Hydrographic and Chemical Data for Rivers Flowing into the Great Bay Estuary, New Hampshire

UNH Sea Grant
Technical Report UNH-SG-161

HYDROGRAPHIC AND CHEMICAL DATA FOR RIVERS FLOWING INTO THE GREAT BAY ESTUARY, NEW HAMPSHIRE

Theodore C. Loder
Jane E. Hislop
Jonathan P. Kim
Gordon M. Smith

Report No.: UNH-SG-161

Department of Earth Sciences
University of New Hampshire
Durham, New Hampshire 03824

September, 1979

This publication is a result of research sponsored by NOAA Office of Sea Grant, Department of Commerce. The U.S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

Published by the University of New Hampshire Marine Advisory Program, a part of the UNH/U-Maine Cooperative University Institutional Sea Grant Program. Available for $1.50 from UNH Marine Advisory Program, Marine Program Building, Durham, NH 03824.

TABLE OF CONTENTS

Introduction. 1

Sample Collection 1

Sample Analyses 4

Data Presentation and Discussion 5

Acknowledgements 7

References Cited 8

Appendix A. - Data 9

Appendix B. - Graphs of nutrient concentration vs. time 40

Appendix C. - Graphs of river flow vs. time: Lamprey River 47

Introduction

This data report summarizes nutrient, temperature and salinity data for water samples collected from eight rivers that flow into the Great Bay Estuary System, New Hampshire. These samples were collected approximately once per month from February 24, 1976 to June 13, 1978. The purpose of this study was to provide data for the calculation of nutrient inputs into the Estuary as part of a larger study at the University of New Hampshire on nutrient flux processes in estuarine systems.

Sample Collection

The sample sites were chosen so that samples would be available from both above and below the dams which mark the limit of tidal excursion on the estuarine rivers. The approximate locations of all sample sites are shown in Figure 1 and detailed descriptions are given in Table 1. The actual sample dates were chosen to coincide with a sampling program conducted in the Estuary from Portsmouth to Great Bay (Loder, 1979). The rivers were sampled in the order listed in Table 1. The Winnicutt River was not sampled after August 1976, because of time considerations and its small size relative to that of the other rivers. Some rivers were not sampled during winter months because of ice cover.

Samples were collected from a bridge or river bank using a polyethylene bucket or a two-liter linear-polyethylene wide-mouth bottle tied to a rope and weighted with a lead weight. The bucket or bottle was rinsed several times with the sample prior to the final sampling. Portions of the sample for nutrient analysis were then stored in acid-rinsed (10% HCl) linear-polyethylene bottles (125-ml) which were rinsed three times with the sample. Samples for salinity analysis were stored in 250-ml linear polyethylene bottles (aged by storage of the previous sample) after rinsing with the sample three times.

Table 1. Descriptive list of sample collection sites.

Sample site Number and Name	Description of site
1. Winnicutt River	Center of Route 101 bridge about 1.3 km west of Greenland, New Hampshire.
2. Squamscott River	Center of Route 108 bridge about 0.8 km east of Newfields, New Hampshire and about 7 km north and below the dam at Exeter, New Hampshire.
3. Lamprey River (A)	Center of Route 108 bridge in Newmarket above the Lamprey River dam. Some samples were taken at the east side of the dam itself, when ice was too thick below the bridge.
4. Lamprey River (B)	Several hundred meters below the dam in Newmarket on either the east or west side river banks depending on access availability.
5. Oyster River (A)	Above Mill Pond dam at the fish ladder in Durham, New Hampshire beside the Route 108 bridge.
6. Oyster River (B)	About 500 meters below the Mill Pond dam at the Durham Town Landing.
7. Bellamy River (A)	Center of Route 108 bridge above the Bellamy River dam beside Sawyer Mills in Dover, New Hampshire.
8. Bellamy River (B)	About 0.5 km downstream from Sawyers Mill at the end of the access road on the northeast side of the river.
9. Cochecho River (A)	Center of the Central Avenue Bridge above the dam in Dover, New Hampshire.
10. Cochecho River (B)	Center of the condemned Washington Street bridge about 0.5 km downstream from dam in Dover, New Hampshire.
11. Salmon Falls River (A)	Center of the State Route 4 bridge above the Salmon Falls River dam at South Berwick, Maine.
12. Great Works River (A)	Center of bridge crossing the Lehighs Mill Pond dam about 2 km south of South Berwick, Maine.
13. Salmon Falls River (B)	Center of Eliot Bridge located on Gulf Road about 4 km east of Dover, New Hampshire.

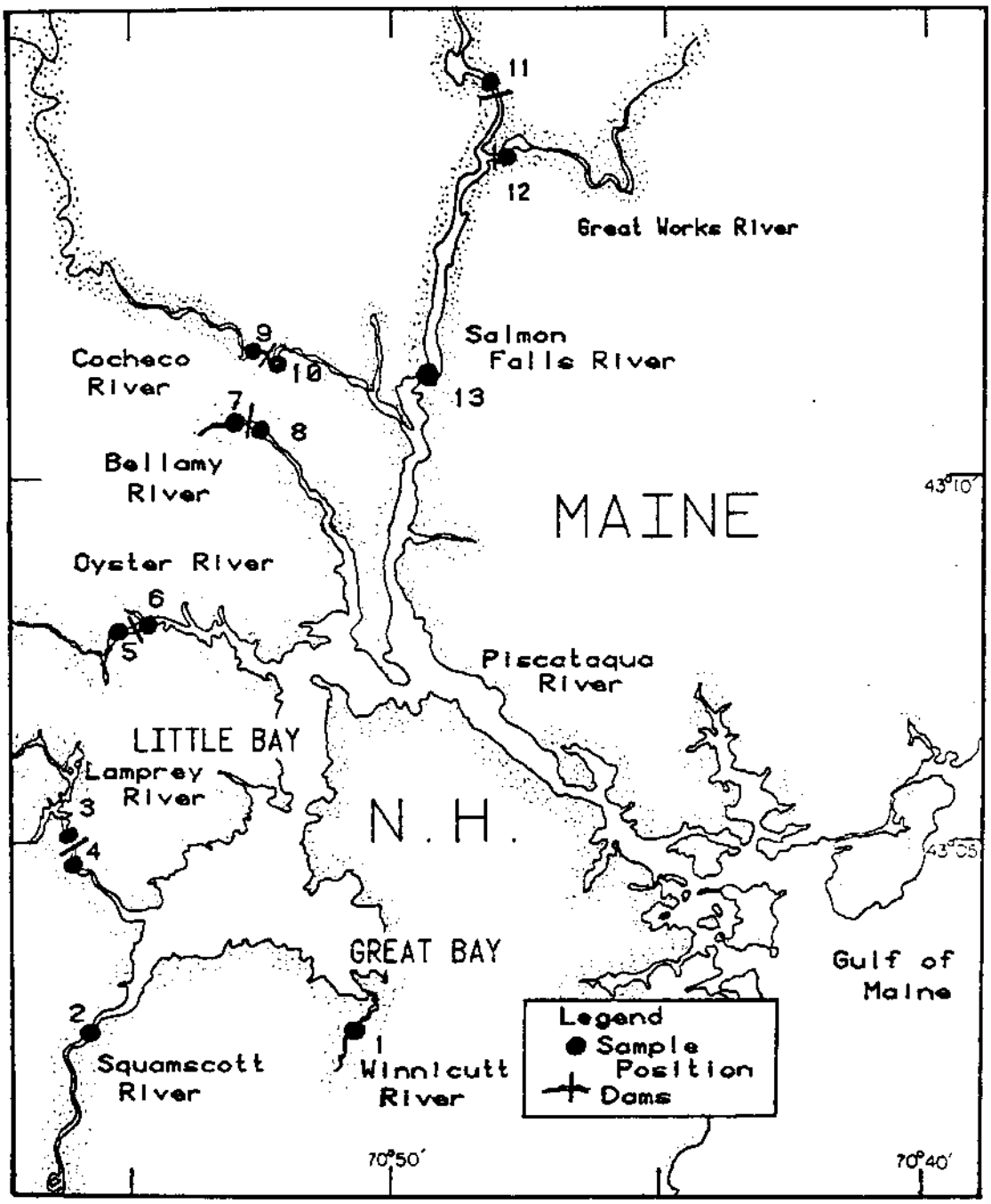


Figure 1. Sampling locations on rivers entering the Great Bay Estuary, N.H.

Each nutrient sample, except those for ammonium analysis, was preserved with mercuric chloride (final concentration ~ 100 ppm) and stored on ice until returned to the laboratory, where they were refrigerated until the analyses were run. Ammonium samples were stored on ice without a preservative and analyzed within 12 hours or less of collection. Sample temperature was determined with a standard laboratory thermometer (± 0.5°C) immersed in the bucket just after nutrient samples were removed or on a fresh sample if the difference between the air and water temperature was more than a few degrees.

Sample Analysis

Salinity samples were analyzed within a few days of collection using a Guildline Autosal salinometer (Model 8400) with a precision of ± 0.003 ppt (based on 5-6 replicate samples). Suspended matter in the samples for nutrient analysis was allowed to settle and the analyses were made on the supernatent using a 2-channel Technician AutoAnalyzer and the following methods: phosphate (TIS, 1973a), silicate (TIS, 1973c), nitrate (TIS, 1972), nitrate (TIS, 1973b), and ammonium (Adamski, 1976). These methods and their modifications are described in detail by Glibert and Loder (1977). The analytical variability of these methods based on replicate analysis of the same samples is quite good as reported by Glibert and Loder (1977): phosphate (± 0.02 µg-at/L), silicate (± 0.08 µg-at/L), nitrate (± 0.05 µg-at/L), nitrite (± 0.009 µg-at/L), and Loder (unpublished data): ammonium (± 0.13 µg-at/L). However, the actual variability of the final data is probably 2 to 5 times the analytical variability and can be attributed in part to sample handling, dilution of samples whose concentrations were off-scale, and errors in estimation or measurement of the turbidity blank. Nutrient standards were prepared in deionized distilled water because of the variability in sample salinities. Consequently, blank and salinity corrections were applied to the data where necessary as described by Loder and Glibert (1977).

Data Presentation and Discussion

The data are presented in two parts: Appendix A which includes all data (Rivers #2 to #31, dates 2/24/76 to 6/13/78), and Appendix B which includes time series plots of nutrient concentrations for each river that was sampled above its dam. The data lists for each sampling date are formated as follows: row number (to facilitate editing); station number (as shown in figure 1); abbreviated river name in which A denotes above dam and B denotes below dam, where appropriate; time in hours; temperature in degrees Celsius; salinity in ppt; and the following nutrients: orthophosphate, reactive silicate, ammonium, nitrite and nitrate - all in micro-gram atoms per liter (μg-at/L = 10^{-6} moles per liter). To convert μg-at/L to mg/l commonly used by river chemists, multiply the μg-at/L concentrations by 14.007 for nitrite, nitrate and ammonium to obtain the concentration in mg N/L; multiply by 30.974 for mg P/L, and by 28.086 for mg Si/L. The NO3/P ratio (Column 12) is the decimal equivalent of the nitrate concentration divided by the phosphate concentration. Finally, a flow number is given which relates the apparent flow at the time of sampling to the following arbitrary scale: (1) stagnant, (2) slow, (3) moderate, (4) fast, (5) very fast.

The time series graphs in Appendix B are included to illustrate seasonal trends in concentration of four nutrients considered: nitrite, nitrate, phosphate and silicate. Ammonium was not plotted because of the limited data available. The vertical scales (concentration of nutrient) were kept the same for each graph to facilitate respective comparisons between rivers. A comparison of the nutrient concentrations in the rivers should indicate the relative extent of anthropogenic nutrient input to each of the 8 rivers studied.

Phosphate, an indicator of sewage effluent input or agricultural runoff, perhaps shows this relative input the best. Its concentration is lowest in the Lamprey River and varies little with seasonal changes. The phosphate concentrations in the Great Works and Bellamy Rivers are not unlike those in

the Lamprey except there are more pronounced seasonal trends. Both these rivers show a concentration peak during January and February 1977, a time of very low river runoff (Appendix C). The Oyster River exhibits similar low phosphate concentrations, although more scattered than the Lamprey. The Salmon Falls and Cocheco Rivers both show evidence of phosphate enrichment relative to the Lamprey, due to sewage effluent input, with concentrations reaching a seasonal maximum during late summer when river flow rates are the lowest and both water temperature and bacterial activity are the highest.

Nitrite tends to follow the same relative trends as phosphate for all the rivers. Nitrate shows a winter maxima for the three least sewage impacted rivers; the Lamprey, Great Works and Bellamy, and much seasonal scatter for the Oyster River. The Salmon Falls and Cocheco Rivers have two nitrate maxima; a primary one which parallels the phosphate peak during the later summer period, and a secondary one, reduced in magnitude, in the winter as found in the other rivers. Although the silicate data tend to be scattered, the concentration in all the rivers would seem to fall over the same range. There is an observed seasonal trend for silicate as well, with the maximum concentrations generally occurring during the late winter months.

Appendix C contains a river flow vs. time graph for the Lamprey River so the reader may examine the general trend of flows for the study period. Preliminary analyses of the nutrient concentrations and river flow rates suggest that there is a non-significant correlation between these two parameters except for silicate which exhibits a very poor correlation in some rivers. These relationships are presently under investigation. The river flow data was compiled from the USGS water-data reports for 1976 and 1977 (USGS,1977, 1978). Further information may be obtained from the senior author.

Acknowledgements

We thank the following people who have helped collect samples, run analyses and reduced data for this report. Tim Norell, Pat Glibert and Jeffery Thorton helped set up the initial sampling programs and did some of the initial field sampling. Peter Harvey, Richard Pratt, Gordon Smith and Jane Hislop completed the remaining field sampling. Samples were run by Pat Glibert, Jeffery Thorton, Susan Murray, and Gordon Smith. The data was compiled, checked, key punched and plotted by Jane Hislop and Jonathan Kim using the Department of Earth Science's Tektronix 4051 graphics computer and plotter. Kathy Langone also helped with key punching. Drs. Lawrence Dingman and Francis Hall, INER, and the Earth Sciences-852 class offered suggestions during this report preparation. This research was supported by the University of New Hampshire Leslie S. Hubbard Marine Program Fund and the NOAA Office of Sea Grant (Contract numbers: 04-6-158-44056, 04-7-158-44034 and 04-8-M01-79) to the University of New Hampshire/University of Maine Cooperative Institutional Sea Grant Program.

References Cited

1. Adamski, J.M. 1976. Simplified Kjeldahl nitrogen determination for seawater by a semiautomated persulfate digestion method. Anal. Chem. 48:1194.

2. Glibert, P.M. and T.C. Loder. 1977. Automated analysis of nutrients in seawater: A manual of techniques. WHOI Technical Report No. 77-47.

3. Loder, T.C. 1979. Hydrographic, chemical and biological data for the Great Bay Estuary field program 1976-1978. (In prep.).

4. Loder, T.C. and P.M. Glibert. 1977. Blank and salinity corrections for automated nutrient analysis of estuarine and seawaters. In: Advances in automated analysis, v. 2. Proc. Technicon International Congress, 1976. Also avail. as Rept. #UNH-SG-JR-101.

5. Technicon Industrial Systems. 1972. Nitrate and nitrate in water and seawater. Industrial Method No. 168-71W.

6. Technicon Industrial Systems. 1973a. Orthophosphate in water and seawater. Industrial Method No. 155-71W.

7. Technicon Industrial Systems. 1973b. Nitrite in water and seawater. Industrial Method No. 161-71W.

8. Technicon Industrial Systems. 1973c. Silicates in water and seawater. Industrial Method No. 186-72W.

9. United States Geological Survey. 1977, 1978. Water Resources Data for New Hampshire and Vermont, Water Years 1977, 1978. USGS Water Data Reports, NH-VT-76-1 and NH-VT-77-1.

Appendix A

Data

CORRECTED DATA LIST: RIVERS #2 24 FEB 1976

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW#					
1.0	1.0	WINNCUT	1445	0.5	0.07	---	93.7	---
0.12	11.9	107.9	4.0					
2.0	2.0	SQUAMTT	1505	0.0	0.00	0.46	97.9	---
0.14	11.2	24.3	4.0					
3.0	3.0	LAMPRY A	1540	0.0	0.00	0.12	104.3	---
0.11	10.0	82.9	3.0					
4.0	4.0	LAMPRY B	1550	0.0	0.00	0.13	105.3	---
0.10	9.5	73.1	2.0					
5.0	5.0	OYSTER A	1610	0.3	0.00	0.29	112.1	---
0.13	18.1	64.4	2.0					
6.0	6.0	OYSTER B	1605	0.0	0.00	0.28	111.1	---
0.15	17.4	62.1	2.0					
7.0	7.0	BELLMY A	1620	1.0	0.00	0.26	114.4	---
0.83	16.7	64.0	1.0					
8.0	8.0	BELLMY B	1635	1.0	0.00	0.29	115.1	---
0.80	18.0	62.1	4.0					
9.0	9.0	COCHCO A	1700	0.0	0.00	0.56	102.6	---
0.14	12.7	22.6	1.0					
10.0	10.0	COCHCO B	1650	-0.5	0.00	0.63	103.4	---
0.15	12.6	20.0	4.0					
11.0	11.0	SAM FS A	1740	0.0	0.00	0.15	107.7	---
0.15	10.9	72.9	1.0					
12.0	12.0	GT WKS A	1755	0.0	0.00	0.12	111.0	---
0.10	10.2	85.3	1.0					
13.0	13.0	SAM FS B	1815	0.5	0.26	0.54	105.6	---
0.16	12.5	23.1	2.0					

CORRECTED DATA LIST: RIVERS #3 03/24/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	1.0	WINNCUT	1130	2.5	0.04	0.09	74.8	---
0.12	9.9	109.9	2.0					
2.0	2.0	SQUAMTT	1150	3.7	0.07	0.50	82.3	---
0.18	12.2	24.6	3.5					
3.0	3.0	LAMPRY A	1205	1.5	0.00	0.10	87.1	---
0.08	7.2	70.2	2.0					
4.0	4.0	LAMPRY B	1210	1.0	0.00	0.10	87.1	---
0.09	7.2	72.4	3.5					
5.0	5.0	OYSTER A	1230	1.5	0.00	0.19	99.1	---
0.12	13.8	72.9	2.5					
6.0	6.0	OYSTER B	1235	1.0	0.00	0.19	98.7	---
0.12	13.4	69.4	3.5					
7.0	7.0	BELLMY A	1245	2.0	0.00	0.29	93.0	---
0.32	13.5	46.1	1.5					
8.0	8.0	BELLMY B	1255	4.5	0.08	12.31	98.7	---
1.63	34.1	2.8	3.5					
9.0	9.0	COCHCO A	1315	1.8	0.00	0.57	95.5	---
0.15	10.7	18.9	1.5					
10.0	10.0	COCHCO B	1305	2.2	0.00	0.64	95.9	---
0.16	10.7	16.6	4.0					
11.0	11.0	SAM FS A	1340	2.0	0.00	0.18	95.8	---
0.10	9.7	54.9	1.5					
12.0	12.0	GT WKS A	1350	0.5	0.00	0.10	101.0	---
0.11	9.8	96.5	2.0					
13.0	13.0	SAM FS B	1410	2.5	0.00	0.21	96.1	---
0.10	9.8	46.5	1.5					

CORRECTED DATA LIST: RIVERS #4 04/21/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P13.FLOW						
1.0	1.0	WINNCUT	1325	18.5	0.04	0.44	50.6	---
0.35	15.8	35.9	2.0					
2.0	2.0	SQUAMTT	1340	18.0	2.29	2.36	51.8	---
0.41	5.3	2.3	2.5					
3.0	3.0	LAMPRY A	1355	17.5	0.00	0.24	48.2	---
0.13	3.2	13.3	1.5					
4.0	4.0	LAMPRY B	1400	17.8	0.97	0.31	47.8	---
0.14	3.4	10.8	2.0					
5.0	5.0	OYSTER A	1435	16.8	0.00	0.22	45.3	---
0.23	9.3	43.4	2.5					
6.0	6.0	OYSTER B	1440	15.5	0.00	0.30	49.8	---
0.23	10.5	35.2	2.5					
7.0	7.0	BELLMY A	1455	17.5	0.00	0.41	47.5	---
0.16	3.0	7.4	1.0					
8.0	8.0	BELLMY B	1500	15.5	0.00	0.39	49.2	---
0.16	4.0	10.4	2.5					
9.0	9.0	COCHCO A	1520	15.8	0.00	2.40	70.3	---
0.51	13.1	5.5	2.0					
10.0	10.0	COCHCO B	1510	16.5	0.00	2.43	69.8	---
0.50	13.2	5.4	2.0					
11.0	11.0	SAM FS A	1542	16.0	0.00	0.98	79.7	---
0.44	10.7	10.9	1.5					
12.0	12.0	GT WKS A	1550	16.0	0.00	0.28	73.6	---
0.17	3.3	11.9	1.0					
13.0	13.0	SAM FS B	1600	15.0	11.54	0.93	47.5	---
0.37	5.8	6.2	4.0					

CORRECTED DATA LIST: RIVERS #5 05/19/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	1.0	WINNCUT	1150	16.5	0.00	0.47	61.8	---
0.35	14.0	29.7	3.0					
2.0	2.0	SQUAMTT	1200	17.3	0.00	2.57	64.4	---
0.61	9.6	3.7	4.0					
3.0	3.0	LAMPRY A	1210	16.8	0.00	0.24	44.9	---
0.20	4.0	17.1	3.0					
4.0	4.0	LAMPRY B	1220	16.8	1.02	0.35	44.5	---
0.20	4.7	13.2	3.5					
5.0	5.0	OYSTER A	1230	15.0	0.00	0.57	78.8	---
0.48	16.0	27.9	4.5					
6.0	6.0	OYSTER B	1235	15.0	0.00	0.66	80.2	---
0.42	16.3	24.6	5.0					
7.0	7.0	BELLMY A	1245	15.5	0.00	0.39	52.2	---
0.24	6.8	17.4	1.5					
8.0	8.0	BELLMY B	1250	15.5	0.00	0.51	53.7	---
0.38	7.8	15.2	4.5					
9.0	9.0	COCHCO A	1310	15.5	0.00	2.07	71.4	---
0.66	11.2	5.4	5.0					
10.0	10.0	COCHCO B	1300	15.5	0.00	1.85	74.3	---
0.59	11.6	6.3	4.0					
11.0	11.0	SAM FS A	1330	15.5	0.00	0.38	74.0	---
0.23	5.5	14.6	2.0					
12.0	12.0	GT WKS A	1335	14.0	0.00	0.27	93.0	---
0.25	5.1	18.6	3.0					
13.0	13.0	SAM FS B	1345	15.0	2.76	0.74	72.2	---
0.37	6.6	8.9	4.5					

CORRECTED DATA LIST: RIVERS #7 07/21/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	1.0	WINNCUT	---	---	---	---	---	---
---	---	---	1.0					
2.0	2.0	SQUAMTT	---	---	---	---	---	---
---	---	---	4.0					
3.0	3.0	LAMPRY A	1202	24.5	0.00	0.05	43.1	0.6
0.07	1.8	3.7	2.0					
4.0	4.0	LAMPRY B	---	---	---	---	---	---
---	---	---	2.0					
5.0	5.0	OYSTER A	1245	24.0	0.00	0.32	85.9	0.5
---	---	---	2.0					
6.0	6.0	OYSTER B	---	---	---	---	---	---
---	---	---	2.0					
7.0	7.0	BELLMY A	1305	24.3	0.00	0.54	61.5	0.5
0.09	1.7	3.1	1.5					
8.0	8.0	BELLMY B	---	---	---	---	---	---
---	---	---	2.0					
9.0	9.0	COCHCO A	1330	24.2	0.00	7.00	85.6	17.8
1.59	40.0	5.7	2.0					
10.0	10.0	COCHCO B	---	---	---	---	---	---
---	---	---	2.0					
11.0	11.0	SAM FS A	1350	25.0	0.00	0.79	60.5	22.0
---	---	---	3.0					
12.0	12.0	GT WKS A	1400	23.6	0.00	0.27	---	0.6
---	---	---	2.0					
13.0	13.0	SAM FS B	---	---	---	---	---	---
---	---	---	2.0					

CORRECTED DATA LIST: RIVERS #8 09/18/76

1.ROW # / 10.NO2	2.STA # / 11.NO3	3.NAME / 12.NO3/P	4.TIME / 13.FLOW	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
1.0	1.0	WINNCUT	1100	22.0	0.00	0.73	167.6	---
0.45	4.2	5.7	1.0					
2.0	2.0	SQUAMTT	1120	23.0	13.82	2.63	51.2	---
1.11	6.1	2.3	4.0					
3.0	3.0	LAMPRY A	1135	24.0	0.00	0.28	66.5.	---
0.18	2.6	9.4	2.0					
4.0	4.0	LAMPRY B	1145	23.0	1.48	0.50	65.3	---
0.17	3.3	6.6	2.0					
5.0	5.0	OYSTER A	1204	20.0	0.00	1.03	136.8	---
0.98	30.2	29.3	2.0					
6.0	6.0	OYSTER B	1210	24.0	8.88	1.87	96.5	---
0.72	17.5	9.4	2.0					
7.0	7.0	BELLMY A	1226	24.0	0.00	0.64	99.5	---
0.11	0.0	8.0	2.0					
8.0	8.0	BELLMY B	1325	24.0	0.22	1.05	98.9	---
0.22	2.7	2.6	3.0					
9.0	9.0	COCHCO A	1405	24.0	0.00	4.28	119.1	---
1.25	34.2	8.0	2.0					
10.0	10.0	COCHCO B	1333	25.0	0.30	4.82	119.9	---
1.05	32.5	6.7	3.0					
11.0	11.0	SAM FS A	1507	25.0	0.00	1.39	79.5	---
0.66	13.7	9.8	3.0					
12.0	12.0	GT WKS A	1520	24.0	0.00	0.64	142.9	---
0.27	7.6	11.9	2.0					
13.0	13.0	SAM FS B	1537	25.0	12.48	2.50	53.6	---
0.76	8.2	3.3	2.0					

CORRECTED DATA LIST: RIVERS #8 08/18/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	1.0	WINNCUT	1100	22.0	0.00	0.73	167.6	---
0.45	4.2	5.7	1.0					
2.0	2.0	SQUAMTT	1120	23.0	13.82	2.63	51.2	---
1.11	6.1	2.3	4.0					
3.0	3.0	LAMPRY A	1135	24.0	0.00	0.28	66.5	---
0.18	2.6	9.4	2.0					
4.0	4.0	LAMPRY B	1145	23.0	1.48	0.50	65.3	---
0.17	3.3	6.6	2.0					
5.0	5.0	OYSTER A	1204	20.0	0.00	1.03	136.8	---
0.98	30.2	29.3	2.0					
6.0	6.0	OYSTER B	1210	24.0	8.88	1.87	96.5	---
0.72	17.5	9.4	2.0					
7.0	7.0	BELLMY A	1226	24.0	0.00	0.64	99.5	---
0.11	0.0	0.0	2.0					
8.0	8.0	BELLMY B	1325	24.0	0.22	1.05	98.9	---
0.22	2.7	2.6	3.0					
9.0	9.0	COCHCO A	1405	24.0	0.00	4.28	119.1	---
1.25	34.2	8.0	2.0					
10.0	10.0	COCHCO B	1333	25.0	0.30	4.82	119.9	---
1.05	32.5	6.7	3.0					
11.0	11.0	SAM FS A	1507	25.0	0.00	1.39	79.5	---
0.66	13.7	9.8	3.0					
12.0	12.0	GT WKS A	1520	24.0	0.00	0.64	142.9	---
0.27	7.6	11.9	2.0					
13.0	13.0	SAM FS B	1537	25.0	12.48	2.50	53.6	---
0.76	8.2	3.3	2.0					

CORRECTED DATA LIST: RIVERS #9 09/18/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	1.0	WINNCUT	---	---	---	---	---	---
---	---	---	---					
2.0	2.0	SQUAMTT	1435	---	20.16	4.52	52.0	---
1.71	13.9	3.1	3.0					
3.0	3.0	LAMPRY A	1450	---	0.00	0.20	54.7	---
0.12	1.6	7.8	2.0					
4.0	4.0	LAMPRY B	1510	---	3.63	1.06	50.2	---
0.20	2.9	2.7	1.0					
5.0	5.0	OYSTER A	1520	---	0.00	0.27	77.2	---
0.20	2.1	7.9	3.0					
6.0	6.0	OYSTER B	1525	---	26.14	5.95	30.4	---
1.03	2.6	0.4	2.0					
7.0	7.0	BELLMY A	1545	---	0.00	0.64	53.7	---
0.21	1.7	2.7	1.0					
8.0	8.0	BELLMY B	1550	19.7	---	6.93	58.8	---
0.25	5.2	0.8	4.0					
9.0	9.0	COCHCO A	1615	19.1	0.00	6.45	83.2	---
2.38	---	---	3.0					
10.0	10.0	COCHCO B	1610	19.3	0.80	6.49	82.0	---
2.18	---	---	2.0					
11.0	11.0	SAM FS A	1625	20.0	0.00	4.66	54.8	---
3.45	55.6	11.9	2.0					
12.0	12.0	GT WKS A	1630	19.5	0.00	0.31	130.9	---
0.16	1.9	6.2	3.0					
13.0	13.0	SAM FS B	1650	20.0	20.85	3.21	28.2	---
1.25	15.5	4.8	4.0					

CORRECTED DATA LIST: RIVERS #10 10/19/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	1.0	WINNCUT	---	---	---	---	---	---
---	---	---	---					
2.0	2.0	SQUAMTT	1400	12.0	19.03	3.64	47.3	9.1
1.48	13.5	3.7	3.0					
3.0	3.0	LAMPRY A	1410	12.0	0.00	0.20	64.9	2.0
0.19	0.7	3.5	1.0					
4.0	4.0	LAMPRY B	1420	11.5	2.39	0.36	62.2	---
0.50	1.0	2.6	1.0					
5.0	5.0	OYSTER A	1435	12.0	0.00	0.23	52.2	0.7
0.08	0.2	0.8	2.0					
6.0	6.0	OYSTER B	1450	11.0	26.48	4.45	26.1	10.0
1.68	6.6	1.5	2.0					
7.0	7.0	BELLMY A	1500	11.0	0.00	0.81	98.5	0.4
0.10	0.7	0.9	1.0					
8.0	8.0	BELLMY B	1515	10.0	0.63	1.17	93.0	3.8
1.66	1.1	0.9	3.0					
9.0	9.0	COCHCO A	1620	9.0	0.00	3.05	58.9	10.8
0.63	15.6	5.1	3.0					
10.0	10.0	COCHCO B	1610	9.0	0.13	3.22	58.4	11.3
0.65	16.1	5.0	2.0					
11.0	11.0	SAM FS A	1630	10.0	0.00	1.43	61.1	16.2
0.53	10.8	7.5	2.0					
12.0	12.0	GT WKS A	16	9.5	0.00	0.27	157.9	1.7
0.20	2.1	7.9	2.0					
13.0	13.0	SAM FS B	1655	11.0	11.26	1.92	43.5	11.7
1.02	11.7	6.1	3.0					

CORRECTED DATA LIST: RIVERS #11 11/16/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4	10.NO2	11.NO3	12.NO3/P	13.FLOW
1.0	1.0	WINNCUT	---	---	---	---	---	---	---	---	---	---
2.0	2.0	SQUAMTT	1430	-1.0	9.04	4.90	---	31.7	---	---	---	2.0
3.0	3.0	LAMPRY A	1440	-2.0	0.00	0.16	---	0.9	---	---	---	2.0
4.0	4.0	LAMPRY B	1445	-2.0	2.00	0.34	---	1.6	---	---	---	2.0
5.0	5.0	OYSTER A	1500	0.0	0.00	0.32	---	1.6	---	---	---	2.0
6.0	6.0	OYSTER B	1515	0.0	10.08	1.65	---	7.6	---	---	---	1.0
7.0	7.0	BELLMY A	1525	-2.0	0.00	0.75	---	7.3	---	---	---	2.0
8.0	8.0	BELLMY B	1535	-2.0	0.20	1.24	---	6.1	---	---	---	3.0
9.0	9.0	COCHCO A	1550	-3.0	0.00	2.91	---	---	---	---	---	2.0
10.0	10.0	COCHCO B	1600	-3.0	2.00	3.12	---	29.5	---	---	---	2.0
11.0	11.0	SAM FS A	1615	-3.0	0.00	1.57	---	18.5	---	---	---	2.0
12.0	12.0	GT WKS A	1625	-3.0	0.00	0.32	---	1.4	---	---	---	2.0
13.0	13.0	SAM FS B	1645	-2.0	14.71	1.83	---	7.9	---	---	---	3.0

CORRECTED DATA LIST: RIVERS #12 12/16/76

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	1.0	WINNCUT	---	---	---	---	---	---
---	---	---	---					
2.0	2.0	SQUAMTT	1030	1.0	1.36	1.74	---	---
---	---	---	3.0					
3.0	3.0	LAMPRY A	1105	1.0	0.00	0.39	139.3	---
0.30	11.9	30.5	1.0					
4.0	4.0	LAMPRY B	1050	1.0	1.18	0.51	140.4	---
0.34	12.3	24.1	2.0					
5.0	5.0	OYSTER A	1115	1.0	0.00	0.63	104.6	---
---	---	---	2.0					
6.0	6.0	OYSTER B	1125	1.0	2.24	1.72	107.5	---
0.86	46.7	27.2	2.0					
7.0	7.0	BELLMY A	1150	1.0	0.00	1.98	121.6	---
0.48	18.1	9.1	2.0					
8.0	8.0	BELLMY B	1200	1.0	1.36	1.13	105.5	---
0.60	24.7	21.9	2.0					
9.0	9.0	COCHCO A	1220	0.0	0.00	2.28	115.1	---
0.44	20.1	8.8	2.0					
10.0	10.0	COCHCO B	1320	1.0	0.08	2.42	166.4	---
0.44	20.1	8.3	2.0					
11.0	11.0	SAM FS A	1240	1.0	0.00	1.09	89.1	---
0.98	19.2	17.6	2.0					
12.0	12.0	GT WKS A	1255	1.0	0.00	0.58	79.2	---
0.32	14.5	25.0	1.0					
13.0	13.0	SAM FS B	1310	0.0	4.06	1.46	---	---
0.54	17.5	12.0	3.0					

CORRECTED DATA LIST: RIVERS #13 01/13/77

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1745	-0.5	13.66	2.00	107.4	51.2
---	---	---	3.0					
2.0	3.0	LAMPRY A	---	---	---	---	---	---
---	---	---	---					
3.0	4.0	LAMPRY B	1515	0.0	0.24	4.28	135.7	13.2
---	---	---	---					
4.0	5.0	OYSTER A	---	---	---	---	---	---
---	---	---	---					
5.0	6.0	OYSTER B	1835	-0.5	0.06	0.99	179.9	14.3
1.32	44.4	44.9	4.0					
6.0	7.0	BELLMY A	1435	0.5	0.00	3.88	140.9	13.9
0.72	20.4	5.2	---					
7.0	8.0	BELLMY B	1500	1.0	9.40	0.51	134.4	15.7
1.21	19.9	39.3	3.0					
8.0	9.0	COCHCO A	---	---	---	---	---	---
---	---	---	---					
9.0	10.0	COCHCO B	---	---	---	---	---	---
---	---	---	---					
10.0	11.0	SAM FS A	1600	0.5	0.00	0.46	142.1	---
0.93	16.3	17.0	1.0					
11.0	12.0	GT WKS A	1615	0.5	0.00	2.34	166.7	7.4
1.20	10.7	9.0	4.0					
12.0	13.0	SAM FS B	1630	-0.5	11.21	0.56	102.7	23.1
1.24	13.9	25.0	3.0					

CORRECTED DATA LIST: RIVERS #14 02/09/77

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	840	-1.0	7.77	3.87	175.2	12.3
0.90	16.3	4.2	4.0					
2.0	3.0	LAMPRY A	910	-0.1	0.07	0.44	169.1	35.9
0.21	13.7	31.1	4.0					
3.0	4.0	LAMPRY B	900	-0.2	28.99	0.48	163.9	5.1
0.15	14.1	29.4	2.0					
4.0	5.0	OYSTER A	928	0.0	0.09	0.83	203.5	31.3
0.67	45.6	55.3	4.0					
5.0	6.0	OYSTER B	---	---	---	---	---	---
---	---	---	---					
6.0	7.0	BELLMY A	942	-0.1	0.00	0.84	159.1	4.8
0.46	25.2	30.0	3.0					
7.0	8.0	BELLMY B	---	---	---	---	---	---
---	---	---	---					
8.0	9.0	COCHCO A	1003	-0.3	0.00	5.62	172.7	13.1
0.32	21.4	3.8	4.0					
9.0	10.0	COCHCO B	1016	---	29.11	0.29	180.0	15.4
0.36	20.0	2.4	3.0					
10.0	11.0	SAM FS A	1034	0.0	0.00	3.34	164.1	9.0
0.43	16.3	13.0	2.0					
11.0	12.0	GT WKS A	1045	0.0	0.00	0.64	208.3	3.1
0.17	11.2	17.6	3.0					
12.0	13.0	SAM FS B	1100	-0.3	17.86	2.78	172.2	6.2
0.34	14.7	5.1	2.0					

CORRECTED DATA LIST: RIVERS #15 03/18/77

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1035	2.0	0.80	0.65	84.9	4.3
0.25	9.0	14.0	3.0					
2.0	3.0	LAMPRY A	1105	1.0	0.00	0.20	81.4	3.1
0.18	6.4	32.3	5.0					
3.0	4.0	LAMPRY B	1055	1.4	0.60	0.16	81.3	2.8
0.15	6.5	40.8	4.0					
4.0	5.0	OYSTER A	1115	1.0	0.00	0.32	91.6	2.9
---	---	---	4.0					
5.0	6.0	OYSTER B	1125	1.0	0.60	0.15	93.4	2.9
0.21	13.0	84.6	4.0					
6.0	7.0	BELLMY A	1145	0.5	0.00	0.36	67.3	4.4
0.28	8.7	24.0	3.0					
7.0	8.0	BELLMY B	1155	0.5	0.40	0.38	68.0	4.7
0.28	10.0	26.6	3.0					
8.0	9.0	COCHCO A	1205	1.8	0.00	0.26	80.4	4.7
0.14	8.4	32.4	3.0					
9.0	10.0	COCHCO B	1215	1.2	0.20	0.39	80.3	5.8
0.14	7.6	19.6	3.0					
10.0	11.0	SAM FS A	1235	0.8	0.00	0.31	76.0	3.8
0.16	6.8	21.7	3.0					
11.0	12.0	GT WKS A	1250	0.2	0.00	0.34	81.5	2.4
0.19	6.4	19.0	3.0					
12.0	13.0	SAM FS B	1305	0.5	0.10	0.24	77.0	4.1
0.19	6.3	26.8	3.0					

CORRECTED DATA LIST: RIVERS #16 03/29/77

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1140	7.5	0.00	0.45	93.4	3.6
0.26	6.1	13.5	4.0					
2.0	3.0	LAMPRY A	1200	5.9	0.00	0.15	94.6	1.6
0.14	8.7	59.1	3.0					
3.0	4.0	LAMPRY B	1154	6.0	0.20	0.14	94.8	1.7
0.22	8.7	64.7	3.0					
4.0	5.0	OYSTER A	1215	5.0	0.00	1.32	95.0	4.6
0.42	43.8	45.8	4.0					
5.0	6.0	OYSTER B	1220	6.8	0.30	1.20	95.2	4.7
0.42	42.6	49.4	3.0					
6.0	7.0	BELLMY A	1245	3.7	0.00	0.34	81.7	3.6
0.30	11.0	32.7	2.0					
7.0	8.0	BELLMY B	1255	4.5	0.40	0.30	82.6	3.8
0.31	11.7	38.5	5.0					
8.0	9.0	COCHCO A	1310	5.0	0.10	0.41	97.5	5.6
0.23	7.3	17.9	4.0					
9.0	10.0	COCHCO B	1320	5.4	0.10	0.38	97.5	5.9
0.22	6.9	18.1	4.0					
10.0	11.0	SAM FS A	1334	4.8	0.00	0.19	95.9	3.5
0.15	9.5	50.6	4.0					
11.0	12.0	GT WKS A	1345	4.1	0.00	0.24	95.8	1.8
0.16	6.0	24.8	3.0					
12.0	13.0	SAM FS B	1400	7.0	0.10	0.20	98.3	2.5
0.19	5.2	26.3	3.0					

CORRECTED DATA LIST: RIVERS #17 04/26/77

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1205	9.0	0.00	0.97	109.6	4.0
0.19	3.4	3.5	3.0					
2.0	3.0	LAMPRY A	1235	9.0	0.00	0.15	92.0	0.9
0.13	2.7	18.0	3.0					
3.0	4.0	LAMPRY B	1225	9.5	0.00	0.23	109.7	1.3
0.13	2.9	12.5	3.0					
4.0	5.0	OYSTER A	1245	8.5	0.00	0.32	126.6	1.1
0.18	10.9	34.1	4.0					
5.0	6.0	OYSTER B	1255	9.0	0.00	0.96	119.7	0.8
0.20	12.8	13.3	2.0					
6.0	7.0	BELLMY A	1306	11.5	0.00	0.23	56.4	1.1
0.11	2.8	12.2	2.0					
7.0	8.0	BELLMY B	1315	11.5	0.00	0.17	55.9	1.2
0.11	3.5	20.5	3.0					
8.0	9.0	COCHCO A	1330	9.0	0.00	0.51	124.4	2.4
0.15	4.4	8.6	4.0					
9.0	10.0	COCHCO B	1340	9.0	0.00	0.48	104.2	2.6
0.14	4.7	9.8	4.0					
10.0	11.0	SAM FS A	1355	9.0	0.00	0.30	108.7	2.9
0.13	3.6	11.9	3.0					
11.0	12.0	GT WKS A	1400	8.0	0.00	0.18	117.6	1.0
0.15	3.7	20.3	2.0					
12.0	13.0	SAM FS B	1415	9.0	0.00	0.32	111.8	2.0
0.14	3.9	12.0	3.0					

CORRECTED DATA LIST: RIVERS #18 05/25/77

1.ROW #	2.STA #	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SIO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1050	24.0	7.68	2.04	47.5	24.9
0.90	12.9	6.3	3.0					
2.0	3.0	LAMPRY A	1115	26.5	0.00	0.13	41.2	0.9
0.23	2.3	18.0	2.0					
3.0	4.0	LAMPRY B	1105	23.5	2.64	0.69	39.9	8.8
0.28	5.0	7.2	3.0					
4.0	5.0	OYSTER A	1130	25.5	0.00	0.21	70.5	0.8
0.48	16.4	78.8	2.0					
5.0	6.0	OYSTER B	1140	25.0	11.06	0.91	35.9	5.2
0.44	9.9	10.8	2.0					
6.0	7.0	BELLMY A	1155	26.0	0.00	0.25	40.6	2.1
0.26	3.2	12.8	1.0					
7.0	8.0	BELLMY B	1205	26.0	0.06	1.24	46.5	10.6
0.38	8.6	6.9	2.0					
8.0	9.0	COCHCO A	1215	25.5	0.00	1.95	73.8	12.8
1.01	29.4	15.1	3.0					
9.0	10.0	COCHCO B	1225	24.0	0.11	2.49	74.7	16.8
1.74	32.0	12.9	2.0					
10.0	11.0	SAM FS A	1240	25.0	0.00	0.66	77.8	7.0
0.47	19.6	29.8	2.0					
11.0	12.0	GT WKS A	1255	22.0	0.00	0.23	97.9	1.9
0.32	10.3	45.0	2.0					
12.0	13.0	SAM FS B	1310	25.0	5.44	1.20	63.6	16.0
0.64	15.8	13.2	2.0					

CORRECTED DATA LIST: RIVERS #19 06/23/77

1.ROW 10.NO2	2.STA# 11.NO3	3.NAME 12.NO3/P	4.TIME 13.FLOW	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
1.0 1.16	2.0 9.2	SQUAMTT 5.8	930 2.0	20.5	11.92	1.59	50.7	20.0
2.0 0.27	3.0 6.5	LAMPRY A 35.9	955 2.0	21.0	0.00	0.18	52.7	2.3
3.0 0.38	4.0 6.8	LAMPRY B 14.9	950 2.0	20.5	1.60	0.45	52.9	7.1
4.0 0.56	5.0 26.2	OYSTER A 97.6	1010 2.0	19.0	0.00	0.27	110.1	2.8
5.0 0.55	6.0 12.9	OYSTER B 13.9	1020 2.0	20.5	13.56	0.93	53.3	5.2
6.0 0.26	7.0 3.5	BELLMY A 9.9	1035 1.0	21.0	0.00	0.35	43.8	3.9
7.0 0.34	8.0 6.1	BELLMY B 10.5	1040 2.0	20.2	0.23	0.59	45.3	4.9
8.0 2.85	9.0 30.1	COCHCO A 6.8	1055 2.0	21.0	0.00	4.40	97.8	20.5
9.0 2.71	10.0 31.9	COCHCO B 5.1	1105 2.0	20.1	2.08	6.21	94.6	---
10.0 1.23	11.0 14.9	SAM FS A 58.1	1120 2.0	22.5	0.00	0.38	77.9	1.8
11.0 0.28	12.0 7.6	GT WKS A 49.5	1130 2.0	20.5	0.00	0.15	37.7	1.6
12.0 0.82	13.0 11.6	SAM FS B 14.0	1145 2.0	21.0	8.49	0.83	59.0	7.9

CORRECTED DATA LIST: RIVERS #20 07/21/77

1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	955	28.0	19.62	3.79	50.8	22.9
---	---	---	4.0					
2.0	3.0	LAMPRY A	1030	29.0	0.00	---	---	0.9
---	---	---	1.0					
3.0	4.0	LAMPRY B	1015	28.0	3.70	---	44.4	3.5
1.23	---	---	2.0					
4.0	5.0	OYSTER A	1045	28.0	0.00	0.18	73.8	1.3
0.33	3.4	18.8	1.0					
5.0	6.0	OYSTER B	1050	27.0	23.12	1.75	9.4	1.8
---	---	---	2.0					
6.0	7.0	BELLMY A	1105	28.0	0.00	0.63	64.0	1.0
0.39	0.7	1.1	1.0					
7.0	8.0	BELLMY B	1115	30.0	0.60	1.48	65.2	6.8
0.99	3.6	2.4	2.0					
8.0	9.0	COCHCO A	1125	28.0	0.00	4.04	88.1	1.4
0.21	25.8	6.4	1.0					
9.0	10.0	COCHCO B	1135	28.0	1.20	4.90	85.9	4.0
0.61	25.9	5.3	2.0					
10.0	11.0	SAM FS A	1145	29.0	0.00	2.51	53.7	7.8
0.13	17.1	6.8	1.0					
11.0	12.0	GT WKS A	1200	27.0	0.00	0.17	104.7	1.2
0.44	0.9	5.3	2.0					
12.0	13.0	SAM FS B	1215	29.0	15.03	1.80	15.5	0.7
1.03	0.4	0.2	2.0					

CORRECTED DATA LIST: RIVERS #21 08/23/77

1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1015	19.2	28.21	2.09	15.3	1.7
0.93	5.5	2.6	3.0					
2.0	3.0	LAMPRY A	1040	21.0	0.00	0.03	49.7	0.4
0.09	0.6	18.9	1.0					
3.0	4.0	LAMPRY B	1030	21.5	6.87	0.77	42.2	3.8
0.31	2.6	3.3	2.0					
4.0	5.0	OYSTER A	1100	20.5	0.00	0.90	52.3	0.7
0.53	15.6	17.3	1.0					
5.0	6.0	OYSTER B	1110	20.5	21.00	3.33	29.1	24.2
0.73	6.3	1.9	3.0					
6.0	7.0	BELLMY A	1120	20.8	0.00	0.55	76.1	0.5
0.14	1.9	3.4	1.0					
7.0	8.0	BELLMY B	1130	21.0	2.54	1.10	74.2	3.4
0.28	6.2	5.7	2.0					
8.0	9.0	COCHCO A	1145	21.0	0.00	6.36	32.5	10.6
1.62	38.0	6.0	1.0					
9.0	10.0	COCHCO B	1150	21.5	11.39	0.20	33.0	46.6
1.72	3.5	17.1	2.0					
10.0	11.0	SAM FS A	1205	23.0	0.00	2.62	24.9	26.2
3.72	38.8	14.8	1.0					
11.0	12.0	GT WKS A	1215	21.0	0.00	0.09	81.0	0.6
0.14	0.1	1.1	2.0					
12.0	13.0	SAM FS B	1220	21.0	14.92	2.98	17.2	8.3
1.84	20.3	6.8	3.0					

CORRECTED DATA LIST: RIVERS #22 09/22/77

1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1007	14.0	24.58	1.89	21.3	---
1.28	0.4	0.0	3.0					
2.0	3.0	LAMPRY A	1031	16.0	0.00	0.21	45.8	---
0.16	7.3	5.4	1.0					
3.0	4.0	LAMPRY B	1024	16.0	10.32	0.10	---	---
---	---	---	3.0					
4.0	5.0	OYSTER A	1045	14.5	0.00	0.59	90.6	---
0.41	21.8	37.0	3.0					
5.0	6.0	OYSTER B	1052	14.8	6.52	1.39	71.8	---
0.61	70.1	6.2	3.0					
6.0	7.0	BELLMY A	1104	15.0	0.00	---	83.5	---
0.26	---	---	2.0					
7.0	8.0	BELLMY B	1114	15.3	21.83	3.26	38.9	---
0.51	31.4	17.5	2.0					
8.0	9.0	COCHCO A	1128	14.5	0.00	2.67	89.5	---
7.30	3.9	1.9	2.0					
9.0	10.0	COCHCO B	1134	15.1	1.90	9.85	89.1	---
8.00	73.0	7.4	3.0					
10.0	11.0	SAM FS A	1152	16.0	0.00	1.41	48.3	---
1.63	28.2	20.0	2.0					
11.0	12.0	GT WKS A	1205	16.0	0.00	---	76.4	---
0.13	0.3	0.2	2.0					
12.0	13.0	SAM FS B	1220	16.0	13.84	0.57	38.7	---
1.66	---	---	3.0					

****

CORRECTED DATA LIST: RIVERS #23 10/20/77

1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1053	11.0	2.84	1.23	95.9	7.8
0.45	3.7	3.0	5.0					
2.0	3.0	LAMPRY A	1120	11.0	0.00	0.18	86.7	0.6
0.15	---	---	4.0					
3.0	4.0	LAMPRY B	1110	10.5	25.18	0.13	89.7	0.2
0.11	2.6	185.9	4.0					
4.0	5.0	OYSTER A	1130	11.0	0.00	0.39	118.8	1.7
0.30	11.0	28.1	4.0					
5.0	6.0	OYSTER B	1140	11.8	1.56	0.71	110.4	4.5
0.34	10.7	15.1	4.0					
6.0	7.0	BELLMY A	1150	11.0	0.00	0.59	77.5	4.5
0.20	6.1	10.4	4.0					
7.0	8.0	BELLMY B	1200	11.5	28.80	0.55	85.1	0.7
0.15	7.3	13.2	4.0					
8.0	9.0	COCHCO A	1225	10.5	0.00	1.12	93.2	3.9
0.22	5.9	5.3	4.0					
9.0	10.0	COCHCO B	1215	11.0	0.00	1.10	93.6	3.8
0.21	5.6	5.1	4.0					
10.0	11.0	SAM FS A	1230	11.0	0.00	0.21	91.2	3.5
0.16	3.5	16.2	4.0					
11.0	12.0	GT WKS A	1245	11.0	0.00	0.12	115.2	0.7
0.19	4.0	33.8	4.0					
12.0	13.0	SAM FS B	1300	11.5	23.37	0.11	101.5	0.8
0.14	4.3	39.4	4.0					

CORRECTED DATA LIST: RIVERS #24 11/17/77

1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1117	7.0	0.30	1.30	128.1	---
0.51	4.9	3.8	4.0					
2.0	3.0	LAMPRY A	1145	7.4	0.00	0.23	98.8	1.5
0.14	---	---	3.0					
3.0	4.0	LAMPRY B	1130	7.5	4.20	0.22	99.9	1.4
0.17	4.8	18.4	4.0					
4.0	5.0	OYSTER A	1155	6.0	0.00	0.38	96.9	2.2
0.54	15.5	41.2	3.0					
5.0	6.0	OYSTER B	1206	7.5	7.26	1.60	99.5	---
0.49	12.0	7.5	3.0					
6.0	7.0	BELLMY A	1218	9.0	0.00	0.41	108.0	8.3
0.33	9.8	24.0	3.0					
7.0	8.0	BELLMY B	1230	8.5	4.37	0.41	108.9	7.9
0.39	11.8	26.8	3.0					
8.0	9.0	COCHCO A	1242	6.0	0.00	1.22	116.1	8.4
0.36	8.8	7.2	3.0					
9.0	10.0	COCHCO B	1255	6.5	0.00	1.21	114.6	8.4
0.36	9.4	7.8	4.0					
10.0	11.0	SAM FS A	1311	7.5	0.00	0.79	110.7	9.4
0.33	5.5	7.0	3.0					
11.0	12.0	GT WKS A	1320	6.0	0.00	0.26	137.4	1.3
0.24	6.1	23.3	3.0					
12.0	13.0	SAM FS B	1335	8.0	2.76	0.52	109.2	7.4
0.36	5.7	11.1	3.0					

CORRECTED DATA LIST: RIVERS #25 12/19/77

1.ROW # / 10.NO2	2.STAT# / 11.NO3	3.NAME / 12.NO3/P13.FLOW	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
1.0	2.0	SQUAMTT	1350	0.5	10.14	0.58	45.8	6.7
0.17	12.6	21.8	2.0					
2.0	3.0	LAMPRY A	1405	0.5	0.00	0.11	38.8	2.0
0.08	8.5	76.8	3.0					
3.0	4.0	LAMPRY B	1415	0.5	17.95	0.11	39.8	1.1
0.08	7.6	206.0	2.0					
4.0	5.0	OYSTER A	1430	0.7	0.00	0.21	40.2	1.8
0.08	17.7	84.3	2.0					
5.0	6.0	OYSTER B	1440	0.5	0.35	0.29	44.6	2.5
0.10	18.9	65.2	2.0					
6.0	7.0	BELLMY A	1450	1.5	0.00	0.21	115.2	5.5
0.33	10.3	49.1	2.0					
7.0	8.0	BELLMY B	1503	1.5	0.00	0.22	---	5.2
0.25	11.2	50.9	3.0					
8.0	9.0	COCHCO A	1530	0.5	0.00	0.75	37.8	7.9
0.10	10.6	14.2	2.0					
9.0	10.0	COCHCO B	1520	0.5	0.57	0.77	112.5	7.4
0.30	9.8	12.8	3.0					
10.0	11.0	SAM FS A	1545	0.5	0.00	0.18	116.4	4.3
0.48	6.5	36.2	2.0					
11.0	12.0	GT WKS A	1555	0.5	0.00	0.12	132.9	1.4
0.33	7.7	64.3	2.0					
12.0	13.0	SAM FS B	1610	0.5	1.03	0.22	39.8	3.9
0.10	7.9	35.7	2.0					

CORRECTED DATA LIST: RIVERS #26 01/24/78

1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P13.FLOW						
1.0	2.0	SQUAMTT	1315	0.5	6.54	0.77	109.9	---
0.44	11.6	15.0	2.0					
2.0	3.0	LAMPRY A	1335	1.0	0.00	0.21	123.0	---
0.42	8.4	40.6	2.0					
3.0	4.0	LAMPRY B	---	---	---	---	---	---
---	---	---	---					
4.0	5.0	OYSTER A	---	---	---	---	---	---
---	---	---	---					
5.0	6.0	OYSTER B	1350	2.0	0.10	0.59	147.0	---
0.54	18.4	31.4	2.0					
6.0	7.0	BELLMY A	---	---	---	---	---	---
---	---	---	---					
7.0	8.0	BELLMY B	1405	0.8	0.00	1.18	111.0	---
0.45	12.2	10.3	2.0					
8.0	9.0	COCHCO A	---	---	---	---	---	---
---	---	---	---					
9.0	10.0	COCHCO B	1425	0.5	6.89	0.50	118.8	---
0.37	11.4	22.8	2.0					
10.0	11.0	SAM FS A	---	---	---	---	---	---
---	---	---	---					
11.0	12.0	GT WKS A	1445	0.5	0.00	0.20	145.0	---
0.34	11.3	57.1	3.0					
12.0	13.0	SAM FS B	1500	0.2	1.02	0.61	119.0	---
0.72	9.1	15.0	3.0					

CORRECTED DATA LIST: RIVERS #27 2/17/78

1.ROW # / 10.NO2	2.STAT# / 11.NO3	3.NAME / 12.NO3/P13.FLOW	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
1.0	2.0	SQUAMTT	1200	0.5	2.85	1.25	141.0	---
0.56	14.6	11.7	3.0					
2.0	3.0	LAMPRY A	---	---	---	---	---	---
---	---	---	---					
3.0	4.0	LAMPRY B	1215	0.5	0.00	0.26	138.0	---
0.28	9.7	37.7	2.0					
4.0	5.0	OYSTER A	---	---	---	---	---	---
---	---	---	---					
5.0	6.0	OYSTER B	---	---	---	---	---	---
---	---	---	---					
6.0	7.0	BELLMY A	---	---	---	---	---	---
---	---	---	---					
7.0	8.0	BELLMY B	1530	0.7	0.00	0.26	110.0	---
0.43	10.6	40.6	3.0					
8.0	9.0	COCHCO A	---	---	---	---	---	---
---	---	---	---					
9.0	10.0	COCHCO B	1513	0.8	15.67	0.71	127.5	---
0.25	12.6	17.7	3.0					
10.0	11.0	SAM FS A	---	---	---	---	---	---
---	---	---	---					
11.0	12.0	GT WKS A	1455	0.5	0.00	0.24	151.0	---
0.38	11.5	47.5	3.0					
12.0	13.0	SAM FS B	1430	0.7	1.87	0.69	123.0	---
1.10	9.7	14.1	3.0					

CORRECTED DATA LIST: RIVERS #28 03/15/78

1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	1400	0.5	0.25	2.55	159.0	---
0.86	16.9	6.6	4.0					
2.0	3.0	LAMPRY A	---	0.5	0.00	0.37	151.0	---
0.28	13.7	36.9	3.0					
3.0	4.0	LAMPRY B	---	0.5	0.34	0.36	148.0	---
0.32	13.9	38.3	3.0					
4.0	5.0	OYSTER A	---	0.4	0.00	1.25	131.0	---
0.81	31.5	25.2	3.0					
5.0	6.0	OYSTER B	---	1.0	0.48	1.39	132.0	---
0.98	39.0	28.1	4.0					
6.0	7.0	BELLMY A	---	0.3	0.00	2.33	---	---
---	---	---	3.0					
7.0	8.0	BELLMY B	---	0.9	0.00	2.29	105.0	---
0.79	20.2	8.8	3.0					
8.0	9.0	COCHCO A	---	---	---	---	---	---
---	---	---	---					
9.0	10.0	COCHCO B	---	0.5	0.00	2.18	138.0	---
0.64	19.3	8.9	3.0					
10.0	11.0	SAM FS A	---	---	---	---	---	---
---	---	---	---					
11.0	12.0	GT WKS A	---	0.2	0.00	0.37	157.0	---
0.32	14.5	39.0	3.0					
12.0	13.0	SAM FS B	1600	1.5	6.33	1.39	104.8	---
0.76	13.6	9.8	3.0					

CORRECTED DATA LIST: RIVERS #29 4/17/78

1.ROW # / 10.NO2	2.STAT# / 11.NO3	3.NAME / 12.NO3/P	4.TIME / 13.FLOW	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
1.0 / 0.67	2.0 / 3.5	SQUAMTT / 7.5	1020 / 4.0	8.0	2.63	0.47	59.7	4.2
2.0 / 0.33	3.0 / 2.4	LAMPRY A / 28.8	1042 / 4.0	7.5	0.00	0.08	68.9	0.7
3.0 / 0.38	4.0 / 2.3	LAMPRY B / 19.2	1030 / 4.0	8.0	0.76	0.12	69.0	0.8
4.0 / 0.41	5.0 / 0.6	OYSTER A / 5.1	1055 / 4.0	7.0	0.00	0.12	75.9	1.0
5.0 / 0.48	6.0 / 9.1	OYSTER B / 22.4	1103 / 4.0	8.5	1.66	0.41	72.2	3.7
6.0 / 0.39	7.0 / 4.6	BELLMY A / 45.7	1120 / 4.0	6.0	0.00	0.10	69.8	2.4
7.0 / 0.42	8.0 / 5.5	BELLMY B / 45.2	1128 / 4.0	5.5	0.73	0.12	70.6	2.5
8.0 / 0.37	9.0 / 4.0	COCHCO A / 9.5	1152 / 4.0	6.5	0.00	0.42	73.4	3.8
9.0 / ---	10.0 / ---	COCHCO B / ---	1144 / 4.0	6.5	0.56	0.41	---	3.9
10.0 / 0.30	11.0 / 3.4	SAM FS A / 26.4	1207 / 4.0	5.5	0.00	0.13	79.5	2.3
11.0 / 0.39	12.0 / 4.5	GT WKS A / 49.8	1218 / 4.0	7.0	0.00	0.09	81.4	1.1
12.0 / 0.31	13.0 / 3.6	SAM FS B / 173.0	1234 / 4.0	6.5	9.77	0.13	82.5	1.3

CORRECTED DATA LIST: RIVERS #30 5/16/78

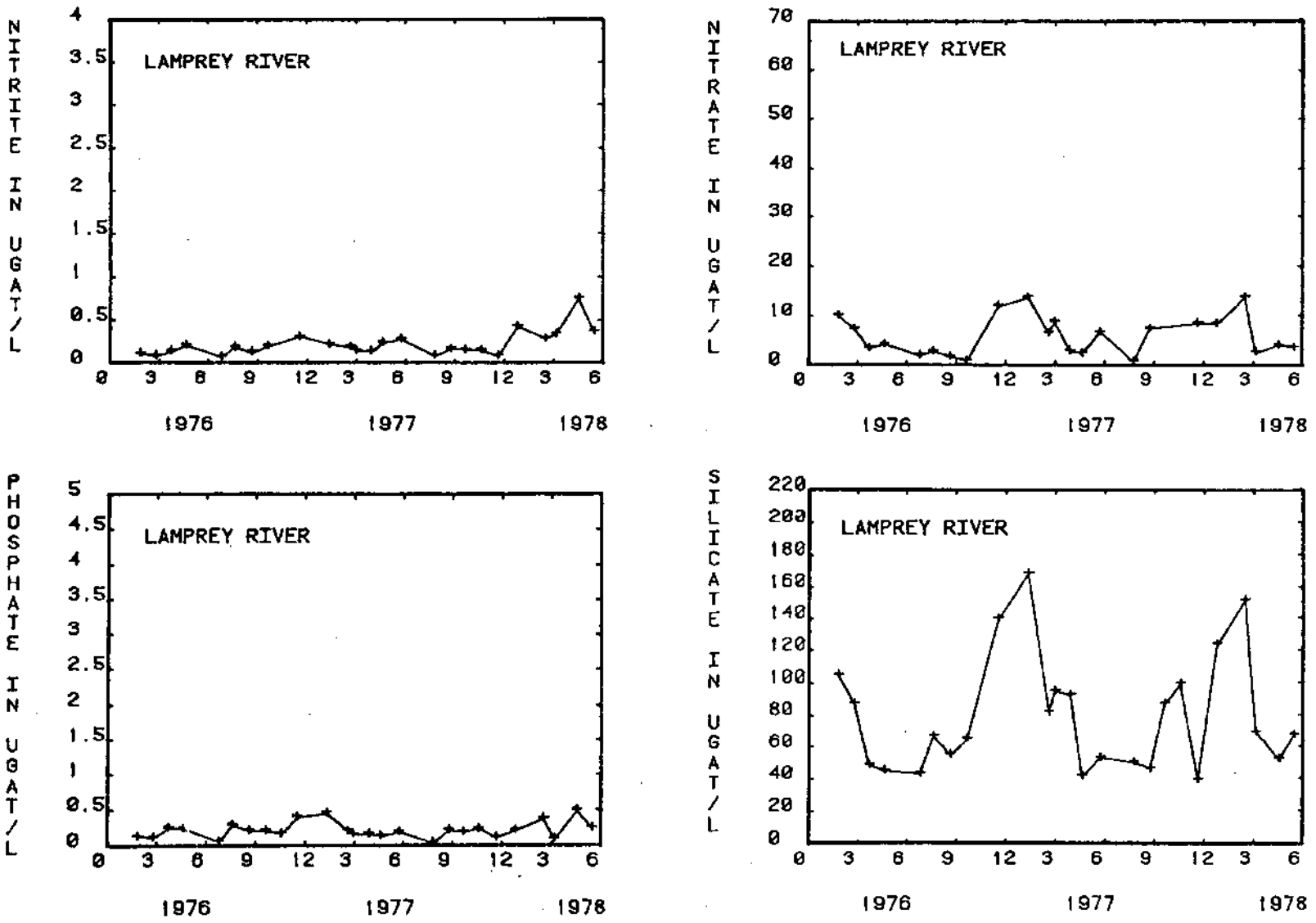
1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	915	11.0	0.10	1.19	53.7	6.4
0.92	5.1	4.3	5.0					
2.0	3.0	LAMPRY A	940	11.0	0.00	0.48	51.7	2.5
0.75	3.9	8.0	5.0					
3.0	4.0	LAMPRY B	928	11.0	19.60	0.25	51.5	1.1
0.68	4.0	15.9	5.0					
4.0	5.0	OYSTER A	953	9.5	0.00	1.38	71.5	6.2
1.10	14.7	10.6	5.0					
5.0	6.0	OYSTER B	958	9.8	13.10	1.03	68.6	3.8
0.92	12.1	11.7	5.0					
6.0	7.0	BELLMY A	1011	11.0	0.00	0.92	54.4	1.9
0.69	4.3	4.7	5.0					
7.0	8.0	BELLMY B	1020	11.0	0.00	1.01	56.3	3.0
0.78	5.5	5.4	5.0					
8.0	9.0	COCHCO A	1044	11.0	0.00	0.93	64.5	5.2
1.13	6.3	6.8	5.0					
9.0	10.0	COCHCO B	1035	11.0	0.00	1.02	65.2	5.0
1.14	6.6	6.5	5.0					
10.0	11.0	SAM FS A	1058	12.0	0.00	0.22	68.2	4.0
0.65	3.6	16.5	5.0					
11.0	12.0	GT WKS A	1111	10.0	0.00	0.35	73.0	1.3
0.55	3.6	10.2	5.0					
12.0	13.0	SAM FS B	1130	11.5	3.43	0.45	70.6	4.6
0.66	3.6	7.9	5.0					

CORRECTED DATA LIST: RIVERS #31 6/13/78

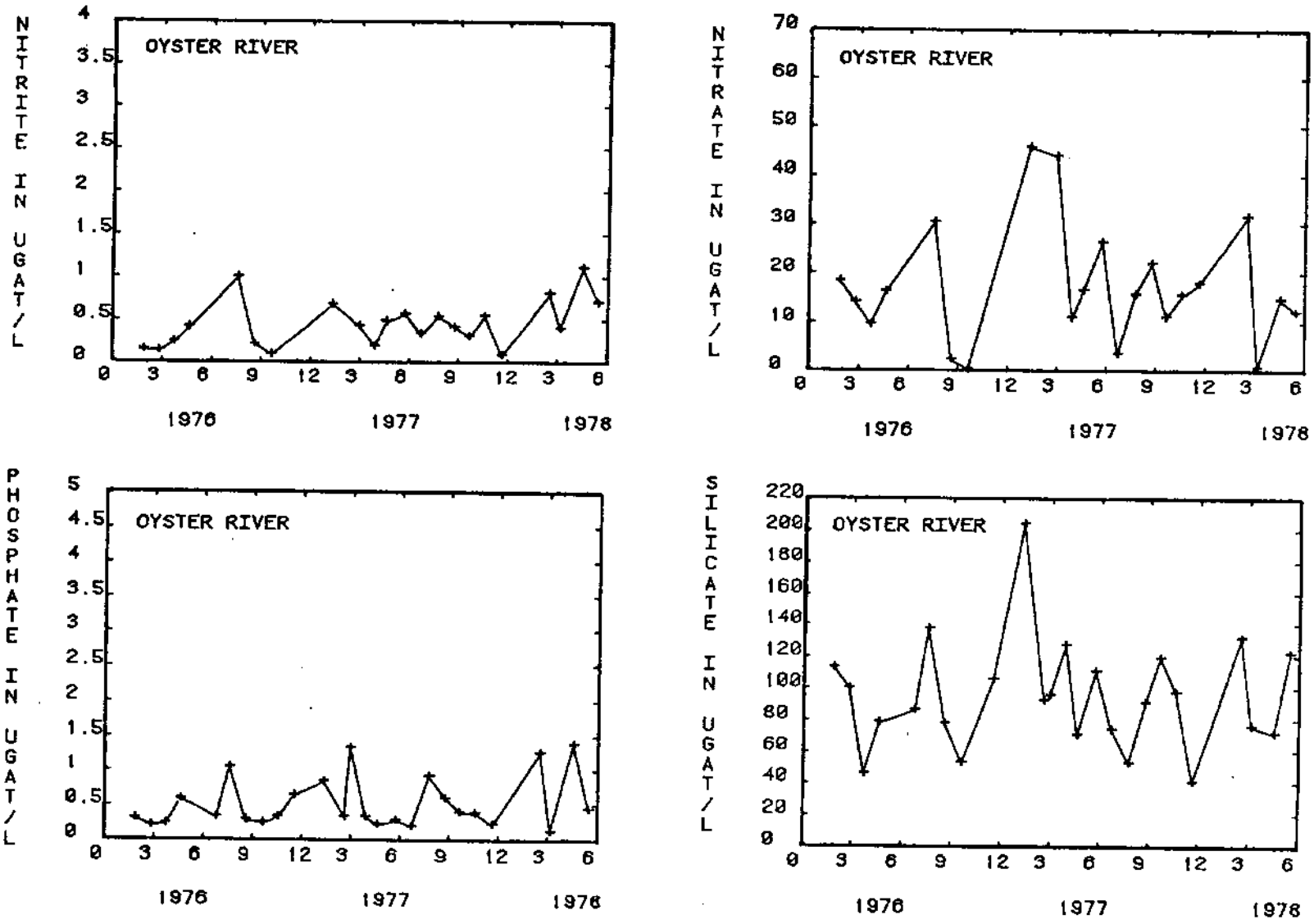
1.ROW #	2.STAT#	3.NAME	4.TIME	5.TEMP	6.SAL	7.PO4	8.SiO2	9.NH4
10.NO2	11.NO3	12.NO3/P	13.FLOW					
1.0	2.0	SQUAMTT	908	21.0	10.80	1.12	63.0	7.5
0.98	6.7	6.0	3.0					
2.0	3.0	LAMPRY A	935	21.1	0.00	0.24	67.3	2.3
0.36	3.4	14.0	3.0					
3.0	4.0	LAMPRY B	922	21.0	0.36	0.64	67.7	3.7
---	---	---	3.0					
4.0	5.0	OYSTER A	947	20.0	0.00	0.44	121.5	3.3
0.71	12.1	27.5	3.0					
5.0	6.0	OYSTER B	955	22.0	11.42	1.01	73.8	9.4
0.76	8.4	8.3	3.0					
6.0	7.0	BELLMY A	1014	22.0	0.00	0.32	43.7	1.5
0.37	2.0	6.3	3.0					
7.0	8.0	BELLMY B	1021	23.0	0.00	0.40	47.4	3.8
0.39	3.8	9.4	3.0					
8.0	9.0	COCHCO A	1050	20.1	0.00	1.76	93.6	10.8
1.49	8.8	5.0	3.0					
9.0	10.0	COCHCO B	1039	20.1	0.00	1.81	92.4	10.9
1.36	8.9	4.9	3.0					
10.0	11.0	SAM FS A	1104	21.8	0.00	0.57	88.5	6.0
0.74	5.5	9.7	3.0					
11.0	12.0	GT WKS A	1125	20.0	0.00	0.10	105.9	1.6
0.47	4.6	43.8	3.0					
12.0	13.0	SAM FS B	1137	21.0	0.85	0.58	93.6	5.6
0.59	5.1	8.8	3.0					

Appendix B

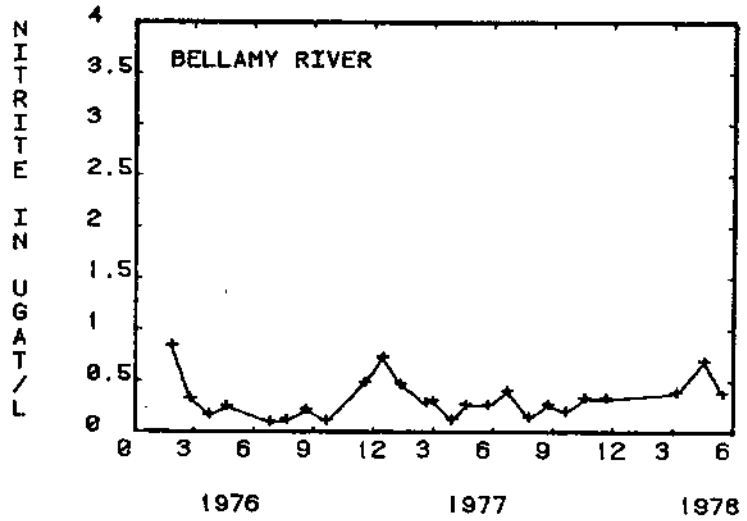
Plots of nutrient concentrations vs. time for 6 rivers entering the Great Bay Estuary, N.H., for February 1976 to June 1978.

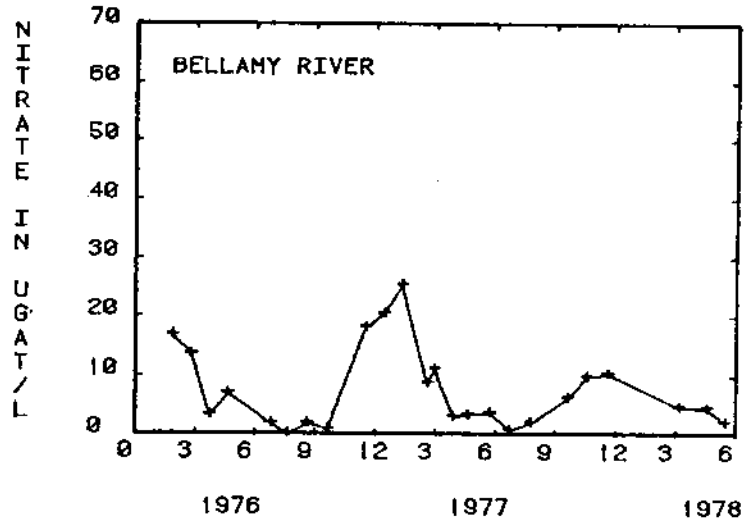


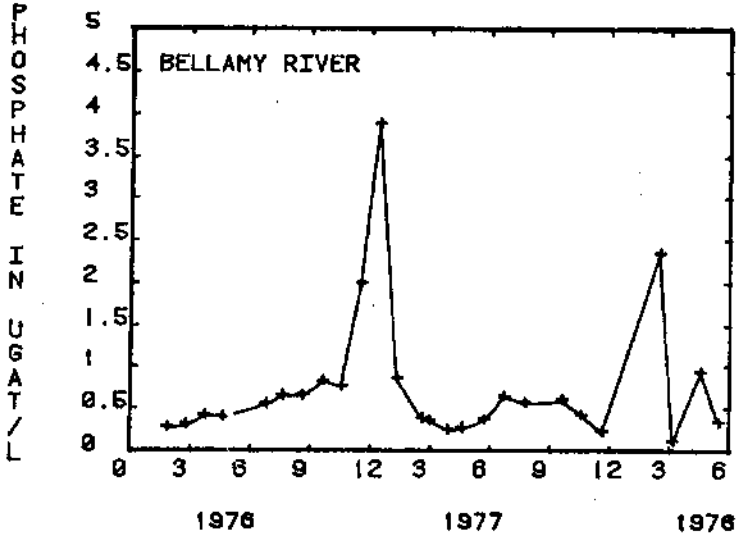
Appendix B-1. Plots of nutrient concentration changes during the study period for the Lamprey River, above dam site (Lampry-A).

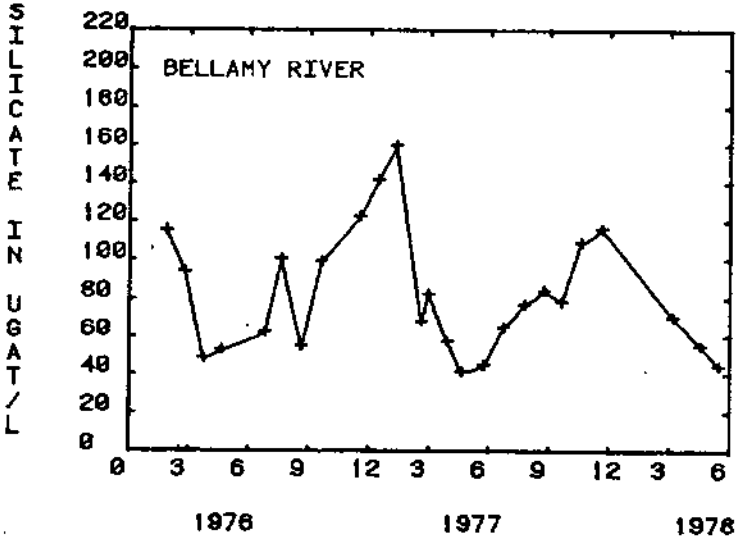


Appendix B-2. Plots of nutrient concentration changes during the study period for the Oyster River above dam site (Oyster-A).

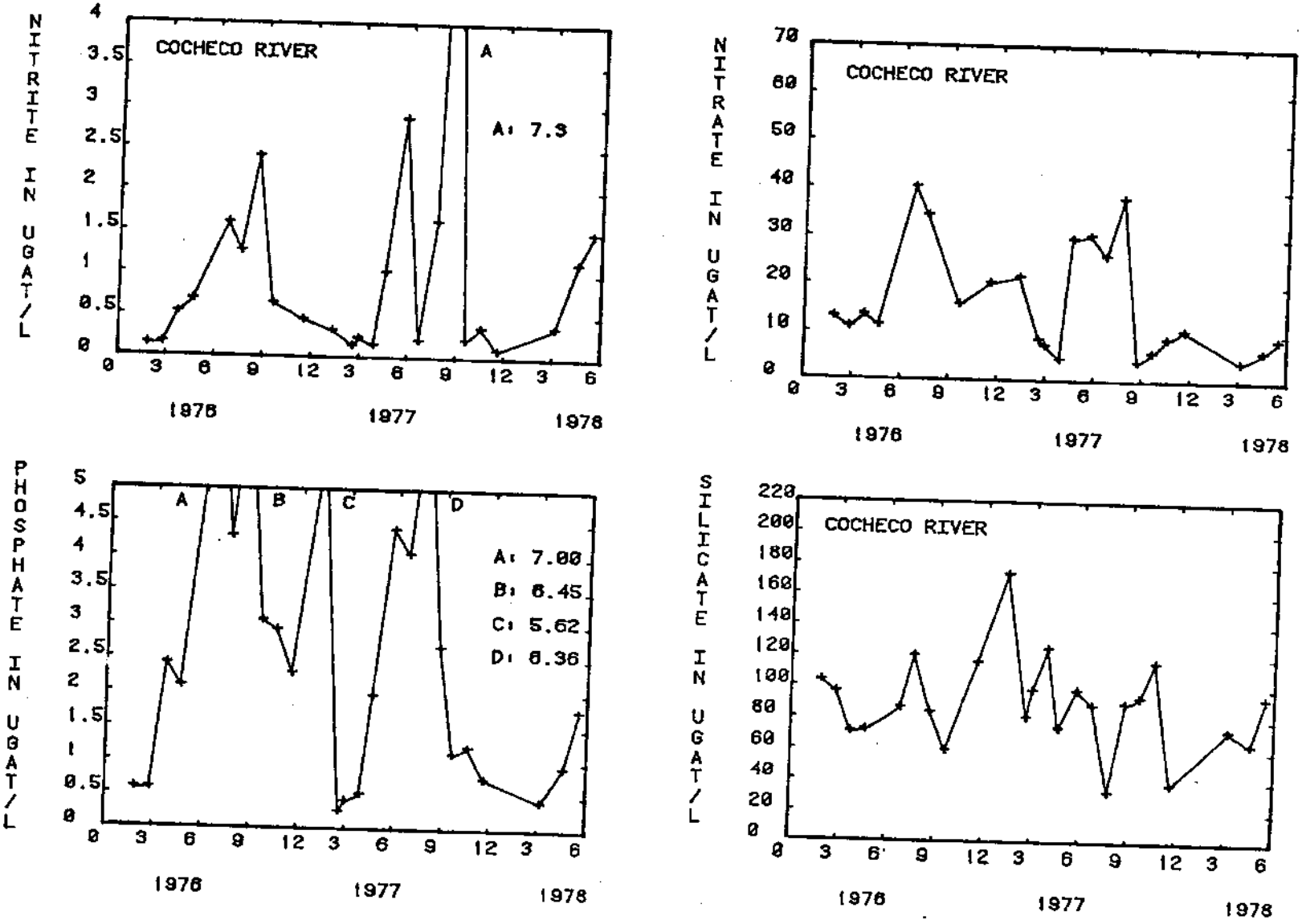




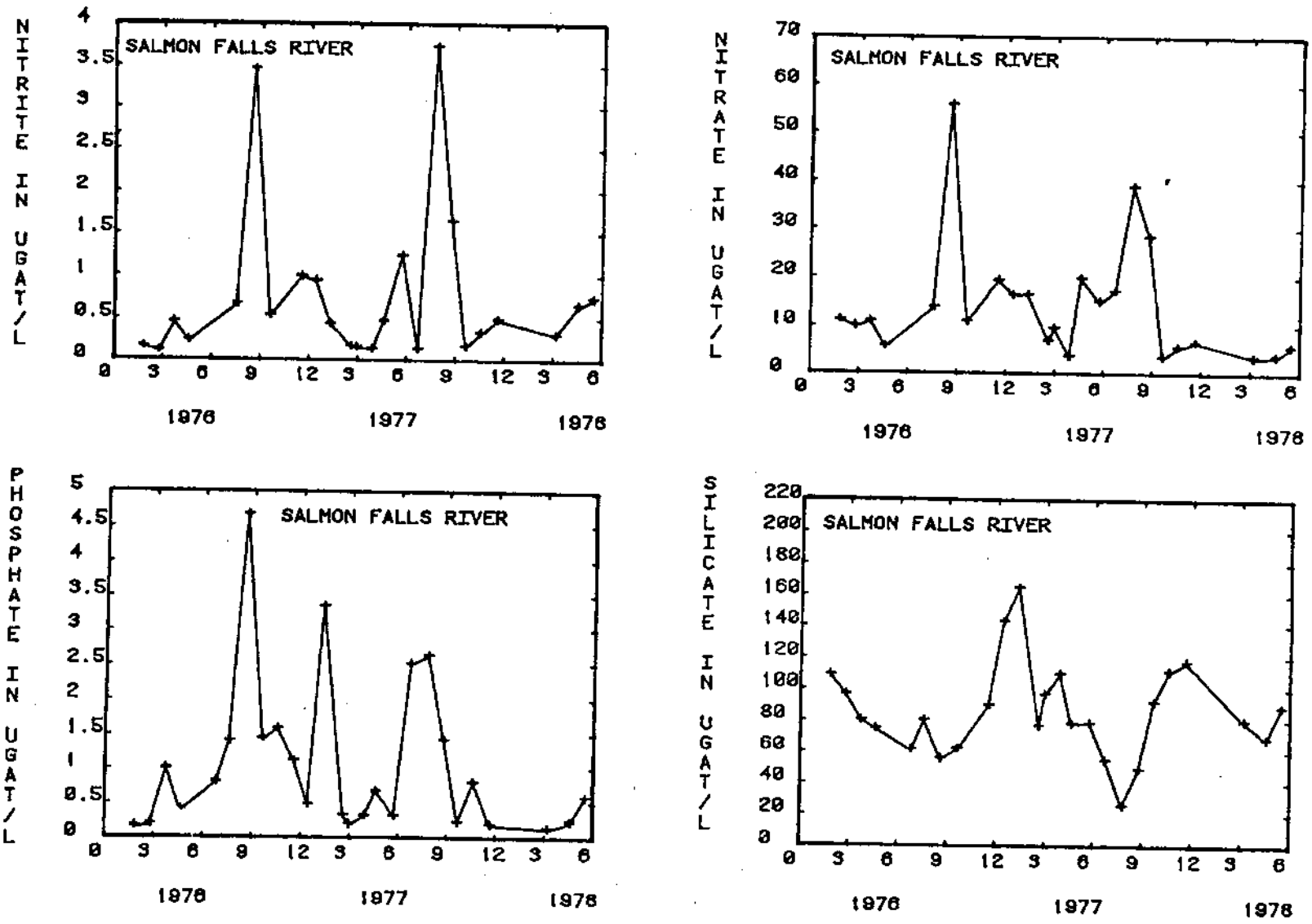




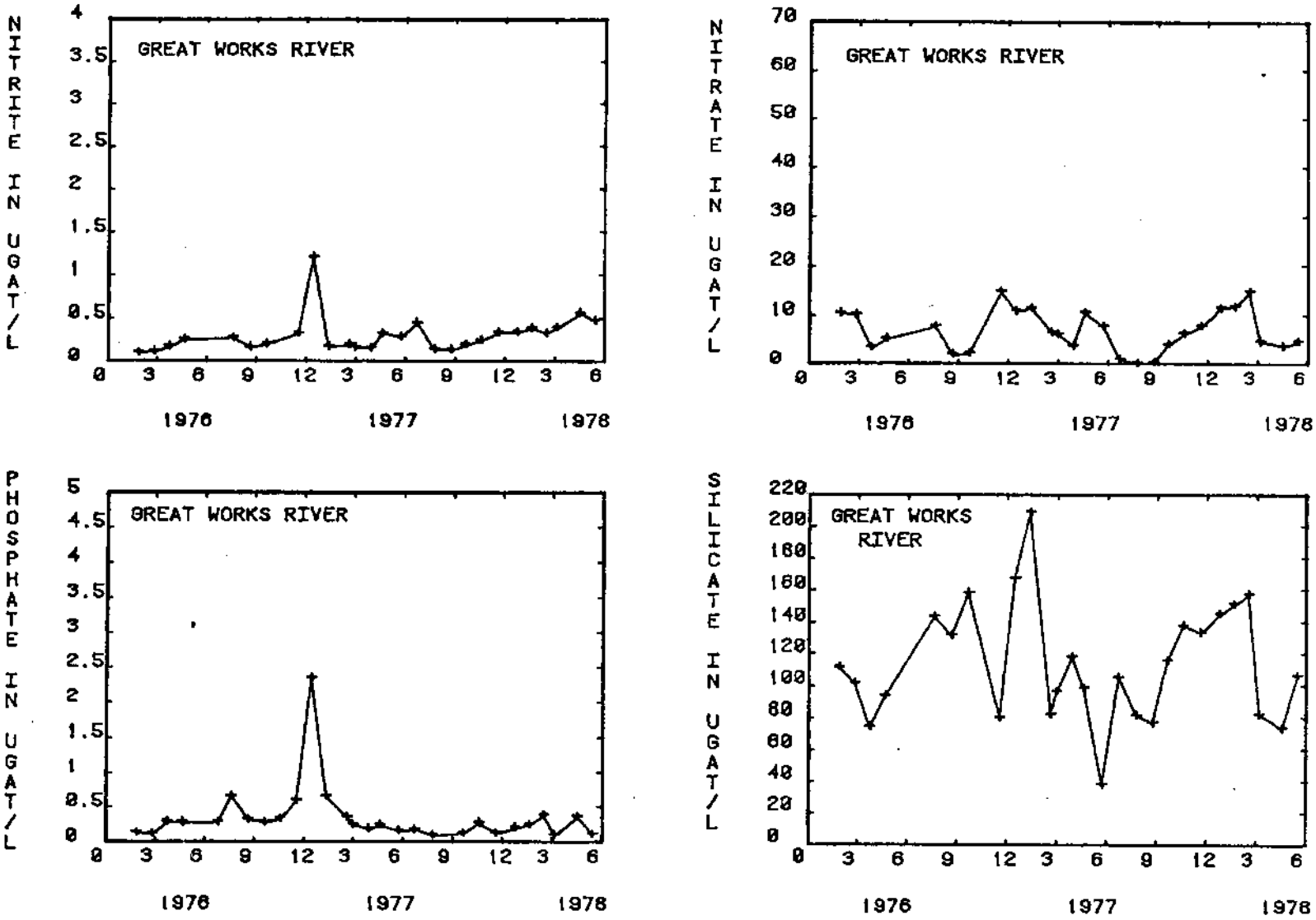
Appendix B-3. Plots of nutrient concentration changes during the study period for the Bellamy River above dam site (Bellmy-A).



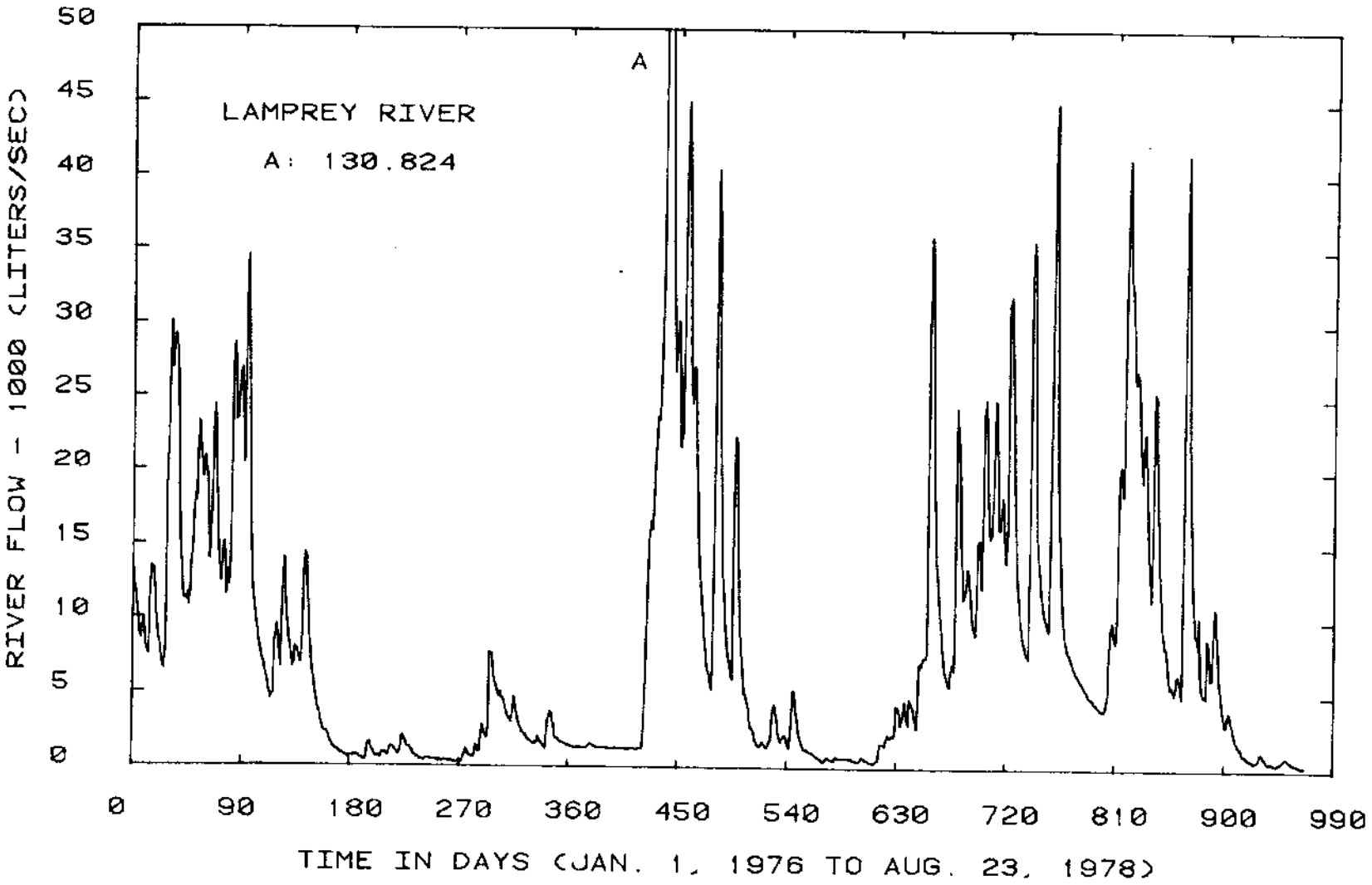
Appendix B-4. Plots of nutrient concentration changes during the study period for the Cocheco River above dam site (Cochco-A).



Appendix B-5. Plots of nutrient concentration changes during the study period for the Salmon Falls River above dam site (SAM FS-A).



Appendix B-6. Plots of nutrient concentration changes during the study period for the Great Works River above dam site (GT WKS-A).



Appendix C. Plot of river flow volume vs. time for the Lamprey River, N.H. Data is from the USGS (1977, 1978).