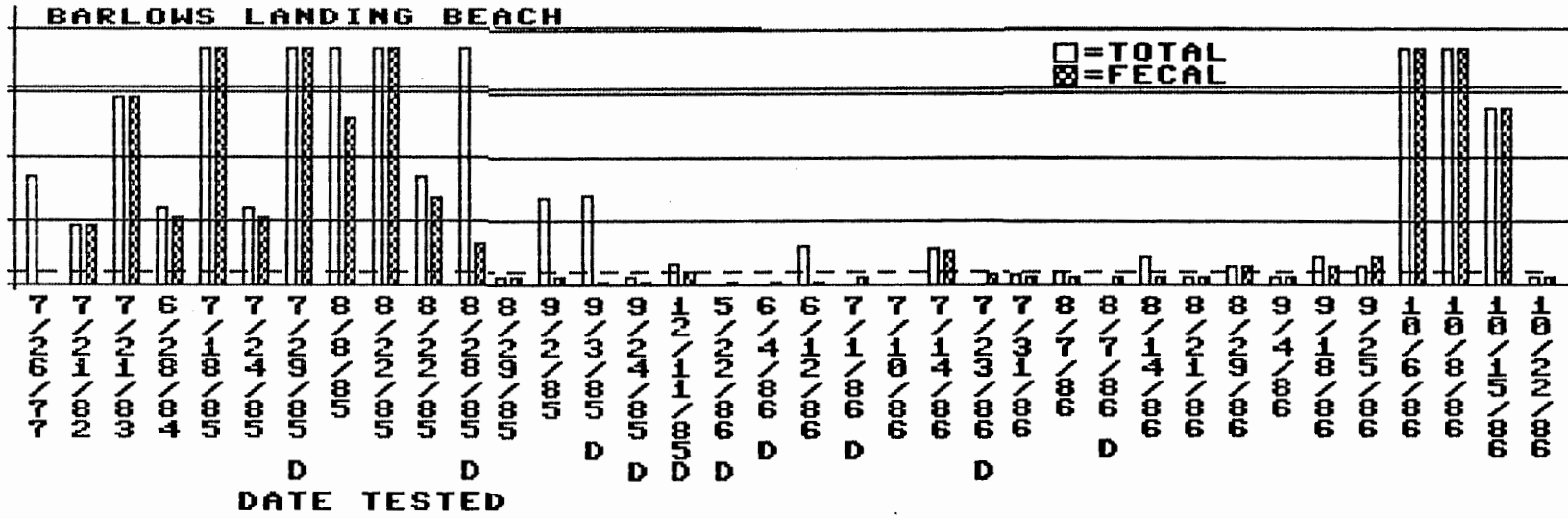
DATE	TOTAL	FECAL	RAIN
8/28/85 D	2400	240	.11 8/25/85 4.29 8/26/85 .38 8/27/85
9/3/85 D	23	3.6	.02 9/2/85 T 9/3/85
9/24/85 D	9.1	3.6	
12/11/85 D	17	17	
6/4/86 D		3.6	.15 6/1/86 .02 6/2/86 .06 6/3/86



DATE	TOTAL	FECAL	RAIN
5/22/86		64	T 5/21/86
			.35 5/22/86
6/4/86 D		1.7	.15 6/1/86
			.02 6/2/86
			.06 6/3/86
7/11/86 D		1.7	T 7/9/86
7/23/86 D		64	.35 7/21/86
8/7/86 D		64	
11/13/86	100	90	.92 11/12/86

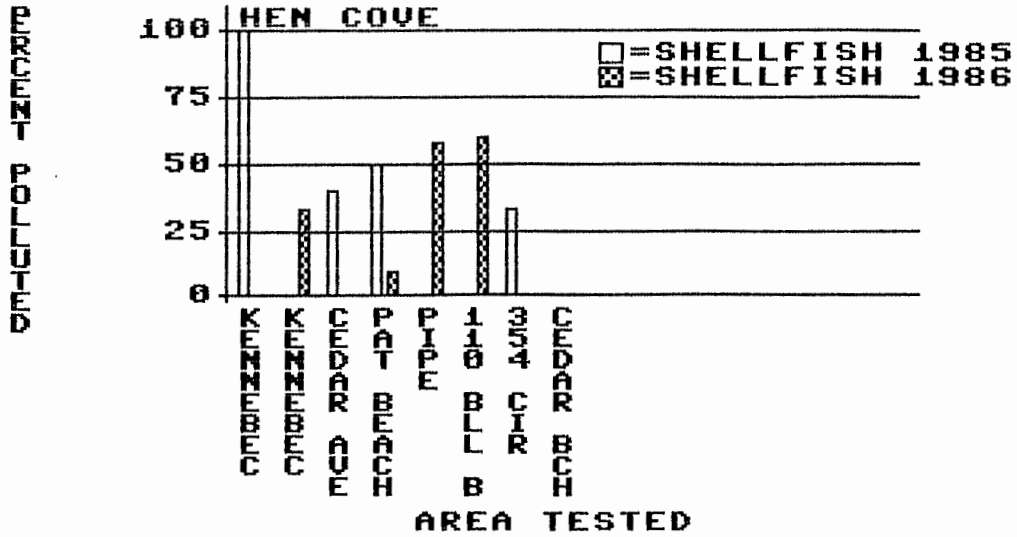


DATE	TOTAL	FECAL	RAIN
8/28/85D	2400	240	4.19 8/26/85
			.38 8/27/85
7/15/86	116	77	.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/23/86D		23	.35 7/21/86
7/30/86	10	10	.44 7/29/86
			.85 7/30/86
8/7/86D		30	
8/13/86	CONF	10	.57 8/11/86
			.22 8/12/86
9/30/86	CONF	20	


BARLOWS LANDING BEACH
=TOTAL
=FECAL
7/26/77
7/21/82
7/21/83
6/28/84
7/18/85
7/24/85
7/29/85 D
8/8/85
8/22/85
8/28/85 D
8/29/85
9/2/85
9/3/85 D
9/24/85 D
12/11/85 D
5/22/86 D
6/4/86 D
6/12/86
7/1/86 D
7/10/86
7/14/86
7/23/86 D
7/31/86
8/7/86
8/7/86 D
8/14/86
8/21/86
8/29/86
9/4/86
9/18/86
9/25/86
10/6/86
10/8/86
10/15/86
10/22/86
DATE TESTED

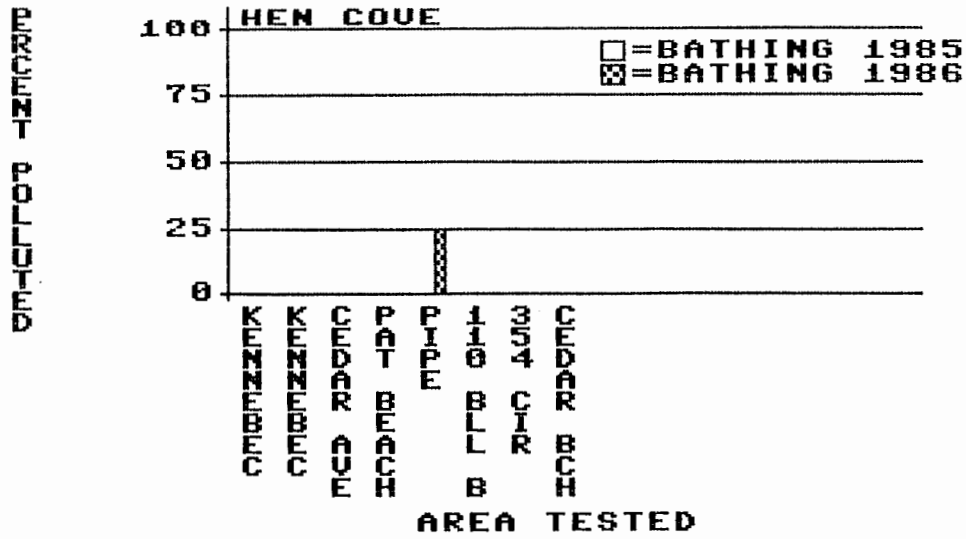
DATE	TOTAL	FECAL	RAIN
7/26/77	110		
7/21/82	60	60	
7/21/83	190	190	
6/28/84	80	70	
7/18/85	330	280	T 7/15/85
			.11 7/16/85
			1.54 7/17/85
7/24/85	80	70	.52 7/22/85
7/29/85 D	240	240	1.70 7/27/85
8/8/85	360	170	.78 8/8/85
8/22/85	TNTC	1800	.05 8/20/85
			.01 8/22/85
8/22/85	110	90	.05 8/20/85
			.01 8/22/85
8/28/85 D	1100	43	.11 8/25/85
			4.19 8/26/85
			.38 8/27/85
8/29/85	10	10	.38 8/27/85
9/2/85	90	10	.02
9/3/85 D	93	3.6	.02 9/2/85
			T 9/3/85
9/24/85 D	9.1	3.6	
12/11/85 D	22	14	
5/22/86 D		3.6	T 5/21/85
			.35 5/22/85
6/4/86 D		3.6	.02 6/2/86
			.06 6/3/86
6/12/86	40	3	.16 6/11/86
			.87 6/12/86
7/1/86 D		8.2	
7/10/86	1	1	T 7/9/86
7/14/86	38	34	.75 7/13/86
			.37 7/14/86
7/23/86 D		11	.35 7/21/86
7/31/86	11	8	.44 7/29/86
			.85 7/30/76
			.09 7/31/86
8/7/86	14	8	
8/7/86 D		8.2	
8/14/86	30	10	.57 8/11/86
			.22 8/12/86
8/21/86	10	10	1.41
8/29/86	20	20	T 8/27/86
			.11 8/28/86
			.27 8/29/86

9/4/86	10	10	.09
9/18/86	30	20	.66 9/16/86
9/25/86	20	30	.02 9/23/86
			.01 9/24/86
			T 9/25/86
10/6/86	1480	1410	.65 10/4/86
			.01 10/5/86
			T 10/6/86
10/8/86	340	340	.01 10/5/86
			T 10/6/86
10/15/86	180	180	.78 10/14/86
			.57 10/15/86
10/22/86	10	10	.31 10/18/86
			T 10/22/86



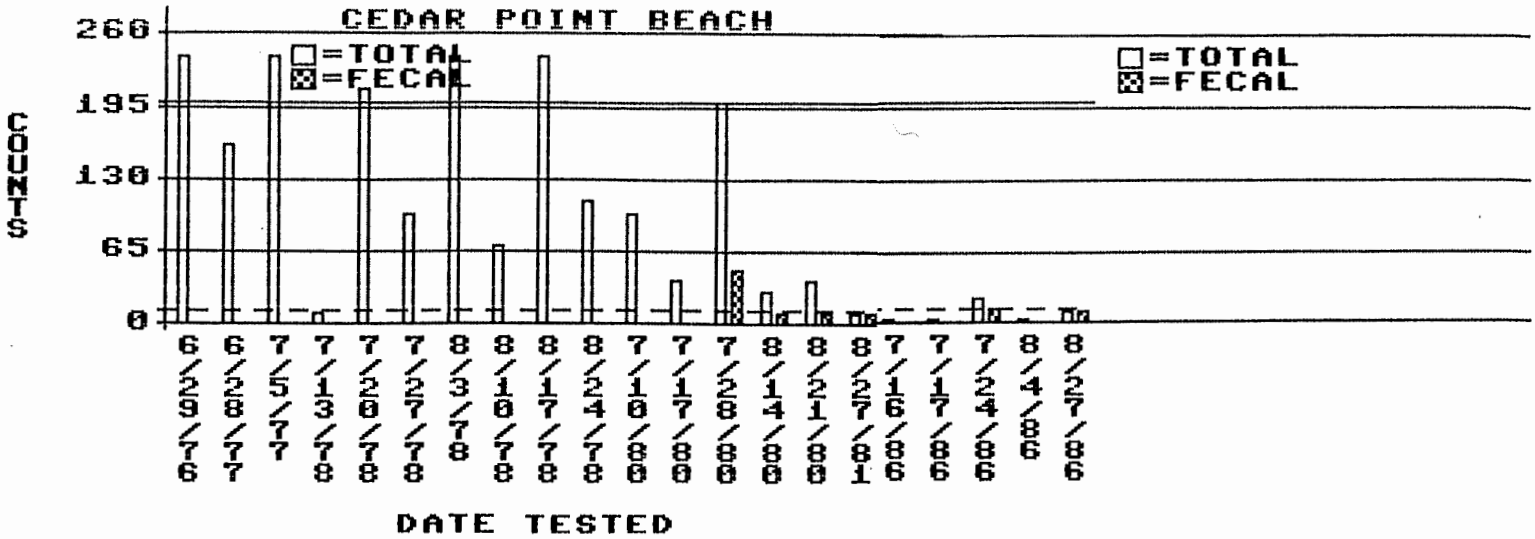
HEN COVE

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Ft. of Kennebec Pocasset Harbor Side	1	100%	2	0%
Ft. of Kennebec Hen Cove Side	1	0%	3	33%
Cedar Avenue	5	40%	1	0%
Patuisset Beach	2	50%	20	10%
Patuisset Pipe	Not Tested		12	58%
110 Bell Bouy Road	1	0%	5	60%
354 Circuit Avenue	3	33%	Not Tested	
Cedar Point Beach	Not Tested		4	0%

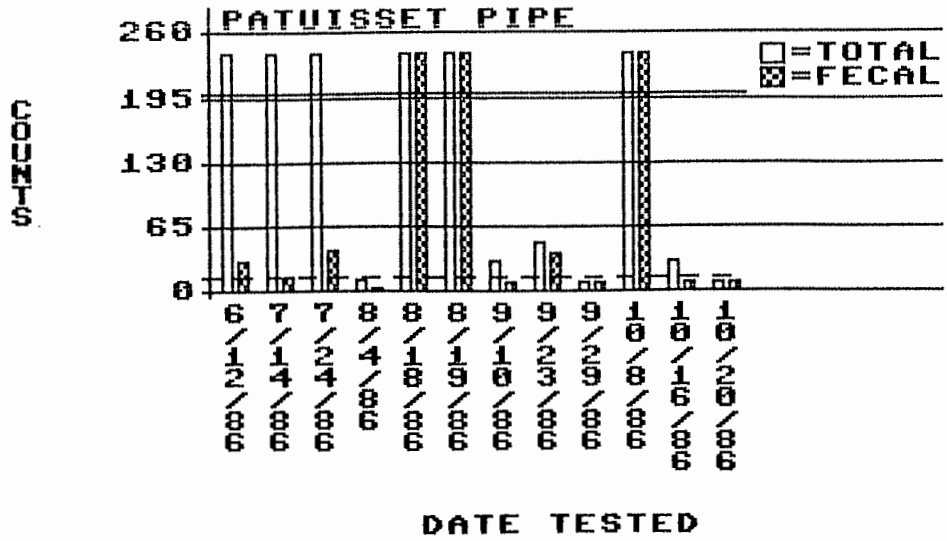


HEN COVE

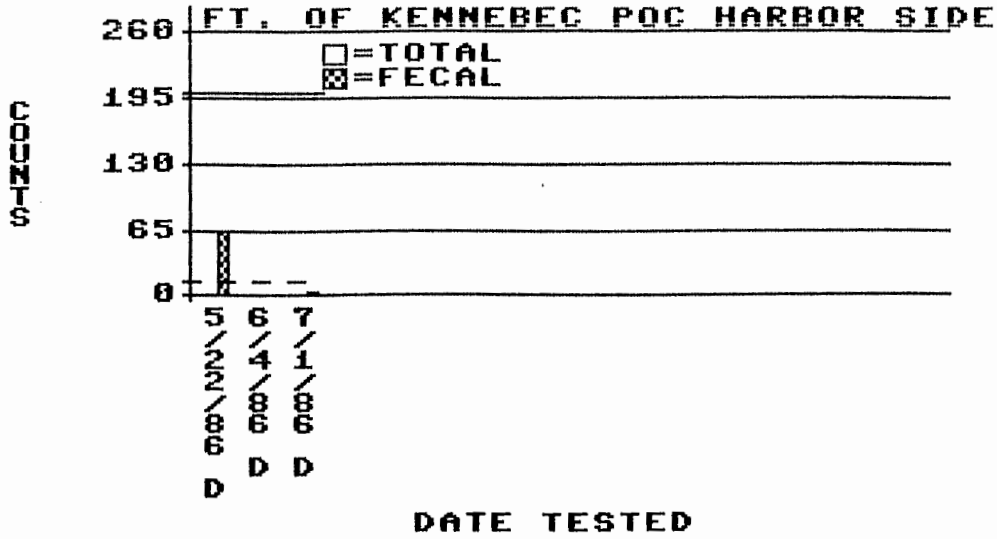
AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Ft. of Kennebec Pocasset Harbor Side	1	0%	2	0%
Ft. of Kennebec Hen Cove Side	1	0%	3	0%
Cedar Avenue	5	0%	1	0%
Patuisset Beach	2	0%	20	0%
Patuisset Pipe	Not Tested		12	25%
110 Bell Bouy Road	1	0%	5	0%
354 Circuit Avenue	3	0%	Not Tested	
Cedar Point Beach	Not Tested		4	0%



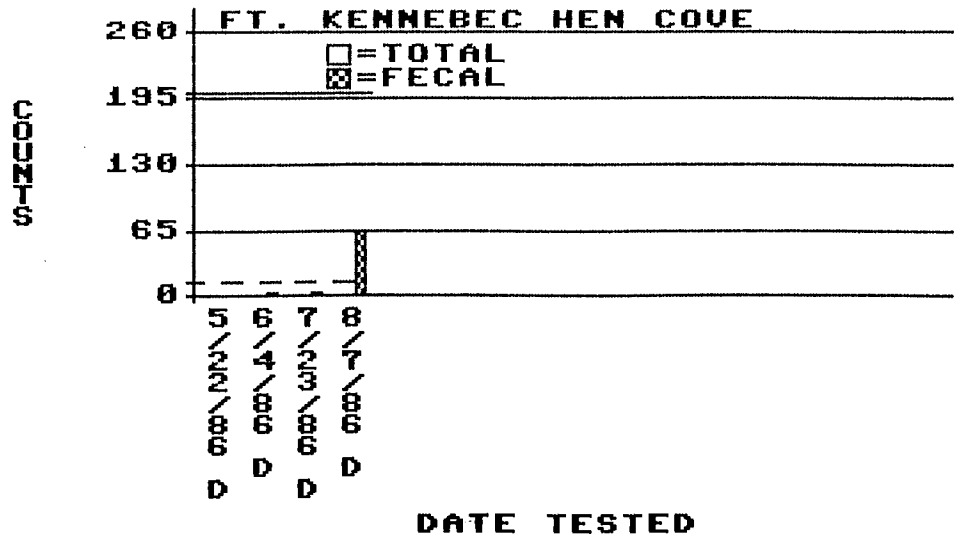
DATE	TOTAL	FECAL	RAIN
6/29/76	280		
6/28/77	160		
7/5/77	1240		
7/13/78	10		
7/20/78	210		
7/27/78	100		
8/3/78	700		
8/10/78	70		
8/17/78	330		
8/24/78	110		
7/10/80	100		
7/17/80	40		
7/28/80	198		
8/14/80	30	10	
8/21/80	40	10	
8/27/81	10	10	
7/16/86	4	0	.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/17/86	4	0	.75 7/13/86
			.37 7/14/86
			.13 7/15/86
8/4/86	24	13	.58 8/3/86
8/27/86	10	10	T



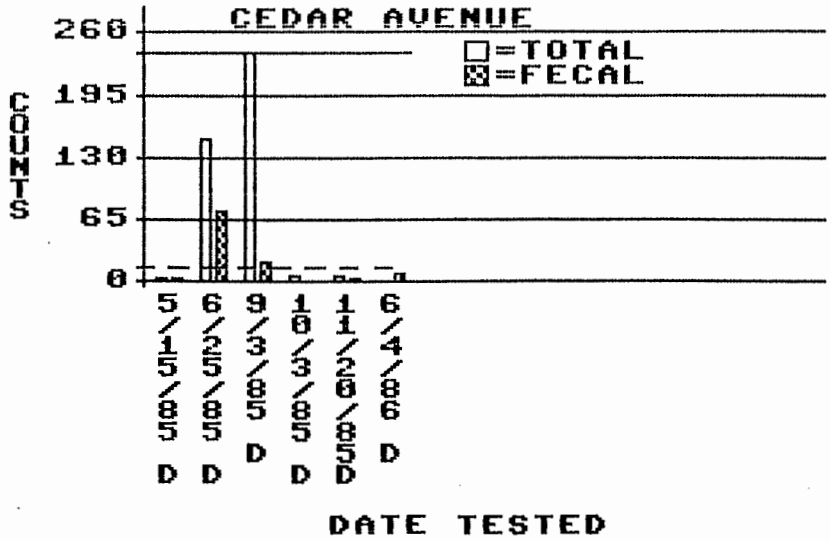
DATE	TOTAL	FECAL	RAIN
6/12/86	TNTC	32	.16 6/11/86
			.87 6/12/86
7/14/86	TNTC	16	T 7/12/86
			.75 7/13/86
			.37 7/14/86
7/24/86	TNTC	42	.35 7/21/86
8/4/86	12	4	.58 8/3/86
8/18/86	CONF	2060	.01 8/17/86
			.01 8/18/86
8/19/86	CONF	300	.01 8/17/86
			.01 8/18/86
			1.41 8/19/86
9/10/86	30	10	.06 9/8/86
9/23/86	50	40	T 9/21/86
			.04 9/22/86
			.02 9/23/86
9/29/86	10	10	
10/8/86	480	250	T 10/6/86
10/16/86	30	10	.78 10/14/86
			.57 10/15/86
10/20/86	10	10	.31 10/18/86



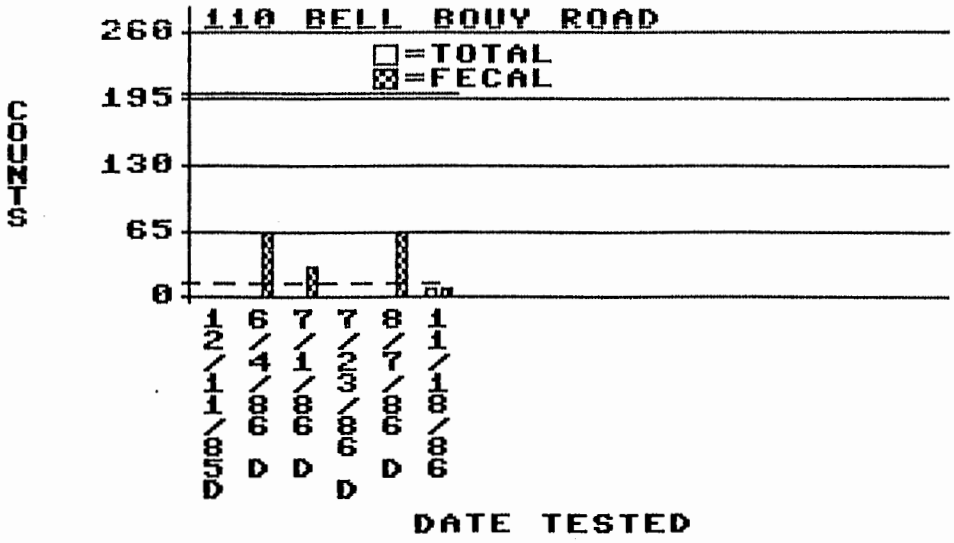
DATE	TOTAL	FECAL	RAIN
5/22/85 D		64	T 5/21/86 .35 5/22/86
6/4/86 D		1.7	.02 6/2/86 .06 6/3/86
7/1/86 D		3.6	



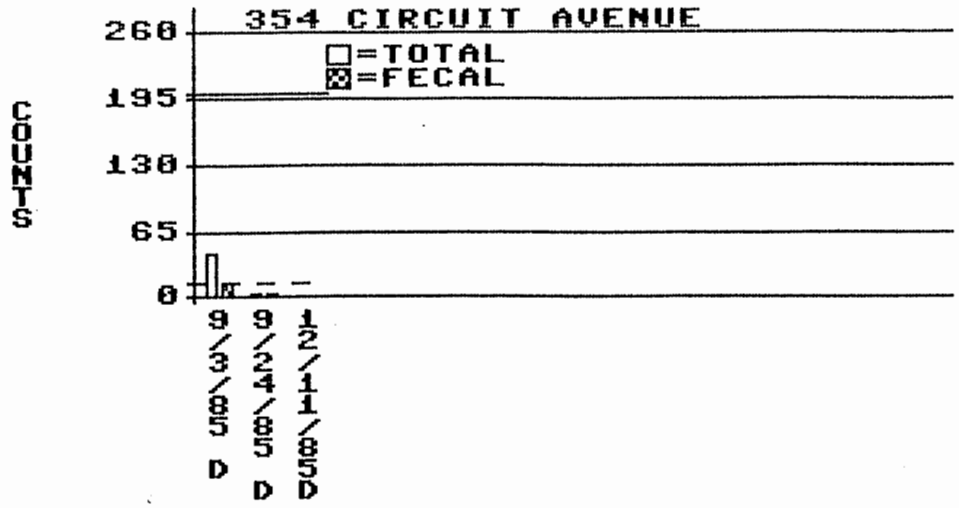
DATE	TOTAL	FECAL	RAIN
5/22/85 D		1.7	T 5/21/86
			.35 5/22/86
6/4/86 D		3.6	.02 6/2/86
			.06 6/3/86
7/23/86 D		3.6	.35 7/21/86
8/7/86 D		64	



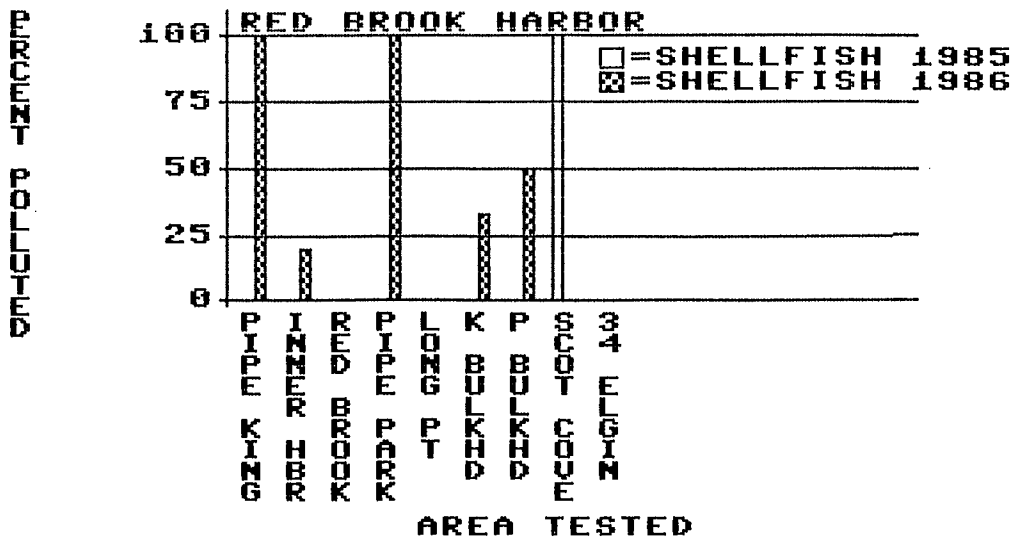
DATE	TOTAL	FECAL	RAIN
5/15/85 D	3	3	.33 5/12/85
			.45 5/13/85
6/25/85 D	150	75	.09 6/24/85
			.53 6/25/85
9/3/85 D	240	21	.02 9/2/85
			T 9/2/85
10/3/85 D	6.8	2	.04
11/20/85 D	7.8	4.5	1.12 11/17/85
			T 11/20/85
6/4/86 D		11	.15 6/1/86
			.02 6/2/86
			.06 6/3/86



DATE	TOTAL	FECAL	RAIN
12/11/85 D	2	2	
6/4/86 D		64	.15 6/1/86
			.02 6/2/86
			.06 6/3/86
7/1/86 D		30	
7/23/86 D		1.7	.35 7/21/86
8/7/86 D		64	
11/18/86	10	10	1.72

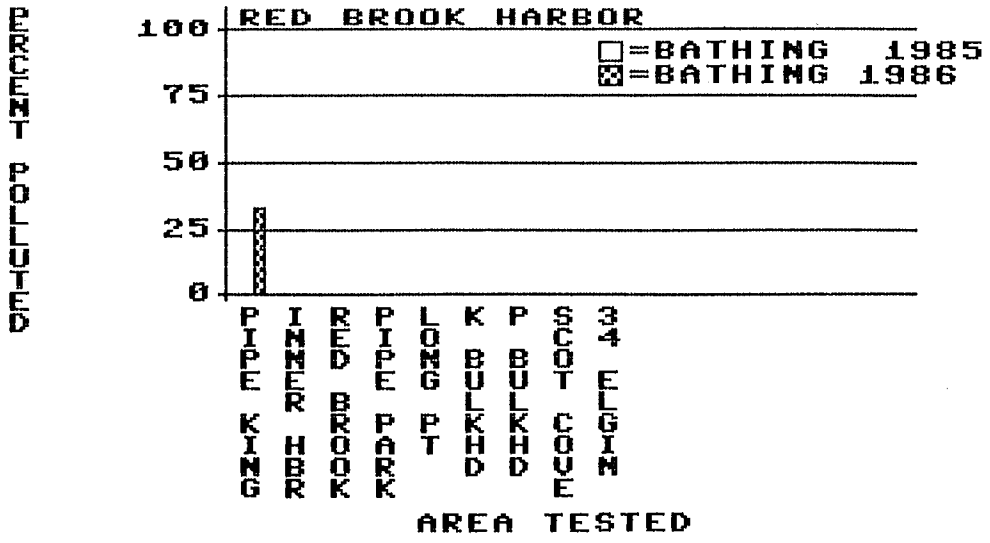


DATE	TOTAL	FECAL	RAIN
9/3/85 D	43	15	.02 9/2/85 T 9/3/85
9/24/85 D	3.6	3	
12/11/85 D	2	2	



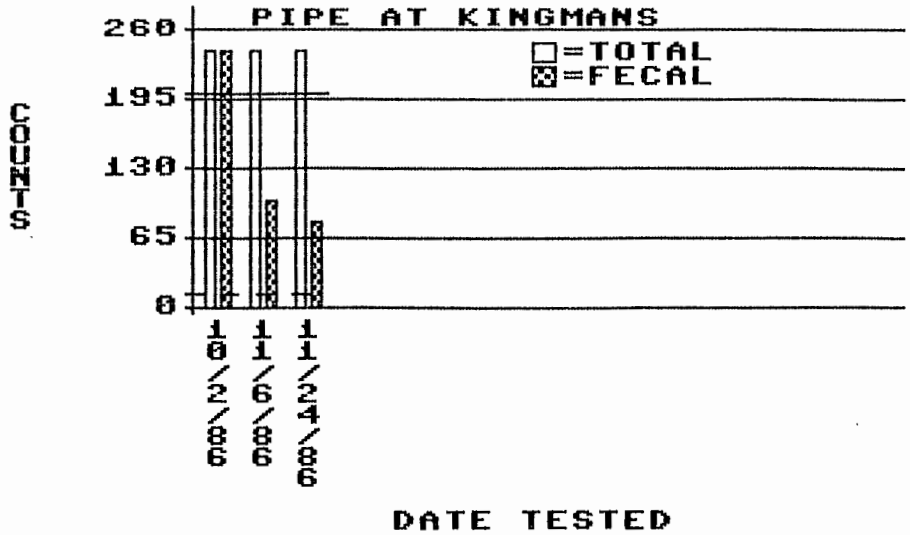
RED BROOK HARBOR

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Pipe at Kingman Marine	Not Tested		3	100%
Kingman's Inner Harbor	Not Tested		4	20%
Red Brook Pond	Not Tested		3	0%
Pipe at Parkers Railway	Not Tested		1	100%
Long Point	1	0%	3	0%
Kingman's Bulkhead	Not Tested		4	33%
Parker's Bulkhead	Not Tested		6	50%
Scotch House Cove	1	100%	4	0%
34 Elgin Road	1	0%	4	0%

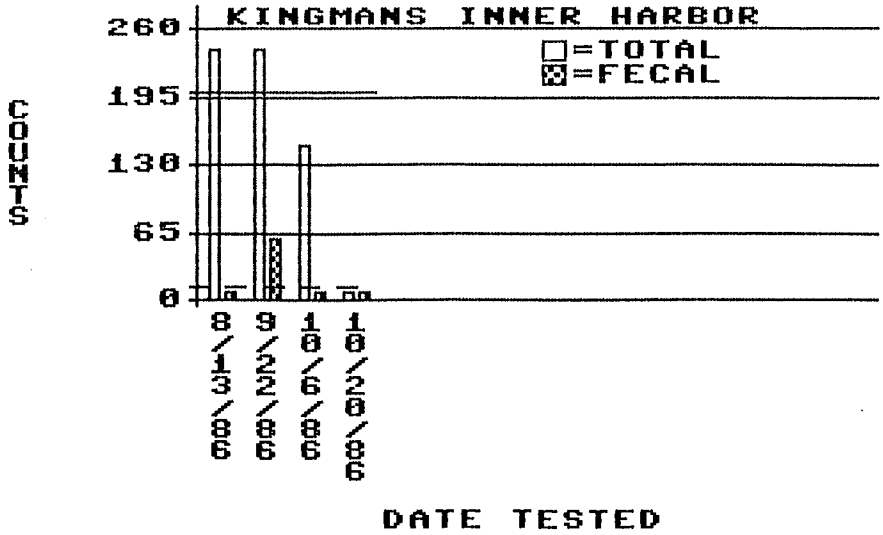


RED BROOK HARBOR

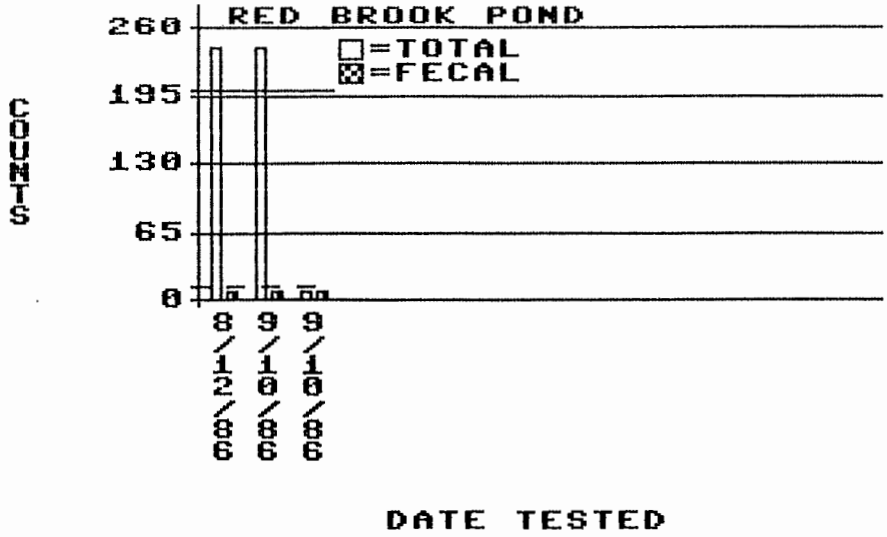
AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Pipe at Kingman Marine	Not Tested		3	33%
Kingman's Inner Harbor	Not Tested		4	0%
Red Brook Pond	Not Tested		3	0%
Pipe at Parkers Railway	Not Tested		1	0%
Long Point	1	0%	3	0%
Kingman's Bulkhead	Not Tested		4	0%
Parker's Bulkhead	Not Tested		6	0%
Scotch House Cove	1	0%	4	0%
34 Elgin Road	1	0%	4	0%



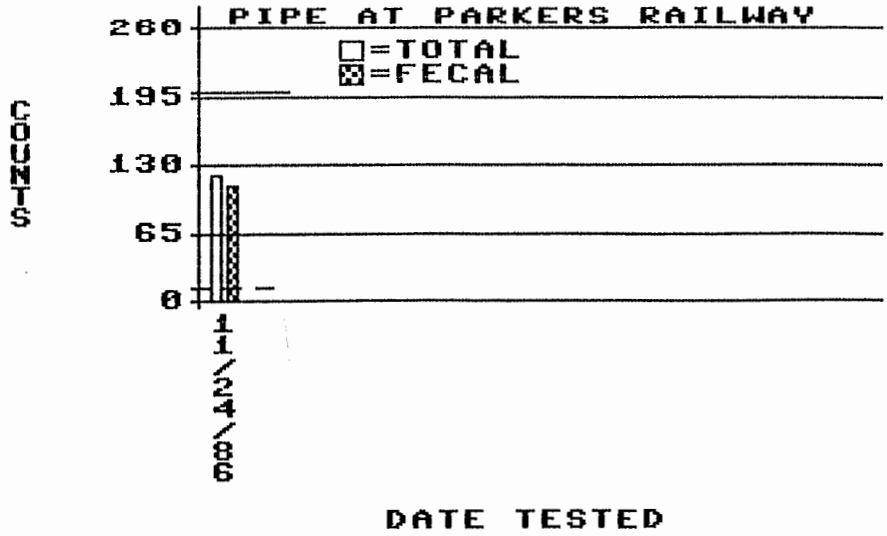
DATE	TOTAL	FECAL	RAIN
10/2/86	TNTC	1370	.18
11/6/86	1520	100	.80 11/5/86
			.08 11/6/86
11/24/86	760	80	.34



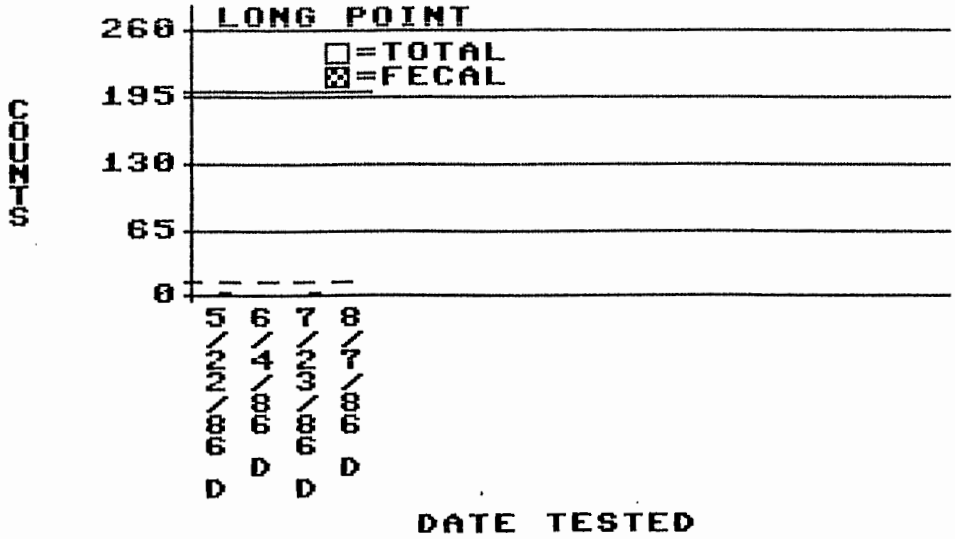
DATE	TOTAL	FECAL	RAIN
8/13/86	CONF	10	.75 8/9/86
			.57 8/11/86
			.22 8/12/86
9/22/86	710	60	T 9/19/86
			T 9/21/86
			.04 9/22/86
10/6/86	150	10	.65 10/4/86
			.01 10/5/86
			T 10/6/86
10/20/86	10	10	.31 10/18/86



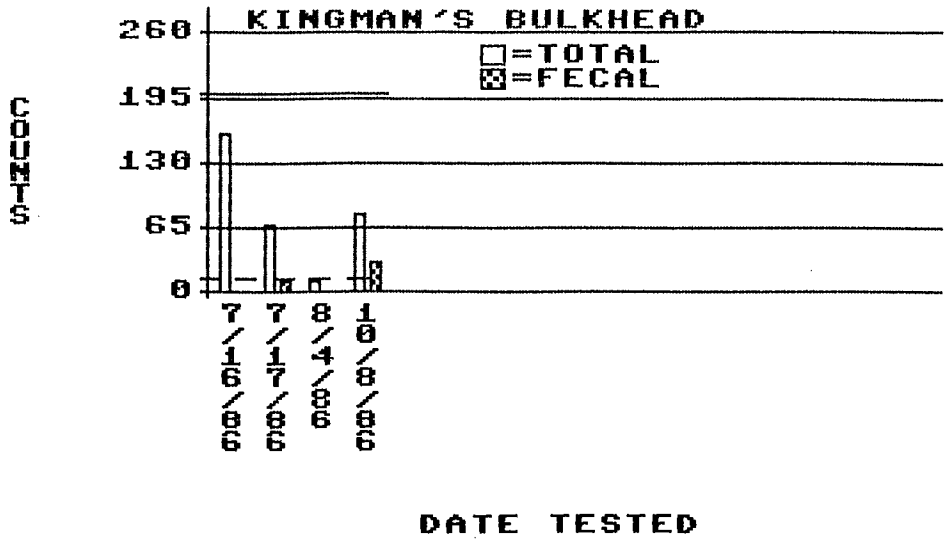
DATE	TOTAL	FECAL	RAIN
8/12/86	CONF	10	.75 8/9/86
			.57 8/11/86
			.22 8/12/86
9/10/86	CONF	10	.06 9/8/86
9/10/86	10	10	.06 9/8/86



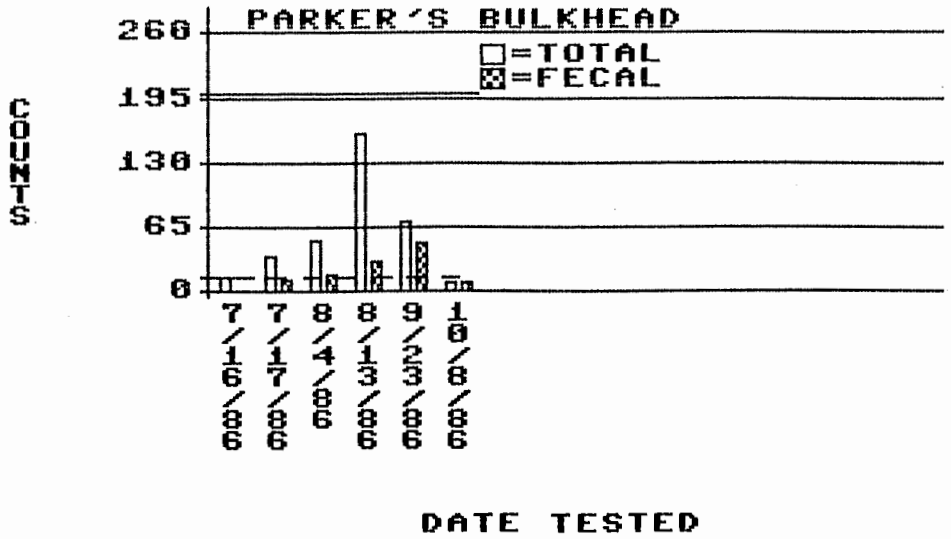
DATE	TOTAL	FECAL	RAIN
11/24/86	120	110	.34 11/24/86



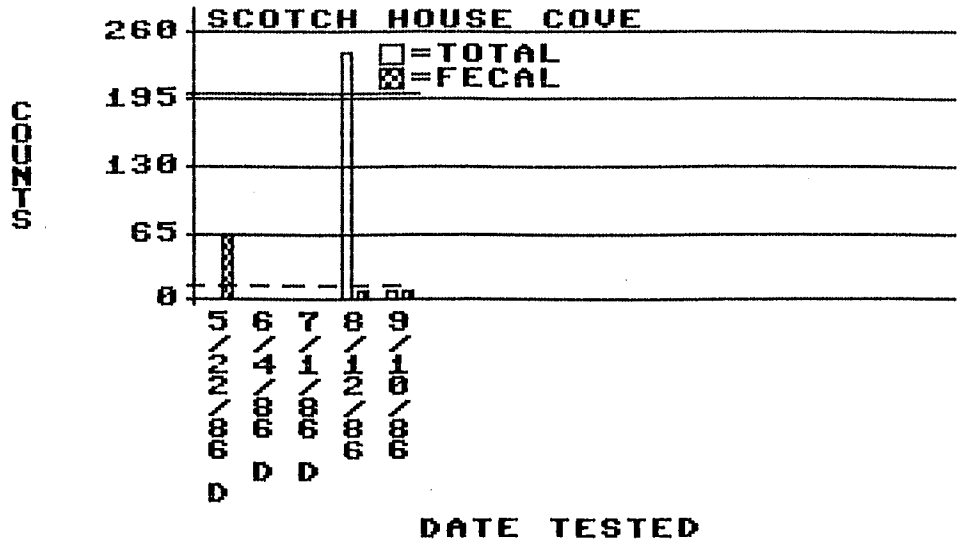
DATE	TOTAL	FECAL	RAIN
5/22/85 D		4.5	T 5/21/86
			.35 5/22/86
6/4/86 D		1.7	.02 6/2/86
			.06 6/3/86
7/23/86 D		3.6	.35 7/21/86
8/7/86 D		1.7	



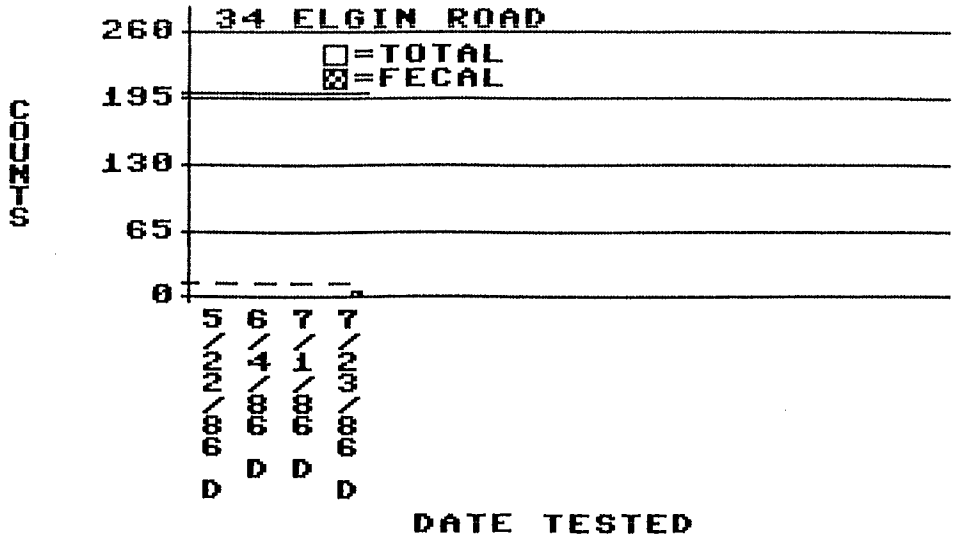
DATE	TOTAL	FECAL	RAIN
7/16/86	160		.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/17/86	68	12	.75 7/13/86
			.37 7/14/86
			.3 7.15/86
8/4/86	12	2	.58 8/3/86
10/8/86	80	30	



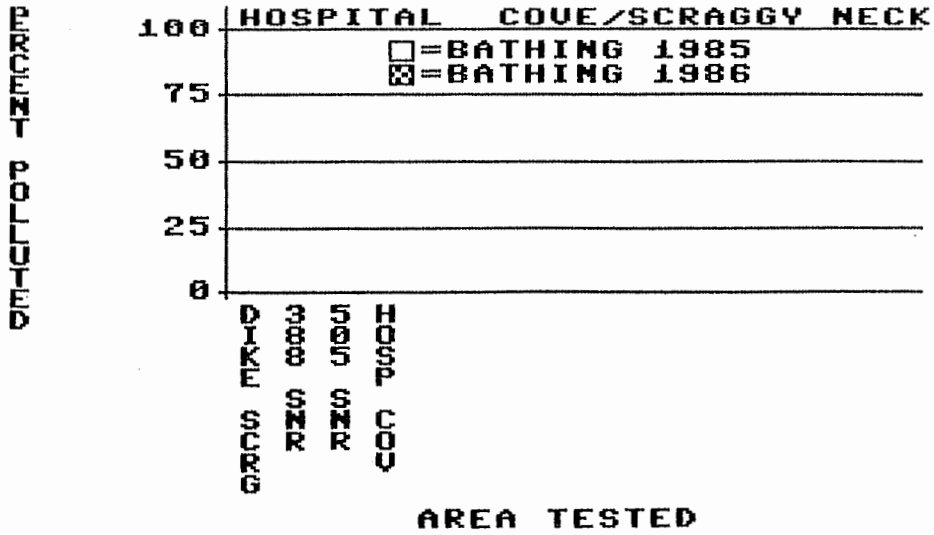
DATE	TOTAL	FECAL	RAIN
7/16/86	16		.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/17/86	36	11	.75 7/13/86
			.37 7/14/86
			.3 7/15/86
8/4/86	54	17	.58 8/3/86
8/13/86	160	30	.57 8/11/86
			.22 8/12/86
9/23/86	70	50	T 9/21/86
			.04 9/22/86
			.02 9/23/86
10/8/86	10	10	



DATE	TOTAL	FECAL	RAIN
5/22/85 D		64	T 5/21/86
			.35 5/22/86
6/4/86 D		1.7	.02 6/2/86
			.06 6/3/86
7/1/86 D		1.7	
8/12/86	CONF	10	.75 8/9/86
			.57 8/11/86
			.22 8/12/86
9/10/86	10	10	.06 9/8/86

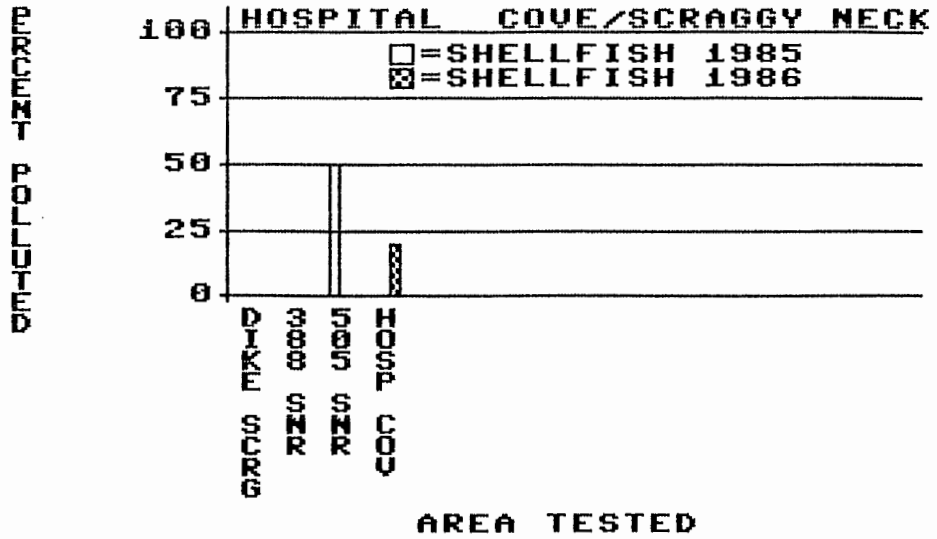


DATE	TOTAL	FECAL	RAIN
5/22/85 D		1.7	T 5/21/86
			.35 5/22/86
6/4/86 D		1.7	.02 6/2/86
			.06 6/3/86
7/1/86 D		1.7	.07 6/28/86
7/23/86 D		5.8	.35 7/21/86



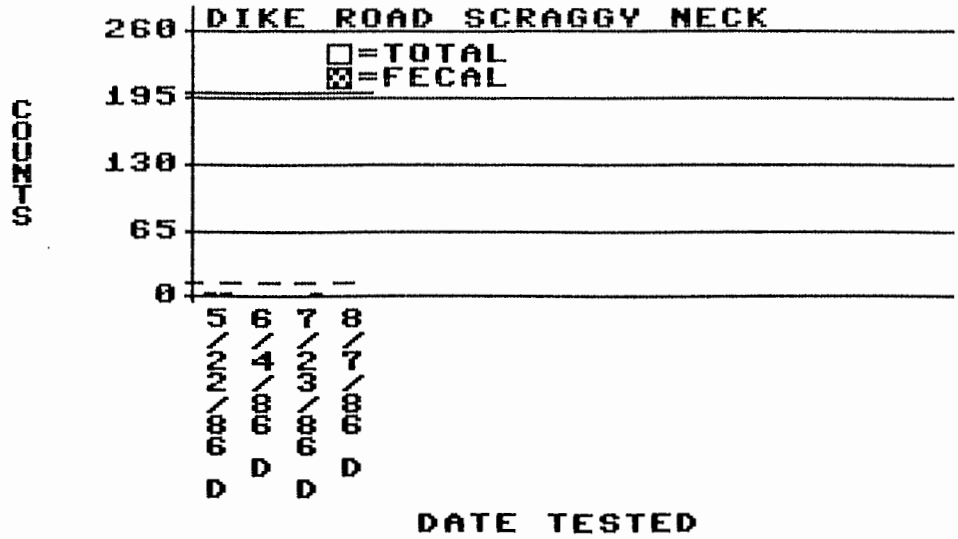
HOSPITAL COVE/SCRAGGY NECK

AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Dike Road Scraggy Neck	Not Tested		4	0%
388 Scraggy Neck Road	3	0%	3	0%
505 Scraggy Neck Road	2	0%	4	0%
Hospital Cove	Not Tested		5	0%

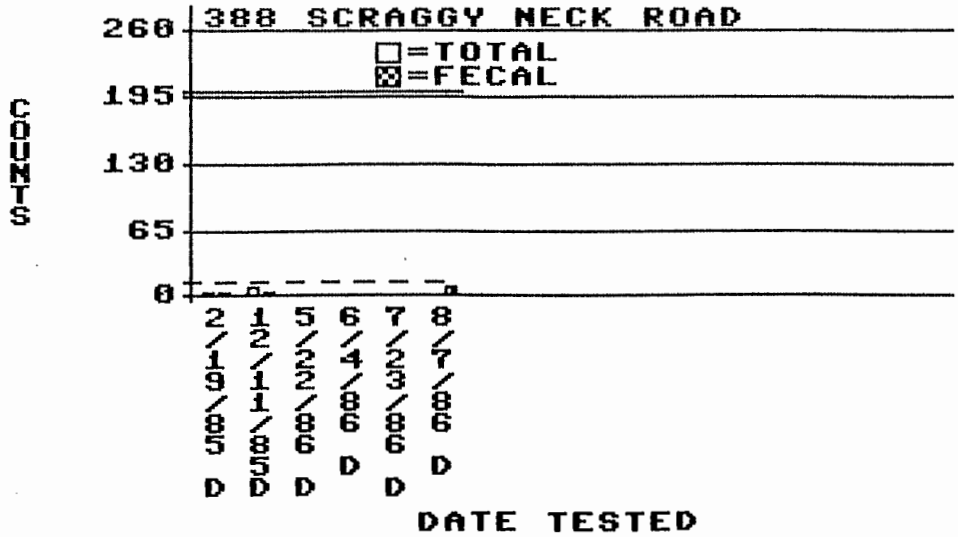


HOSPITAL COVE/SCRAGGY NECK

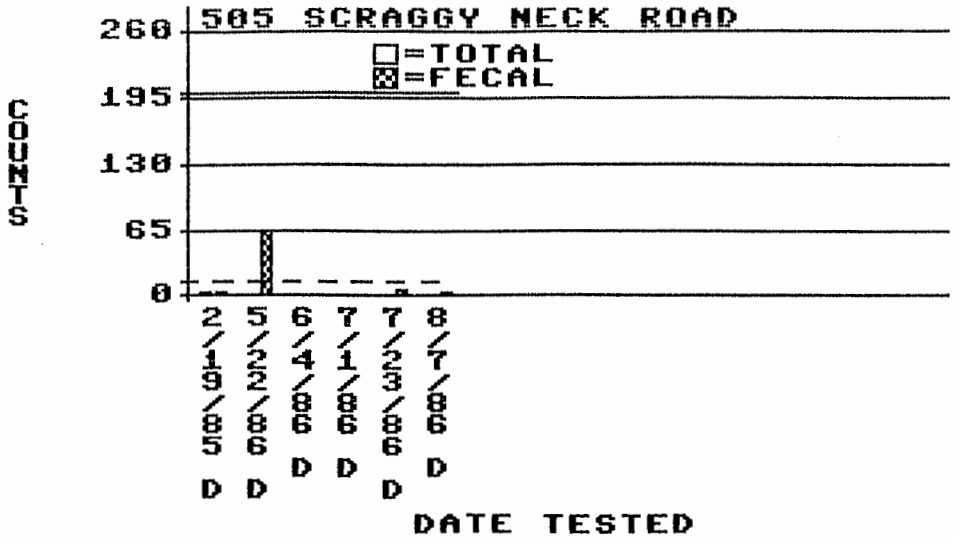
AREA TESTED:	1985 # TESTS	1985 % Polluted	1986 # TESTS	1986 % POLLUTED
Dike Road Scraggy Neck	Not Tested		4	0%
388 Scraggy Neck Road	3	0%	3	0%
505 Scraggy Neck Road	2	50%	4	0%
Hospital Cove	Not Tested		5	20%



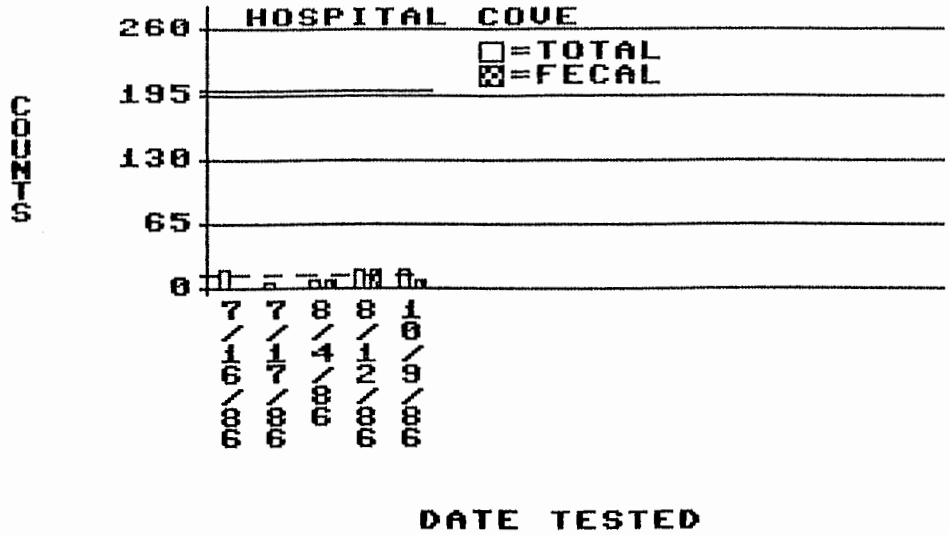
DATE	TOTAL	FECAL	RAIN
5/22/86 D		4.5	T 5/21/86 .35 5/22/86
6/4/86 D		1.7	.02 6/2/86 .06 6/3/86
7/23/86 D		3.6	.35 7/21/86
8/7/86 D		1.7	



DATE	TOTAL	FECAL	RAIN
2/19/85 D	3.6	3.6	
12/11/85 D	9.3	4	
5/22/85 D		1.7	T 5/21/86
			.35 5/22/86
6/4/86 D		1.7	.02 6/2/86
			.06 6/3/86
7/23/86 D		1.7	.35 7/21/86
8/7/86 D		8.2	

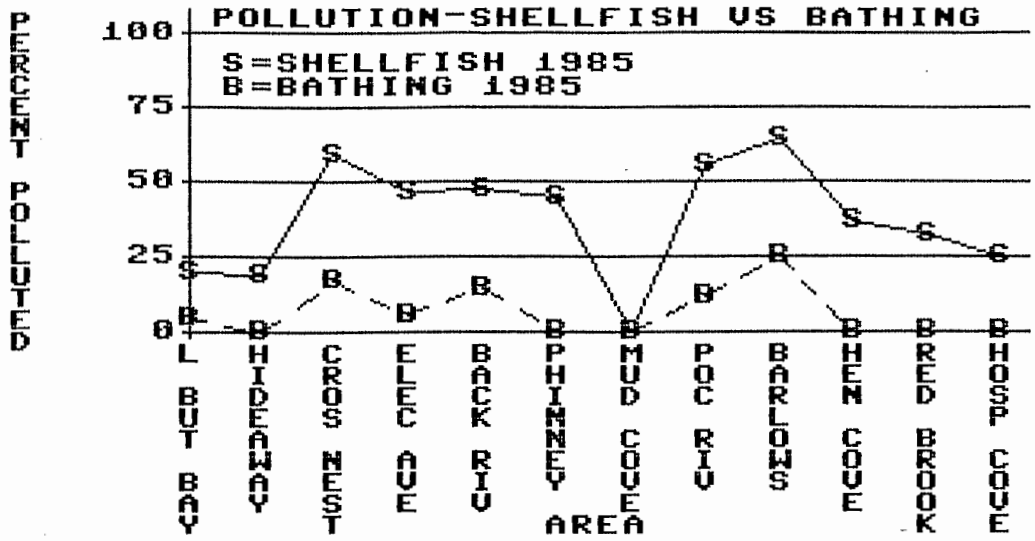


DATE	TOTAL	FECAL	RAIN
2/19/85 D	3.6	3	
5/22/85 D		64	T 5/21/86
			.35 5/22/86
6/4/86 D		1.7	.02 6/2/86
			.06 6/3/86
7/1/86 D		1.7	.07 6/28/86
7/23/86 D		5.8	.35 7/21/86
8/7/86 D		3.6	

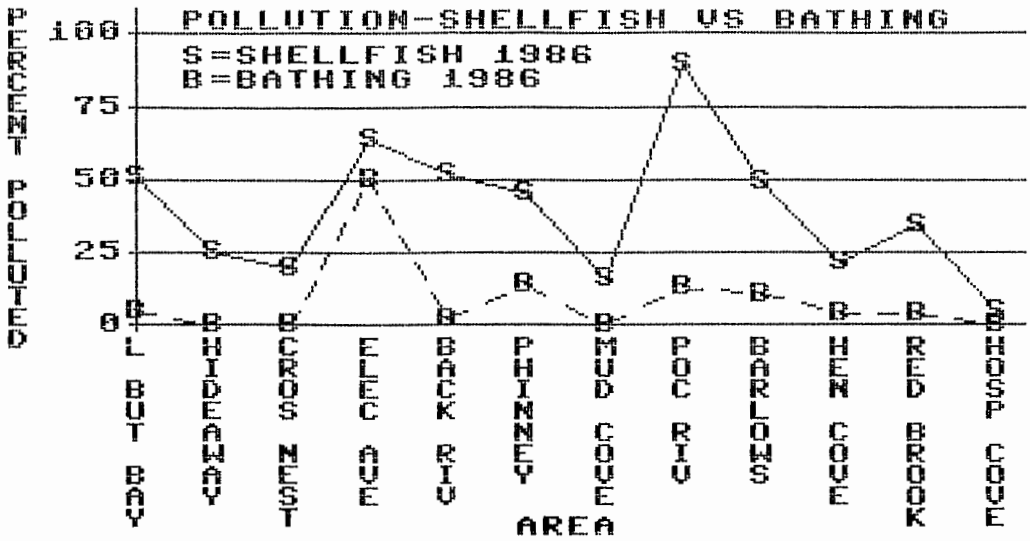


DATE	TOTAL	FECAL	RAIN
7/16/86	20		.75 7/13/86
			.37 7/14/86
			.13 7/15/86
7/17/86	8	1	.75 7/13/86
			.37 7/14/86
			.3 7/15/86
8/4/86	10	10	.58 8/3/86
8/12/86	20	20	.57 8/11/86
			.22 8/12/86
10/9/86	20	10	

LINE GRAPH #1

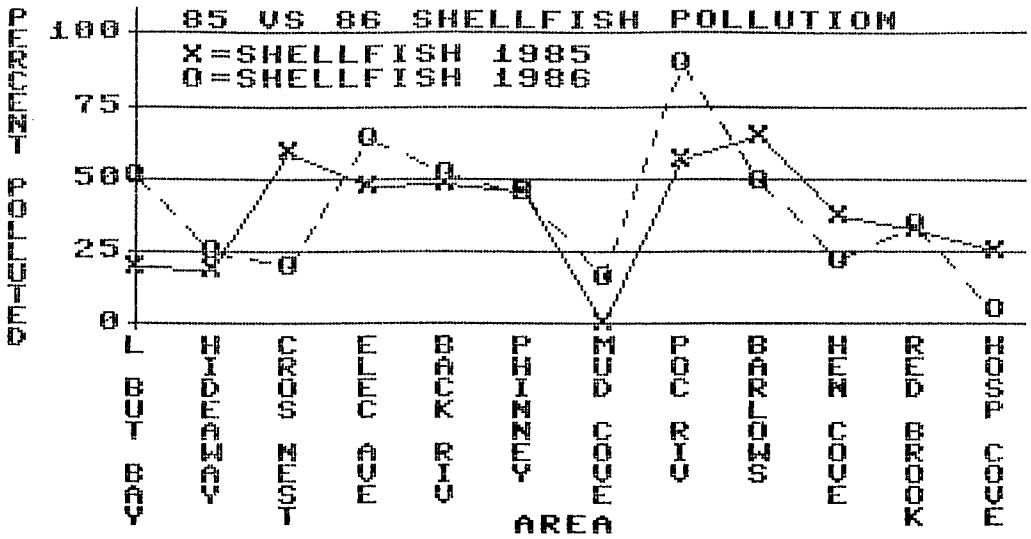


AREA NAME	SHELLFISH 1985 Percent/Time Polluted	BATHING 1985 Percent/Time Polluted
L But Bay (Little Buttermilk Bay)	20%	5%
Hideaway	19%	0%
Cros Nest (Crows Nest Cove)	59%	17%
Elec Ave (Electric Avenue)	47%	6%
Back Riv (Back River)	48%	15%
Phinney (Phinney's Harbor)	45%	0%
Mud Cove	0%	0%
Poc Riv (Pocasset River	56%	12%
Barlows (Barlows Landing)	65%	25%
Hen Cove	37%	0%
Red Brook (Red Brook Harbor)	33%	0%
Hosp Cove (Hospital Cove)	25%	0%



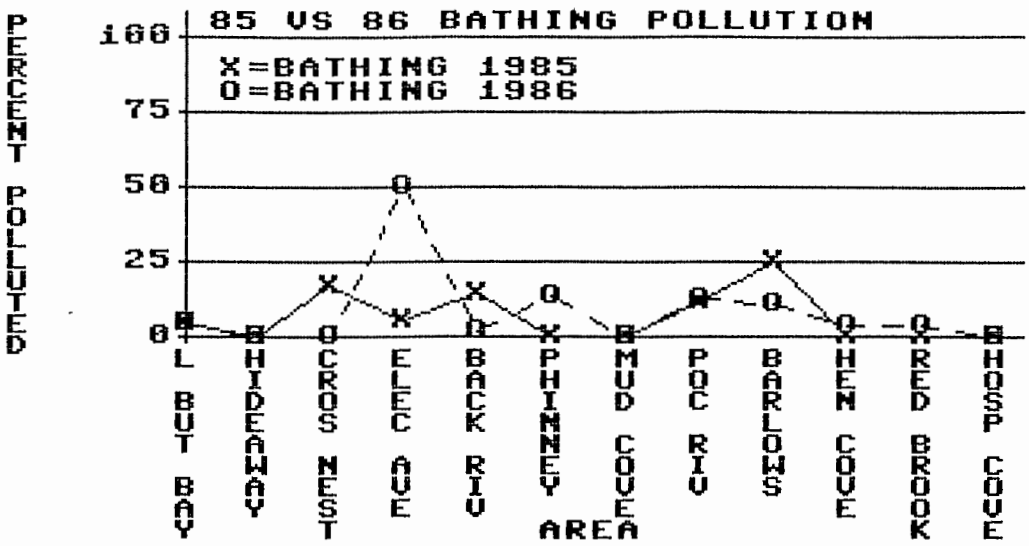
AREA NAME	SHELLFISH 1986 Percent/Time Polluted	BATHING 1986 Percent/Time Polluted
L But Bay (Little Buttermilk Bay)	51%	5%
Hideaway	25%	0%
Cros Nest (Crows Nest Cove)	20%	0%
Elec Ave (Electric Avenue)	64%	50%
Back Riv (Back River)	52%	2%
Phinney (Phinney's Harbor)	45%	14%
Mud Cove	16%	0%
Poc Riv (Pocasset River	89%	13%
Barlows (Barlows Landing)	49%	11%
Hen Cove	22%	4%
Red Brook (Red Brook Harbor)	34%	4%
Hosp Cove (Hospital Cove)	5%	0%

LINE GRAPH #3



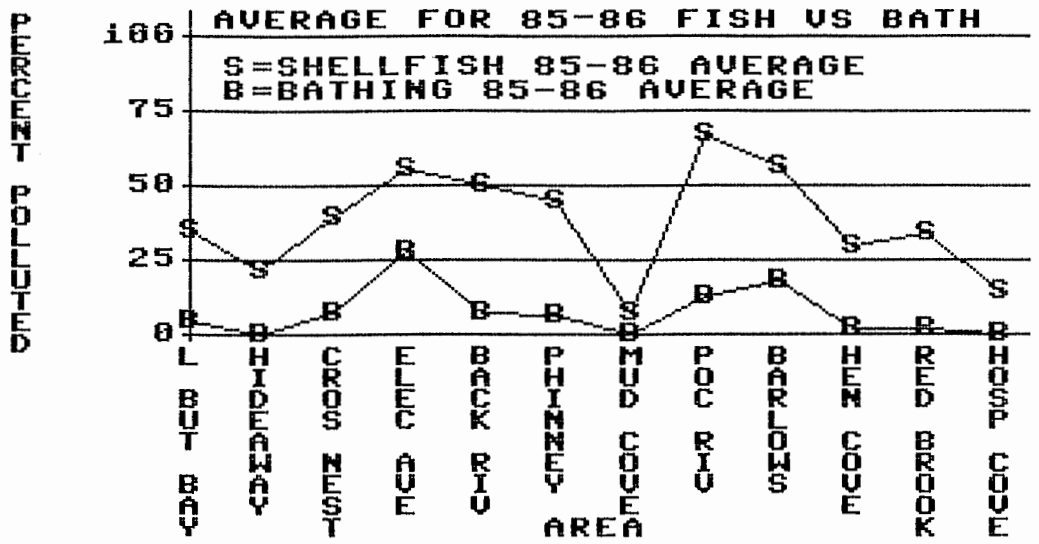
AREA NAME	SHELLFISH 1985 Percent/Time Polluted	SHELLFISH 1986 Percent/Time Polluted
L But Bay (Little Buttermilk Bay)	20%	51%
Hideaway	19%	25%
Cros Nest (Crows Nest Cove)	59%	20%
Elec Ave (Electric Avenue)	47%	64%
Back Riv (Back River)	48%	52%
Phinney (Phinney's Harbor)	45%	45%
Mud Cove	0%	16%
Poc Riv (Pocasset River	56%	89%
Barlows (Barlows Landing)	65%	49%
Hen Cove	37%	22%
Red Brook (Red Brook Harbor)	33%	34%
Hosp Cove (Hospital Cove)	25%	5%

LINE GRAPH #4



AREA NAME	BATHING 1985 Percent/Time Polluted	BATHING 1986 Percent/Time Polluted
L But Bay (Little Buttermilk Bay)	5%	5%
Hideaway	0%	0%
Cros Nest (Crows Nest Cove)	17%	0%
Elec Ave (Electric Avenue)	6%	50%
Back Riv (Back River)	15%	2%
Phinney (Phinney's Harbor)	0%	14%
Mud Cove	0%	0%
Poc Riv (Pocasset River	12%	13%
Barlows (Barlows Landing)	25%	11%
Hen Cove	0%	4%
Red Brook (Red Brook Harbor)	0%	4%
Hosp Cove (Hospital Cove)	0%	0%

LINE GRAPH #5



AREA NAME	SHELLFISH 85/86 AVERAGE Percent/Time Polluted	BATHING 85/86 AVERAGE Percent/Time Polluted
L But Bay (Little Buttermilk Bay)	35%	5%
Hideaway	22%	0%
Cros Nest (Crows Nest Cove)	40%	8%
Elec Ave (Electric Avenue)	56%	28%
Back Riv (Back River)	50%	8%
Phinney (Phinney's Harbor)	45%	7%
Mud Cove	8%	0%
Poc Riv (Pocasset River	67%	13%
Barlows (Barlows Landing)	57%	18%
Hen Cove	30%	2%
Red Brook (Red Brook Harbor)	34%	2%
Hosp Cove (Hospital Cove)	15%	0%

APPENDIX 4

THE MILLIPORE FILTER, GENERAL DESCRIPTION

The Millipore filter, composed of pure clean intert cellulose esters, is a thin porous membrane containing millions of capillary pores of uniform dimension per square centimeter of filter surface. These pores are essentially direct channels through the filter and are evenly distributed over its surface area. Filters are available in different porosity grades ranging from 10 millimicrons to 8 microns. The size of pores in the Millipore filters is controlled to an extraordinary degree. For example, the total range of pore size distribution in the filter whose mean pore size is 0.45 microns plus or minus 0.02 microns. One of the most significant characteristics of these filters is absolute surface retention of all parts larger than its pore size. The pores which pass through the filter occupy 80-85% of the total filter volume while the cellulose matrix, which defines the pores, occupies only 15-20%. This unique porosity characteristic permits extremely high flow rates for gasses and liquids. For example, the flow of water through a filter with a mean pore size of 0.45 microns is 20 gallons per minute per square foot at a pressure of 15 pounds per square inch (psi). The Millipore filter is stable in the presence of oxygen at temperatures up to 125 degrees C. Conversely, in oxygen free systems it may be used at temperatures up to 200 degrees C. It is also stable at low temperatures and has been used in filtration of liquid helium at -270 degrees C. The flash point of the Millipore filter is in excess of 200 degrees C. It will not absorb or retain within the filter structure significant qualtities of soluable components. (Sanitarian's Handbook)

TOTAL COLIFORM

After sampling and filtration, the membrane filter is placed on top of MF-Endo media containing lactose, protein digest, vitamins, selective chemicals , and Schiff's Reagent. As the membrane incubates for 24 hours at 35 degrees C +/- 0.5, the medium diffuses through the pores in the filter, supplying nutrients to the multiplying bacteria. Many kinds of bacteria from the water sample can grow and form colonies under these conditions, but only the coliforms will ferment lactose, One by-product of this reaction is an acid aldehyde complex that will combine with the Schiff's Reagent to form an iridescent green coating over the growing colonies. Thus, the coliforms can be identified as dark red colonies with a greenish-gold "sheen", when seen with 10-20 X magnification and fluorescent illumination. The few non-coliforms that may appear are red in color, lacking the sheen appearance.

FECAL COLIFORM

The filtration step is similar to that for total coliform. The medium used for this test is M-FC, containing lactose, protein digest, vitamins, bile salts, selective chemicals, and aniline blue dye. The membrane is incubated for 24 hours at 44.5 degrees C +/- 0.2, allowing only coliforms of fecal orgin to grow into visible colonies. The non-fecal coliforms, due to heat shock, generally do not grow. As the fecal coliforms grow, they ferment lactose, producing acid which reacts with the aniline dye to produce a blue color. When viewed with a stereomicroscope at 10-20 X magnification, all colonies exhibiting a blue color are fecal coliforms. Any non-fecal thermophile colonies appearing on the filter will exhibit a green, grey, or cream color. (Millipore Filter Operations Manual)

SAMPLING PROCEDURES

When the sample is collected, leave ample air space in the bottle (at least 2.5 cm) to facilitate mixing by shaking, preparatory to examination. Collect samples that are representative of the water being tested and use aseptic techniques to avoid sample contamination.

Keep sampling bottle closed until it is to be filled. Remove stopper and cap as a unit; do not contaminate inner surface of stopper or cap and neck of bottle. Fill container without rinsing, replace stopper or cap immediately, and if used, secure hood around neck of bottle.

Bathing Beaches: Collect samples of bathing-beach water at locations and time of greatest bather load, and, in natural bathing places, increase sampling frequency during periods of stormwater runoff and in the bathing season.

Manual Sampling: Take samples from a river, stream, lake or reservoir by holding the bottle near its base in the hand and plunging it, neck downward, below the surface. Turn bottle until neck points slightly upward and mouth is directed toward the current. If there is no current, as in the case of a reservoir, create a current artificially by pushing bottle forward horizontally in a direction away from the hand. When sampling from a boat, obtain samples from upstream side of boat. (Standard Methods for Laboratory Procedures)

• ~~Add Abstract~~
• " QA COMM.
• Data In?

ENTRY NO. 6

Data Documentation Form

Entered

(RN) REFERENCE IDENTIFIER (assigned by EOEA):

2

(ST) SITE (Buttermilk Bay, Buzzards Bay, etc.):

Buttermilk Bay, Little Buttermilk Bay, other coastal areas in town of Bourne

(TI) PROJECT/PROGRAM TITLE:

Water quality monitoring report for Bourne, MA. 1985-1986

(DS) DATA SET NAME (if applicable):

N/A

(PI) PRINCIPAL INVESTIGATOR(S)/PROGRAM MANAGER(S):

T.E. Fantozzi, Health Officer

(PO) COLLECTING OR PROCESSING ORGANIZATION (address, telephone number and contact, if different from principal investigator):

Contact: Tracy Warnche (508) 748-3600
Coastal Zone Managmnt/Southeast
Town Building
2 Spring Street Marion, MA 02108

(PR) PROGRAM SPONSOR, CONTRACT, PROJECT, OR EXPERIMENT NAME (include project officer, address, and telephone number, if applicable): Bourne Board of Health
Selectman Task Force on local pollution
24 Perry Ave
Buzzards Bay, MA (508) 759-3435

(PC) PROJECT COSTS AND DATES WHEN STUDY WAS CONDUCTED:

Cost: $ 12,000 (1st) Study dates: 1/2/85 - 11/18/86

2nd } $ 7-8,000
3rd }

(AB) ABSTRACT (Description of project, including purpose, objectives, hypothesis, results and conclusions):

Samples for fecal and total coliform bacteria were analyzed by the Barnstable Board of Health lab for 82 sites in Bourne Bay. The report contains data collected by the Barnstable lab and the DEQE for 1985 and 1986.

(DC) DATA COLLECTION DESCRIPTION:

Observing station or vessel name (ship, boat, buoy, land, fixed station, aircraft, satellite, other): Wading

Data collection type (transect, point location, trackline, array): point location

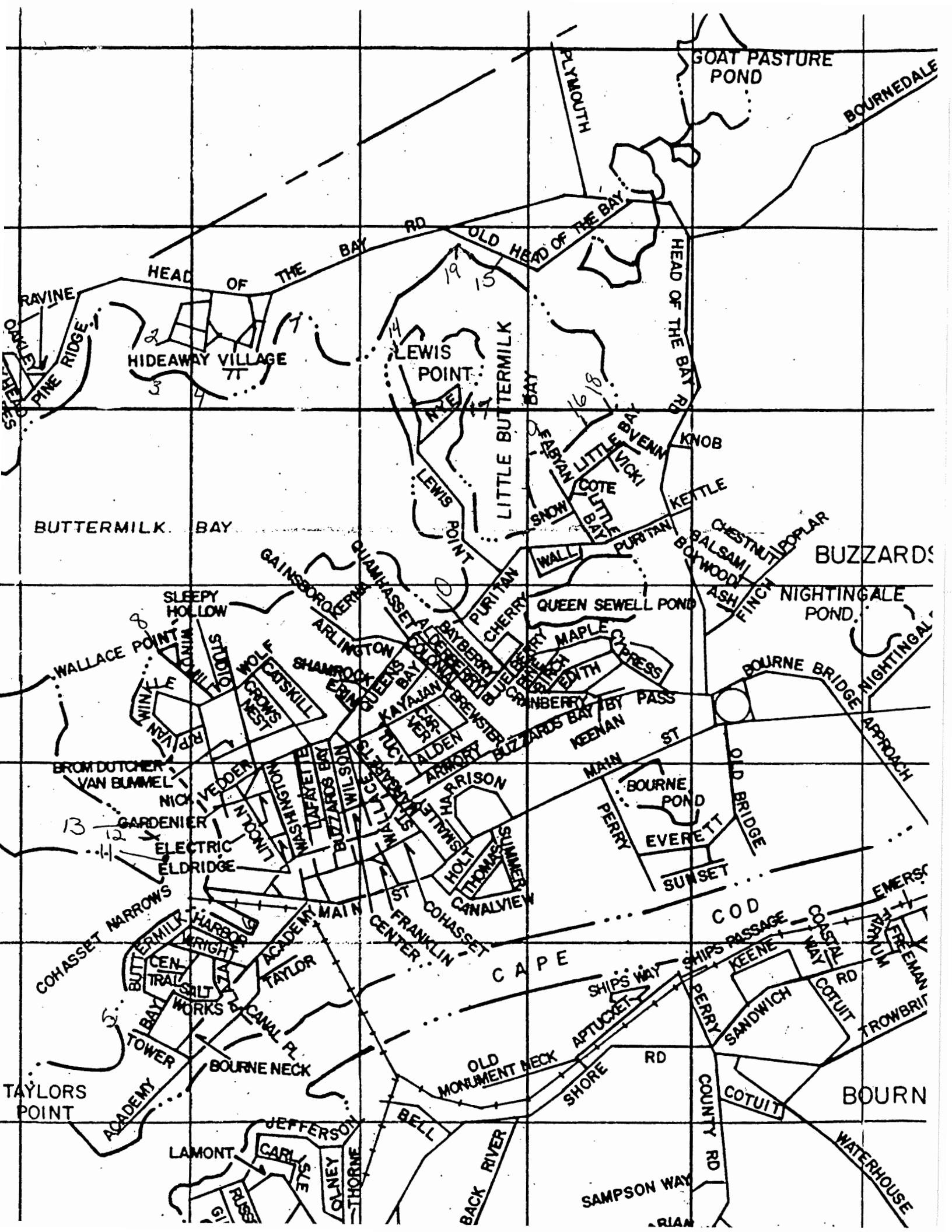
Number of stations or sites: 18 (Buttermilk) 82 total

Number of observations: <1000

(PE) PERIOD OF RECORD:

	Year	Month	Day	Hour
Earliest Date:	1985	01	02	
Latest Date:	1986	11	18	

(LR) LENGTH OF RECORD (Include information about gaps in the record, days, months, years):


GOAT PASTURE POND
BOURNEDALE
PLYMOUTH
HEAD OF THE BAY RD
OLD HEAD OF THE BAY
HEAD OF THE BAY RD
RAVINE
OAKLEY
PINE RIDGE
HIDEAWAY VILLAGE
LEWIS POINT
LITTLE BUTTERMILK BAY
NYE
FARYAN
LITTLE BAY
VENN
VICKI
KNOB
LEWIS POINT
COTE
SNOW
LITTLE BAY
KETTLE
BUTTERMILK BAY
PURITAN
WALL
CHESTNUT
POPLAR
BALSAM
BOXWOOD
ASH
FINCH
BUZZARDS
GAINSBORO
KERNA
QUAMHASSET
PURITAN
CHERRY
QUEEN SEWELL POND
NIGHTINGALE POND
SLEEPY HOLLOW
ARLINGTON
ALDERBERRY
BAYBERRY
COLONIAL
BLUEBERRY
MAPLE
CYPRESS
WALLACE POINT
WINKLE
STUDIO
WOLF
CATSKILL
CROWS NEST
SHAMROCK
ERIN
QUEENS BAY
KAYAJAN
BREWSTER
BIRCH
EDITH
CRANBERRY
BOURNE BRIDGE
NIGHTINGALE
BY PASS
APPROACH
VAN WINKLE
BUZZARDS BAY
KEENAN
ST
MAIN
BROM DUTCHER
VAN BUMMEL
VEDDER
NICK
WASHINGTON
LAFAYETTE
BUZZARDS BAY
WILSON
TUCK
ALDEN
ARMORY
HARRISON
BOURNE POND
OLD BRIDGE
GARDENIER
ELECTRIC
ELDRIDGE
LINCOLN
MAYFLOWER
SMALLEY
HOLT
THOMAS
SUMMER
PERRY
EVERETT
SUNSET
COHASSET NARROWS
MAIN ST
CANALVIEW
COHASSET
FRANKLIN
CENTER
COD
CAPE
BUTTERMILK BAY
HARBOR
WRIGHT
ACADEMY
TAYLOR
CENTRAL
SALT WORKS
CANAL PL
SHIPS PASSAGE
KEENE
COASTAL WAY
FREEMAN
SHIPS WAY
APTUCKET
PERRY
SANDWICH
COTUIT RD
TROWBRIDGE
TOWER
BOURNE NECK
OLD MONUMENT NECK
SHORE RD
COUNTY RD
COTUIT
TAYLORS POINT
ACADEMY
BELL
JEFFERSON
LAMONT
CARLISLE
OLNEY
THORNE
BACK RIVER
SAMPSON WAY
WATERHOUSE
BOURN

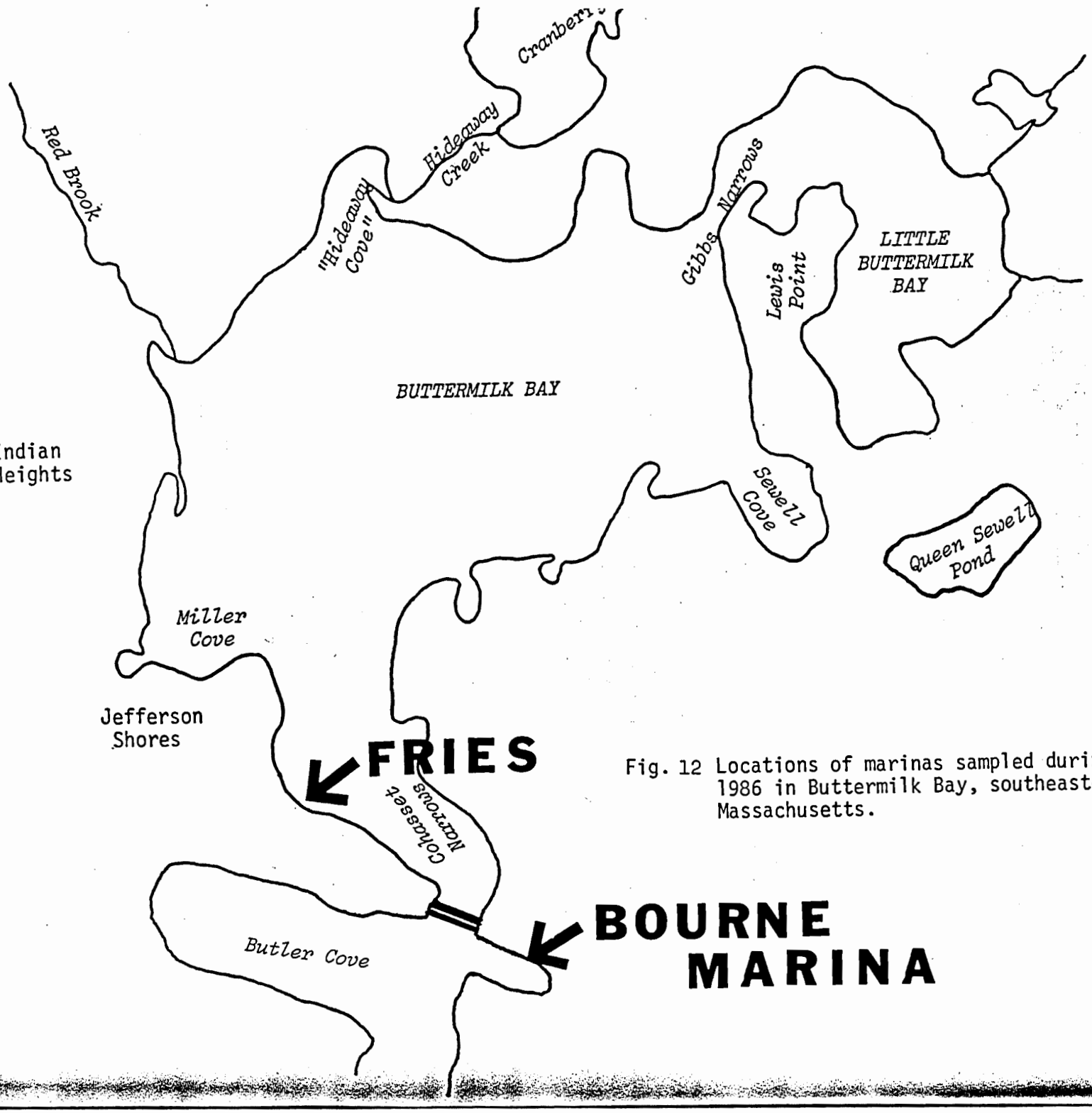
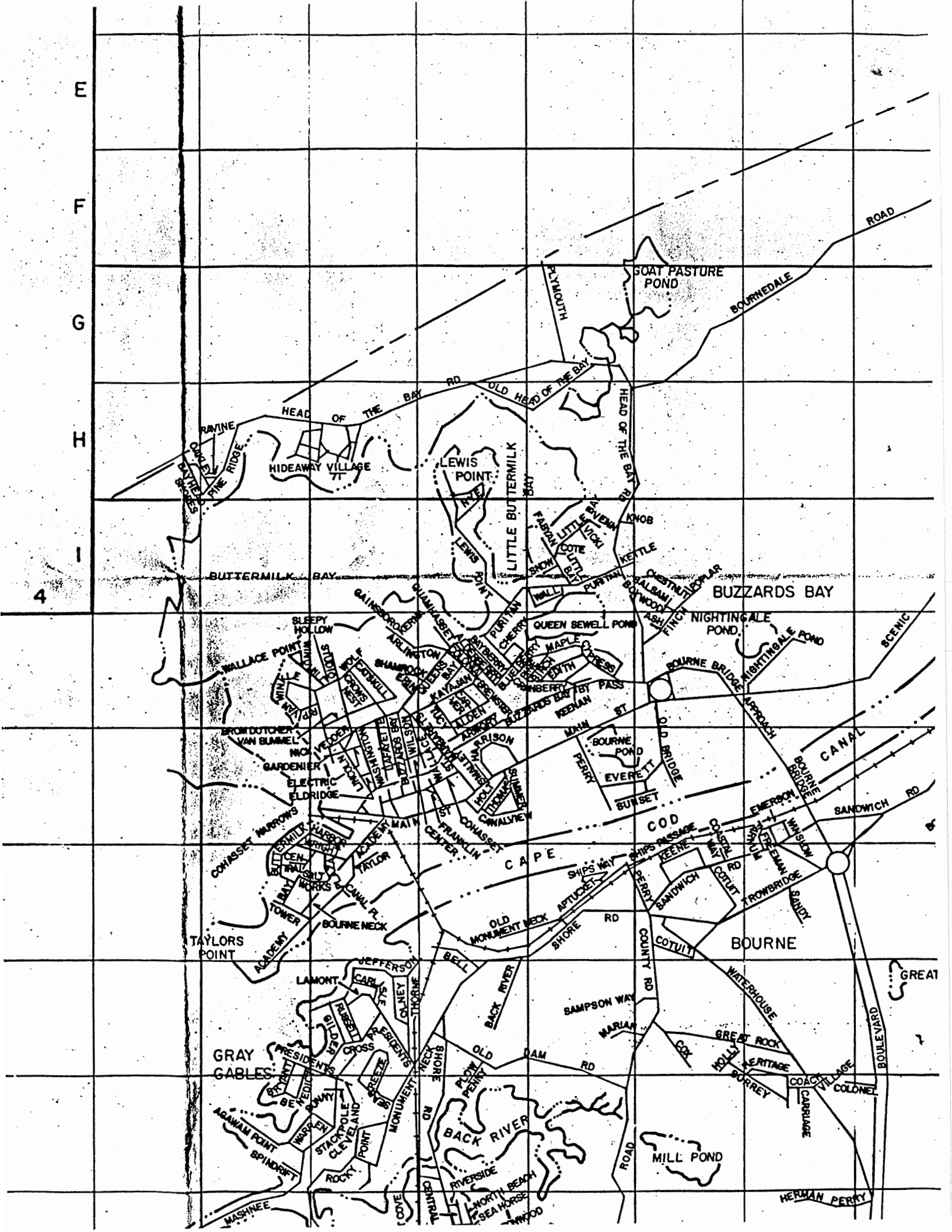


Fig. 12 Locations of marinas sampled during 1986 in Buttermilk Bay, southeastern Massachusetts.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4
GOAT PASTURE POND
BOURNEDALE ROAD
PLYMOUTH
HEAD OF THE BAY RD
OLD HEAD OF THE BAY
RAVINE
PINE RIDGE
BAYHEAD SHORES
HIDEAWAY VILLAGE
LEWIS POINT
LITTLE BUTTERMILK BAY
LEWIS POINT
BUTTERMILK BAY
BUZZARDS BAY
KNOB
KETTLE
CHESTNUT
POPLAR
BALSAM
FINCH
ASH
NIGHTINGALE POND
QUEEN SEWELL POND
PURITAN
CHERRY
MAPLE
CYPRESS
EDITH
CRANBERRY
BY PASS
KEENAN
BUZZARDS BAY
BOURNE BRIDGE APPROACH
SCENIC
MAIN ST
BOURNE POND
EVERETT
PERRY
OLD BRIDGE
SUNSET
CANAL
CAPE COD
BOURNE BRIDGE
SANDWICH RD
EMERSON
WINSLOW
FREEMAN
COASTAL WAY
SHIPS PASSAGE
SHIPS WAY
KEENE
SANDWICH
TROWBRIDGE
SANDY
COTUIT RD
APTUCXET
SHORE RD
OLD MONUMENT NECK
COUNTY RD
COTUIT
BOURNE
WATERHOUSE
GREAT
BOULEVARD
SLEEPY HOLLOW
WALLACE POINT
GAINSBOROUGH
ARLINGTON
SHAMROCK
KAYAJAN
ALDEN
ARMORY
HARRISON
WASHINGTON
LAFAYETTE
BUZZARDS BAY
WILSON
LINCOLN
BROM DUTCHER
VAN BUMMEL
GARDENIER
ELECTRIC
ELDRIDGE
COHASSET NARROWS
BUTTERMILK
HARBOR
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BAY
BOURNE NECK
TAYLORS POINT
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JEFFERSON
LAMONT
CARLISLE
OLNEY
THORNE
BELL
BACK RIVER
SAMPSON WAY
MARIAN
COX
GREAT ROCK
HOLLY
HERITAGE
SORREY
COACH
VILLAGE
COLONEL
CARRIAGE
GRAY GABLES
PRESIDENTS
RUSSELL
GILDER
CROSS
BREEZE
BRYANT
BENEDICT
SUNNY
WARREN
STACKPOLE
CLEVELAND
POINT
MONUMENT NECK RD
SHORE
OLD DAM RD
PLOW PENNY
BACK RIVER
ROAD
MILL POND
AGAWAM POINT
SPINDRIFT
ROCKY
RIVERSIDE
NORTH BEACH
SEA HORSE
COVE
CENTRAL
MASHNEE
HERMAN PERRY