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ENVIRONMENTAL STUDIES IN THE CHANDLER SLOUGH WATERSHED

By

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

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SUMMARY

Chandler Slough is a major tributary to the Kissimmee River and C-38, and has been documented as a major source of phosphorus to the River. About 5.5 km upstream of C-38, water flowing in the swamp channel spreads out and flows over land through a predominately herbacious and shrubby emergent marsh (Pickerelweed, Pontederia lanceolata and Buttonbush, Cephalanthus occidentalis) approximately 384 ha (950 acres) in size.

Water quality sampling at the inflow and outflow points of the marsh was undertaken in an experimental attempt to assess the assumption that marshes serve as nutrient filters. During the initial few weeks of the wet season, phosphorus and nitrogen levels at the marsh outflow were higher than concentrations measured at the inflows. This "first flush" phenomena was attributed to the wash out of decayed plant material from the previous growing season. From the best available water chemistry data a net quantity of 1.5 tonnes of phosphorus (0.39 tonnes/km^2) and 2.0 tonnes of nitrogen (0.52 tonnes/km^2) were released from the marsh during this first flush.

After the first flush, phosphorus concentrations through the remainder of the wet season were generally lower at the outflow of the marsh than at the inflow, indicating a net retention of phosphorus by the marsh system. During this period there was no substantial net conversion of ortho-phosphorus to total phosphorus. Based on budget calculations, the Chandler Slough marsh retained 11 to 32 percent of the phosphorus input over the course of an entire wet season. No consistent trend for nitrogen concentrations was evident during this same time period. After the initial "first flush" the marsh alternated between acting as a source and a sink for nitrogen. Howeven, when integrated over the entire wet season the marsh increased the nitrogen load by 1 to 5 percent. Based upon a statistical analysis of the inflow and outflow water quality data, the changes in the nitrogen and phosphorus loads

attributable to the marsh were considered not to be significant. Since the results presented are an experimental case study subject to the limitations of the experimental design, the uptake and release rates reported are preliminary and subject to revision based upon additional data.

The above ground portion of the emergent marsh community in Chandler Slough was sampled during the 1976 growing season. Estimates of marsh plant productivity and nutrient concentrations in plant tissues indicate a net accumulation of 5.39 tonnes of phosphorus and 22.27 tonnes of nitrogen during the interval from February to August 1976. This accumulation compares favorably with the calculated 1.6 to 6.3 tonnes of phosphorus retained by the marsh in 1975 and 1976 based upon water quality and quantity data. No correlation was evident between nitrogen assimilated by aquatic vegetation and nitrogen retained from waters flowing through the marsh.

Whereas water quality data indicate relatively instantaneous retention of nutrients by the marsh, actual incorporation into above ground plant tissues may not occur for some time. Some nutrients assimilated by the marsh may be stored in the soil, or in plant roots and rhizomes, and translocated to growing tissues at a later date.

Herbaceous and shrubby aquatic vegetation in Chandler Slough represent only a short term nutrient sink. Most of these plants die back during the winter, and nutrients in above ground tissues may be translocated to rhizomes, incorporated in peats, or flushed into the Kissimmee River with the ensuing wet season.

Several unsampled nutrient assimilation mechanisms also occur in Chandler Slough. These include phytoplankton and periphyton, growth of woody tissues, and export by animals.

INTRODUCTION

The Kissimmee River (C-38) contributes approximately 56 percent of the total surface water inflow, 35 percent of the total nitrogen load, and 24 percent of the total phosphorus load to Lake Okeechobee (Davis and Marshall 1975). Routine water quality sampling through the Kissimmee River Basin indicated that the southern portion of the system, below S-65C, was the primary contributor of phosphorus (Dineen et al. 1974; Lamonds 1975). Specifically the Chandler Slough watershed was identified as a major source of phosphorus to C-38. Subsequent investigations were initiated to determine the effects of the Chandler Slough marsh on the quality of water entering C-38 (Shih and Hallett 1974). The use of freshwater marshes in the Kissimmee River floodplain has been proposed as a means to reduce the rate of eutrophication of Lake Okeechobee. The overall objective of this study, therefore, was to document the water chemistry, vegetation, and soils in the Chandler Slough marsh in order to gain a better understanding of the effects of a freshwater marsh on runoff from a large watershed.

DESCRIPTION OF THE STUDY AREA

Chandler Slough is the largest tributary to the Kissimmee River (C-38) and is located about 4.5 km upstream of water control structure S-65D (Figure 1). The drainage area of Chandler Slough is 360.5 km^2 (SFWMD 1976) and is located within Okeechobee County, Florida. Elevations range from about 21 meters msl near the headwaters of the slough to 8 meters msl at the river. Soils within the Chandler Slough basin are dominated by the Myakka-Placid and Immokalee-Pompano associations (Huber and Heaney 1976). Groundwater tables in the basin normally fluctuate 0 to 76 cm below the surface (McCaffrey et al. 1976).

The headwaters of this system are located in an area that is dominated by palmetto (Serenoa repens) prairie, seasonal ponds, and pasture land. Peat Marsh and Fish Slough drain from the east into a narrow cypress (Taxodium distichum) swamp called Cypress Slough. From the west, Ash Slough and Gore Slough drain into Chandler Slough. Cypress Slough and Chandler Slough subsequently converge south of US 98 where the water spreads over a wide plain (Figure 2). This plain is designated as Chandler Slough marsh. Soils within the marsh are primarily of the Pompano-Immokalee association. Dominant vegetation in this marsh consists of aquatic broadleaf plants and shrubs. Water quality sampling was undertaken throughout the entire drainage area while examinations of vascular plant production, marsh water quality, and soils were centered in the Chandler Slough marsh.

Land in the Chandler Slough basin is primarily occupied by cattle ranches and open wetlands. According to Huber and Heaney (1976) 81.9 percent of the land is unimproved, improved and ditched pasture, and 18 percent is marsh and swamp (Table 1). Unimproved pasture is described as grazing lands with a variety of trees and shrubs usually pines (Pinus sp.), oaks (Quercus sp.), palmettos and sabal palms (Sabal palmetto). Improved pasturelands have been cleared of shrubs

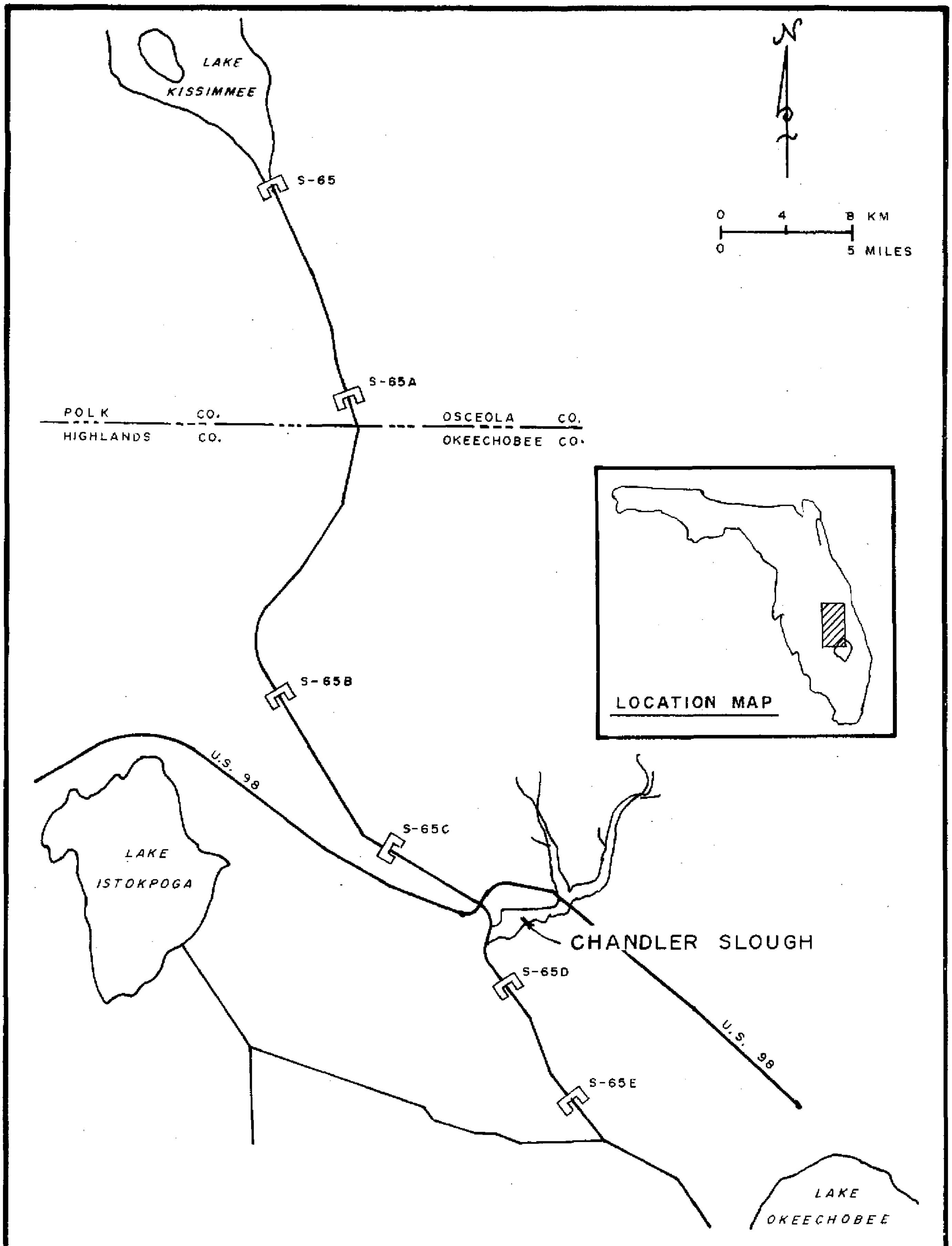

Figure I LOCATION OF CHANDLER SLOUGH IN THE KISSIMMEE RIVER BASIN

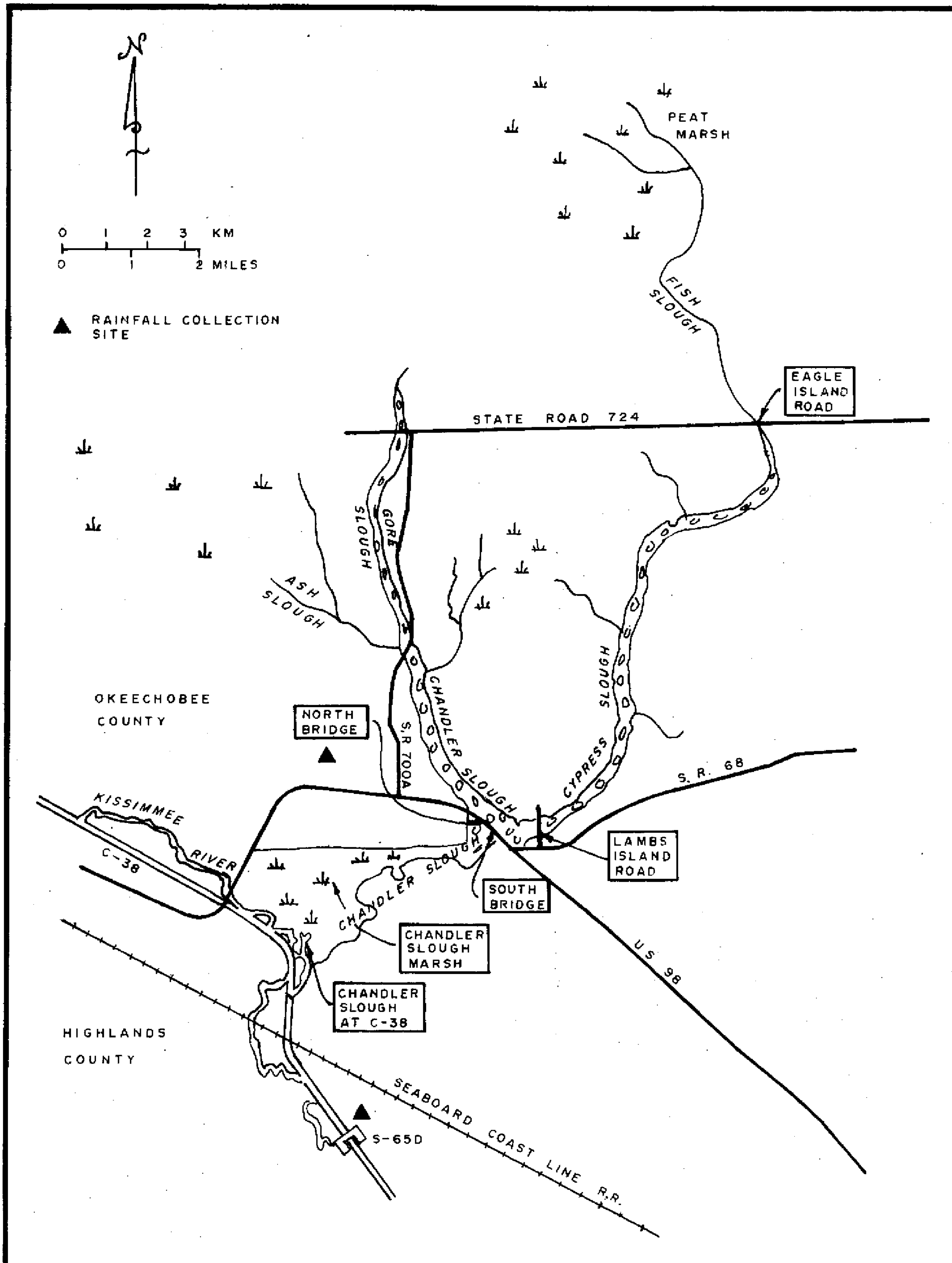

Figure 2 LOCATION OF CHANDLER SLOUGH DRAINAGE SYSTEM AND WATER SAMPLING STATIONS

TABLE 1. LAND USE ANALYSIS OF CHANDLER SLOUGH (AREAS IN SQUARE KILOMETERS AND PERCENT)

Area	Improved Pasture	Unimproved Pasture	Forest	Marsh & Swamp	Ditched Improved Pasture	Total Area
Chandler Slough (North Bridge)	40.43	24.45	.10	22.95	39.42	127.35
	31.9%	19.3%	0.1%	18.1%	31.1%	
Cypress Slough (South Bridge)	38.51	34.86	4.71	41.31	54.73	174.12
	22.1%	20.0%	2.7%	23.7%	31.4%	

Modified from Huber and Heaney (1976)

and trees and have been planted with drought resistant fodder grass. In areas where a high water table and/or poor drainage cause a ground saturation problem, improved pastures have been ditched. Terrestrial forest in the Chandler Slough basin occupy only 1.6 percent of the land.

The climate in this portion of Florida is subtropical with warm summers and moderate winters. Rainfall is seasonal with about 75 percent of the total occurring in a well defined wet season, from May through October. This distribution of rainfall results in considerable surface water flow during part of the year. During the late winter and early spring many of the creeks and sloughs, such as Chandler Slough, become completely dry.

Table 2 presents a monthly rainfall summary for the study period and a summary of the period of record for the two rain gauge stations located near Chandler Slough (Figure 2). Rainfall at S-65D totaled 90.04 cm in 1975 and 91.74 cm in 1976. This is approximately 25 cm or 20 percent below the mean for the 9 year period of record (1968-1976). Although annual rainfall quantities were similar, in 1975 the rain was distributed evenly throughout the wet season while in 1976 about 28 percent of the rainfall occurred in May.

TABLE 2 RAINFALL SUMMARY FOR THE CHANDLER SLOUGH STUDY AREA

Rainfall Station	Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
					Rainfall (cm)								
Bassinger	1974	1.09	1.88	0.08	1.35	11.38	←	44.22	→	12.70	3.50	1.24	4.70
	1975	1.85	3.63	1.75	2.29	10.87	20.22	19.69	5.91	4.85	12.12	2.74	1.68
	1976	0.46	2.06	5.97	4.17	26.82	10.08	10.08	19.89	17.83	←	11.35	→
					Period of Record Summary (1972-1976)								
	Mean	3.30	3.07	4.90	3.86	14.55	15.47	16.92	15.67	9.88	6.40	6.27	3.61
	Max.	9.78	4.75	9.14	9.80	26.82	20.22	20.98	20.22	17.83	12.12	14.20	4.70
	Min.	0.46	1.88	0.08	1.35	9.40	10.72	10.08	6.91	1.35	2.82	1.24	1.68
					Rainfall (cm)								
S-65D	1974	0.38	1.47	0.00	2.08	17.35	24.51	33.10	9.02	9.70	2.67	2.87	3.61
	1975	0.25	3.12	1.85	2.95	10.95	17.02	13.84	6.48	17.02	14.33	0.79	1.45
	1976	0.30	4.37	3.05	5.41	25.65	11.96	12.45	14.12	9.09	0.51	2.54	2.29
					Period of Record Summary (1968-1976)								
	Mean	3.38	4.22	7.57	4.04	12.34	22.68	17.96	12.19	11.86	12.09	4.17	2.77
	Max.	12.27	6.73	18.97	13.26	2.79	40.77	33.10	21.77	13.26	31.72	8.76	5.69
	Min.	0.25	1.47	1.85	0.51	5.00	11.96	3.61	6.48	1.93	0.51	0.41	0.38

OBJECTIVES

Investigations in the Chandler Slough watershed were divided into three major areas: water chemistry, marshland vegetation, and soils. The major objectives associated with each field of study were:

Water Chemistry

1. Document the water quality within the Chandler Slough watershed.
2. Examine the diel variation in the water chemistry within the Chandler Slough system.
3. Measure the effect of the Chandler Slough marsh on the quality of the water.
4. Determine the nutrient uptake and release rates attributable to the Chandler Slough marsh.

Marsh Vegetation

1. Prepare a vegetation map of Chandler Slough.
2. Measure the production of rooted and floating vascular plants at different times of the year.
3. Determine the nutrient composition in major species of vascular plants, and trace the nutrient cycling in marsh vegetation through the year.
4. Secure data on species composition, plant density, biomass and volume displacement in the marsh through the year. This data will be presented for use by others in calculations of water flow patterns, rates and retention times in a marsh.

Soils

1. Characterize the type and chemical composition of the soils found in Chandler Slough.
2. Examine the seasonal changes in the chemical composition of the soils.

PART I

WATER CHEMISTRY SECTION

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PART I

WATER CHEMISTRY SECTION

SAMPLING AND ANALYTICAL METHODS

Chemical Methodology and Sampling Frequency

Five sampling stations were selected in the Chandler Slough marsh watershed: (1) Eagle Island Road; (2) Lambs Island Road; (3) North Bridge; (4) South Bridge; and (5) Chandler Slough at C-38. An additional sixth station was established within the marsh in order to monitor diel changes in water quality. Table 3 and Figure 2 present the description and location of the six water quality monitoring sites. These sites were sampled according to the schedule presented in Tables 4 and 5.

Water samples were collected at a depth of 0.25 m with an ISCO(R) automatic water sampler or a Niskin(R) grab sampler. Dissolved nutrient and major ion samples were filtered through 0.45 micron Nuclepore(R) membrane filters. Unfiltered samples were collected for total nutrient analyses. All samples were stored in polyethylene bottles on ice. In the laboratory samples were stored in the dark at 4^{o} C. Laboratory analyses of the samples were completed within two weeks after collection.

Fourteen chemical parameters were determined on each sample:

a. Nutrient forms: ammonia, nitrate, nitrite, total Kjeldahl nitrogen, ortho-phosphate, total phosphate, and silica;

b. Major ions: sodium, potassium, magnesium, calcium, chloride, sulfate, and alkalinity.

Field data were measured with a Hydrolab(R) monitor and included water temperature, dissolved oxygen, pH and specific conductance. For collection of diel field data the Hydrolab(R) monitor was interfaced with a NERA(R) recording system.

TABLE 3. DESCRIPTION OF CHANDLER SLOUGH STATION LOCATIONS

Station	Location Description
Eagle Island Road	Eagle Island Road Bridge (SR724) over Fish Slough
Lambs Island Road	Lambs Island Road Bridge over Cypress Slough
North Bridge	U. S. Highway 98 Bridge over Chandler Slough
South Bridge	U. S. Highway 98 Bridge over Cypress Slough
Chandler Slough at C-38	Approximately 1 km upstream on Chandler Slough from the Kissimmee River
Chandler Slough Marsh	At SFWMD gauging station in center of the Chandler Slough marsh

TABLE 4 DIEL SAMPLING PROGRAM FOR CHANDLER SLOUGH

Number of Samples Collected

Station	7/23 to 7/25/74	9/16 to 9/20/74	11/5 to 11/15/74	6/24 to 6/29/75	7/21 to 7/27/75	9/16 to 9/22/75	10/13 to 10/19/75	11/10 to 11/16/75	6/14 to 6/17/76	8/16 to 8/19/76	10/11 to 10/14/76	Total
Eagle Island Rd.		-	-	12	13	13	-	-	-	-	-	38
Lambs Island Rd.	3	11	20	11	9	13	13	-	-	-	-	80
North Bridge	4	20	17	9	8	13	-	13	-	-	-	84
South Bridge	18	18	15	11	13	13	13	13	-	-	-	114
Chandler Slough at C-38	10	14	18	11	13	13	13	13	-	-	-	105
Chandler Slough Marsh	-	-	-	-	-	-	-	-	18	16	23	57
												478

TABLE 5 GRAB SAMPLING PROGRAM FOR CHANDLER SLOUGH

Number of Samples Collected

Station	1974 J	F	M	A	M	J	J	A	S	O	N	D	1975 J	F	M	A	M	J	J	A	S	O	N	D	1976 J	F	M	A	M	J	J	A	S	O	Total
Eagle Island Rd.	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	5	6	8	4	7	33
Lambs Island Rd.	-	-	-	-	-	-	-	-	-	1	-	1	1	1	1	1	-	2	1	2	1	1	1	-	-	-	-	-	-	8	5	8	4	7	46
North Bridge	-	-	-	-	1	1	1	1	1	2	1	1	1	1	1	1	-	4	2	2	1	1	1	-	-	-	-	-	-	8	5	8	4	7	56
South Bridge	-	-	-	-	1	1	1	1	1	2	1	1	1	1	1	1	-	4	2	2	1	1	1	-	-	-	-	-	-	8	5	8	4	7	56
Chandler Slough at C-38	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	-	-	1	-	-	1	5	6	9	5	8	59
																																			250

Chemical analyses were performed using methods either recommended or approved by the American Public Health Association or the Environmental Protection Agency. Most analyses were performed on a Technicon Industrial Systems II Auto-Analyzer(R) or a Perkin Elmer Model 306 Atomic Absorption Spectrophotometer(R). Complete descriptions of specific analytical methodologies are presented in Appendix A.

Mass Loading Methodology

Material loadings were calculated by combining daily flow rates at a particular site and time period, with the corresponding chemical data. Since chemistry data was not collected daily, two chronologically successive chemistry data points were averaged to give an estimated value for the time period between these two points. This average was then used in conjunction with daily flow data within the time period to compute the daily loadings. When water chemistry data was available at the beginning of a wet season the first wet season water chemistry value was used exclusively with all the preceding flow data for that season.

RESULTS

WATER QUALITY CHARACTERISTICS IN THE CHANDLER SLOUGH SYSTEM

Water quality characteristics for the five sampling stations in the Chandler Slough system are presented in Table 6. Interpretation will be limited to an analysis of the wet season data which includes the periods June 1 through November 31, 1975 and May 1 through October 31, 1976.

Average phosphorus values in the Chandler Slough system were high in comparison to other surface waters in the Kissimmee River Valley (Federico and Brezonik 1975; Lamonds 1975). The Eagle Island Rd. station had the lowest concentrations of ortho and total phosphorus with mean values of 0.128 and 0.213 mg/l, respectively (Table 6). Downstream at the Lamb Island Rd. station (Cypress Slough) average phosphorus concentrations increase to 0.169 and 0.230 mg/l for ortho and total phosphorus, respectively. Before Cypress Slough enters the Chandler Slough marsh it passes under the South Bridge station where phosphorus levels were 0.192 and 0.242 mg/l for ortho and total phosphorus, respectively. Phosphorus concentrations in Chandler Slough at the North Bridge Station were higher than at the South Bridge station, with an average of 0.337 mg/l for orthophosphorus and 0.410 mg/l for total phosphorus. Discharge from the Chandler Slough marsh had mean ortho and total phosphorus concentrations of 0.173 and 0.244 mg/l, respectively. The ratio of ortho to total phosphorus was relatively constant among the five sampling stations. This ratio ranged from 0.60 at the Eagle Island Rd. station to 0.82 at the North Bridge station, and averaged 0.76.

Seasonal variations for ortho and total phosphorus were pronounced. Maximum phosphorus concentrations occurred at the beginning of the wet season. Minimum phosphorus concentrations usually occurred toward the end of the wet season. The differences in mean phosphorus concentrations between the 1975 and 1976 wet

TABLE 6 - SUMMARY OF 1975-76 WET SEASON WATER CHEMISTRY DATA BY STATION

Parameter	Station EAGLE	LAMB	SOUTH	NORTH	C-38
O-PO_4 as P	0.128[1] 0.002-0.312[2]	0.169 0.040-0.337	0.192 0.070-0.52	0.337 0.087-2.206	0.173 0.002-0.699
T-PO_4 as P	0.213 0.038-0.561	0.230 0.064-0.479	0.242 0.090-0.547	0.410 0.113-2.395	0.224 0.034-1.039
Total N	1.72 0.84-4.99	1.37 0.86-2.51	1.27 0.86-2.29	1.69 0.92-6.00	1.42 0.80-2.87
NO_2 as N	0.006 0.004-0.018	0.006 0.004-0.017	0.006 0.004-0.027	0.008 0.004-0.015	0.006 0.004-0.011
NO_3 as N	0.040 0.004-0.307	0.039 0.004-1.149	0.034 0.004-1.114	0.015 0.004-0.385	0.037 0.004-1.320
NH_4 as N	0.04 0.01-0.21	0.05 0.01-0.47	0.05 0.01-0.23	0.05 0.01-0.48	0.03 0.01-0.23
SiO_2	5.1 2.0-7.7	5.2 1.9-9.1	4.9 2.5-12.3	5.5 2.8-10.8	4.5 1.1-7.3
Na	12.59 5.76-22.30	12.20 4.46-33.60	12.41 5.27-36.00	13.48 4.60-37.10	11.31 3.05-15.92
K	2.08 0.19-3.60	2.30 0.20-5.11	2.23 0.18-4.86	2.58 0.18-7.90	1.86 0.07-3.70
Ca	14.01 9.66-21.78	12.36 7.10-22.40	12.75 6.38-23.00	14.25 4.30-32.60	11.97 7.64-17.19
Mg	3.16 1.57-5.80	2.82 1.60-5.60	2.82 1.36-5.90	3.20 1.00-8.90	2.77 1.90-3.68
Cl	27.9 14.0-90.3	24.9 11.3-65.4	25.3 11.3-73.4	28.9 8.4-86.6	24.1 13.3-39.3
SO_4	9.6 5.0-26.9	8.2 5.0-25.1	7.5 5.0-20.1	10.3 5.0-32.8	6.6 5.0-13.0
Alk as $CaCO_3$	29.8 4.9-50.0	27.6 4.9-52.0	26.6 4.9-54.5	33.7 6.2-85.5	25.6 11.8-44.5
Temp °C [3]	27.8 20.6-32.0	24.1 19.6-27.5	24.3 20.3-27.5	24.9 20.4-28.5	25.9 20.3-28.5
D.O. [3]	4.4 2.4-6.8	4.1 2.9-5.6	1.7 0.4-3.7	1.9 0.5-3.5	3.5 1.1-6.7
Sp. Cond. [3] µmhos/cm	146 69-202	132 78-195	133 70-200	176 100-250	142 83-210
pH	6.37 5.80-6.60	6.62 6.20-7.70	6.38 5.8-7.10	6.42 5.80-7.10	6.26 4.70-6.95

[1] mean
[2] range
[3] 1976 data only

seasons were small. In general mean total phosphorus concentrations were higher in 1976 than in 1975 for the Lamb Island, South Bridge, and North Bridge stations (Tables 7 and 8), but lower at the Eagle Island Road and C-38 stations.

Total nitrogen concentrations rarely exceeded 2.50 mg/l. Two year means for all five stations for total nitrogen were relatively constant: 1.72 mg/l (Eagle Island), 1.37 mg/l (Lambs Island), 1.27 mg/l (South Bridge), 1.69 mg/l (North Bridge) and 1.42 mg/l (C-38). The inorganic forms of nitrogen, (ammonia, nitrite and nitrate) were usually less than 10 percent of the total nitrogen value.

Nitrites were low with an average wet season concentration of 0.006 mg/l for all stations but the North Bridge station. At the North Bridge station nitrite levels were slightly higher at 0.008 mg/l. Mean nitrate concentrations in Fish and Cypress Sloughs, ranged from 0.147 mg/l at the Eagle Island Road station to 0.039 and 0.034 mg/l for the Lambs Island and South Bridge stations, respectively. Chandler Slough at the North Bridge station had a lower mean nitrate concentration (0.015 mg/l) than Fish and Cypress Sloughs. The mean nitrate concentration at the C-38 station increased to 0.037 mg/l. Ammonia concentrations were low at mean levels of 0.04 mg/l for the Eagle Island Road station, and 0.05 mg/l for the Lambs Island Road, South Bridge, and North Bridge stations. The mean ammonia concentration was lower at the Chandler Slough at C-38 station (0.03 mg/l) than at the other stations.

Nitrogen concentration did not exhibit any consistent intra-seasonal trend. High levels occurred at the beginning of each wet season and randomly throughout the wet season. Mean total nitrogen concentration remained relatively consistent in the 1975 and 1976 wet seasons (Tables 7 and 8).

Mean silicate concentrations were moderate and varied only slightly among the five sampling sites: Eagle Island (5.1 mg/l), Lambs Island (5.2 mg/l), South Bridge (4.9 mg/l), North Bridge (5.5 mg/l) and C-38 (4.5 mg/l).

TABLE 7 - SUMMARY OF 1975 WET SEASON WATER CHEMISTRY DATA BY STATION

Parameter	Station EAGLE	LAMB	SOUTH	NORTH	C-38
O-PO_4 as P	0.151[1] 0.081-0.312[2]	0.149 0.040-0.260	0.177 0.070-0.520	0.326 0.087-2.026	0.179 0.002-.069
T-PO_4 as P	0.242 0.131-.056	0.214 0.064-0.375	0.227 0.090-0.547	0.408 0.113-2.395	0.229 0.034-1.039
Total N	1.76 1.35-4.99	1.19 0.86-1.71	1.20 0.89-2.29	1.66 0.92-6.00	1.38 0.80-2.87
NO_2 as N	0.006 0.004-0.009	0.006 0.004-0.017	0.006 0.004-0.027	0.007 0.004-0.015	0.006 0.004-0.009
NO_3 as N	0.030 0.004-0.307	0.020 0.004-0.114	0.046 0.004-1.114	0.020 0.004-0.385	0.048 0.004-1.32
NH_4 as N	0.04 0.01-0.21	0.04 0.01-0.18	0.05 0.01-0.23	0.06 0.01-0.48	0.03 0.01-0.21
SiO_2	5.7 2.0-7.7	5.3 1.9-9.1	4.9 2.5-12.3	5.5 2.8-10.8	4.5 2.4-5.9
Na	13.60 8.0-22.3	14.34 9.20-33.60	14.52 10.70-36.00	11.63 4.60-37.10	11.49 7.50-13.75
K	2.33 1.60-2.90	2.27 1.80-3.50	2.17 1.59-4.40	2.59 1.50-7.90	2.21 1.22-3.70
Ca	15.71 9.90-12.78	12.93 7.10-22.40	13.38 7.4-23.0	12.46 4.30-32.60	12.20 8.5-15.29
Mg	3.63 2.40-5.80	3.07 1.60-5.60	3.08 1.70-5.90	2.79 1.00-8.90	2.98 1.90-3.64
Cl	31.2 14.9-90.3	26.4 15.7-65.4	27.2 17.5-73.4	28.8 8.4-86.6	25.0 13.3-39.3
SO_4	11.8 5.9-26.9	9.1 5.0-25.1	7.8 5.0-20.1	11.9 5.0-32.8	6.3 5.0-9.8
Alk. as $CaCO_3$	30.8 4.9-50.0	27.2 4.9-52.0	26.3 4.9-54.5	31.5 12.0-85.5	24.2 12.5-39.0
Temp$^\circ$ C	-	-	-	-	26.1 24.5-27.8
D.O.	-	-	-	-	3.2 1.6-5.9
Sp. Cond. µmhos/cm	-	-	-	-	175 120-210
pH	-	-	-	-	6.36 5.95-6.65

[1]mean
[2]range

TABLE 8 - SUMMARY OF 1976 WET SEASON WATER CHEMISTRY DATA BY STATION

Parameter	Station				
	EAGLE	LAMB	SOUTH	NORTH	C-38
O-PO_4 as P	0.096[1] 0.002-0.293[2]	0.204 0.061-0.337	0.228 0.094-0.336	0.357 0.121-0.808	0.163 0.016-0.350
T-PO_4 as P	0.174 0.038-0.459	0.256 0.104-0.479	0.277 0.121-0.397	0.412 0.159-0.855	0.217 0.091-0.426
Total N	1.52 0.84-2.04	1.37 0.96-2.51	1.30 0.86-1.81	1.65 1.31-2.63	1.38 1.06-1.83
NO_2 as N	0.007 0.004-0.018	0.007 0.004-0.10	0.007 0.004-0.011	0.008 0.004-0.012	0.007 0.004-0.011
NO_3 as N	0.040 0.004-0.159	0.020 0.004-0.177	0.015 0.004-0.054	0.009 0.004-0.024	0.020 0.004-0.226
NH_4 as N	0.04 0.01-0.13	0.06 0.01-0.47	0.05 0/01-0.17	0.04 0.01-0.13	0.04 0.01-0.23
SiO_2	4.2 2.1-6.0	4.9 3.2-7.8	5.0 3.1-7.0	5.4 4.0-8.0	4.6 1.1-7.3
Na	11.61 5.76-17.88	10.67 4.46-18.11	10.50 5.27-18.11	14.68 6.25-25.33	11.18 3.05-15.92
K	1.84 0.19-3.60	2.31 0.20-5.11	2.28 0.18-4.86	2.57 0.18-5.51	1.60 0.07-3.53
Ca	12.36 9.66-19.27	11.96 8.35-18.14	12.18 6.38-20.75	15.40 8.18-23.29	11.80 7.64-17.19
Mg	2.67 1.57-3.89	2.63 1.87-4.18	2.55 1.36-3.72	3.51 2.16-5.85	2.61 2.00-3.68
Cl	23.3 14.0-37.0	22.3 11.3-30.9	20.8 11.3-29.4	29.2 14.9-41.2	22.3 14.9-33.6
SO_4	6.3 5.0-11.0	6.6 5.0-10.9	6.4 5.0-10.5	7.3 5.0-11.4	7.0 5.0-13.0
Alk as $CaCO_3$	28.5 17.0-38.8	28.3 10.7-45.0	27.4 13.5-42.5	37.5 6.2-77.5	28.2 11.8-44.5
Temp °C	27.8 20.6-32.0	24.1 19.6-27.5	24.3 20.3-27.5	24.9 20.4-28.5	25.9 20.3-28.5
D.O.	4.4 2.4-6.8	4.1 2.9-5.6	1.7 0.4-3.7	1.9 0.5-3.5	3.6 1.1-6.7
Sp. cond. µmhos/cm	146 69-202	132 78-195	133 70-200	176 100-250	136 83-210
pH	6.37 5.80-6.60	6.62 6.20-7.70	6.38 5.80-7.10	6.42 5.80-7.10	6.22 4.70-6.95

[1]mean
[2]range

The mean concentrations of the major cations were within the range of values reported for surface waters in the Kissimmee River Basin (Federico and Brezonik 1975; Lamonds 1975). Concentrations of sodium, potassium, calcium, and magnesium were moderate and relatively consistent from station to station. The highest values occurred at the North Bridge station and the lowest values at the point of inflow into the Kissimmee River.

Concentrations of chlorides, sulfates and alkalinity were also moderate to low throughout the Chandler Slough system. The two year mean values for these parameters showed little variation from station to station. Maximum values, however, occurred consistently at the North Bridge station and minimum values occurred at C-38. Chloride and sulfate concentrations were generally higher in 1975 than 1976, but alkalinities were usually higher for the 1976 wet season.

Water temperatures fluctuated substantially during the wet season, as much as 8^{0} C at any one site. Based on two year averages, the highest temperatures were recorded at the Eagle Island Road (27.8^{0} C) and the lowest values, at the Lambs Island Road (24.1^{0} C).

Based on 1976 data, mean dissolved oxygen concentrations were high at the Eagle Island station (4.4 mg/l), decreased at Lambs Island (4.1 mg/l) and dropped substantially at the South Bridge (1.7 mg/l). The North Bridge averaged 1.9 mg/l. At the outflow of the Chandler Slough marsh, the mean dissolved oxygen concentration increased to 3.5 mg/l.

Specific conductivity values throughout the 1976 wet season generally fluctuated within the 100-200 μmhos/cm range. The North Bridge station which displayed the highest ionic values, had the highest conductivity (176 μmhos/cm). The other four stations were fairly congruous with average values of 146 μmhos/cm (Eagle Island), 132 μmhos/cm (Lambs Island), 133 μmhos/cm (South Bridge) and 142 μmhos/cm (C-38).

Water in the Chandler Slough system was slightly acidic in nature. Values of pH ranged from 4.7 to 7.7 although the range of pH values in 1976 was consistent among the five stations: Eagle Island (5.80-6.60), Lambs Island (6.20-7.70), South Bridge (5.80-7.10), North Bridge (5.80-7.10) and Kissimmee River at C-38 (4.70-6.95).

DIEL VARIATION IN THE INFLOW AND OUTFLOW CONCENTRATIONS OF TOTAL PHOSPHORUS FOR THE CHANDLER SLOUGH MARSH

Diel studies at the inflow and outflow stations of the Chandler Slough marsh were undertaken in 1974 and 1975 for the purpose of examining the effects of the marsh on short term water quality variations.

Figure 3 displays the diel variations in the inflow and outflow concentrations of total phosphorus. Daily variation in total phosphorus concentrations was greatest at the beginning of the wet season (July 1974 and June 1975) and decreased as the season progressed. The September 1974 samples showed a close correspondence in inflow and outflow values for samples which were collected simultaneously.

DIEL VARIATION WITHIN THE CHANDLER SLOUGH MARSH

Three diel studies within the Chandler Slough marsh were undertaken during June 14-18, August 16-19, and October 11-14, 1976 to measure short term water quality variations.

Phosphorus

From June 14-17 (Figure 4) total phosphorus averaged 0.435 mg/l with daily peak values of 0.534, 0.455, 0.436, and 0.436 mg/l, respectively. Maximum phosphorus levels occurred at 0830 hrs. on June 15 and 0030 hrs. on the remaining days. Minimum values of 0.437, 0.428, 0.404, 0.392 mg/l occurred at 1630 hrs. on June 14-16, and 1230 hrs. on June 17. During this period the inflow averaged 7.4 m^3/sec. The diel levels of ortho-phosphorus paralleled the levels of total phosphorus and averaged 0.365 mg/l.

During the August sampling period (Figure 5) the mean inflow increased to 23.1 m^3/sec. Mean total and ortho-phosphorus levels decreased to 0.281 and 0.228 mg/l, respectively. Total phosphorus did not exhibit the same rhythmic patterns

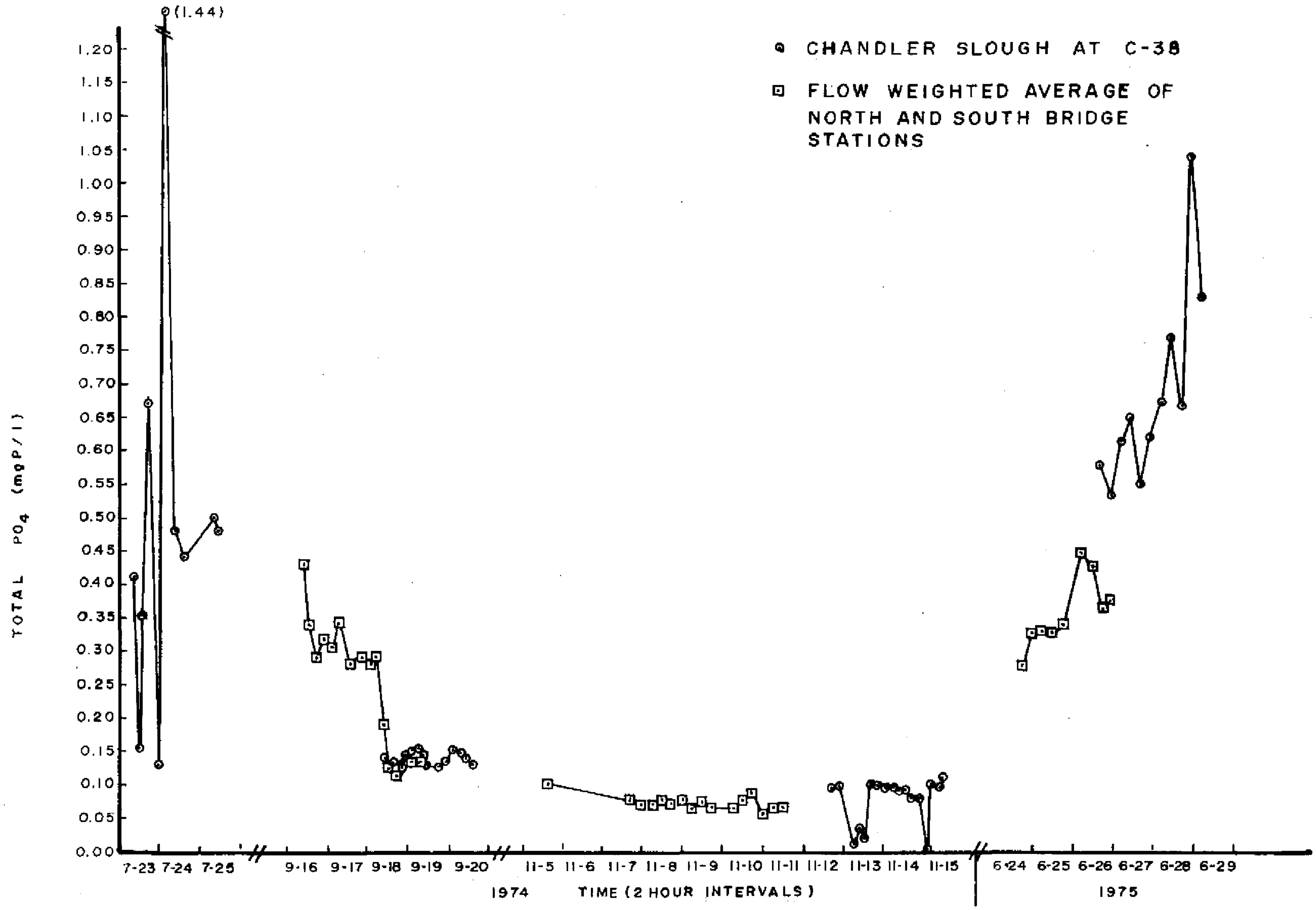

Figure 3 DIEL VARIATION IN THE INFLOW AND OUTFLOW CONCENTRATIONS OF TOTAL PHOSPHORUS FOR THE CHANDLER SLOUGH MARSH IN 1974 AND 1975

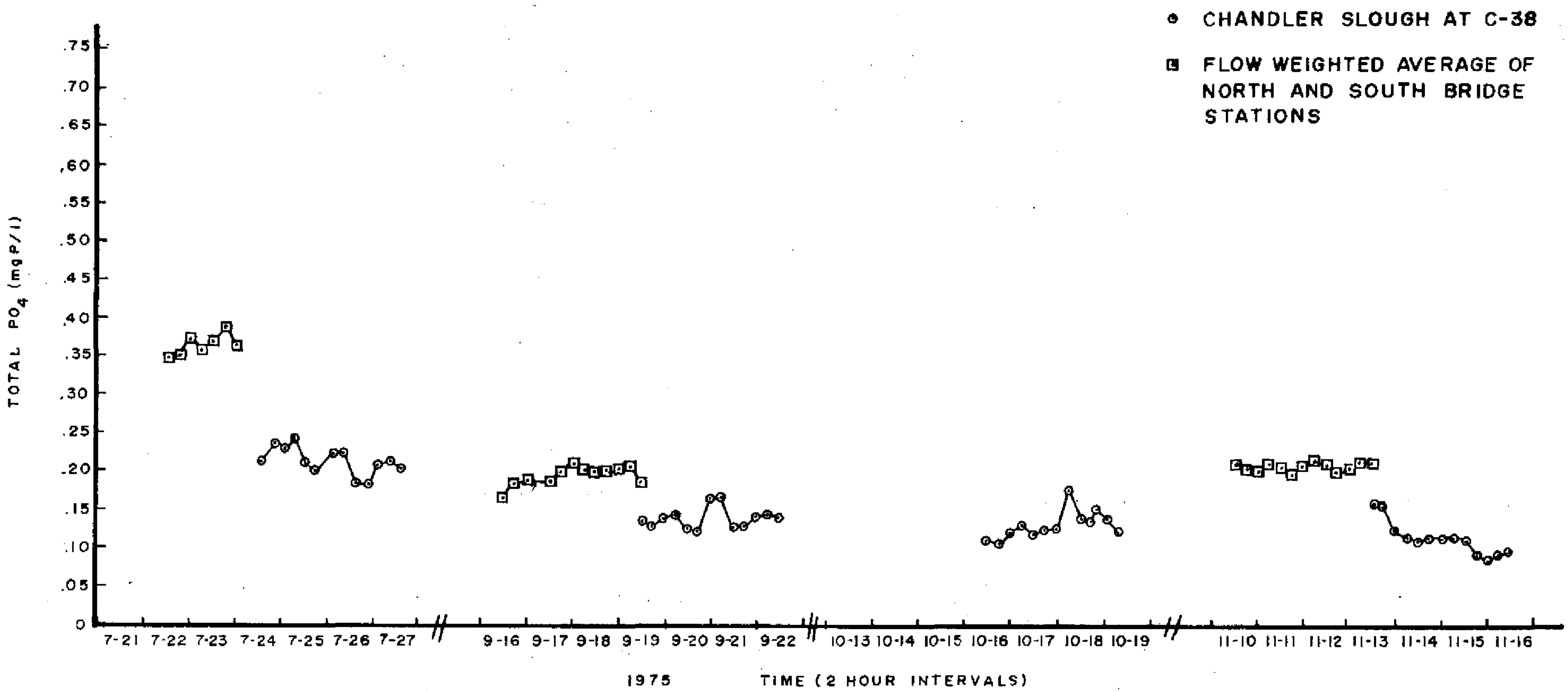

Figure 3 (Cont.) DIEL VARIATION IN THE INFLOW AND OUTFLOW CONCENTRATIONS OF TOTAL PHOSPHORUS FOR THE CHANDLER SLOUGH MARSH IN 1974 AND 1975

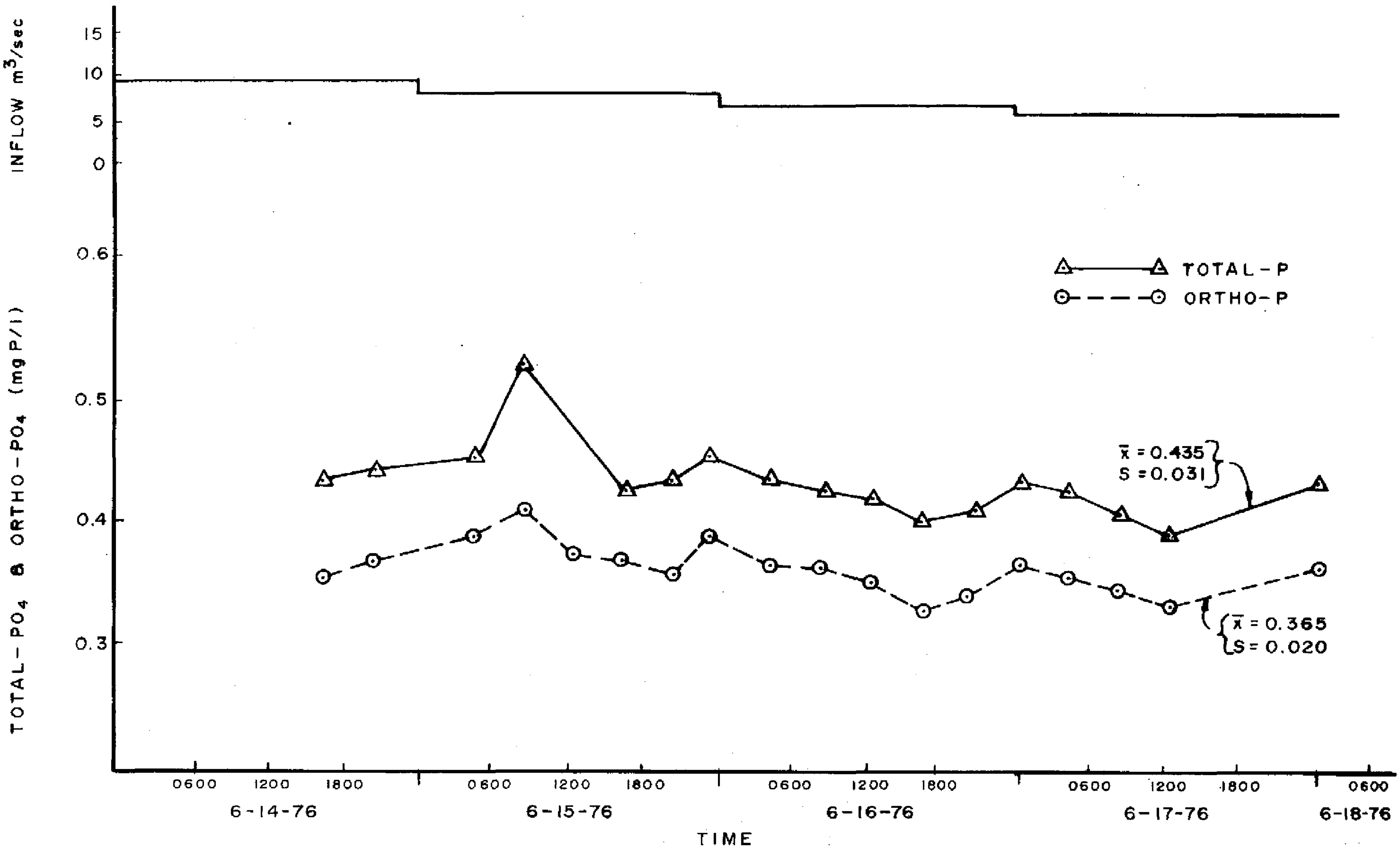

Figure 4 DIEL VARIATION IN TOTAL AND ORTHO PHOSPHORUS IN THE CHANDLER SLOUGH MARSH DURING JUNE 14-18, 1976

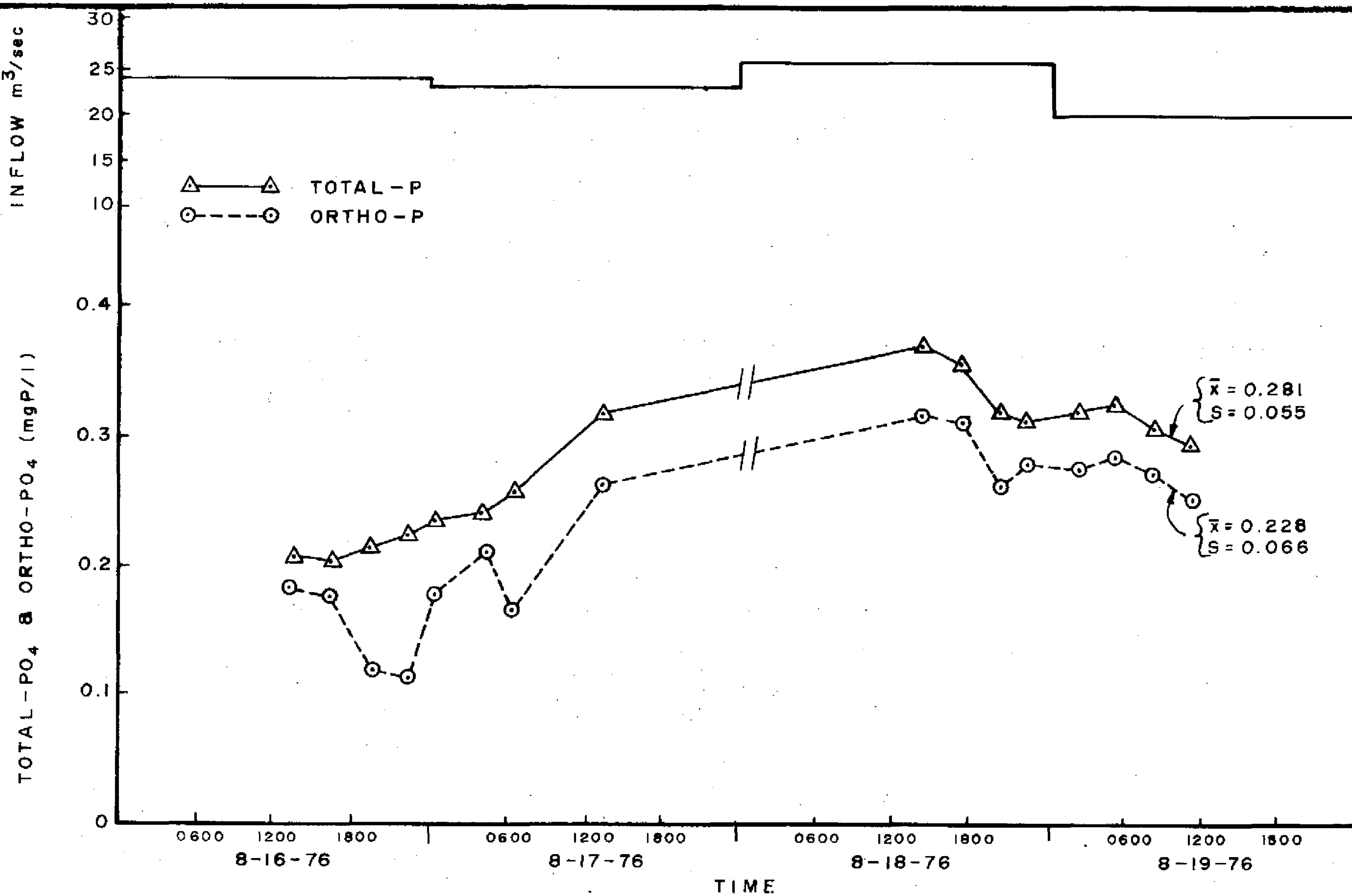

Figure 5 DIEL PHOSPHORUS VARIATION IN THE CHANDLER SLOUGH MARSH DURING AUGUST 16-19, 1976

that were apparent in June. Instead, total phosphorus increased linearly from 0.203 mg/l (August 16 @ 1630 hrs.) to 0.370 mg/l (August 17 @ 1330 hrs.) decreasing thereafter to 0.295 mg/l. Ortho-phosphorus paralleled total phosphorus except at the beginning of the sampling period. During the first 18 hours ortho-phosphorus exhibited a sinusoidal pattern with maximums of 0.182, 0.208, and 0.252 mg/l and minimums of 0.113 and 0.163 mg/l.

The average inflow during the October sampling period (Figure 6) decreased to 0.8 m^3/sec. There was a decrease in the diel fluctuations of phosphorus with mean concentrations of 0.158 mg/l total phosphorus and 0.112 mg/l ortho-phosphorus. Total phosphorus decreased slightly from 0.189 mg/l (October 11 @ 1430 hrs.) to 0.140 mg/l (October 14 @ 1230 hrs.). During the same time interval ortho-phosphorus concentrations decreased from 0.137 to 0.102 mg/l.

<u>Nitrogen</u>

Total nitrogen levels remained relatively constant (std. dev. = 0.05) at 1.41 mg/l, during July (Figure 7) with total organic nitrogen accounting for 94 percent of the total nitrogen. Inorganic nitrogen fluctuations appeared responsible for perturbations in total nitrogen levels during the first 17 hours of the study. During this initial period inorganic nitrogen and total organic nitrogen concentrations appeared to be inversely related.

The mean total nitrogen concentration during August (Figure 8) declined to 1.30 mg/l and increased in variability (std. dev. = 0.20). The oscillations in total nitrogen appeared continually but were not correlated with any particular time frame. Total organic nitrogen accounted for 90 percent of the total nitrogen and was responsible for most of the variability. On two occasions (August 16 @ 1930 hrs. and August 18 @ 2030 hrs.) inorganic nitrogen pulses were sufficient to cause a noticeable increase in total nitrogen levels. In these two instances total organic nitrogen concentrations decreased slightly.

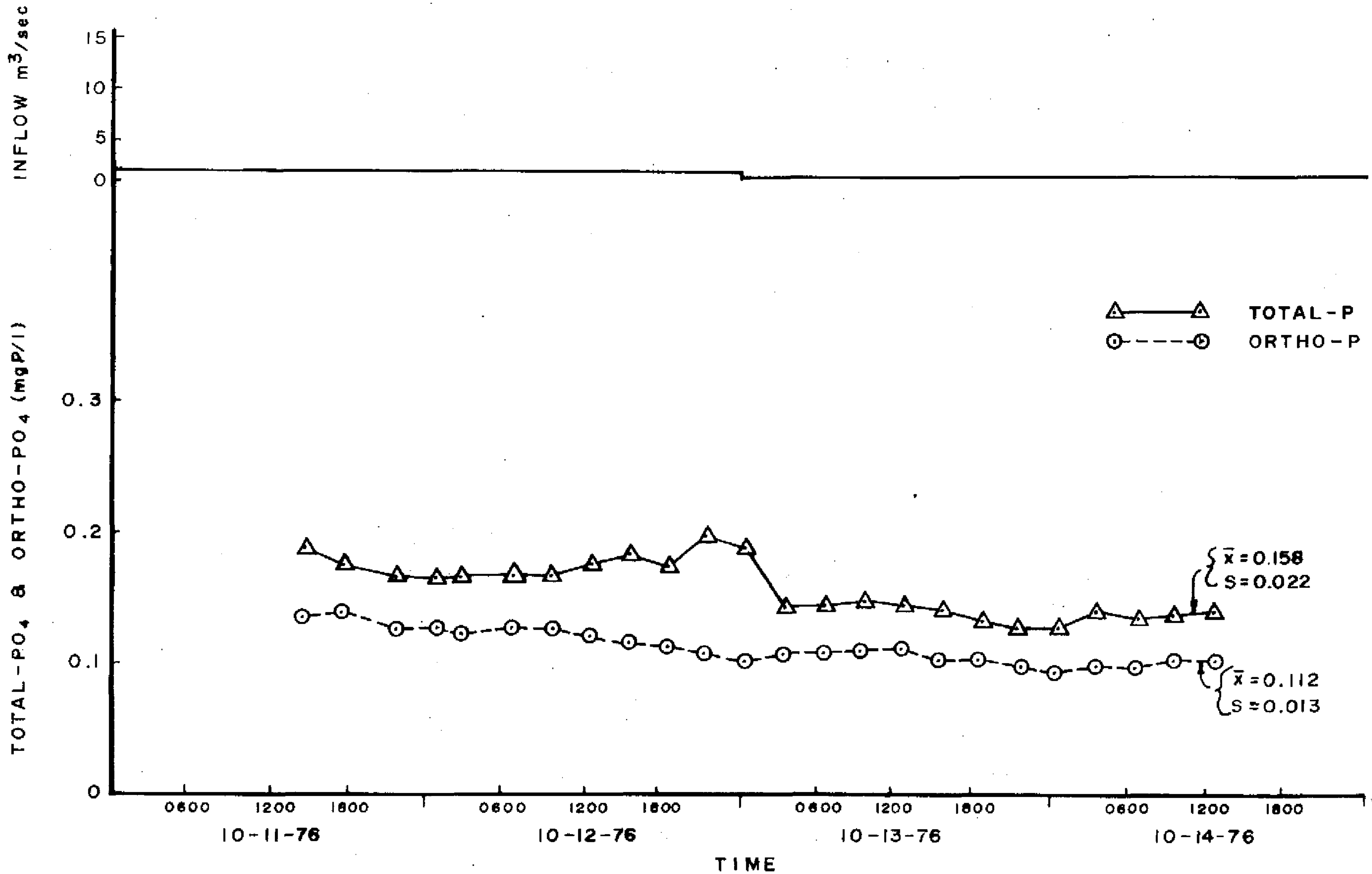

Figure 6 DIEL PHOSPHORUS VARIATION IN THE CHANDLER SLOUGH MARSH DURING OCTOBER 11-14, 1976

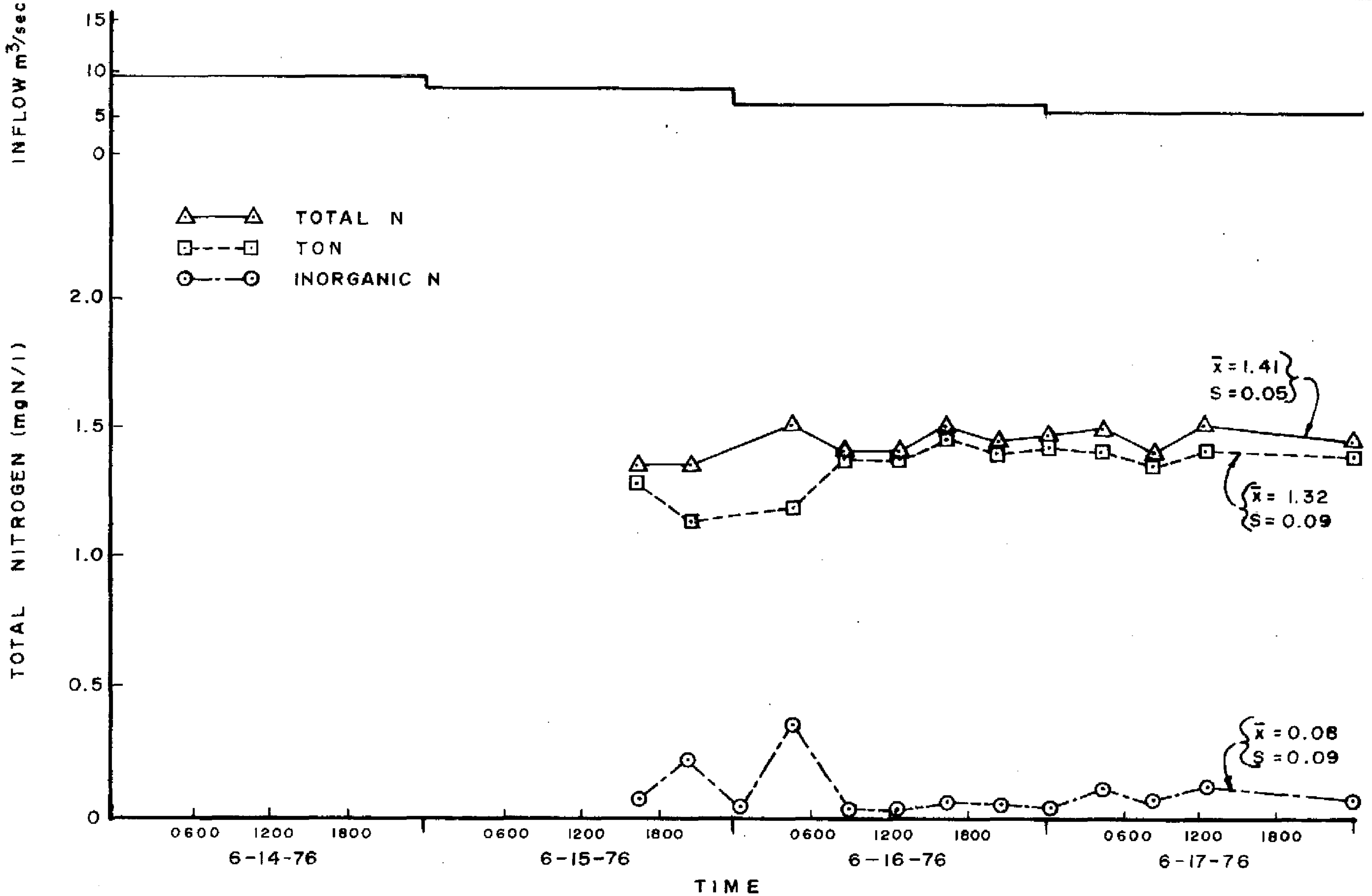

Figure 7 DIEL NITROGEN VARIATION IN THE CHANDLER SLOUGH MARSH DURING JUNE 14-17, 1976

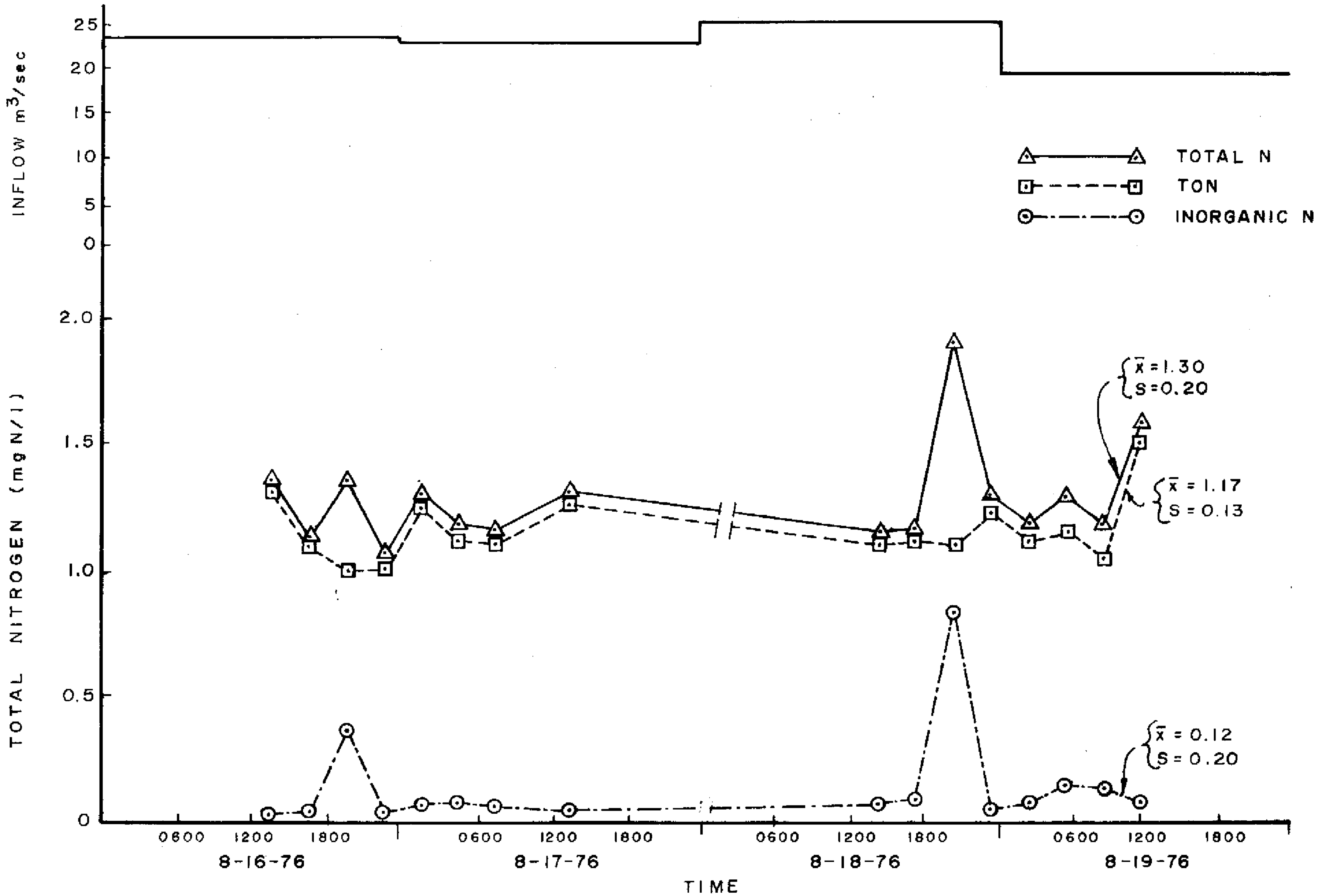

Figure 8 DIEL NITROGEN VARIATION IN THE CHANDLER SLOUGH MARSH DURING AUGUST 16-18, 1976

Major Cation and Anion Constituents

Variations in flow, sodium, alkalinity, potassium, calcium, and chloride for the three diel studies are presented in Figures 9 to 11. Sodium, calcium, chloride, and alkalinity exhibited irregular oscillations which, within each sampling period, were not correlated to the time of day or to flow. Potassium did not vary by more than 1 mg/l throughout the three periods.

Comparisons of the means among the three sampling periods indicated that, in general, the concentrations of the major ions were inversely proportional to the flow.

Field Parameters

Dissolved oxygen, temperature, conductivity, and pH were measured at 30 minute intervals from June 14-17, 1976. The diel variation for oxygen and temperature are plotted in Figure 12. Dissolved oxygen was low and varied between 0.8 and 2.1 mg/l. Dissolved oxygen was highest during the afternoon hours, when maximum photosynthetic activity would be expected, and lowest in the early morning hours. Temperature ranged from 26.4 to 29.6^{0} C with high values occurring in the early evening (2000 hours) and low values occurring in mid-morning (0900 hours). Conductivity ranged from 135 to 162 umho/cm and pH ranged from 6.7 to 7.4 units with no apparent rhythmic pattern.

EFFECT OF THE CHANDLER SLOUGH MARSH ON WATER QUALITY

The evaluation of the effect of the marsh on water quality considered only that water chemistry data obtained during periods of flow. The discharge hydrographs for the two inflow stations (Figures 13 to 16), North Bridge and South Bridge, were used to delineate the time periods for which valid input/output comparisons could be made. The wet season time periods used in further analyses were June 7, 1975 through January 7, 1976 and May 17, 1976 through October 27, 1976.

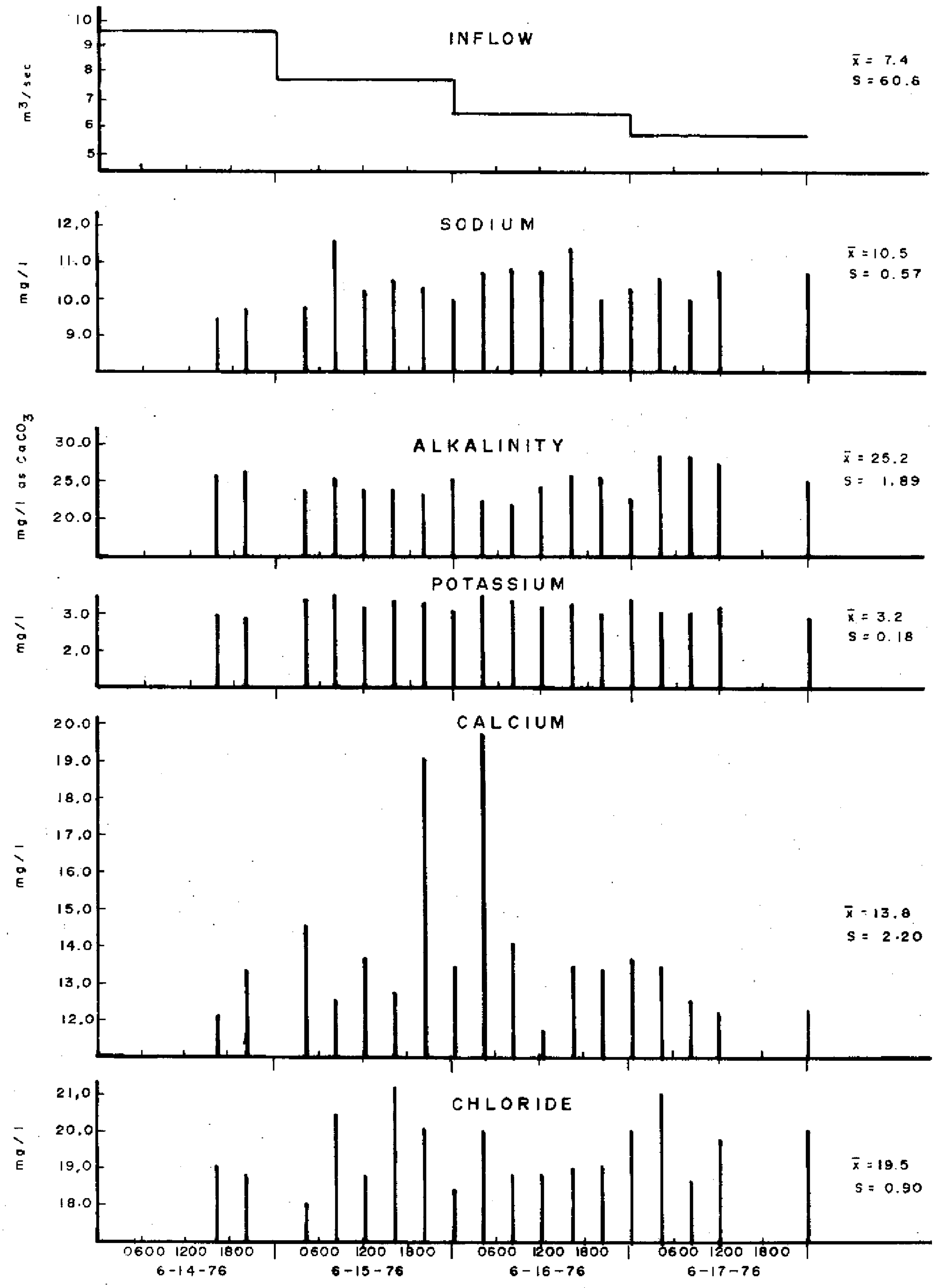

Figure 9 DIEL VARIATIONS IN SODIUM, ALKALINITY, POTASSIUM, CALCIUM, AND CHLORIDE IN THE CHANDLER SLOUGH MARSH DURING JUNE 14-17, 1976

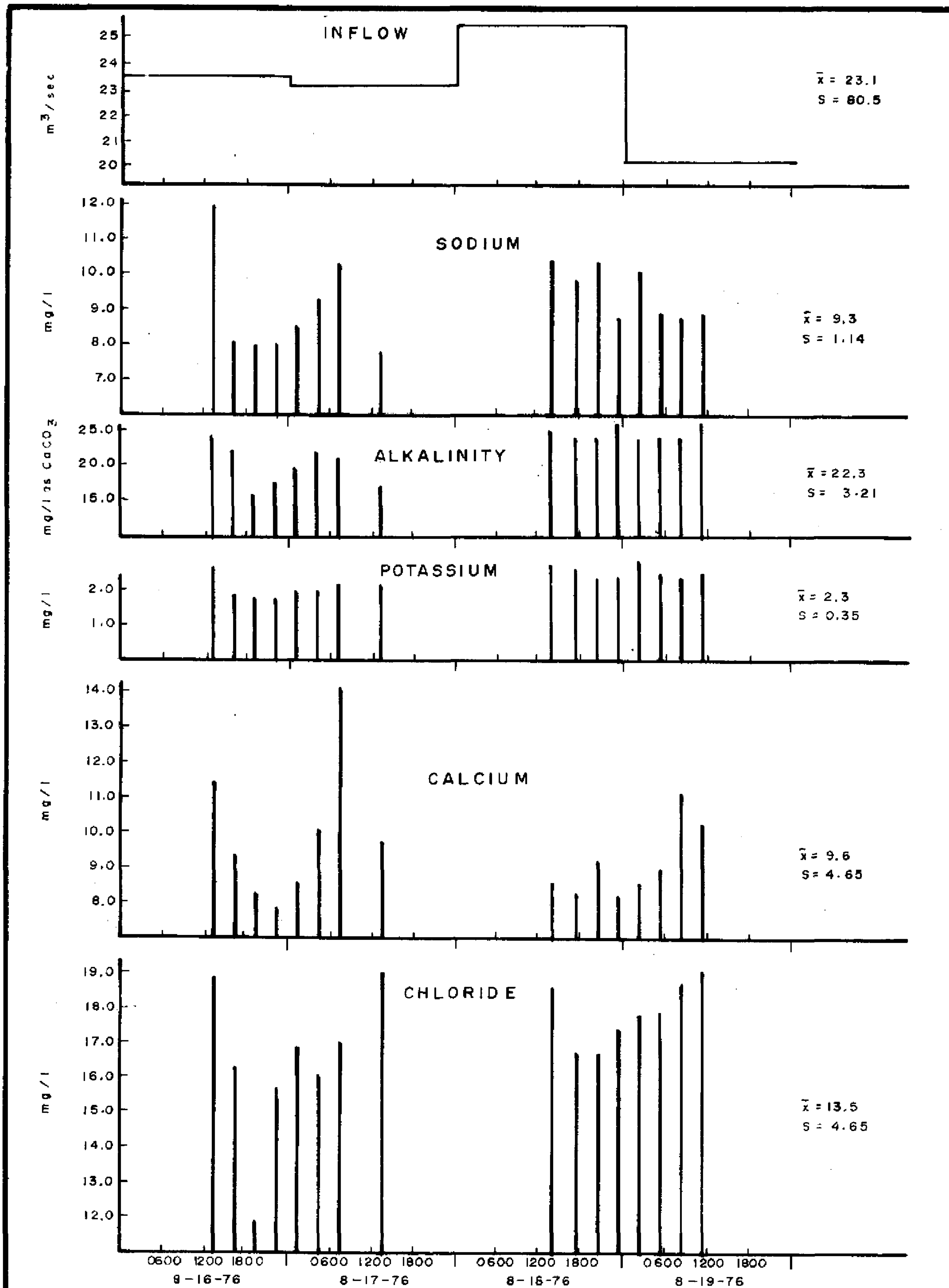

Figure 10 DIEL VARIATIONS IN SODIUM, ALKALINITY, POTASSIUM, CALCIUM, AND CHLORIDE IN THE CHANDLER SLOUGH MARSH DURING AUGUST 16-19, 1976

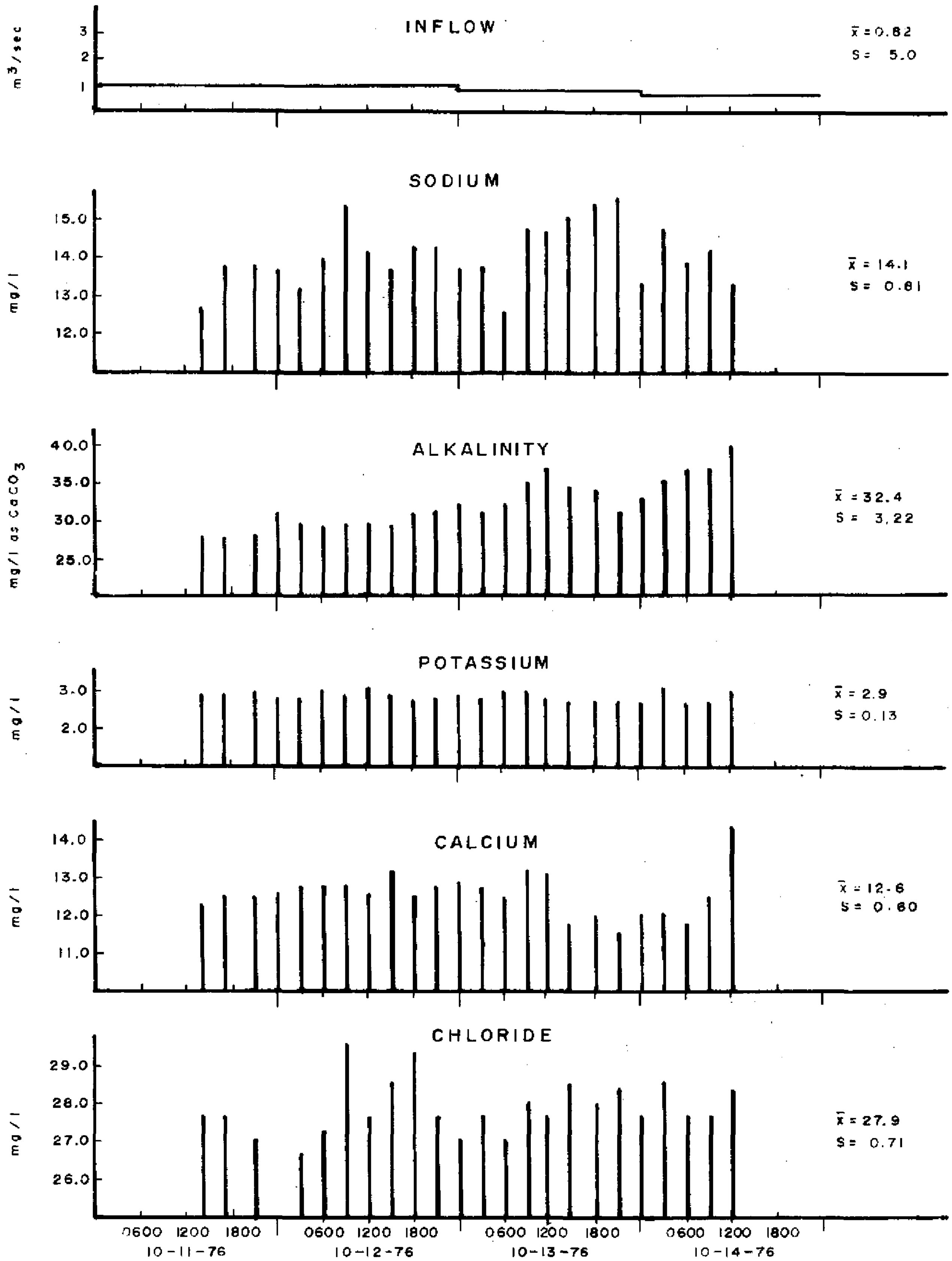

Figure 11 DIEL VARIATIONS IN SODIUM, ALKALINITY, POTASSIUM, CALCIUM, AND CHLORIDE IN THE CHANDLER SLOUGH MARSH DURING OCTOBER 11-14, 1976

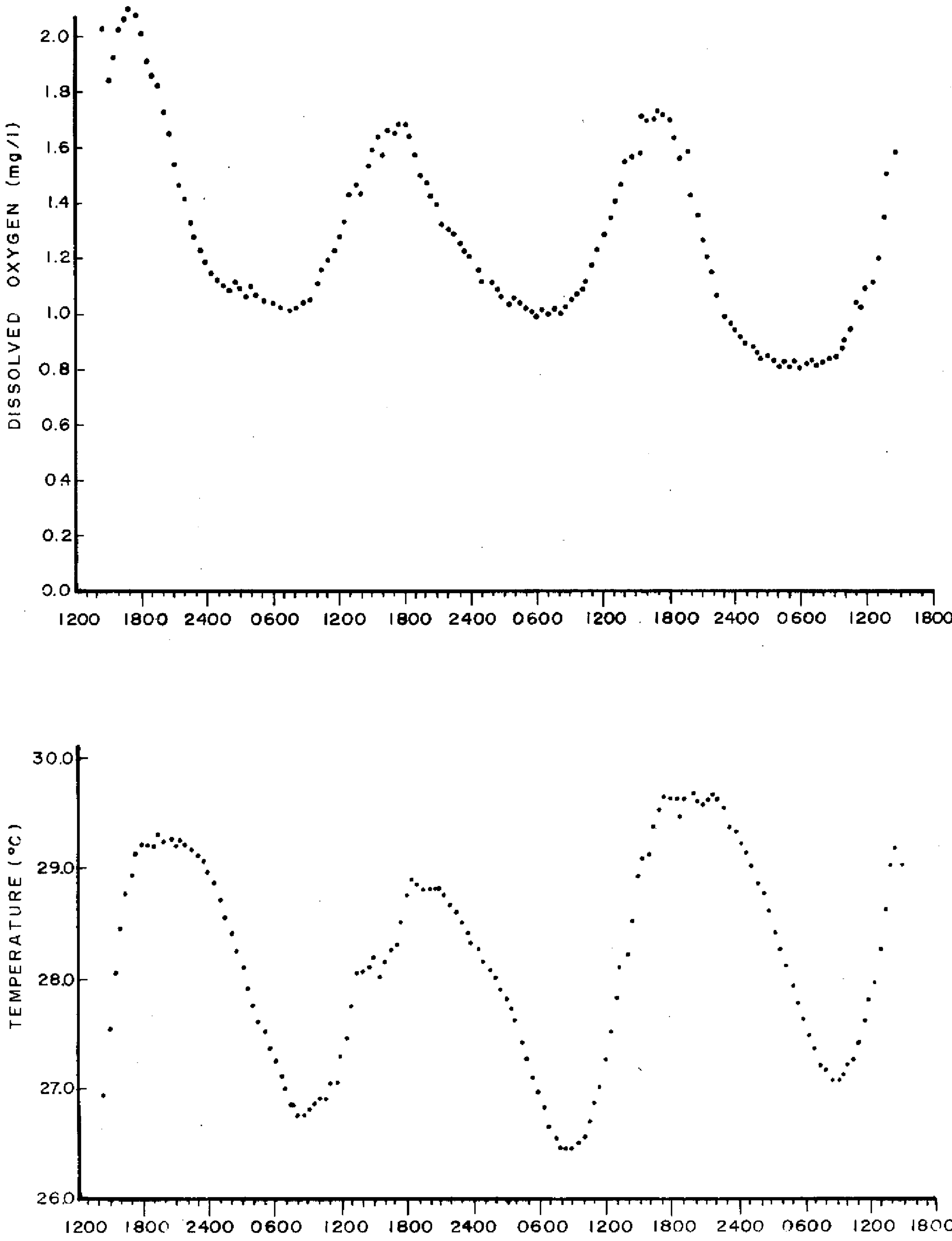

Figure 12 DIEL VARIATION IN FIELD PARAMETERS IN THE CHANDLER SLOUGH MARSH FROM JUNE 14-17, 1976

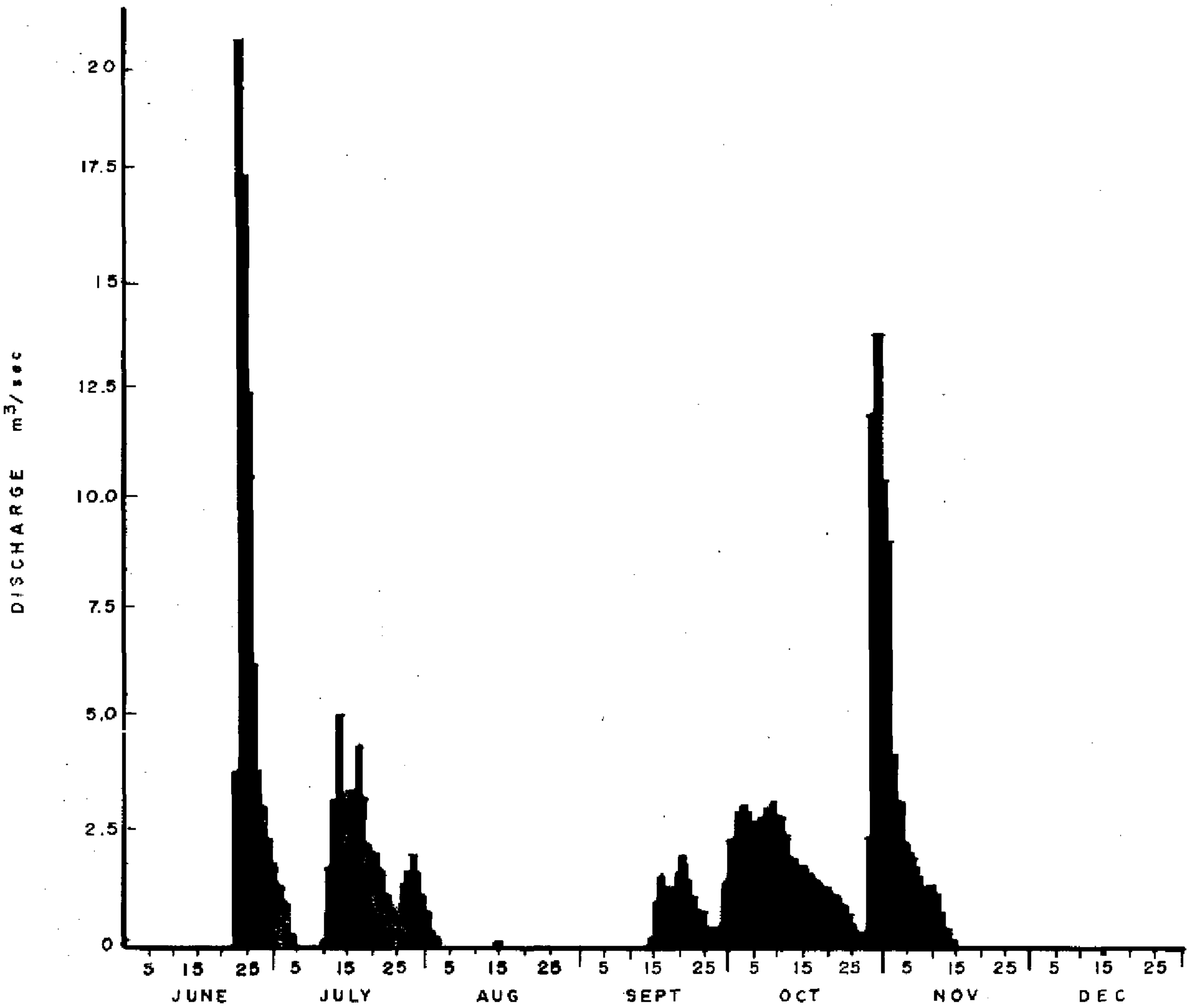

Figure 13 1975 DISCHARGE HYDROGRAPH FOR THE NORTH BRIDGE STATION

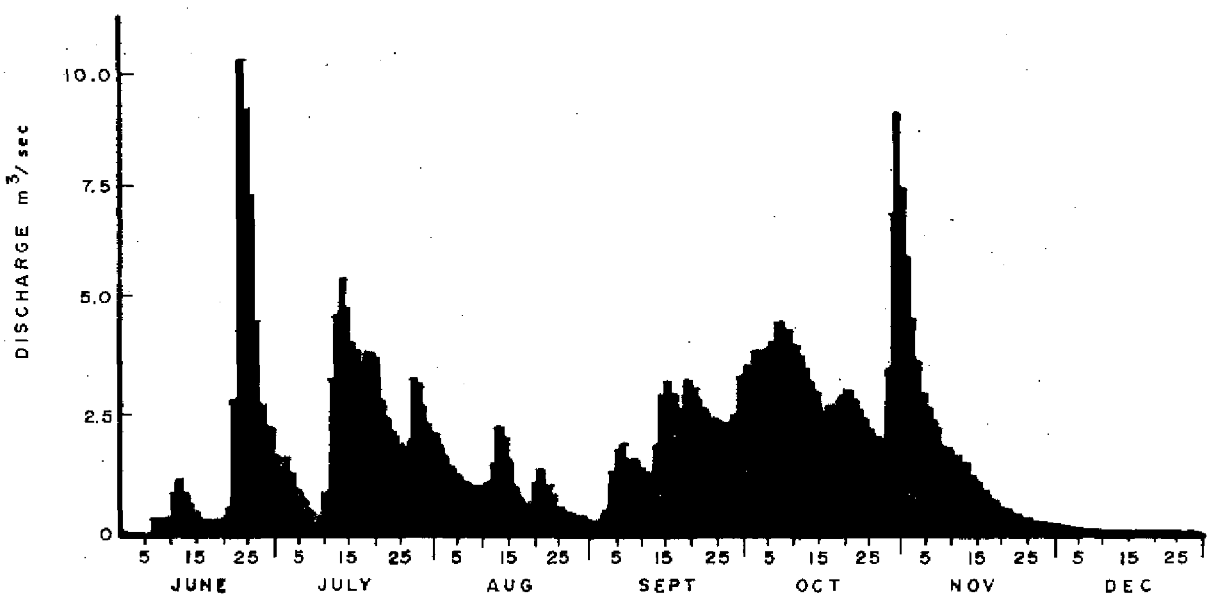

Figure 14 1975 DISCHARGE HYDROGRAPH FOR THE SOUTH BRIDGE STATION

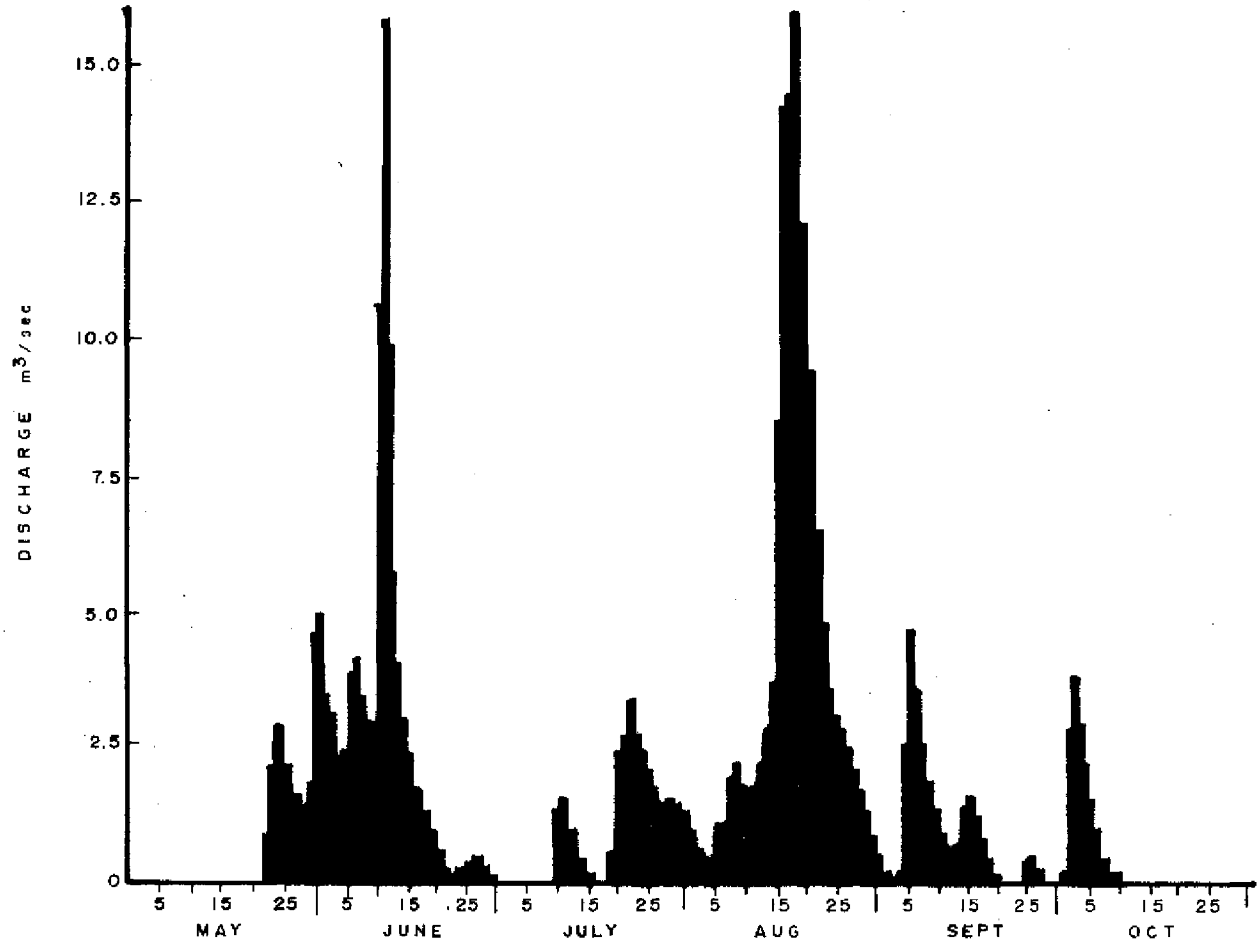

Figure 15 1976 DISCHARGE HYDROGRAPH FOR THE NORTH BRIDGE STATION

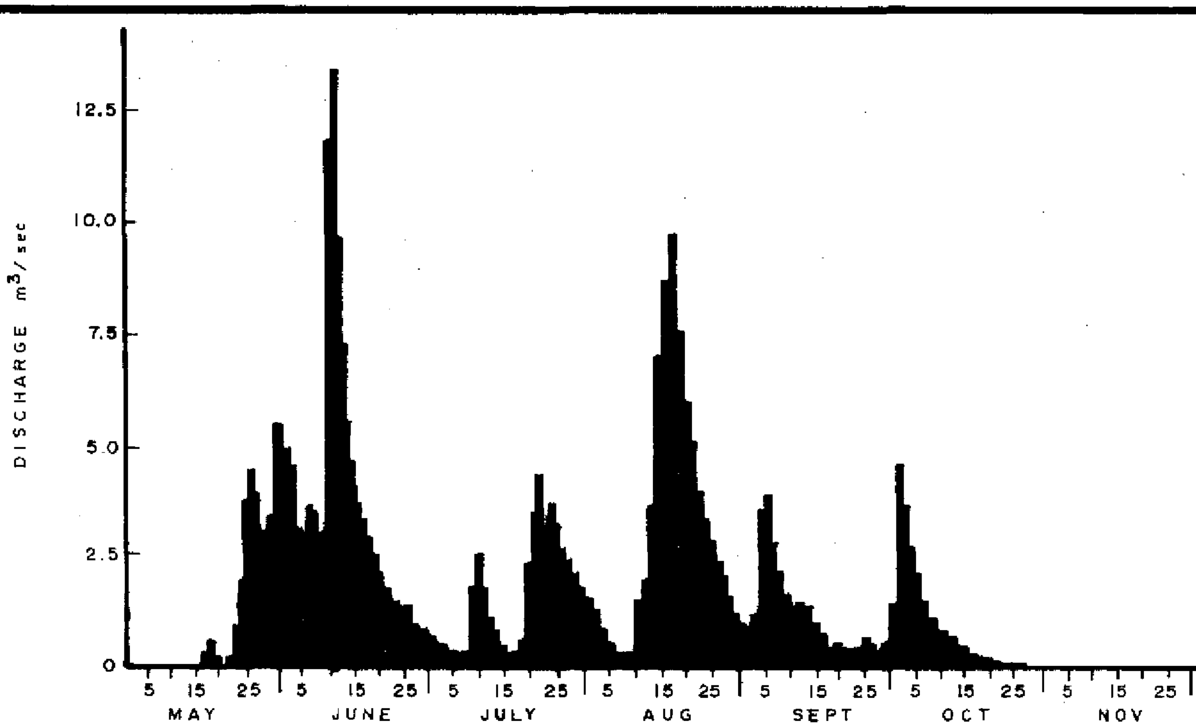

Figure 16 1976 DISCHARGE HYDROGRAPH FOR THE SOUTH BRIDGE STATION

Chemical concentrations entering the marsh were estimated by flow weighting the concentrations measured at the two inflow stations according to the following formula:

$$C_i = \frac{V_n C_n}{V_n + V_s} + \frac{V_n C_s}{V_n + V_s}$$

where C_i = flow weighted inflow concentration of parameter C

C_n = concentration of C at North Bridge Station

C_s = concentration of C at South Bridge Station

V_n = discharge rate at North Bridge Station

V_s = discharge rate at South Bridge Station

The outflow from the marsh was represented by the chemical concentrations measured at the Chandler Slough at C-38 station.

Major Cations and Anions

Displayed in Table 9 are the means and standard deviations of inflow and outflow concentrations of nutrients, major cations, and anions during 1975 and 1976. Comparisons of mean inflow chloride concentrations to mean outflow chloride concentrations indicated that the outflow from the marsh had an 8 percent reduction in chlorides in 1975 and a 4 percent reduction in 1976. The statistical significance of these reductions were tested using a two-way analysis of variance (ANOVA). The two main effects tested were station (inflow and outflow) and wet season (1975 and 1976). The results of this analysis indicated no significant difference between mean inflow and outflow concentrations and no difference between wet season means (Table 10).

Based upon comparisons between the mean inflow to the marsh vs the mean outflow, sodium decreased between 7 and 12 percent; silica decreased between 8 and 19 percent; calcium increased 2 percent in 1975 and decreased 13 percent in 1976; magnesium increased 7 percent in 1975 and decreased 7 percent in 1976; potassium remained constant in 1975 and decreased 36 percent in 1976; and sulfate decreased

TABLE 9. CONCENTRATIONS OF SELECTED WATER CHEMISTRY PARAMETERS BEFORE AND AFTER THE WATER PASSES THROUGH THE CHANDLER SLOUGH MARSH

	1975			1976	
Parameter (mg/l)	Inflow(1)		Outflow(5)	Inflow	Outflow
Ortho-P	0.217	Mean	0.182	0.290	0.173
	0.086	Std. Dev.	0.183	0.153	0.078
Total-P	0.276		0.232	0.349	0.226
	0.102		0.210	0.169	0.091
NO_x-N(2)	0.035		0.049	0.020	0.024
	0.069		0.176	0.013	0.048
NH_4-N	0.053		0.029	0.047	0.037
	0.061		0.029	0.046	0.046
TON(3)	1.29		1.32	1.36	1.32
	0.288		0.171	0.149	0.203
Total-N(4)	1.34		1.39	1.42	1.38
	0.262		0.255	0.152	0.218
Cl^-	27.2		25.1	23.1	22.1
	13.8		5.5	6.2	4.6
Na	13.0		11.5	11.8	11.0
	8.5		1.9	3.7	2.9
Ca	11.9		12.2	13.3	11.6
	5.0		2.6	3.2	1.8
Mg	2.8		3.0	2.8	2.6
	1.4		0.6	0.5	0.4
K	2.2		2.2	2.5	1.6
	0.76		0.93	1.7	1.0
SiO_2	4.9		4.5	5.9	4.8
	2.0		0.74	3.8	1.1
SO_4	9.2		6.2	7.0	7.2
	5.4		1.5	2.3	2.4

(1) Inflow concentrations were calculated by flow weighting and then summing the concentrations measured at the North and South Bridge Stations
(2) $NO_3 = NO_x - NO_2$
(3) TON = TKN - NH_4
(4) Total-N = TKN + NO_x
(5) Outflow measurements were made at Chandler Slough at C-38 Station.

TABLE 10. RESULTS OF TWO-WAY ANALYSES OF VARIANCE FOR TOTAL NITROGEN, TOTAL PHOSPHORUS AND CHLORIDE

Dependent Variable: Total Nitrogen

Source of Variation	Sum of Squares	Degrees of Freedom	F	Significance of F
Main Effects	.047	2	.409	.665
Station	.023	1	.399	.529
Wet Season	.028	1	.480	.489
2-Way Interactions	.055	1	.954	.330
Residual	.103	1		
Total	7.867	137		

Dependent Variable: Total Phosphorus

Source of Variation	Sum of Squares	Degrees of Freedom	F	Significance of F
Main Effects	.488	2	9.052	.001 **
Station	.029	1	1.079	.302
Wet Season	.472	1	17.517	.001 **
2-Way Interactions	.203	1	7.544	.007 **
Residual	2.345	87		
Total	3.037	90		

Dependent Variable: Chloride

Source of Variation	Sum of Squares	Degrees of Freedom	F	Significance of F
Main Effects	101.472	2	.566	.570
Station	98.789	1	1.102	.297
Wet Season	1.253	1	.014	.906
2-Way Interactions	73.056	1	.815	.369
Residual	8068.080	90		
Total	8242.611	93		

**Highly Significant

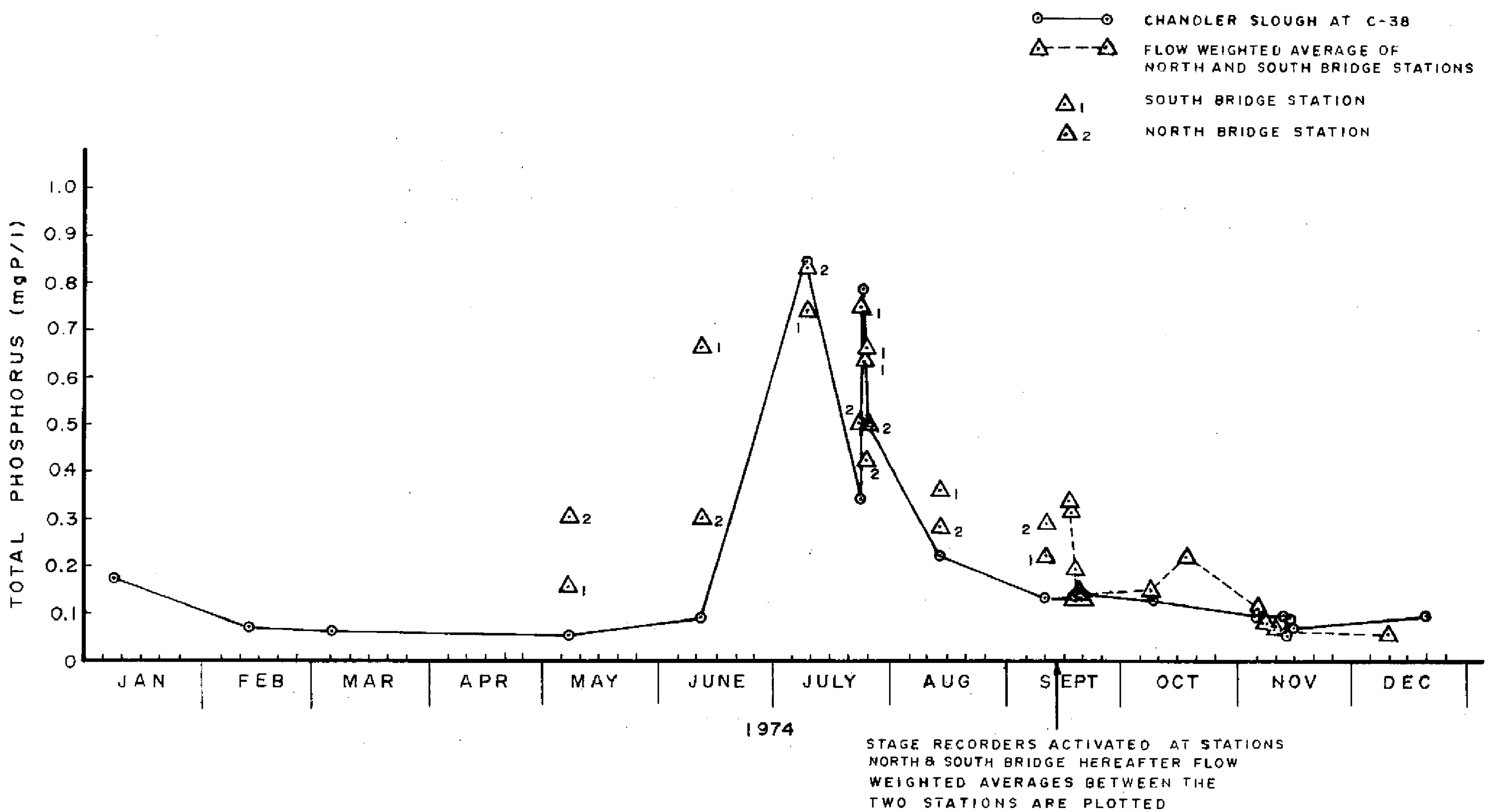

Figure 17 INFLOW AND OUTFLOW TOTAL PHOSPHORUS CONCENTRATIONS DURING 1974 FOR THE CHANDLER SLOUGH MARSH

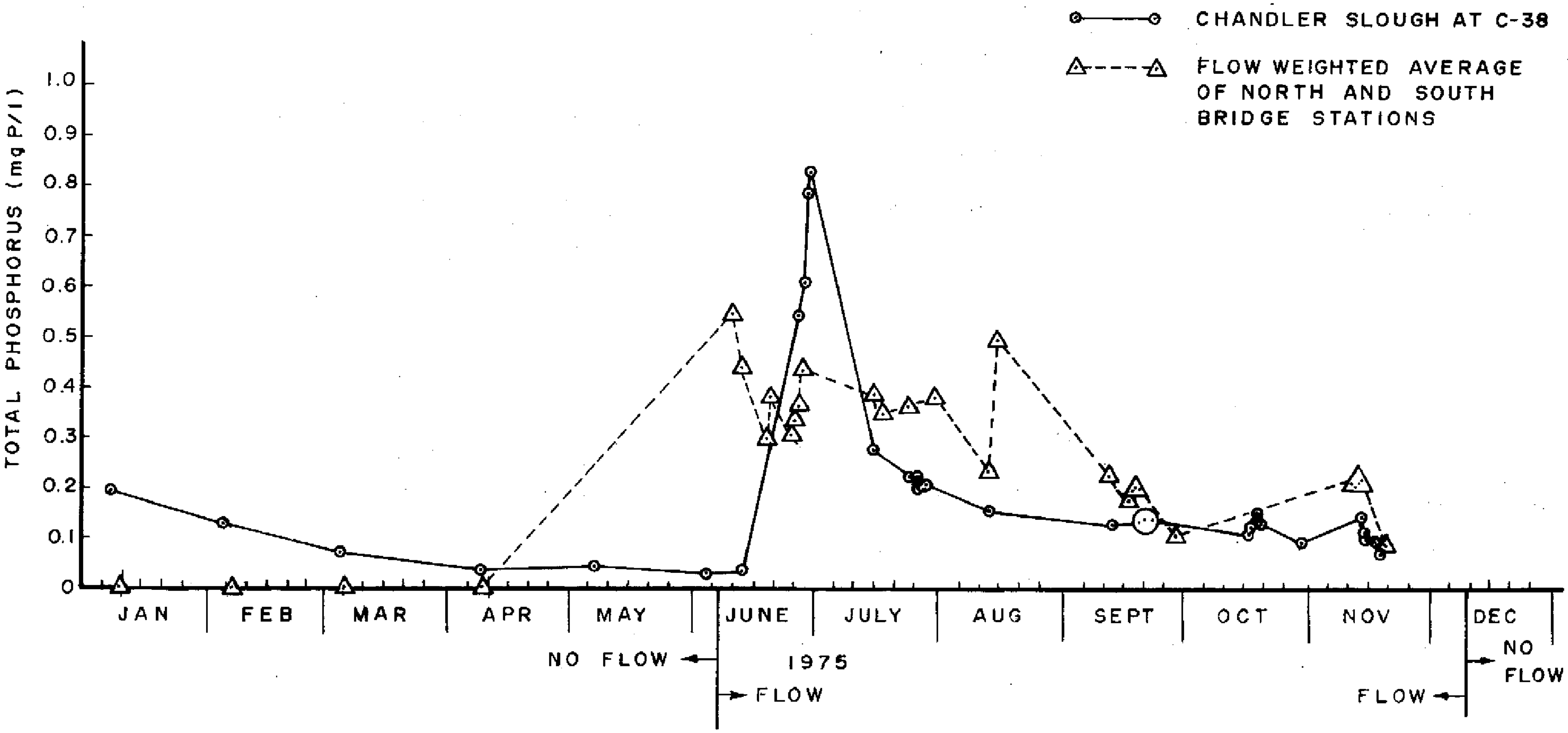

Figure 18 INFLOW AND OUTFLOW TOTAL PHOSPHORUS CONCENTRATIONS DURING 1975 FOR THE CHANDLER SLOUGH MARSH

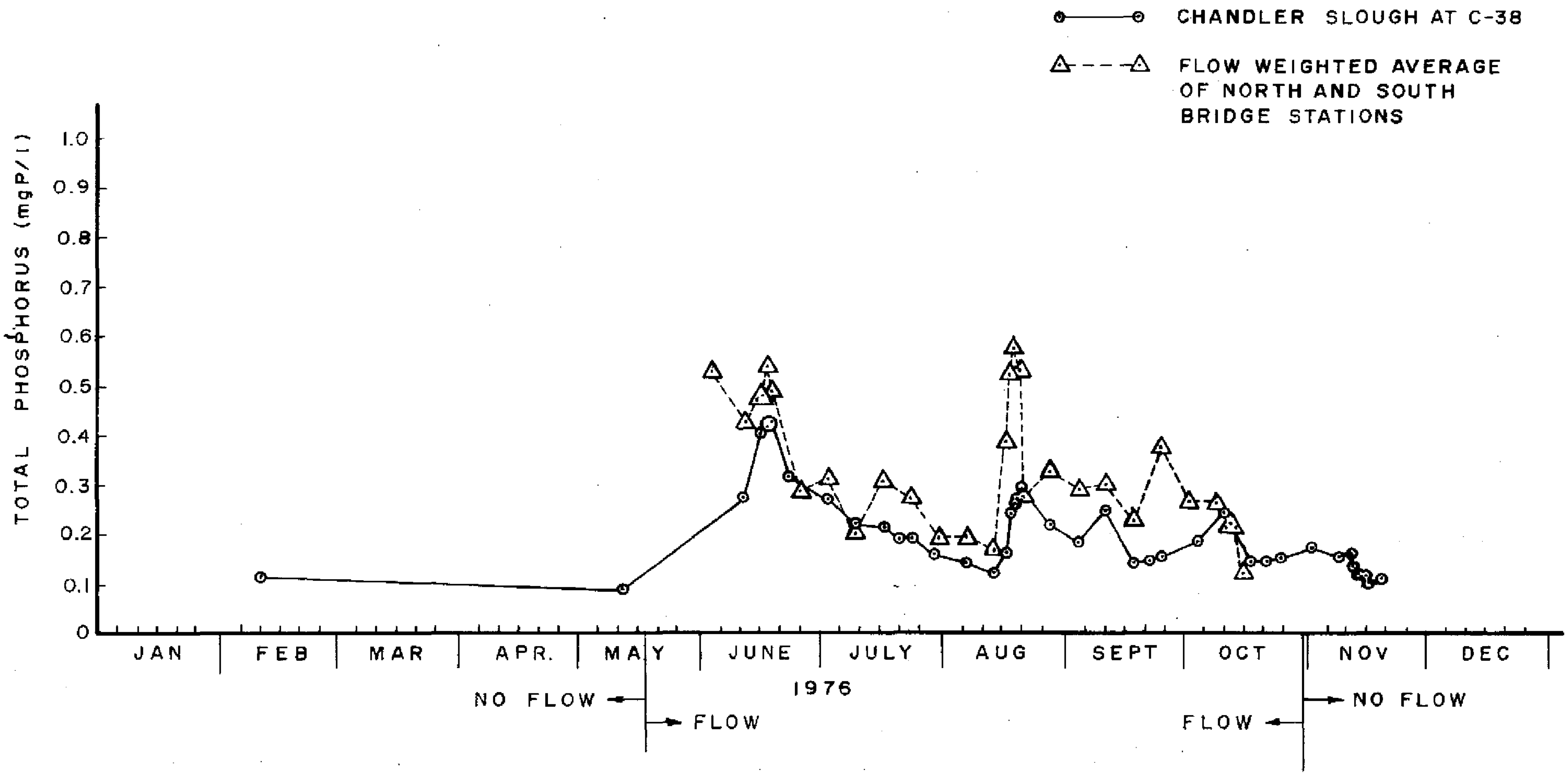

Figure 19 INFLOW AND OUTFLOW TOTAL PHOSPHORUS CONCENTRATIONS DURING 1976 FOR THE CHANDLER SLOUGH MARSH

23 percent in 1975 and increased 3 percent in 1976.

Phosphorus

Figures 17 to 19 show the temporal effect of the marsh on total phosphorus. In 1974 and 1975, outflow concentrations of total phosphorus were generally lower than inflow levels with the exception of samples collected in the beginning of July 1974 and at the end of June 1975. During these short periods, total phosphorus concentrations at the outflow of the marsh exceeded the inflow levels. Averaged over the 1975 wet season, the marsh reduced the inflow concentration of total phosphorus by approximately 16 percent (Table 9). In 1976 the apparent reduction in total phosphorus concentration was about 35 percent. However, the initial surge of total phosphorus that was observed in the outflow at the beginning of the 1975 wet season (Figure 18) was absent in 1976 (Figure 19). A two-way ANOVA was performed in order to test the statistical significance of these phosphorus reductions. The results of this ANOVA (Table 10) indicated that the main wet season effect and the interaction term (station x wet season) were both significant while the main station effect was not significant. Specifically this implies that the wet seasons affect the phosphorus concentration measured at the two stations in a nonparallel fashion from one year to the next. Ortho-phosphorus concentrations generally paralleled total phosphorus concentrations during both wet seasons (Table 9).

Nitrogen

Total nitrogen concentrations measured in 1974, 1975, and 1976 are displayed in Figures 20 to 22. During these three wet seasons the outflow concentrations of total nitrogen were neither consistently higher nor lower than inflow concentrations. Interseasonal comparisons (Table 9) indicate that average outflow concentrations of total nitrogen exceeded the weighted inflow concentrations in 1975 (1.39 vs 1.34 mg N/l), but not in 1976 (1.38 vs 1.42 mg N/l). However these

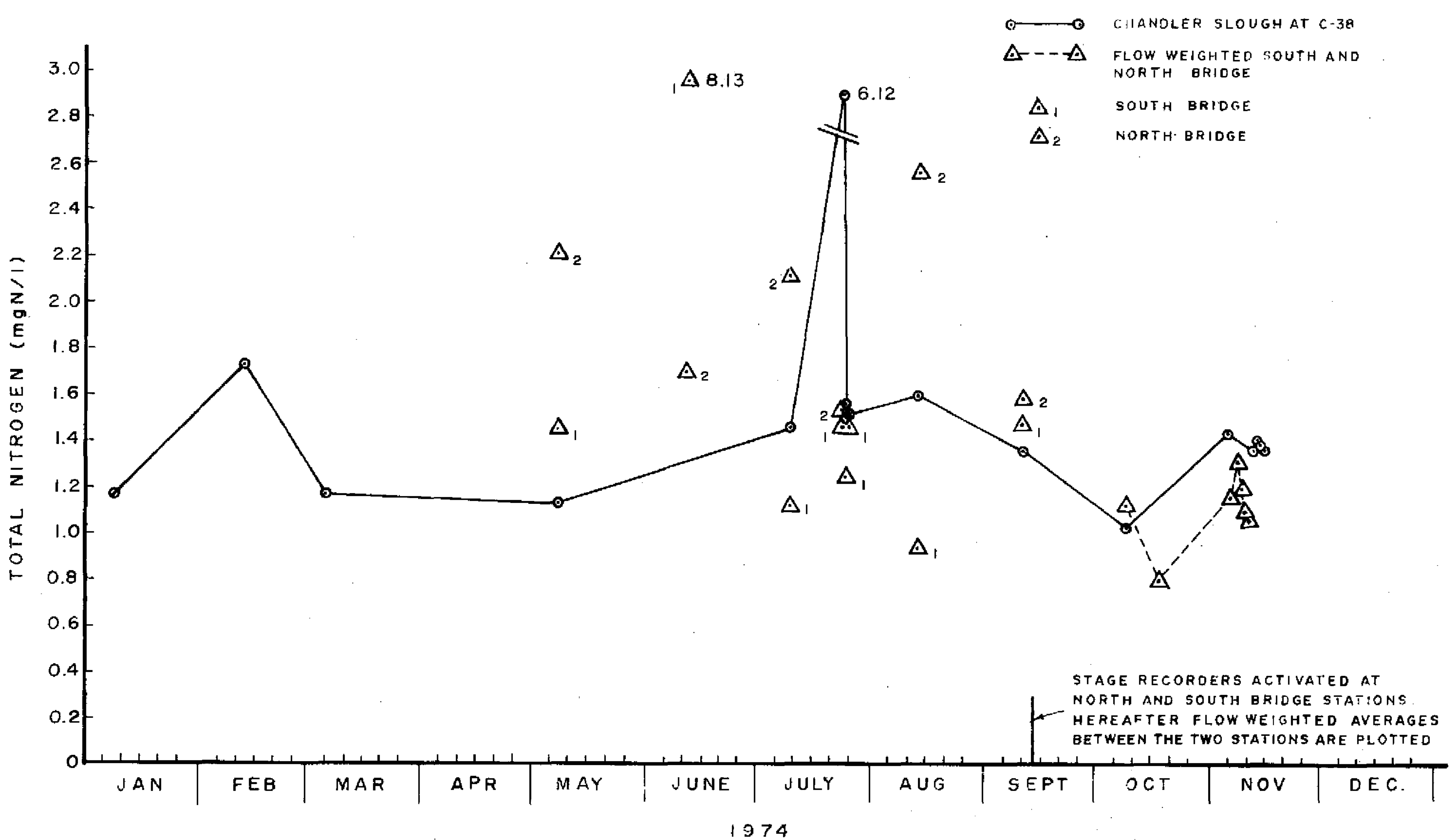

Figure 20 INFLOW AND OUTFLOW TOTAL NITROGEN CONCENTRATIONS DURING 1974 FOR THE CHANDLER SLOUGH MARSH

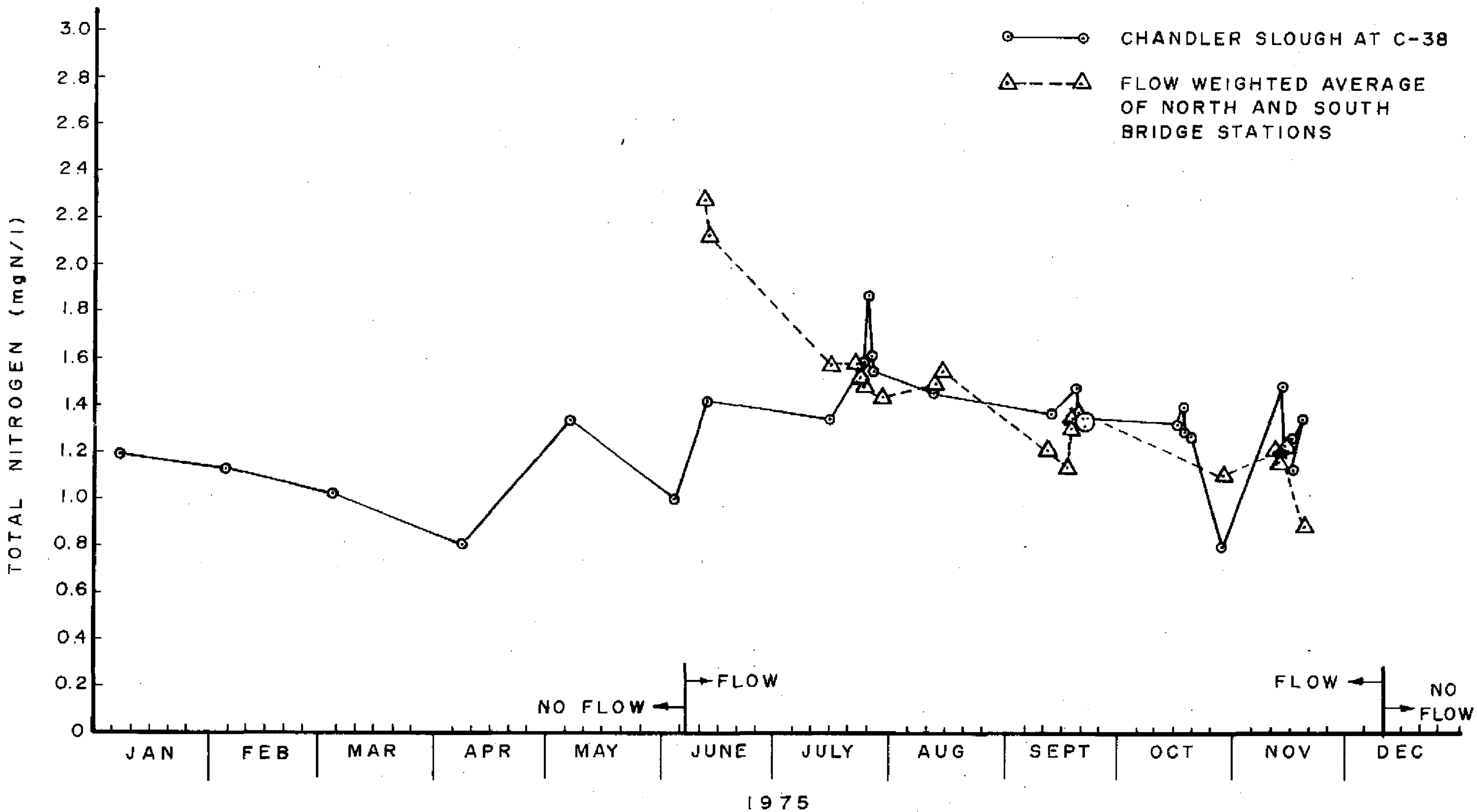

Figure 21 INFLOW AND OUTFLOW TOTAL NITROGEN CONCENTRATIONS DURING 1975 FOR THE CHANDLER SLOUGH MARSH

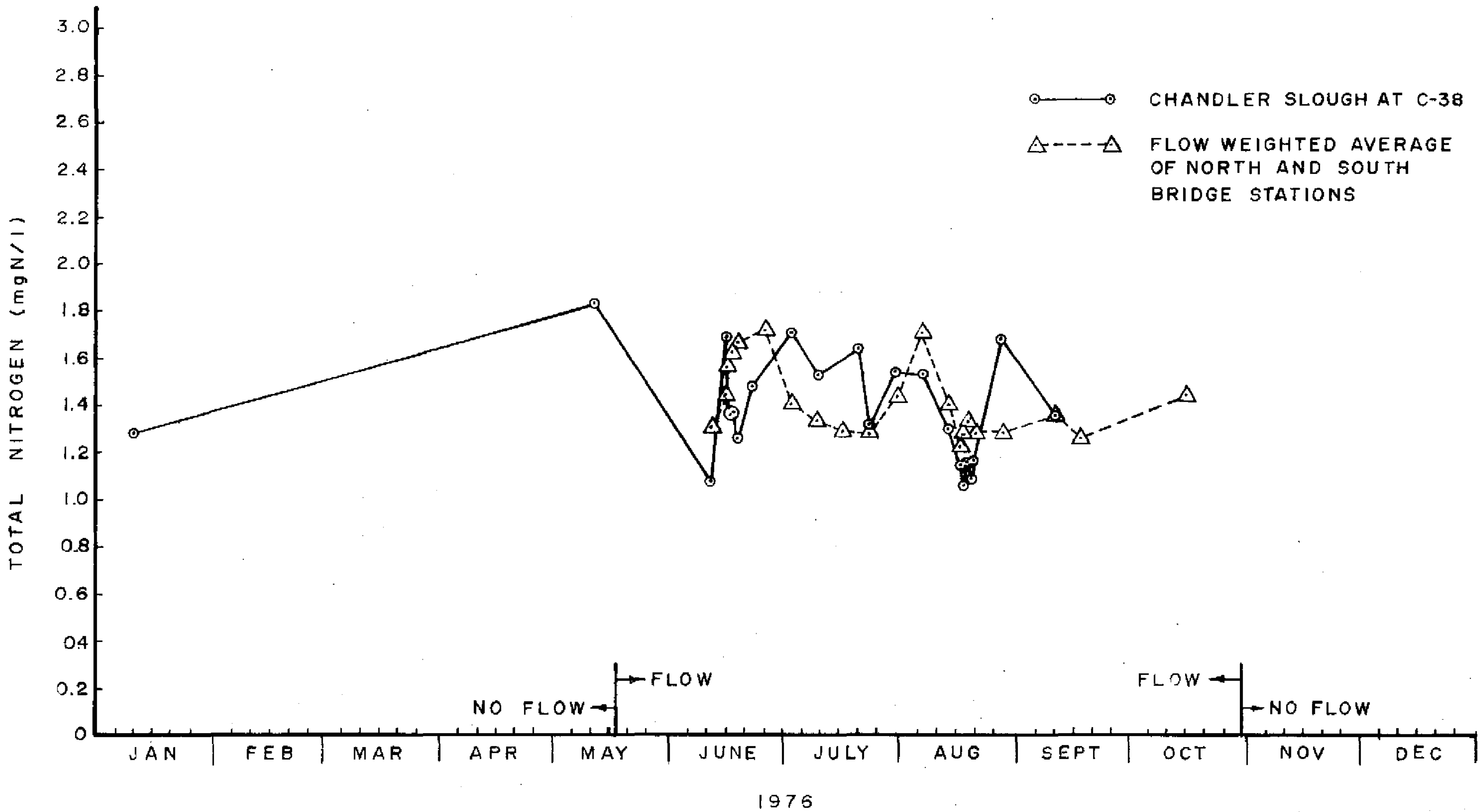

Figure 22 INFLOW AND OUTFLOW TOTAL NITROGEN CONCENTRATIONS DURING 1976 FOR THE CHANDLER SLOUGH MARSH

differences were not statistically significant (Table 10).

A comparison of the changes in nitrogen species indicates that in 1975 mean NO_x and total organic nitrogen levels paralleled the increase in the mean total nitrogen concentration (Table 9). Ammonia, however, decreased from a mean inflow concentration of 0.053 mg/l to a mean outflow concentration of 0.029 mg/l. During 1976, total organic nitrogen concentrations decreased an average of 0.04 mg/l, ammonia decreased 0.01 mg/l and NO_x increased 0.004 mg/l.

MASS LOADING ANALYSIS FOR THE CHANDLER SLOUGH MARSH

An input/output analysis was performed to estimate nutrient retention or release rates within the Chandler Slough marsh system. The two major inflows to the marsh (Chandler Slough and Cypress Slough) were represented by the North and South Bridge stations, respectively. Total nutrient input to the marsh was calculated by summing the loadings that were derived for these two major inflows. Table 11 presents monthly summaries of the nutrient loadings past the North and South Bridge Stations. Presented in Table 12 is a seasonal summary of these loadings. During the 1975 wet season, 52 percent of the total phosphorus, 47 percent of the total nitrogen, and 41 percent of the total flow to the Chandler Slough marsh was contributed by Chandler Slough. During the 1976 wet season, Chandler Slough supplied 57 percent of the total phosphorus, 53 percent of the total nitrogen and 47 percent of the flow to the marsh. Since in this analysis only two inflow sources were considered, the remainder of the nutrients and flow for both seasons was contributed by Cypress Slough.

The daily hydrologic outflow from the marsh was assumed to be equal to the daily inflow past the North and South Bridge Stations. This combined flow was used in conjunction with nutrient concentrations measured at the Chandler Slough at C-38 Station to estimate the total nutrient export from the marsh.

TABLE 11. MONTHLY NITROGEN AND PHOSPHORUS LOADINGS FOR THE NORTH AND SOUTH BRIDGE STATIONS.

Loadings in Metric Tons (Tonnes)

Month/yr.	Total Phosphorus North Bridge	Total Phosphorus South Bridge	Total Nitrogen North Bridge	Total Nitrogen South Bridge	Flow (acre-ft.) North Bridge	Flow (acre-ft.) South Bridge
9/74	0.4	0.7	1.9	3.6	998	2204
10/74	0.6	1.5	3.6	7.5	2011	6103
11/74	0	0	0	0.4	0	357
12/74	0	0	0	0.2	0	212
1/75	0	0	0	0	0	28
2/75	0	0	0	0	0	30
3/75	0	0	0	0	0	0
4/75	0	0	0	0	0	0
5/75	0	0	0	0	0	0
6/75	2.5	1.3	8.3	5.2	4953	3461
7/75	2.5	1.9	8.4	8.9	4046	5546
8/75	0.1	0.7	0.2	4.4	89	2503
9/75	0.3	1.1	2.4	6.5	1226	4518
10/75	1.4	1.5	11.1	10.9	5893	8093
11/75	0.8	0.6	5.0	4.7	2807	3590
12/75	0	0	0	0.1	0	107
1/76	0	0	0	0	0	0
2/76	0	0	0	0	0	0
3/76	0	0	0	0	0	0
4/76	0	0	0	0	0	0
5/76	0.6	0.5	1.7	2.6	1456	2299
6/76	3.8	3.1	12.0	11.7	6442	8168
7/76	0.8	1.1	4.7	5.8	2176	3556
8/76	5.0	2.5	16.7	10.7	9684	7186
9/76	0.7	0.9	3.2	3.9	1872	2511
10/76	0.5	0.6	1.9	3.6	1043	2132

TABLE 12. SUMMARY OF NUTRIENT LOADINGS AT THE NORTH AND SOUTH BRIDGE STATIONS

	North Bridge						South Bridge					
	Total-P		Total-N		Flow		Total-P		Total-N		Flow	
Period	tonnes	%*	tonnes	%*	acre-ft.	%*	tonnes	%*	tonnes	%*	acre-ft.	%*
6/7/75-1/7/76	7.6	52%	35.4	47%	19014	41%	7.1	48%	40.7	53%	27819	59%
5/17/76-10/27/76	11.4	57%	40.2	51%	22673	47%	8.7	43%	38.3	49%	25853	53%

* Percent of surface loadings to the marsh.

Chloride, Sodium and Calcium Loadings

Listed in Table 13 are monthly summaries of chloride, sodium, and calcium imports and exports for the Chandler Slough marsh. The period from September 1974 through February 1975 represents only a partial wet season and therefore will be disregarded in this and subsequent discussions. Loading information is therefore available for two complete wet seasons: June 1975 through January 1976 and May 1976 through October 1976. Net quantities of chloride, sodium, and calcium exchanged within the marsh are presented in Table 14. During the 1975 and 1976 wet seasons the marsh affected an apparent 5 to 6 percent reduction in chloride loadings, a 2 to 16 percent reduction in sodium loadings, and a 0 to 17 percent reduction in calcium loadings. Since chloride and sodium are usually considered to be conservative elements, it appears that the outflow from the marsh was underestimated by only 2 to 5 percent in 1975 and 6 to 16 percent in 1976.

Nitrogen Loadings

Figures 23 and 24 depict the daily net loadings of nitrogen uptake and release for the Chandler Slough marsh during the 1975 and 1976 wet seasons. Loads above the zero line indicate a net release while loads below the zero line indicate a net retention. Since the marsh outflow was not measured, no hydrologic residence time was considered in these calculations. Both nitrogen loading graphs indicate a first flush phenomenon associated with the first intensive discharge into the marsh at the beginning of the wet season. The duration of this initial net export was directly associated with the duration of the initial discharge. This was especially apparent in the beginning of the 1976 wet season. This first flush was associated with a net export (release) of total nitrogen of approximately 1,950 kg N in 1975 and 5,580 kg N in 1976.

There was no direct relationship between flow and either retention or release rates during the remainder of the wet season. It is evident, however, that the

TABLE 13. MONTHLY SUMMARY OF CHLORIDE, SODIUM, AND CALCIUM IMPORTS AND EXPORTS FOR CHANDLER SLOUGH MARSH.

	Chloride		Sodium		Calcium	
	Tonnes		Tonnes		Tonnes	
Month	Import[1]	Export[2]	Import	Export	Import	Export
9/74	87.5	76.8	50.4	47.1	46.8	43.7
10/74	204.3	199.9	116.3	111.9	106.3	102.3
11/74	12.3	11.4	5.7	5.8	4.0	4.2
12/74	15.4	18.6	4.1	4.4	2.3	5.9
1/75	2.3	2.4	0.5	0.6	0.3	0.8
2/75	3.1	1.2	0.6	0.6	0.3	0.8
3/75	-(3)	-	-	-	-	-
4/75	-	-	-	-	-	-
5/75	-	-	-	-	-	-
6/75	213.1	165.3	98.3	97.2	101.4	95.5
7/75	281.2	277.3	129.5	143.3	138.2	143.7
8/75	72.7	77.0	38.1	42.3	39.7	47.7
9/75	196.0	190.4	92.8	93.8	97.7	105.6
10/75	536.6	509.5	249.4	228.3	265.4	257.2
11/75	237.7	240.1	116.3	104.4	123.6	117.6
12/75	3.6	5.1	2.0	1.7	2.0	2.0
1/76	0.5	0.6	0.3	0.2	0.3	0.3
2/76	-	-	-	-	-	-
3/76	-	-	-	-	-	-
4/75	-	-	-	-	-	-
5/76	62.4	91.9	75.7	48.3	76.0	52.2
6/76	443.5	353.9	240.1	177.6	260.0	197.1
7/76	162.2	157.4	93.0	84.8	96.8	90.3
8/76	421.9	411.5	203.4	208.6	237.3	213.9
9/76	118.6	114.2	59.1	44.5	67.9	58.5
10/76	107.0	101.9	41.2	36.9	49.7	44.9

(1) Import was calculated as the sum of the loadings from the North Bridge Station and the South Bridge Station.

(2) Export was calculated using the sum of the hydrologic inflows from the North Bridge Station and the South Bridge Station and the ionic concentrations measured at the Chandler Slough at C-38 station.

(3) "-" indicates no measured flow.

TABLE 14. NET CHANGE IN CHLORIDE, SODIUM, AND CALCIUM LOADS ENTERING CHANDLER SLOUGH MARSH.

Period	Number of Days	Chloride		Sodium		Calcium	
		Δ Tonnes	%Δ	Δ Tonnes	%Δ	Δ Tonnes	%Δ
6/7/75-1/7/76	214	-76.1	-5%	-15.5	-2%	+1.6	0%
5/17/76-10/27/76	164	-84.8	-6%	-111.8	-16%	-130.8	-17%

Note: minus (-) sign indicates a net reduction
plus (+) sign indicates a net release

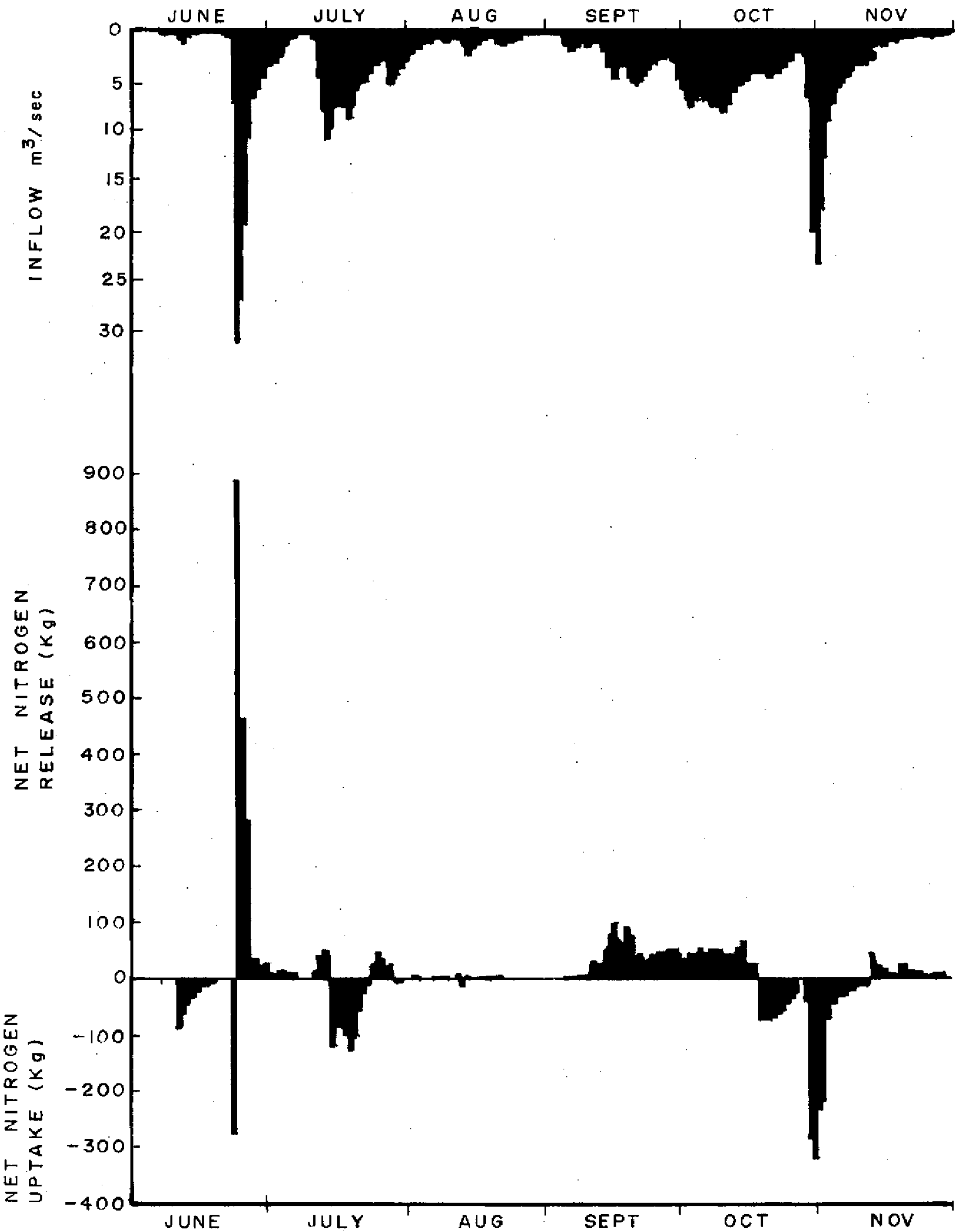

Figure 23 DAILY NET UPTAKE AND RELEASE RATES FOR TOTAL NITROGEN IN THE CHANDLER SLOUGH MARSH DURING 1975

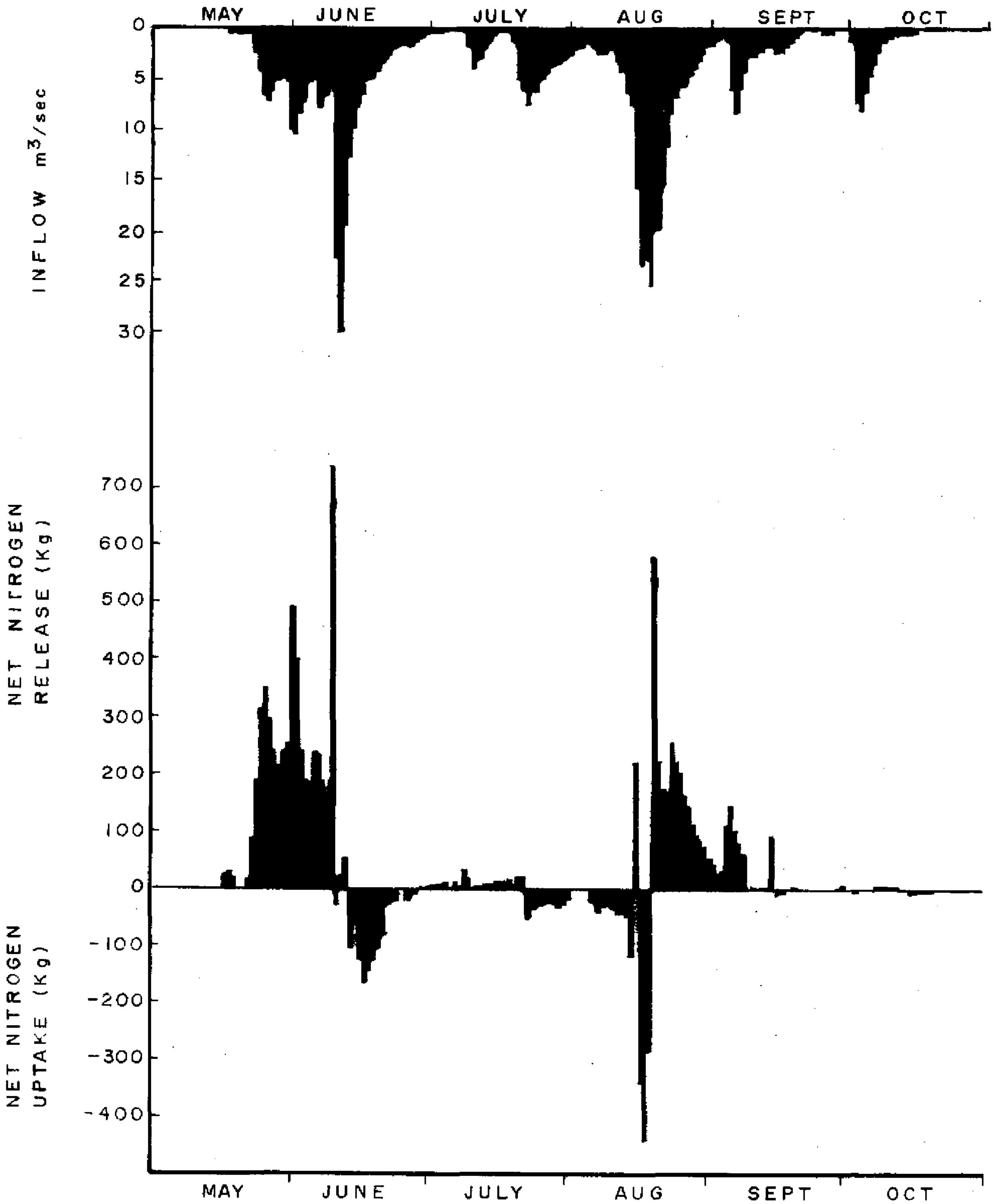

Figure 24 DAILY NET UPTAKE AND RELEASE RATES FOR TOTAL NITROGEN IN THE CHANDLER SLOUGH MARSH DURING 1976

marsh alternates between serving as a nitrogen source and sink throughout the wet season.

The net change in nitrogen loadings is summarized in Table 15. During the 1975 wet season the total organic nitrogen load was reduced by about 1 percent and the inorganic nitrogen load was increased by 30 percent. The net result was about a 1 percent (0.6 tonnes) net increase in the total nitrogen export. Nitrogen exports during the 1976 wet season exhibited a trend similar to that found in 1975, although the quantities of the exports increased. Total organic and inorganic nitrogen exports increased over import loads by approximately 5 and 7 percent, respectively, during 1976. As a result the marsh increased the net export of total nitrogen by approximately 5 percent (4 tonnes) in 1976.

Table 16 summarizes the seasonal nitrogen loading and release rates for the marsh. The total nitrogen load to the marsh was 76.0 and 78.5 tonnes during the 1975 and 1976 wet season, respectively. Total net nitrogen releases were 0.6 and 3.7 tonnes, respectively, for the two wet seasons. These values, when averaged over the marsh area, were 0.16 and 0.96 g/m^2, respectively. Daily release rates were 0.7 and 5.9 mg N/m^2/day for 1975 and 1976, respectively.

Phosphorus Loadings

Daily net uptake and release rates for phosphorus are displayed in Figures 25 and 26. An initial flush of phosphorus from the marsh was observed at the beginning of the 1975 wet season (Figure 25). In June 1975 the initial discharge into the marsh resulted in a net export of approximately 1,460 kg of phosphorus. Figure 26 indicates that phosphorus was retained in the marsh at the beginning of the 1976 wet season. The 1976 intensive sampling program began on June 11 and the loadings calculated during this period were based upon the assumption that the inflow and outflow concentrations that were measured on June 11 were representative of the levels that were present prior to that date. Data collected

TABLE 15. NET CHANGE IN NITROGEN LOADS ENTERING CHANDLER SLOUGH MARSH

		Total Organic Nitrogen		Inorganic Nitrogen		Total Nitrogen	
Period	Number of Days	Δ Tonnes	% Δ	Δ Tonnes	% Δ	Δ Tonnes	% Δ
6/7/75 - 1/7/76	214	-0.4	-1%	+1.0	+30%	+0.6	+1%
5/17/76 - 10/27/76	164	+3.5	+5%	+0.2	+7%	+3.7	+5%

Note: minus (-) sign indicates a net reduction
plus (+) sign indicates a net release

TABLE 16. SUMMARY OF NITROGEN LOADING AND RELEASE RATES FOR CHANDLER SLOUGH

Period	No. of days	Inflow ($m^3 x 10^6$)	N load to marsh (tonnes)	N load per km^2 (drained) (kg/km^2)	Nitrogen Release by marsh (tonnes)	Nitrogen Release Per unit area of marsh g/m^2	Nitrogen Release Per unit area of marsh per day mg/m^2
6/7/75-1/7/76	214	57.8	76.0	279.4	0.6	0.16	0.7
5/17/76-10/27/76	164	59.9	78.5	288.6	3.7	0.96	5.9

Note: Area of marsh = 3.85 km^2
Drainage area of marsh = 272 km^2

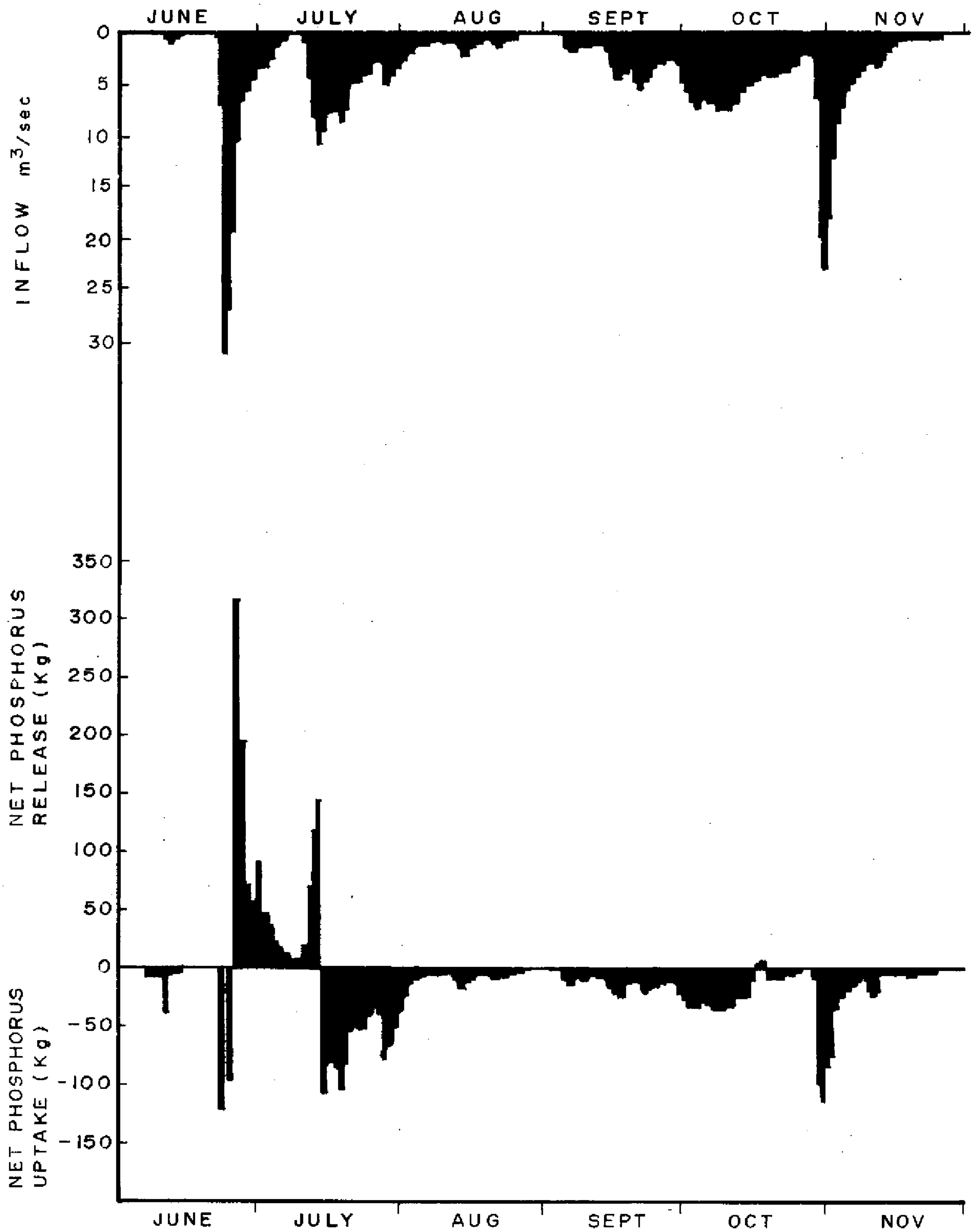

Figure 25 DAILY NET UPTAKE AND RELEASE RATES FOR TOTAL PHOSPHORUS IN THE CHANDLER SLOUGH MARSH DURING 1975

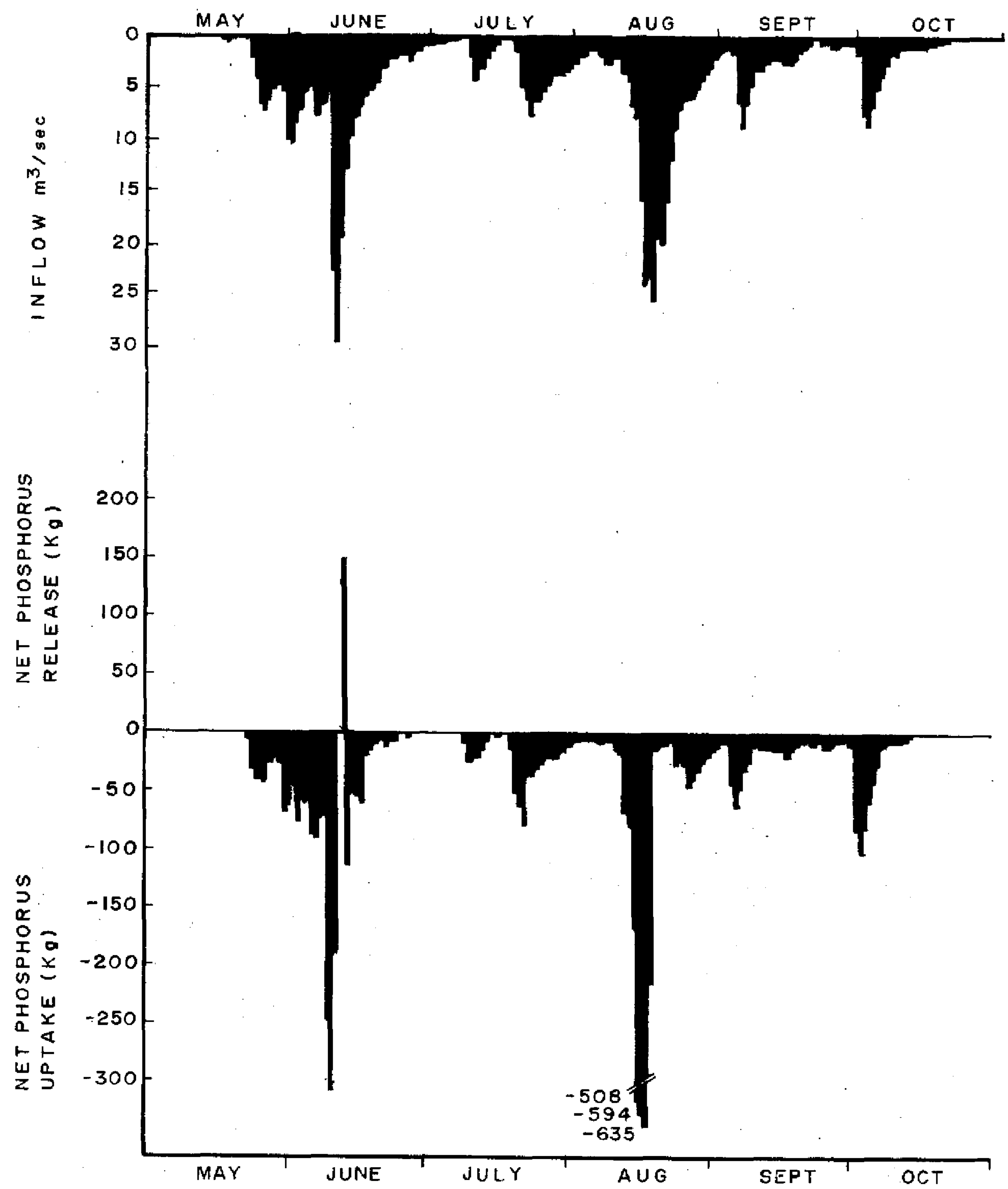

Figure 26 DAILY NET UPTAKE AND RELEASE RATES FOR TOTAL PHOSPHORUS IN THE CHANDLER SLOUGH MARSH DURING 1976

during the beginning of the 1974 and 1975 wet seasons, however, indicated that the initial outflow concentrations frequently exceeded the inflow concentrations. The assumption that levels measured after June 11 were representative of prior values probably resulted in a masking of the first flush and an exaggeration of the phosphorus uptake at the beginning of the 1976 wet season.

After the initial discharges, the marsh acted as a net phosphorus sink during the remainder of the 1975 and 1976 wet seasons. The quantity of phosphorus retained was directly proportional to the flow. When the inflow and phosphorus loads were increased the net phosphorus retention was also increased.

Table 17 presents the calculated quantity and percent changes in ortho and total phosphorus for each wet season. Ortho phosphorus loadings were reduced by about 15 percent (1.7 tonnes) in 1975 and 39 percent (6.6 tonnes) in 1976. Similarly, total phosphorus was reduced by approximately 11 percent (1.6 tonnes) and 32 percent (6.3 tonnes) in 1975 and 1976, respectively.

Phosphorus loading and uptake rates, recalculated on a per area and per day basis are presented in Table 18. During 1975 the marsh retained 0.42 g P/m^2, which corresponds to a daily retention of 2.0 mg P/m^2/day (0.02 lbs./acre/day). The average phosphorus retention increased during the 1976 wet season to 1.6 g P/m^2 of marsh or 9.8 mg P/m^2/day (0.09 lbs./acre/day).

TABLE 17. NET CHANGE IN PHOSPHORUS LOADS ENTERING CHANDLER SLOUGH MARSH

Period	Number of Days	Ortho-Phosphorus		Total Phosphorus	
		Δ Tonnes	% Δ	Δ Tonnes	% Δ
6/7/75-1/7/76	214	-1.7	-15%	-1.6	-11%
5/17/76-10/27/76	163	-6.6	-39%	-6.3	-32%

Note: minus (-) sign indicates a net reduction
plus (+) sign indicates a net release

TABLE 18. SUMMARY OF PHOSPHORUS LOADINGS AND RETENTION RATES FOR CHANDLER SLOUGH MARSH

Period	No. of days	Inflow ($m^3 x 10^6$)	P load to marsh (tonnes)	P load per km^2 drained (kg/km^2)	Phosphorus Retention by marsh (tonnes)	Phosphorus Retention Per unit area of marsh g/m^2	Phosphorus Retention Per unit area of marsh per day mg
6/7/75-1/7/76	214	57.8	14.5	53.3	1.6	0.42	2.0
5/17/76-10/27/76	164	59.9	20.0	73.5	6.3	1.6	9.8

Note: Area of marsh = 3.85 km^2
Drainage area of marsh = 272 km^2

DISCUSSION

The Chandler Slough marsh has two major inflows, Chandler Slough and Cypress Slough. Cypress Slough was estimated to supply between 53 and 59 percent of the total inflow with the difference being supplied by Chandler Slough. Direct rainfall on the marsh and possible groundwater inflows were not evaluated in estimating the inflow to the marsh. Direct rainfall was not considered since the area of the marsh (3.85 km^2) was small relative to the entire marsh drainage basin (272 km^2). Groundwater inflows may have been a major source of the water; however, since no data on groundwater inputs were available, this source of water was also not considered.

The water in Cypress Slough had moderate levels of total phosphorus (0.213 mg/l), moderately low total nitrogen concentrations (1.72 mg/l), and low chloride concentrations (27.9 mg/l) upstream at Eagle Island Road. Further downstream at Lambs Island Road total phosphorus concentrations increased to 0.230 mg/l, total nitrogen concentrations decreased to 1.37 mg/l, and chlorides decreased to 24.9 mg/l. Still further down the watercourse, at the South Bridge Station, the quality of water that entered the Chandler Slough marsh was higher in total phosphorus (0.242 mg/l), lower in total nitrogen (1.27 mg/l), and slightly higher in chlorides (25.3 mg/l) than the levels of these parameters at Lambs Island Road.

The water supplied to the marsh by Chandler Slough was moderately high in total phosphorus (0.410 mg/l), moderately low in total nitrogen (1.69 mg/l), and low in chlorides (28.9 mg/l). The higher phosphorus concentrations discharged by Chandler Slough, as compared to Cypress Slough, was probably due to a greater percentage of pastureland in the Chandler Slough basin than in the Cypress Slough basin.

The flow weighted nutrient concentrations that entered the Chandler Slough marsh from Cypress and Chandler Sloughs averaged 0.276 (1975) to 0.349 (1976) mg/l for total phosphorus and from 1.34 (1975) to 1.42 (1976) mg/l for total nitrogen. During the 1975 and 1976 wet seasons the marsh reduced total phosphorus levels 25 percent to a mean outflow concentration of 0.232 mg/l in 1975 and 0.226 mg/l in 1976. These phosphorus values for the discharge from the Chandler Slough marsh were higher than the other major sloughs that discharge into C-38 (Table 19). The ratio of ortho-phosphorus to total phosphorus in the inflow ranged from 0.79 to 0.83 and the outflow ranged from 0.77 to 0.78, indicating little net conversion of ortho phosphorus to total phosphorus. The mean outflow total nitrogen concentration was increased to 1.39 mg/l in 1975 and reduced to 1.38 mg/l in 1976. Changes in the mean inflow and outflow concentrations of the various nitrogen forms were less consistent than for total nitrogen: NO_x increased between 17 to 29 percent, ammonia decreased between 21 and 45 percent, and total organic nitrogen increased 2 percent in 1975 and decreased 3 percent in 1976. These results exhibit some of the trends reported by Shih and Hallett (1974) who indicated a 12 pereent reduction in NO_x and a 25 percent reduction in ammonia during their 5 day study. Chloride concentrations were reduced 4 to 8 percent to a range of 22.1 to 25.1 mg/l. This reduction in chloride concentrations could have been the result of such secondary inflows as direct precipitation, minor tributaries, and immediate drainage. However the chloride concentration in these secondary inflows would have to be lower than that measured in the outflow from the marsh. These changes between the inflow and outflow concentrations of total phosphorus, total nitrogen, and chloride were tested statistically and were not significant.

Internally the marsh exhibited limited phosphorus fluctuations which occurred during periods when biological uptake of nutrients, especially by

TABLE 19. SUMMARY OF HIGH FLOW VALUES FOR PACKINGHAM, BUTTERMILK, SKEETER ARMSTRONG, BLANKET BAY, ICE CREAM, AND CHANDLER SLOUGHS

Parameter (mg/l)	Packingham[1] Slough	Buttermilk[1] Slough	Skeeter[1] Slough	Armstrong[1] Slough	Blanket Bay[1] Slough	Ice Cream[1] Slough	Chandler[2] Slough
Cond. (μmho/cm)	56	80	147	118	125	137	142
Alk. (as $CaCO_3$)	12.0	16.5	27.5	18.5	22.8	36.6	25.6
D.O.	2.2	4.0	1.9	3.6	3.8	5.9	3.5
Ca	4.0	6.3	9.2	6.7	10.8	13.2	11.97
Na	4.6	5.6	11.3	9.6	7.8	9.5	11.31
SO_4^{-2}	8.0	16.5	17.1	18.2	8.3	5.5	6.6
Cl^-	7.5	13.4	20.5	16.3	18.0	13.8	24.1
TOC	34.3	31.2	23.9	22.6	24.5	19.0	---
NH_3-N	0.43	0.067	0.047	0.053	0.063	0.026	0.030
NO_3^--N	0.58	0.403	0.089	0.058	0.089	0.106	0.037
TKN	1.68	1.34	1.31	1.29	1.43	1.15	1.39
Ortho-P	0.038	0.047	0.04	0.051	0.076	0.026	0.173
Total-P	0.068	0.08	0.104	0.112	0.133	0.047	0.224
SiO_2	7.2	6.1	5.8	4.0	4.5	1.8	4.5

[1] Extracted from Federico and Brezonik, 1975

[2] From this study

periphyton, would be expected to be at or near a maximum. No substantial net conversions of ortho-phosphorus to total phosphorus were indicated by the data collected within the marsh. Also no consistent patterns were observed in the nitrogen, sodium, potassium, calcium, chloride, and alkalinity fluctuations. However, on several occasions pulses of inorganic nitrogen caused an appreciable increase in total nitrogen levels. Dissolved oxygen remained low in the marsh, ranged between 0.8 and 2.1 mg/l, and followed defined diel patterns.

Diel studies on the inflow and outflow marsh stations indicated that the concentration and variation in total phosphorus was the greatest at the beginning of the wet season, probably due to the variability associated with the initial discharge into the marsh and the washout rate of the detritus. As the wet season progresses the marsh system stabilized, resulting in a less variable outflow concentration of total phosphorus. During one sampling period (September 1974) there was an overlap in the collection of the inflow and outflow samples which showed that for samples collected simultaneously there was a close correspondence of phosphorus values. Therefore, the nutrient reduction capability of the marsh may not be as great as was indicated by the other sampling periods and by the data presented by Shih and Hallett (1974).

An assumption was made that the hydrologic outflow from the Chandler Slough marsh was equal to the combined inflows past the North and South Bridge stations. Based upon inflow/outflow comparisons of the chloride and sodium loadings, it appears that the marsh outflow was underestimated by only 3.5 percent in 1975 and 11 percent in 1976. This assumption therefore appears to be valid.

Nitrogen loading data indicated that the Chandler Slough marsh served as a net source of nitrogen to C-38, ranging from 0.16 to 0.96 g N/m^2 of marsh/day over the course of an entire wet season. The marsh produced a net export of

0.6 tonnes of nitrogen or about a 1 percent increase over inflow levels in 1975. This increase was the net result of a 1 percent reduction in the total organic nitrogen load and a 30 percent increase in the inorganic nitrogen load. Similarly, in 1976 the marsh exported a net 4 tonnes of nitrogen, equivalent to a 5 percent increase over inflow loadings. This net increase was accounted for by increases in total organic and inorganic nitrogen loads of 5 and 7 percent, respectively.

The effect of the marsh on the phosphorus loads was different than the effect on nitrogen loads. The marsh retained an average of 0.42 to 1.6 g P/m^2 of marsh/day. Eleven percent (1.6 tonnes) of the total phosphorus input was retained in 1975 and 32 percent (6.3 tonnes) in 1976. The trend for ortho-phosphorus loadings was similar, with a 15 percent (1.7 tonnes) retention in 1975 and a 39 percent (6.6 tonnes) retention in 1976.

Since the data collected in 1975 was the most complete, the lower nitrogen release (0.16 g N/m^2 of marsh/day or 1 percent increase over flow levels) and phosphorus retention (0.42 g P/m^2 of marsh/day or 11 percent decrease of the inflow level) rates are probably the more reliable of the two annual estimates. However, since the statistical analysis of the changes in nitrogen, phosphorus, and chloride concentrations attributable to the marsh indicated no significant difference between inflow and outflow concentrations, these estimated changes in the loadings of these parameters are probably also not significant.

At the beginning of the 1975 wet season a "first flush" effect was observed for both nitrogen and phosphorus. During the winter there was a die-back of vegetation and subsequent buildup of decaying organic matter. The initial discharge at the beginning of the following wet season caused a first flush phenomenon which washed out some of the decaying organic matter. During this initial 3 week period a net quantity of approximately 1.5 tonnes of phosphorus and 1.95 tonnes of nitrogen were dicharged from the marsh. A similar phenomenon was also observed in 1976 for nitrogen but not for phosphorus. Artifacts of the sampling program (no data collected during the initiation of the 1976 wet season) in conjunction with the assumptions used in the loading calculations (first sample collected in 1976 was representative of wet season conditions existing prior to that sample) could be responsible for the differences between the 1975 and 1976 first flushes. After the initial washout of nutrients, the Chandler Slough marsh alternated between serving as a nitrogen source and sink with no readily apparent correlation to either flow or time. The marsh acted as a net phosphorus sink with the amount of retention being proportional to the flow and phosphorus input.

Spangler et al. (1976) investigated the use of artificial and natural marshes in Wisconsin as purifiers of effluent from municipal treatment plants. They noted that the natural Brillion Marsh reduced the phosphorus load by 32 percent. However since their method of approximation was fairly crude they interpreted this reduction as meaning only that the output (16.1×10^3 kg P) was on the same order of magnitude as the input (23.7×10^3 kg P). They also reported that this same conclusion was reached by Lee et al. (1969). This phosphorus reduction reported by Spangler et al. is in relatively good agreement with the range of 11 to 32 percent phosphorus reduction reported in this study.

Bentley (1969) also reviewed the nutrient dynamics of several marshes in Wisconsin and noted that the concentrations of nitrogen and phosphorus were lower in the discharge waters than in the waters entering the marshes. On an annual basis he noted that nutrient concentrations in the marsh were lowest throughout the growing season, increasing in the fall as the plants decayed. He concluded that the marsh acted as a nutrient sink for runoff with elevated nutrient concentrations and that the concentrations of nutrients entering the marshes' receiving waters would have been greater had the inflow not passed through a marsh environment.

Huber and Heaney (1976) approached the theory of the biological filter from a mathematical view, providing a technique for characterizing water quality uptake rates as a function of detection time, type of uptake mechanism, and type of pollutant. Their study also encompassed the Chandler Slough marsh and they reported phosphorus reductions of 20 percent, which is in close correlation to this study.

Several studies not only documented the uptake of nutrients into the biomass but also the subsequent release of these nutrients in the form of organic material at a later date. Griej (1976) and Richardson et al. (1975) working independently in the natural marshes of central Michigan documented the role of a marsh as a short term filter, removing limited amounts of nutrients from the water and later dissipating these nutrients in a major flux downstream, in this case with the advent of the spring thaw. Similarily Spangler et al. also reported that the Brillion Marsh tends to store phosphorus during the summer growing season and that a large slug of phosphorus passes from the marsh during spring runoff. These trends correspond closely to what was observed in this study.

WATER CHEMISTRY CONCLUSIONS

Based upon the available data the following major conclusions can be drawn concerning the water chemistry data:

1. Approximately half of the nutrient load and flow to the Chandler Slough marsh is contributed by the North Bridge Station (Chandler Slough). The remaining load and flow enters via the South Bridge Station (Cypress Slough).
2. There is no significant difference between the average inflow and outflow concentrations of nitrogen, phosphorus, and chloride for the Chandler Slough marsh.
3. Based on conservative ion loadings, the flow past the North and South Bridge Stations accounted for 97 and 89 percent of the total inflow to the marsh for 1975 and 1976, respectively.
4. The Chandler Slough marsh appears to act as a net source of nitrogen and a net phosphorus sink. The marsh was estimated to increase the nitrogen load by 1 to 5 percent and decrease the phosphorus load by 11 to 32 percent, with the lower values considered to be the more reliable. These changes, however, were not considered to be statistically significant.
5. Apparent at the beginning of the 1975 wet season was a first flush phenomenon during which a large net slug of nitrogen (1.95 tonnes) and phosphorus (1.5 tonnes) was removed from the marsh. After the initial discharge, the marsh served as a net sink for phosphorus but alternated between acting as a source and a sink for nitrogen. Indirect evidence indicates that the same pattern probably also occurred during the 1974 and 1976 wet seasons.
6. Within the Chandler Slough marsh there was no substantial net conversion of ortho-phosphorus to total phosphorus.

PART II

MARSH VEGETATION

James F. Milleson

PART II

MARSH VEGETATION

Seasonal changes in the composition and biomass of an aquatic plant community may have an effect on the quality of the surface water flowing through the marsh. A sampling program was designed to measure production of the vascular plant community in Chandler Slough through the growing season concurrent with studies of water quality dynamics. The nutrient composition of the major plant species was also measured in order to estimate standing stocks of nitrogen and phosphorus during the year. In addition, a detailed vegetation map of Chandler Slough was prepared and the physical characteristics of many plant species such as height, weight, and volume displacement, were measured through the year.

Fresh water marshes are among the most productive plant communities in the temperate zone and may be two or more times as productive as comparable terrestrial systems (Jervis 1969). High productivities of emergent marshes are attributable to ample supplies of water and nutrients from upland drainage areas, lack of grazing by herbivores, species adapted to wetland environments (Auclair *et al*. 1976) and a longer growing season than adjacent terrestrial communities (Keefe 1972). Many investigations into marsh productivity and nutrient uptake have been focused on monospecific stands of wetland vegetation (Boyd 1969, 1970, 1971; Boyd and Hess 1970; Bernard 1974) although others have studied more diverse emergent wetland communities (Jervis 1969; Auclair *et al*.1976) or submergent vegetation (Gerloff and Krombholz 1966). Chandler Slough is a diverse wetland system which includes cypress, pickerelweed, and buttonbush communities.

MATERIALS AND METHODS

A vegetation map of the major plant communities in Chandler Slough was prepared using recent aerial photography (Highlands County Tax Assessor's Office -

Watson and Company, Tampa, Florida (1966); Mark Hurd Aerial Survey's , Inc., Minneapolis, Minnesota (1972); U.S. Department of Agriculture, ASCS, (1974)) to help differentiate major plant communities. Ground truthing of these communities included a record of species present and relative abundance. A brief description of each plant community was prepared from field notes and observations. Plant identification was based on Long and Lakela (1971). The area of each major vegetation zone was estimated from a scale drawing of the vegetation map using a Dietzgen compensating polar planimeter.

Periodic sampling of three vascular plant communities in Chandler Slough was conducted from October 1975 until October 1976. Sample sites were selected in the marsh south of U.S. 98 (Figure 27). Vegetation sample site 1 was dominated by buttonbush shrubs and smaller herbaceous aquatic plants, and had a ground elevation of 28.8 ft msl (8.78 m msl). Site 2 was characterized by broadleaf emergent vegetation such as pickerelweed and arrowhead, with an average ground elevation of 29.2 ft msl (8.90 m msl). The third vegetation site was located under a canopy of sparsely populated cypress and had an average ground elevation of 30.8 ft msl (9.39 m msl).

A permanent 100 m^2 plot was marked at each location. Quantitative samples were taken October 29 - November 5, 1975; February 3-10, 1976; April 19 and 26, 1976; June 14-17, 1976; August 16-19, 1976; and October 11-14, 1976. Two samples were collected from each site during each sampling period. All living plant material and detritus within a 0.5 m^2 metal frame was harvested at ground level. Vegetation was sorted by species and stems counted. The total wet weight of each species was measured in the field to the nearest 0.1 gram, and later adjusted to dry weight in the laboratory. Buttonbush shrubs were larger than the 0.5 m^2 frame and were sampled separately. The number of buttonbush shrubs at site 1 were counted to provide an average density/m^2. Biomass estimates were made by harvesting and weighing only green leaves and stems.

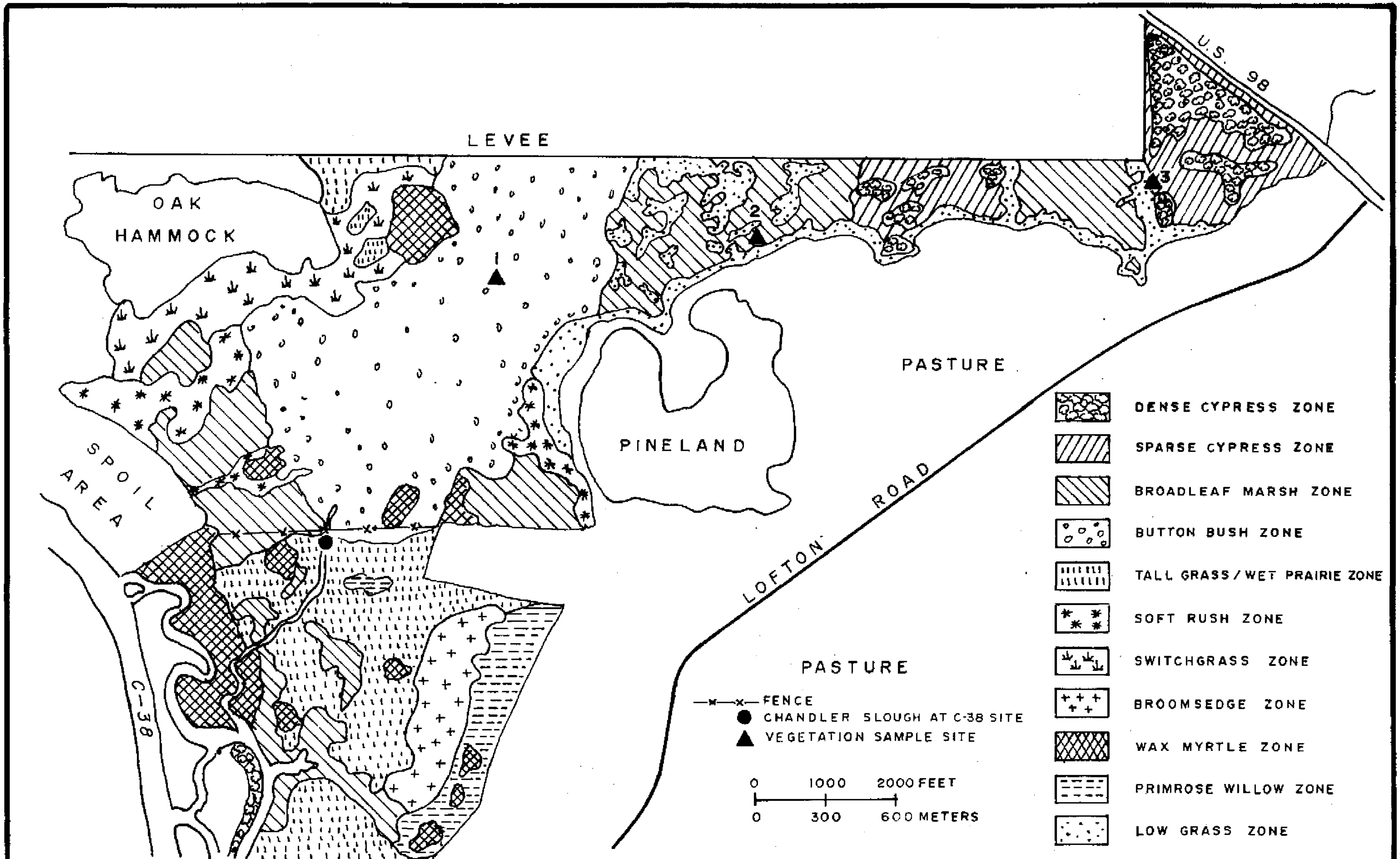

Figure 27. VEGETATION COMMUNTIES OF CHANDLER SLOUGH

Net productivity in the marsh was calculated from the difference in standing crop between two sampling periods and the length of the interval in days. At selected times several physical characteristics were measured for the more abundant species. Ten to 25 plants were collected from outside of the 100 m^2 plots, and were measured for total length, wet weight, leaf shape, number of leaves per stem, and volume displacement (either entirely or at 15 cm intervals of plant height).

Nitrogen and phosphorus concentrations were determined for the most abundant species in the marsh on each date. The plants were harvested at ground level, rinsed with fresh water and weighed wet in the field. After oven drying at 70-80^{o}C for 72 hours, the plants were re-weighed, and a wet to dry weight conversion factor was determined. Dried plant samples were then ground in a Wiley Mill to pass through a 0.5 mm mesh screen. Subsamples that weighed 0.075 g and 0.050 g were obtained for nitrogen and phosphorus analyses, respectively. Analytical methods for determination of nitrogen and phosphorus are outlined in Section III.

RESULTS

Vegetation Mapping

The vegetational composition of Chandler Slough between U.S. 98 and the Kissimmee River was represented by eleven plant communities (Figure 27). A description of each plant community is presented in Appendix C.

The area of each community between U.S. 98 and a fence line near the Chandler Slough at C-38 water quality station is presented below:

Vegetation Zone	Area	
	Acres	Square Meters x 10^3
Buttonbush	366.4	1482.8
Broadleaf Marsh	174.0	704.2
Low Grass	89.3	361.4
Switchgrass	81.9	331.4
Sparse Cypress	73.7	298.3
Soft Rush	66.9	270.7
Dense Cypress	56.7	229.5
Wax Myrtle	25.2	102.0
Tall Grass - Wet Prairie	16.4	66.4
Total	950.2	3846.7

Vegetation Sampling - Dry Weight Conversion Factors

The water content of aquatic plants ranged from 73% to 96% of the wet weight measured in the field. For a more accurate comparison of vegetation samples, dry weight values are used.

Table 20 lists all species that were collected from Chandler Slough during the study and a factor for conversion of wet weight to dry weight. Since conversion factors were obtained during the course of preparation for chemical analysis, conversion factors for the less abundant species were not calculated. Estimated conversion factors were assigned to these species based on their growth habits and plant characteristics. Conversion factors for *Polygonum sp.*, *Pontederia lanceolata*, *Sagittaria lancifolia* and detritus were considerably higher when Chandler Slough was dry than when the marsh was flooded so both a wet season and a dry season factor have been listed for these species.

Vegetation Sampling Density and Biomass

SITE 1

Sampling results from site 1 are presented in Table 21. Twenty

TABLE 20. PLANT SPECIES RECOVERED FROM SAMPLING SITES IN CHANDLER SLOUGH, AND WET TO DRY WEIGHT CONVERSION FACTORS

Species	Factor
Aster sp.	.25*
Bacopa caroliniana	.07
Bacopa monnieri	.06
Ceratophyllum sp.	.04*
Cephalanthus occidentalis	.28
Cyperus articulatus	.26*
Cyperus haspan	.12
Diodia virginiana	.09
Eichhornia crassipes	.06
Eleocharis sp.	.19*
Eupatorium sp.	.20*
Hydrochloa caroliniensis	.19
Hydrocotyle umbellata	.09*
Hypericum mutilum	.09*
Iris hexagona	.14
Juncus effusus	.26
Leersia hexandra	.09*
Lindernia anagallidea	.09
Lippia nodiflora	.09*
Ludwigia repens	.07
Ludwigia sp.	.09*
Mikania scandens	.25*
Panicum hemitomon	.26
Panicum paludivagum	.15*
Panicum repens	.09
Polygonum sp.(small)	.17a
	.27b
Polygonum sp.(large)	.30
Pontederia lanceolata	.09a
	.14b
Proserpinaca sp.	.09*
Rhynchospora inundata	.12*
Rhynchsopora sp.	.12*
Sagittaria lancifolia	.08a
	.11b
Sagittaria sublata	.05
Thalia genicula	.12
unknown spp.	.10*
detritus	.07a
	.80b

* estimated
[a] wet marsh factor
[b] dry marsh factor

TABLE 21. VEGETATION DENSITY, DRY WEIGHT, BIOMASS AND PRIMARY PRODUCTION PER SQUARE METER AT SITE 1 IN CHANDLER SLOUGH, OCTOBER 1975 TO OCTOBER 1976

Date (Water Depth)	10-29-75 (25cm)		2-3-76 (0cm)		4-26-76 (0cm)		6-15-76 (36cm)		8-16-76 (58cm)		10-11-76 (21cm)	
Species	# stems	grams*	# stems	grams*	# stems	grams*	# stems	grams*	# stems	grams*	# stems	grams*
Aster sp.	1	3.0			20	20.5	2	1.6	6	6.2	10	10.0
Bacopa caroliniana			3	0.1			118	8.1	1	0.1	16	1.3
Cephalanthus occidentalis			-	28.0	-	68.0	-	115.1	-	19.8		
Cyperus haspan	8	2.9	4	0.3	5	0.8	3	3.0	13	5.0	10	2.0
Diodia virginica	12	7.0			21	5.6	12	2.0	4	1.6		
Hypericum mutilum	219	26.7	13	0.5					8	0.6	41	4.1
Juncus effusus											16	7.4
Leersia hexandra							3	0.1	1	0.1		
Lindernia anagallidea					84	10.2						
Ludwigia repens	118	35.6	256	25.5	1	0.2	13	0.4	3	0.1	1	0.2
Ludwigia sp.					1	0.9						
Mikania scandens			5	0.3	4	4.7	7	7.8	49	32.9	17	8.3
Panicum hemitomon	68	38.0	67	22.6	71	9.6	80	27.0	77	38.0	144	67.5
Panicum paludivagum					5	1.4						
Polygonum sp.	137	332.1	3	0.4					2	0.2		
Pontederia lanceolata	131	384.1	62	18.2	123	58.5	242	167.0	186	218.6	112	150.7
Proserpinaca sp.											3	0.2
Rhynchospora inundata									1	0.2		
Sagittaria lancifolia	15	70.0			14	16.4	6	26.7	16	65.6	7	28.0
Unidentifiable					1	0.1						
Total Living	709	899.6	413	95.9	350	196.9	486	358.8	367	389.0	377	279.7
Detritus		188.0		1021.0		463.1		185.0		120.6		111.1
# of Days since previous sample					82		49		61		55	
Net Production g/m2					+100.4		+162.5		+30.2		-109.3	
Rate $g/m^2/day$					1.22		3.32		0.50		- 1.99	

*Dry weight

species of plants were recovered between October 1975 and October 1976. Eight species were present in at least five of these samples. The most abundant species, by weight, were Pontederia lanceolata, Cephalanthus occidentalis, Sagittaria lancifolia, Panicum hemitomon, Mikania scandens, and Ludwigia repens. Other seasonally or locally abundant species included Aster sp., Diodia virginica and Hypericum mutilum.

Diversity of species in each sample ranged from 11 to 14, except in February when only 9 species were collected. Data in Table 21 indicate seasonal growth patterns for some species. Growth of Cephalanthus occidentalis began by February, peaked in June, and declined through the remainder of the summer. Pontederia lanceolata and Sagittaria lancifolia were most abundant in August, while Panicum hemitomon was most abundant in October.

February was assumed to be the beginning of the 1976 growing season and net primary production averaged 1.22 $g/m^2/day$ from February 3 to April 26. The most productive period was from April 26 to June 15 with a net rate of 3.32 $g/m^2/day$. Growth slowed substantially in midsummer to 0.50 $g/m^2/day$ and plant death exceeded growth between August 16 and October 11 with a net productivity rate of -1.99 $g/m^2/day$. Dry weight biomass increased from 95.9 g/m^2 in February to 389.0 g/m^2 in August for a net production of 293.1 g/m^2, and then declined to 279.7 g/m^2 in October for a net loss of 109.3 gm/m^2.

Data from October 1975 have been included to show biomass decline through the winter months. Production at site 1 in 1975 was considerably greater than production measured in 1976. The October 1975 sample had a biomass of 899.6 g/m^2, whereas the peak biomass in 1976 was only 389.0 g/m^2.

SITE 2

Table 22 presents the results of plant sampling at site 2. Eleven species of plants were collected at this site, but only four of these species were present regularly. Sagittaria lancifolia and Pontederia lanceolata were the dominant emergents, and Ludwigia repens was the most abundant submergent. Eichhornia crassipes, a floating aquatic, was present whenever the marsh was flooded. Other species such as Thalia geniculata, Iris hexagona, Cyperus haspan, and Polygonum sp., were either seasonally or locally abundant. Two terrestrial species were collected in April 1976.

Plant diversity within the samples ranged from three species in February to six species in April, June and October. Although water hyacinths were not rooted, these plants became lodged amongst emergent vegetation, occupied available habitat, and were included in the samples. Eichhornia crassipes was a significant member of the Chandler Slough flora during the wet season.

Growth at site 2 was rapid, and fairly constant from February 10 to August 17. Production averaged 3.53 $g/m^2/day$ during this period for a total increase of 667.5 g/m^2. During this interval most of the net primary production was attributed to Pontederia lanceolata and Sagittaria lancifolia rather than Eichhornia crassipes. From August 17 to October 12 the net production measured -1.10 $g/m^2/day$. Water hyacinths were a major component at site 2 during this period, but increases in hyacinths did not compensate for losses of P. lanceolata and S. lancifolia.

The October 1975 biomass was slightly higher than the maximum biomass measured in August 1976.

TABLE 22. VEGETATION DENSITY, DRY WEIGHT, BIOMASS AND PRIMARY PRODUCTION PER SQUARE METER AT SITE 2 IN CHANDLER SLOUGH, OCTOBER 1975 TO OCTOBER 1976

Date (Water Depth)	10-29-75 (40cm)		2-10-76 (0cm)		4-19-76 (0cm)		6-16-76 (45cm)		8-17-76 (63cm)		10-12-76 (21cm)	
Species	# stems	grams*	# stems	grams*	# stems	grams*	# stems	grams*	# stems	grams*	# stems	grams*
Cyperus haspan							1	1.1				
Eichhornia crassipes			10	16.5			11	18.3	12	57.4	27	217.2
Eupatorium sp.					1	28.4						
Iris hexagona					25	50.7						
Ludwigia repens					1	0.1	209	20.8	12	3.6	1	0.2
Mikania scandens							3	2.1				
Polygonum sp.	154	373.4	4	11.4							1	3.2
Pontederia lanceolata	23	85.3	75	20.9	135	40.2	68	59.4	131	180.4	175	300.5
Sagittaria lancifolia	64	334.9			92	167.8	102	389.3	93	474.9	24	83.2
Thalia geniculata	7	138.4									10	51.6
Unidentifiable					2	4.1						
Total Living	248	932.0	89	48.8	256	291.3	394	491.0	248	716.3	238	655.9
Detritus		219.9		1171.3		733.9		90.3		138.1		81.7
# of Days since previous sample					69		59		61		55	
Net Production g/m^2					+242.5		+199.7		+225.3		-60.4	
Rate g/m^2/day					3.51		3.38		3.69		- 1.10	

*Dry weight

SITE 3

The results of the site 3 sampling are presented in Table 23. This site was the most diverse of the three. Twenty species of plants were recovered from this site during the sampling period, and two categories, "unknown grasses", and "terrestrial conglomerate", were used to describe an assortment of unidentified plants. Site 3 contained nine unsampled cypress trees (Taxodium distichum) in the 100 m^2 area. Considerable seasonal variation of species occurred at site 3. Since site 3 was inaccessible in August an alternate site in a similar habitat was selected about 1000 meters to the west.

Number of species per sample ranged from 10 to 12 during all sampling periods except February. No attempt was made to determine the number of species in the ground cover in February 1976.

Growth and productivity measurements at site 3 were complicated because the location was inaccessible in August. The alternate site had a standing crop of 518.6 g/m^2 which was much higher than was expected at site 3. Based on results from the preceding and subsequent samples, a standing crop of 300.0 g/m^2 was estimated for August 17.

Net production at site 3 between February 10 and April 19 was 1.13 g/m^2/day, a rate that was similar to that reported from site 1 during the same time period. A slight decline of -0.21 g/m^2/day was measured in the early wet season. The greatest production occurred in mid-summer with an estimated rate of 2.79 g/m^2/day. Like the other two sites, a negative net production rate was estimated for the end of the summer, -0.64 g/m^2/day.

Vegetation Sampling - Plant Detritus

At sites 1 and 2 the detrital mass was highest in February, and was 100-200 g/m^2 greater than the living standing crop measured the previous October.

TABLE 23. VEGETATION DENSITY, DRY WEIGHT, BIOMASS AND PRIMARY PRODUCTION PER SQUARE METER AT SITE 3 IN CHANDLER SLOUGH, NOVEMBER 1975 TO OCTOBER 1976

Date (Water Depth)	11-5-75 (43cm)		2-10-76 (0cm)		4-19-76 (0cm)		6-16-76 (35cm)		8-17-76** (52cm)		10-13-76 (15cm)	
Species	# stems	grams*	# stems	grams*	# stems	grams	# stems	grams*	# stems	grams	# stems	grams*
Aster sp.					10	9.9					1	0.4
Bacopa caroliniana							2	0.2				
Bacopa monnieri					315	23.1	140	10.3	53	3.9	4	0.3
Certophyllum sp.									2	0.8		
Diodia virginica	2	1.3					5	1.3			7	12.5
Eichhornia crassipes					1	0.1					2	1.8
Eleocharis sp.	-	1.1					-	0.7			19	1.3
Hydrochloa caroliniensis	-	8.7					-	27.5	-	42.9		
Hydrocotyle umbellata					10	1.8	2	0.3	2	0.4		
Hypericum mutilum					1	0.1			5	0.5		
Lippia nodiflora	112	13.7			80	9.8	62	7.6	1	0.1	3	0.3
Ludwigia repens	111	33.9			1	0.1	12	1.2	19	11.7	202	60.8
Ludwigia sp.	8	1.0			1	1.1						
Polygonum sp.	31	132.8			15	67.2	21	58.1	123	348.5	50	142.4
Pontederia lanceolata	22	64.6			7	4.3	6	4.7	15	26.1	20	27.5
Rhynchospora sp.	7	1.9					7	1.3				
Sagittaria lancifolia	11	51.3										
Sagittaria sublata	90	3.7					106	4.4	161	6.7	674	28.0
Terr. Ground Cover			-	64.4								
Unknown Grasses	4	1.0			67	21.8	38	12.3	220	77.0	2	0.5
Unidentifiable					2	1.5	1	0.2				
Total Living	398	315.0	-	64.4	510	142.3	402	129.9	601	518.6 300.0***	984	264.4
Detritus		10.2		143.3		309.2		10.9				75.8
# of Days since previous sample					69		59		61		56	
Net Production g/m²					+77.9		-12.4		+170.1		-35.6	
Rate g/m²/day					1.13		- 0.21		2.79		- 0.64	

* Dry weight
** Alternate site approximately 1000 meters west of Site 3
*** Estimated for Site 3

Decomposition proceeded rapidly through the spring. Only 18% (site 1) and 8% (site 2) of the detritus that was present in February was still present by mid-June. Net loss of detritus was slower during the remainder of the wet season. This may have resulted from addition of new detrital material as some plant stems died.

Changes in the amount of detrital material present at site 3 showed no distinct seasonal trends. The maximum amount of detritus occurred in the April sample.

Vegetation Sampling - Average Physical Characteristics of Plant Species

Several physical characteristics of the aquatic plants in Chandler Slough were measured throughout the study (Appendix D). Measurements of emergent species such as *Pontederia lanceolata* and *Sagittaria lancifolia* included plant height, leaf blade length, individual stem wet weight, and volume displacement at 15 cm intervals. Measurement of submergents such as *Ludwigia repens*, *Bacopa caroliniana* and *Polygonum sp*. consisted of stem length, average number of leaves per stem, leaf dimensions, and displacement per gram wet weight.

Chemical Analysis of Plant Tissues

Chemical analyses of plant tissues from Chandler Slough are presented in Table 24. Laboratory procedures produced a coefficient of variability of less than 10%, with the following exceptions: October 1975, nitrogen 15%; April 1976, nitrogen 15%; October 1976, phosphorus 14%.

An assessment of seasonal and spatial trends in chemical composition of many species is limited by the lack of continuous data. Only the most abundant

TABLE 24. CHEMICAL ANALYSIS OF PLANT TISSUE IN CHANDLER SLOUGH, JUNE 1975 - OCTOBER 1976, PERCENTAGE OF DRY WEIGHT.

		Jun 16 1975		Oct 29 1975		Feb 3 1976		Apr 26 1976		Jun 15 1976		Aug 16 1976		Oct 12 1976		Average Nutrient Concentration *	
SPECIES	Site #	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Bacopa caroliniana	1									1.73	0.37			1.28	0.45	1.51	0.41
Bacopa monnieri	3									1.75	0.32					1.75	0.32
Cephthanthus occidentalis	1							2.05	0.15	1.83	0.15	1.10	0.12			1.66	0.14
Cyperus haspan	1											1.31	0.21			1.31	0.21
Eichhornia crassipes	1	2.79	0.60	1.05	0.33											1.14	0.37
	2									2.03	0.19	0.78	0.31	0.60	0.24		
	3			1.59	0.48					1.99	0.57	1.64	0.57	0.93	0.36		
Hydrochloa carolinensis	3									2.68	0.38					2.68	0.38
Iris hexagona	1	1.65	0.24	1.35	0.21	1.98	0.36	1.07	0.16	1.50	0.21					1.63	0.22
	2									1.57	0.19						
	3			1.18	0.16	2.24	0.23	1.48	0.17								
	3							1.18	0.15								
Diodia virginiana	1													1.22	0.45	1.22	0.45
Juncus effusus	1													0.55	0.11	0.55	0.11
Lindernia anagallidea	1							1.86	0.22							1.86	0.22
Ludwigia repens	1			1.57	0.40	2.07	0.19			1.83	0.43			1.59	0.46	1.83	0.42
	2									2.03	0.50	1.58	0.50				
	3											1.99	0.63	1.48	0.46		
Panicum hemitomon	1											1.32	0.20	0.96	0.15	1.14	0.18
Panicum repens	3									2.05	0.51					2.05	0.51
Ground cover	3					2.62	0.38									2.62	0.38
Unknown Grasses	3											0.89	0.31			0.89	0.31
Polygonum sp.	1	1.43	0.24	1.03	0.27												
	3			1.22	0.25	2.06	0.27	2.11	0.15	2.01	0.31	1.07	0.31	1.05	0.29	1.58	0.27
	3							1.28	0.14								
Polygonum sp. B	3									1.61	0.28					1.61	0.28
Pontederia lanceolata	1	2.78	0.27	1.68	0.16	2.40	0.38	1.79	0.21	1.57	0.29	1.68	0.27	1.23	0.18	1.70	0.29
	1							1.70	0.18								
	2									1.36	0.29	1.12	0.26	1.32	0.21		
	3			1.33	0.23					2.09	0.43	1.50	0.41	1.24	0.36		
Sagittaria lancifolia	1	2.65	0.28	1.72	0.31			2.89	0.26	2.06	0.38	2.03	0.37	2.06	0.40	2.18	0.35
	2							2.39	0.24	2.00	0.31	1.85	0.40	2.37	0.41		
	2							2.92	0.29								
	3			2.35	0.44									1.63	0.43		
Sagittaria sublata	3													2.02	0.45	2.02	0.45
Thalia geniculata	1	1.70	0.32	1.41	0.21							0.83	0.19				
	2									1.79	0.29	1.85	0.26	0.83	0.21	1.32	0.24
	3			0.83	0.21												
														Average		1.64	0.31

*1976 growing season February through October only species were collected during sampling trips, with the intent of estimating the amount of nitrogen and phosphorus that was contained in the vegetation. Nearly complete data are available for Eichhornia crassipes, Iris hexagona, Ludwigia repens, Polygonum sp., Pontederia lanceolata, Sagittaria lancifolia, and Thalia geniculata. These seven species, plus Cephalanthus occidentalis, were among the dominant plants in Chandler Slough.

There are several trends in nutrient concentrations which appear for some species of marsh plants in Chandler Slough. The highest nitrogen levels in the above ground portions of living plants generally occurred around April and June, and then declined through the remainder of the growing season. Seasonal trends in phosphorus concentrations of the dominant plant species were irregular. Iris hexagona had high levels of phosphorus in February, then concentrations declined through the year. Polygonum sp. and Pontederia lanceolata had high phosphorus concentrations in February and June, with reductions in April and through the summer. Phosphorus in Sagittaria lancifolia was high in June and declined thereafter.

When samples of a species were taken from two or more locations in the marsh, nutrient concentrations were usually higher at the locations furthest upstream.

Table 24 lists the average nutrient concentration in plants from Chandler Slough. These values include only the growing period from February to October 1976. Multiple results from several sites on the same date were first averaged. Average phosphorus concentrations were generally highest in submergent plant species such as Bacopa caroliniana (0.37%), Bacopa monnieri (0.32%), Hydrochloa caroliniensis (0.38%), Diodia virginiana (0.45%), Ludwigia repens (0.42%) and

Sagittaria sublata (0.45%) and in floating aquatic species such as Eichhornia crassipes (0.37%). Emergent plant species generally had phosphorus concentrations less than 0.30%. Sagittaria lancifolia and Panicum repens were two exceptions. No correlations were apparent between nitrogen concentrations and plant species or growth habits.

Detritus

Nutrient analyses of the detrital component of the marsh were performed only during the February, April and August 1976 sampling periods. Detritus was separated by species in February and April, but undifferentiated in the August sample.

	%N	%P
February 1976		
Pontederia lanceolata	0.99	0.13
Sagittaria lancifolia	1.70	0.27
Polygonum sp.	0.79	0.21
April 1976		
Pontederia lanceolata	0.91	0.07
Sagittaria lancifolia	1.15	0.10
Polygonum sp.	0.66	0.08
August 1976		
undifferentiated	0.93	0.08

Nutrient concentrations in February exhibited a 17 to 35% reduction from values obtained from living plant material during the previous October (Table 24). Subsequent reductions in phosphorus content of detritus ranged from 46 to 63% between February and April. Nitrogen reduction during this interval ranged from only 8 to 32%. Very little change was apparent in detritus nutrient content between April and August.

Uptake of Primary Nutrients

The amounts of nitrogen and phosphorus contained in above ground plant tissues in Chandler Slough on any date can be estimated by multiplying the dry weight biomass for each species (See Tables 21, 22, and 23) by the chemical composition in plant tissue for that date (See Table 24). Since a chemical analysis of each species was not run for each date, certain procedures were followed in making these calculations. The percentage of nitrogen and phosphorus for each species was obtained in the following order if available:

1. From the station and date considered
2. From other stations on the date considered
3. From the overall average for that species from all dates and stations

If chemical analyses were not available for any species, the average of all species was used, 1.64% nitrogen and 0.31% phosphorus.

The standing stocks of nitrogen and phosphorus in each site for each sample date are presented in Table 25.

DISCUSSION

Vegetation sampling in Chandler Slough, and resultant determinations of chemical composition, standing crops, and net productivity rates, have been limited to the above ground portion of herbaceous aquatic plants, plus leaves and stems of Cephalanthus occidentalis. Several portions of the aquatic flora of Chandler Slough were not considered in this study. These include:

1. Root Material

Many investigators limit plant production measurements to the above ground portion because of difficulties in sampling root material (Keefe 1972). Since the root mass of some plants is as large as the aerial portions, unsampled

TABLE 25. STANDING CROP OF PRIMARY NUTRIENTS IN AQUATIC VEGETATION OF CHANDLER SLOUGH, FEBRUARY 1976 TO OCTOBER 1976

	Site 1		Site 2		Site 3	
Date	gN/m^2	gP/m^2	gN/m^2	gP/m^2	gN/m^2	gP/m^2
Feb 1976	1.713	0.212	0.925	0.166	1.687	0.245
Apr 1976	3.726	0.415	6.310	0.716	2.253	0.335
Jun 1976	5.952	0.883	9.435	1.526	2.589	0.440
Aug 1976	6.471	1.078	11.311	2.565	6.422	1.707
Oct 1976	3.536	0.573	7.706	1.604	3.374	0.938

roots are a considerable omission in terms of standing crop. Bernard (1974) showed that roots of Carex rostrata made up less than 50% of total biomass during most of the year. McNaughton (1966) reported that Typha roots account for about 50% of total biomass. Essential nutrients are translocated throughout plant tissues to those areas where growth is occurring, and are stored in underground portions during the winter. Bernard (1974) indicated that the rate of loss of underground production during the spring and summer was about the same as the production of plant roots during the fall. Up to 30% of the following year's above ground growth of Carex rostrata was attributed to translocation of material stored in rhizomes. Boyd (1971) attributed only 10% of annual net production of Juncus effusus to root growth. Most of the plants in Chandler Slough are perennial, and the above ground portions die back during the winter. However, new growth is initiated from persistent underground roots and rhizomes before surface water flows through the marsh.

2. Cephalanthus occidentalis woody tissue

Woody tissue of buttonbush was not sampled because of difficulties in field collection and processing for laboratory analysis. The woody branches of the plant which grow during spring and summer, become brittle during the winter. These branches readily break off of the plant, and eventually decompose and release their nutrients. Therefore, woody buttonbush tissue constitutes a short term sink for those nutrients incorporated.

3. Taxodium distichum and Fraxinus caroliniana

Cypress and Pop Ash trees were also unsampled in this study. Nutrients utilized in the formation of roots, trunks and branches of these trees are stored permanently. Since both species are deciduous, the leaves constitute a short term nutrient sink during the growing season.

4. Periphyton

Filamentous growth of periphyton were attached to much of the vegetation in the eastern portion of the slough during the early wet season. Sunlight is more available to algae when the vascular plants are small. Short term nutrient uptake from the water by periphyton represents an unmeasured quantity.

The maximum standing crop of a plant community is a commonly used method to estimate annual net productivity although many researchers agree that this method under estimates net production (Keefe 1972; Porter 1967). This method does not consider plant mortality which was replaced by new growth during a period of overall biomass increase, or the growth of some plants when the community is experiencing an overall decrease in biomass (Porter 1967).

The following table summarizes maximum standing crop biomass values reported from several wetland communities:

Species or Community (Above ground portion of plant)	Maximum Dry Weight Standing Crop (g/m^2)	Location	Source
Alternanthera philoxeroides	841	Alabama	Boyd 1969
Carex rostrata	852	Minnesota	Bernard 1974
Juncus effusus	1673*	S. Carolina	Boyd 1971
Justicia americana	640	Alabama	Boyd 1969
Pontederia lanceolata	980	Florida	Odum 1957
Scirpus sp.	1970	Florida	Odum 1957
Scirpus - Equisetum	845	St. Lawrence R.	Auclair *et al* 1976
Typha latifolia	1527	Oklahoma	Penfound 1956
Typha latifolia	1904	New Jersey	Jervis 1969
Typha latifolia	684	S. Carolina	Boyd 1970
Open aquatic	1547	New Jersey	Jervis 1969
Sedge swale	1494	New Jersey	Jervis 1969
Three Florida River Systems	524	Florida	Penfound 1956
" " " "	410	Florida	Penfound 1956
" " " "	422	Florida	Penfound 1956
Wet Prairie	161	Florida	Porter 1967

* Total net production of spring and autumn growth periods

Recent standing crop biomass measurements in the Kissimmee River marshes have been reported as wet weight. Using the dry weight conversion factors developed in this study, a *Pontederia* - *Sagittaria* - *Hydrochloa* marsh exhibited a maximum standing crop of 549 g/m^2 (Milleson 1976), and Goodrick and VanArman (1978) indicate a value of 457 g/m^2 for a *Panicum hemitomon* - *Pontederia* wet prairie. Considerable work has been done on the ecology of sawgrass, *Cladium jamaicense* in south Florida. Steward and Ornes (1975a) report biomass in mature sawgrass stands as 3231 ± 397 g/m^2 but indicate that several years growth is required to produce a mature stand. They also reported an absence of seasonal variation of standing crop in mature stands. After burning, a sawgrass community weighed 920 ± 102 g/m^2 within 12 months, and 1374 ± 44 g/m^2 within 15 months. Forthman (1973) reported sawgrass standing crops of 897 to 1116 g/m^2 in south Florida.

The maximum dry weight standing crops measured in Chandler Slough during 1976 ranged from 389.0 g/m^2 at Site 1 to 716.3 g/m^2 at Site 3. These values were similar to other results reported for diverse wetland plant communities in Florida.

Net primary productivity rates for the three sample sites were positive from February through August (one exception) and negative in late summer. A late summer decline in production was also reported by Auclair et al (1976), Boyd (1969, 1970), Jervis (1969), and Bernard (1974). Increased sampling frequency would have provided a better estimate of net productivity rates and determination of maximum standing crop. Net productivity rates for the sampling intervals in Chandler Slough ranged from 0.50 g/m^2/day to 3.69 g/m^2/day, and were lower than many other reported productivity rates in more northern climates.

Maximum short interval net productivity rates were reported for Carex rostrata in Minnesota; 10.9 g/m^2/day (Bernard 1974); Scirpus-Equisetum in St. Lawrence River, 12.9 g/m^2/day (Auclair et al 1976); sedge swale in New Jersey, 22.8 g/m^2/day (Jervis 1969); Typha latifolia in Oklahoma, 34.2 g/m^2/day (Penfound 1956). Jervis (1969) indicated that the high productivity rates in cool climates compensated for the short growing seasons.

Plant detrital mass at Sites 1 and 2 was highest in February, and exceeded the living macrophyte biomass from the previous October. The 17 to 35% reduction in nutrient content of detritus compared with living material between October and November was probably due to translocation prior to death and decomposition during the winter. Boyd (1971) reported that the concentration of nitrogen and phosphorus in fresh dead Juncus effusus was not significantly different from amounts in living material on the same date, but that 50% of the nitrogen and phosphorus was lost from detritus in the first 30-60 days. Davis (1978) indicated that standing dead leaves of cattail and sawgrass contain about half the concentration of nitrogen and phosphorus as living leaves, due to leaching and translocation of nutrients. Subsequent decomposition of plant detrital material proceeded more rapidly during the spring in Chandler Slough with 82% - 92% loss in weight by mid-June. Boyd (1971) reported 60% loss of detrital matter in Juncus effusus in four months.

Concentrations of nitrogen and phosphorus in above ground plant tissues exhibited considerable variability among species, date of sampling and location. Although some general trends were described, many more samples would be required to provide statistical validity. Boyd (1970) cautions that "patterns of seasonal changes in composition vary for both species and nutrients and broad generalizations cannot be made at this time." A wide range of nutrient levels in Pontederia lanceolata, Sagittaria lancifolia, Panicum hemitomon, Polygonum sp., Ludwigia sp. and Bacopa caroliniana, were apparent in samples collected in close proximity to each other in South Florida Conservation Area 3 (Schemnitz and Schortemeyer 1974). Nitrogen levels in Chandler Slough plants were comparable with Conservation Area 3 results, but phosphorus levels were generally 2 to 10 times higher in Chandler Slough.

Nutrient levels in above ground plant tissues of rooted aquatic plants do not reflect immediate nutrient uptake from surface waters since there is considerable translocation of materials between roots, foliage and reproductive plant tissues. Boyd documented decreasing nitrogen and phosphorus levels in Typha latifolia (1970) and Justicia americana (1969) from late spring through the summer. Steward and Ornes (1975a) documented high concentrations of nitrogen and phosphorus in sawgrass leaves regrowing one month after burning, followed by decreasing trend for 3 to 5 months. Plant tissues from Chandler Slough showed highest levels of nitrogen early in the growing season, followed by a decreasing trend. Phosphorus levels exhibited less distinct trends. In some species the maximum amounts occurred in February or April while in other species the maximum occurred in June or August.

The average nitrogen concentration in submergent plant species was not significantly different from emergent species, however the submergents had higher phosphorus levels than emergent species. In artificial enrichment studies, Steward and Ornes (1975b) showed that the submersed Utricularia sp. had considerably higher phosphorus levels than sawgrass, and that the rate of uptake of phosphorus was greater for Utricularia than for sawgrass.

In the 22 sampling instances in this study where the same species of plant was collected from two different sites on the same date during the wet season, concentrations of nitrogen were higher at the upstream station 59% of the time and concentrations of phosphorus were higher 73% of the time. This suggests that the assimilation of nutrients by marsh vegetation may be related to ambient concentrations in the water. Boyd and Hess (1970) indicated that correlations between nutrient concentrations in the water and in plant tissues were significant although not very strong. Steward and Ornes (1975b) showed the capability for luxury uptake of nutrients by sawgrass in artificial enrichment studies.

There are 950.2 acres of marsh in Chandler Slough between U.S. 98 and the downstream water quality sampling point. Site 1 in the buttonbush zone is representative of 366.4 acres; Site 2 is representative of 174.0 acres of broadleaf marsh; and Site 3 is representative of 163.0 acres of sparse cypress and low grass areas. To be conservative, the growth rates from Site 3 were applied to the remaining 246.8 acres of marsh to determining overall nutrient uptake values.

The figures below indicate the increase or decrease in standing crop of nitrogen and phosphorus at each site during the 1976 growing season:

Site	February to April		April to June		June to August		August to October	
	gN/m^2	gP/m^2	gN/m^2	gP/m^2	gN/m^2	gP/m^2	gN/m^2	gP/m^2
1	+2.013	+.203	+2.226	+.468	+ .519	+ .195	-2.935	-.505
2	+5.385	+.550	+3.125	+.810	+1.876	+1.039	-3.605	-.956
3	+ .566	+.090	+ .336	+.105	+3.833	+1.267	-3.048	-.769

Changes in nutrient standing crop were multiplied by the total marsh area represented and then divided by the time interval between samples to estimate daily nutrient uptake rates and total assimilation for the emergent marsh vegetation. Since sampling trips encompassed several days, average time intervals of February to April (69 days), April to June (59 days), June to August (61 days) and August to October (55 days) were used. The results of these calculations are presented in Table 26.

Net uptake of nutrients by marsh vegetation during the 1976 growing season in Chandler Slough was 22.27 tonnes nitrogen and 5.39 tonnes phosphorus. Comparison of these figures with apparent nutrient retention as measured by water quality sampling is difficult. February through August 1976 was the documented period during which phosphorus was incorporated into above ground plant tissues in Chandler Slough. The water quality data provided in Section I indicated that after the "first flush" phenomenon, during which nutrients from decayed plant tissues are washed into the receiving waters, there was a net uptake of phosphorus by the marsh throughout the remainder of the wet season. The phosphorus retained by the marsh after the date of maximum standing crop biomass may still be incorporated into growing plants, or may be stored in plant root systems to initiate the following years growth. The water quality data provided in Section I indicated that 1.6 tonnes of phosphorus were retained by the marsh in 1975. The value of 6.3 tonnes of phosphorus retained in 1976 is high because the "first flush" was not sampled.

Further investigations would be required to accurately quantify the amount of phosphorus incorporated into plant tissues which was translocated back to plant roots or rhizomes, incorporated into soil, or decomposed and flushed into the Kissimmee River with the ensuing wet season.

Nitrogen budgets based on water quality analyses were considerably different from nitrogen budgets based on marsh plant samplings. Water quality sampling indicated a net nitrogen export of 1.95 tonnes in 1975

TABLE 26. NUTRIENT UPTAKE BY VASCULAR MARSH VEGETATION IN CHANDLER SLOUGH, FEBRUARY 3, 1976 TO OCTOBER 11, 1976

				Nitrogen		
Time Interval	# Days	g/m^2	lb/acre	tonne/marsh	$g/m^2/day$	lb/acre/day
Feb 10-Apr 18	69	2.00	17.85	7.69	.029	0.26
Apr 19-Jun 16	59	1.59	14.21	6.13	.027	0.24
Jun 17-Aug 16	61	2.19	19.59	8.45	.036	0.32
Aug 17-Oct 11	55	-3.08	-27.48	-11.84	-.056	-0.50
Feb 3- Aug 16	189	5.79	51.66	22.27	.031	.273

				Phosphorus		
Time Interval	# Days	g/m^2	lb/acre	tonne/marsh	$g/m^2/day$	lb/acre/day
Feb 10-Apr 18	69	.22	1.97	.85	.003	.03
Apr 19-Jun 16	59	.37	3.32	1.43	.006	.06
Jun 17-Aug 16	61	.81	7.24	3.12	.013	.12
Aug 17-Oct 11	55	-.70	-6.23	-2.69	-.013	-.11
Feb 3- Aug 16	189	1.40	12.53	5.39	.007	.066

and 5.58 tonnes in 1976. Vegetation sampling showed a net uptake of 22.27 tonnes nitrogen by vascular herbaceous plants during the February to August 1976 growing season.

SUMMARY AND CONCLUSIONS

1. Seasonal changes in aquatic vascular plant biomass and composition were documented from three dominant plant communities in Chandler Slough, beginning in October 1975 and proceeding through the 1976 growing season. The major emphasis has been placed on samples from February, April, June, August and October 1976 as representative of one growing season. Minimum standing crop occurred in February and ranged from 48.8 g/m^2 to 95.9 g/m^2. Maximum biomass occurred at each site in August and ranged from 300.0 g/m^2 (estimated) to 716.3 g/m^2. At each site a decrease in biomass was evident in the August to October interval.
2. The nutrient composition in the above ground portion of plants was measured for dominant species during the 1976 growing season. Although nitrogen and phosphorus concentrations in plant tissues exhibited considerable variation among species, several trends in nutrient composition were evident. In most species the highest concentration of nitrogen occurred in February or April and declined throughout the remainder of the year. When the same species was sampled from two or more locations on the same date, concentration of nitrogen and phosphorus were usually higher in the upstream sample, indicating some relationship between nutrient availability in the water and uptake. Submergent plant species generally had higher phosphorus concentrations in their tissues than emergents. The average concentration levels in all aquatic plants sampled was 1.64% nitrogen and 0.31% phosphorus.
3. Plant detrital mass at the beginning of the 1976 growing season was 100 to 200 g/m^2 greater than the living standing crop measured in October 1975.

Decomposition proceeded rapidly with only 55% of the debris (from site 1 and 2) remaining in April, and 13% in June. Chemical analysis of the detritus showed a 50% reduction in phosphorus and 3% reduction in nitrogen concentrations between February and April. Lesser reductions occurred between April and August.

4. Uptake of primary nutrients, as measured in the above ground portions of marsh plants, was calculated by changes in species composition and biomass, nutrient concentrations, and the time interval between sampling periods. The results from each site were weighted by the total representative area in Chandler Slough to yield total results. From February to August aquatic vegetation in the marsh assimilated 22.27 tonnes of nitrogen and 5.39 tonnes of phosphorus. This was considered a short term sink since most vegetation died during the winter. Nutrients incorporated into plant tissues during the growing season may have been translocated back into plant rhizomes, incorporated into marsh soils, or washed into the receiving waters with the first flush of the following wet season. Other unsampled sources of nutrient retention in Chandler Slough were woody plants, phytoplankton, periphyton, and animals.

PART III

SOILS

Morris Rosen

PART III

SOILS

INTRODUCTION

This part of the Chandler Slough Study was undertaken to study the physical characteristics and nutrient status of soils in Chandler Slough and the surrounding areas. To obtain this information soil samples were collected for chemical analysis and bulk density determinations. The Okeechobee County Soil Survey (McCollum and Pendleton 1971) described the soils of Chandler Slough as a mixture of organic and mineral soils. No detailed soil map of the slough area is available, however.

METHODS AND MATERIALS

During 1975 and 1976 soil samples for physical and chemical analyses were collected from thirty-eight (38) sampling sites in the Chandler Slough marsh and surrounding uplands. The locations of these samples are shown in Figure 28.

In May 1975 soil samples for chemical analyses were taken from profile cores at depths of 0 - 15 cm, 30 - 46 cm, and 62 - 76 cm. The 1976 samples were composites of ten cores 1.9 cm in diameter and 15 cm deep obtained from an area approximately 90 m^2 around the sample site. Additional soil samples were also taken at the three vegetation study plots periodically in 1975 and 1976. Bulk density samples were taken with a slide hammer driven core soil sampler that was 5 cm long X 5 cm in diameter.

Soil samples were prepared for analysis using the following methods: samples were air dried and ground fine enough with a mortar and pestle to pass through a #10 sieve (U. S. Standard Sieve Series). A representative sub-sample was then ground with a Diamonite(R) mortar and pestle so as to pass through a #35 mesh

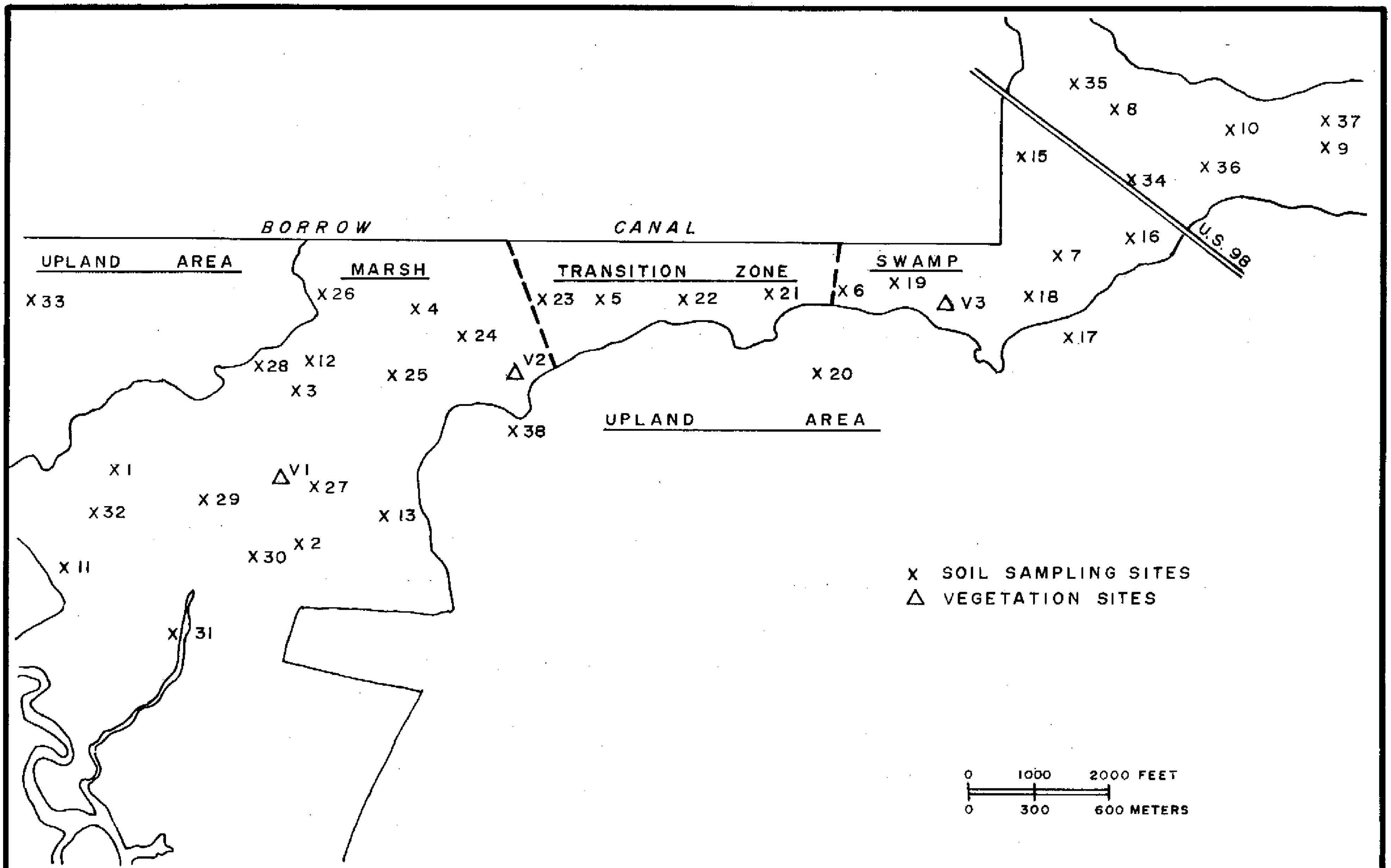

Figure 28 LOCATION OF SOIL SAMPLE SITES IN THE CHANDLER SLOUGH MARSH

sieve. The prepared samples were oven dried for two hours at 100° C.

Soil samples were analyzed for potassium, calcium, and magnesium by the lithium metaborate fusion method (Medlin, Suhr, and Bodkin 1969). Phosphate analysis was performed on samples solubilized by lithium metaborate fusion using a modified Technicon Auto-Analyzer(R) method. Samples for nitrogen analysis were digested to ammonia with a Technicon(R) BD-40 block digestor. Samples weighing 0.1500 gm were mixed with one Curtin Matheson Scientific Kel-pak(R) #3 and 20 ml of concentrated sulfuric acid. The mixture was digested for 3 hours at 200° C followed by 2 hours at 370° C. The digested samples were diluted with deionized water to 750 ml and analyzed for ammonia using Technicon methodology #146/71A.

Organic matter analyses were done gravimetrically by dry ashing the soil samples at 450° C.

Bulk density samples were dried at 105° to a constant weight. The volume of the aluminum sampling cylinders was used to calculate the density of the soil.

RESULTS

Table 27 gives a statistical summary of the nitrogen and phosphorus concentrations of soil samples collected at different depths in the soil profile in and around Chandler Slough. The data shows that the highest nitrogen and phosphorus concentrations were in the surface layer of the soil. Average nitrogen concentrations were from 5 to 13 times higher than phosphorus concentrations in these soil samples.

The geographical distribution of soil nitrogen and phosphorus concentrations from surface samples is shown in Figures 29 and 30, respectively. Nutrient data is summarized in Table 28, with sample sites divided into four vegetation zones that roughly approximate the vegetation discussed in Section II. Both nitrogen and phosphorus concentrations were lower in samples collected from upland pastures than from those collected in the slough. Samples from the transition zone were slightly lower in nitrogen and phosphorus concentration than samples from the marsh or swamp vegetation zone. Soils from the marsh vegetation zone were similar to soils in the cypress swamp zone in nitrogen and phosphorus concentrations.

Table 29 compares the nitrogen and phosphorus concentrations, and the contents per square meter in the top 15 cm of organic soils, inorganic soils, and mixed soils. Bulk density was used to determine soil type. Buckman and Brady (1969) state that the bulk density of inorganic soils usually ranges from 1.25 gm/cm^3 to 1.45 gm/cm^3, whereas organic soils have bulk densities between 0.20 gm/cm^3 and 0.30 gm/cm^3. The soil phosphorus content per square meter displayed a gradient with the inorganic soils having the highest phosphorus levels and the organic soils the lowest, but the phosphorus concentration fluctuated only a small amount. Soil nitrogen, on the other hand, did not show any trends for

TABLE 27. STATISTICAL SUMMARY OF PHOSPHORUS AND NITROGEN CONCENTRATIONS BY DEPTH OF SAMPLE

Depth	Statistic	% Phosphorus	% Nitrogen
0-15 cm	$\bar{x}$	0.026	0.333
	s	0.011	0.297
	n	11	11
	cv	44%	89%
30-46 cm	$\bar{x}$	< 0.01	0.074
	s	-	0.059
	n	11	10
	cv	-	80%
61-76 cm	$\bar{x}$	< 0.01	0.054
	s	-	0.035
	n	11	11
	cv	-	65%

Legend

$\bar{x}$ = mean
s = standard deviation
n = number of samples
cv = coefficient of variability

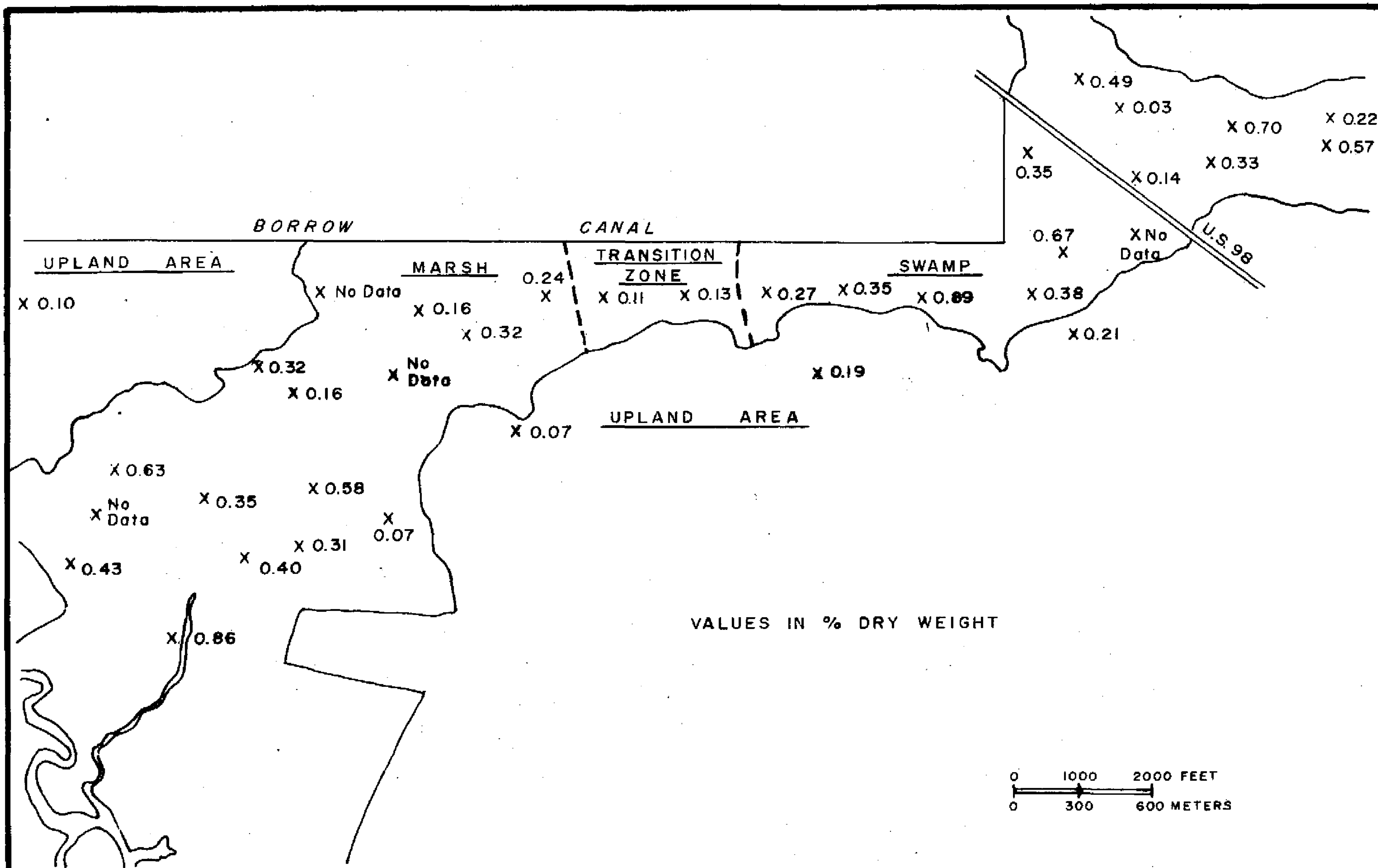

Figure 29 DISTRIBUTION OF NITROGEN CONCENTRATIONS IN THE CHANDLER SLOUGH MARSH SOILS

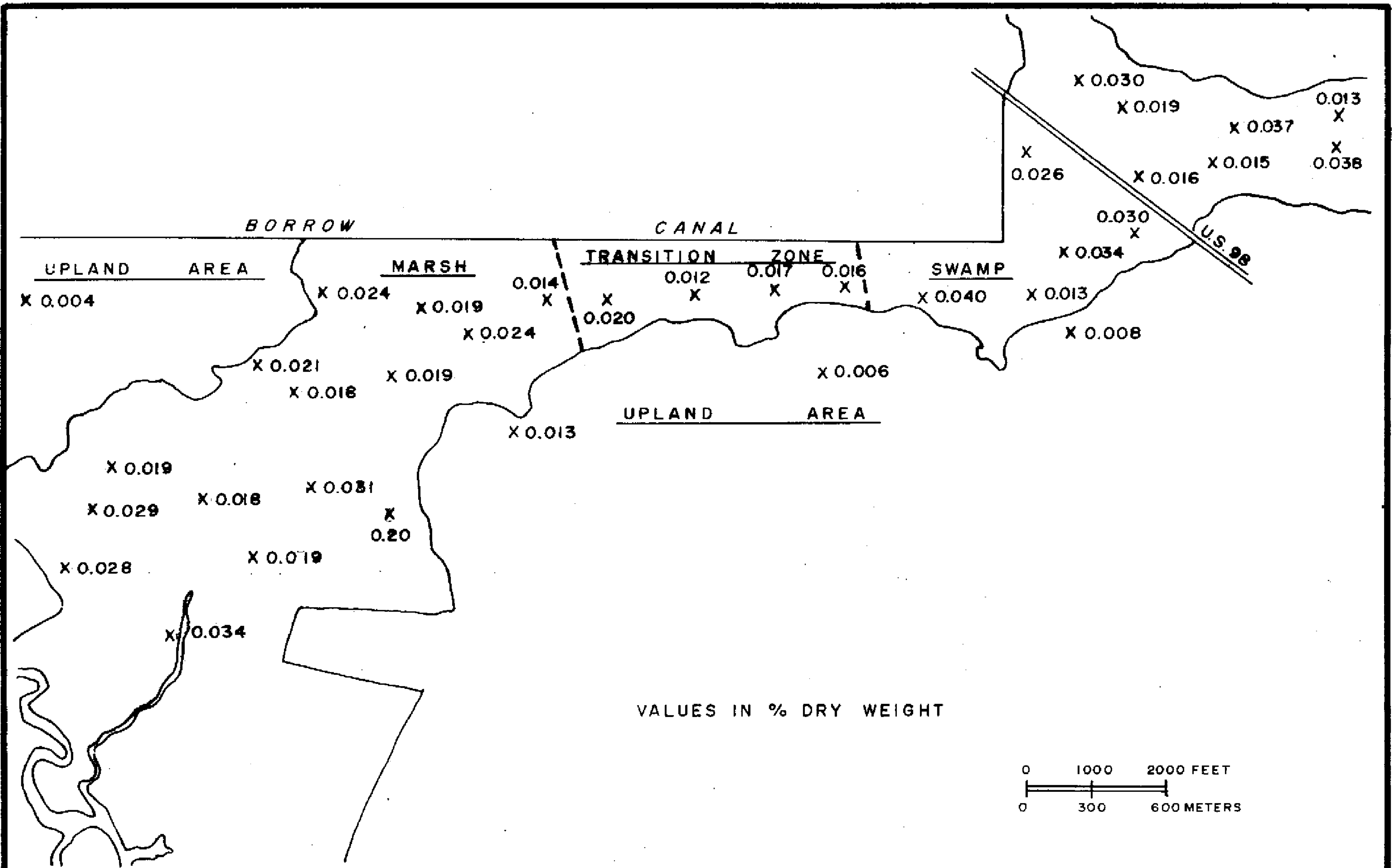

Figure 30 DISTRIBUTION OF PHOSPHORUS CONCENTRATIONS IN THE CHANDLER SLOUGH MARSH SOILS

TABLE 28. STATISTICAL SUMMARY OF PHOSPHORUS AND NITROGEN CONCENTRATIONS BY VEGETATION TYPE

Vegetation Type	Statistic	% Phosphorus	% Nitrogen
Marsh	$\bar{x}$	0.023	0.372
	s	0.006	0.216
	n	15	13
	cv	26%	58%
Transition Zone	$\bar{x}$	0.016	0.215
	s	0.003	0.115
	n	4	4
	cv	20%	53%
Swamp	$\bar{x}$	0.026	.434
	s	0.010	0.259
	n	12	11
	cv	40%	60%
Upland Pasture	$\bar{x}$	0.008	0.143
	s	0.004	0.068
	n	4	4
	cv	50%	48%

Legend

$\bar{x}$ = mean
s = standard deviation
n = number of samples
cv = coefficient of variability

TABLE 29. COMPARISON OF THE NUTRIENT CONTENT IN THE TOP 15 CM OF SOIL BY SOIL TYPE

Sample Site No.	Soil Type	Bulk Density gm/cm^3	Nitrogen %	Nitrogen gN/m^2	Phosphorus %	Phosphorus gP/m^2
13	Inorganic	1.21	.07	127	.020	36
22	Inorganic	0.98	.13	191	.012	18
38	Inorganic	1.00	.07	105	.013	20
26	Organic	0.27	-	-	.024	10
36	Organic	0.31	.33	153	.015	7
18	Mixture	0.82	.38	467	.013	16
	Mean of Inorganic Samples		.09	141	0.015	25
	Mean of Organic Samples		(.33)	(153)	0.020	9
	Mixture Samples		(.38)	(467)	(.013)	(16)

Values in parentheses are for single samples content per square meter, but concentrations of nitrogen in the soil were lower in the inorganic soils than in the organic or mixed soils.

Seasonal samples were collected at vegetation sampling sites shown in Figure 28. Seasonal changes of nitrogen and phosphorus composition are shown in Table 30. The phosphorus concentration remains almost constant from one sampling date to the next at all three sites, but Site 3 was slightly lower than Sites 1 and 2. Nitrogen, on the other hand, was quite variable from site to site and from one collection date to the next. Soil nitrogen concentrations were highest at all three sampling sites in February of 1976. Sites 1 and 2 were similar in nitrogen concentration and slightly higher than Site 3.

Table 31 shows the organic matter content of the February 1976 samples from vegetation study sites 1, 2, and 3. Carbon values were calculated by multiplying the organic matter concentration by 0.56 which, according to Broadbent (1965) is a valid conversion factor. The carbon:nitrogen (C:N) ratio for the 3 vegetation samples are also shown.

Appendix F contains the chemical composition of the soil samples collected during 1975 and 1976.

TABLE 30. CHEMICAL COMPOSITION OF THE TOP 15 CM OF SOIL AT VEGETATION SAMPLING SITES IN CHANDLER SLOUGH OCTOBER 1975 - OCTOBER 1976

Date	Element	Vegetation Site 1 (Organic) % Composition	Vegetation Site 2 (Mixed) % Composition	Vegetation Site 3 (Inorganic) % Composition
10-75	Nitrogen	.55	.14	.07
	Phosphorus	.019	.017	.012
2-76	Nitrogen	.98	1.03	.34
	Phosphorus	.019	.024	.020
4-76	Nitrogen	.31	.32	.21
	Phosphorus	.018	.017	.011
6-76	Nitrogen	.35	.37	.22
	Phosphorus	.018	.023	.013
8-76	Nitrogen	.39	.30	.19
	Phosphorus	.022	.018	.011
10-76	Nitrogen	.38	.26	.22
	Phosphorus	.018	.014	.010

TABLE 31. ORGANIC MATTER, CARBON, AND NITROGEN CONCENTRATIONS AND THE RESULTING C:N RATIOS OF FEBRUARY 1976 SAMPLES

Vegetation Site	% Composition			
	Organic Matter	Carbon*	Nitrogen	Carbon: Nitrogen Ratio
1	13	7.2	.98	7.4:1
2	13	7.2	1.03	7.0:1
3	5	2.8	.34	8.2:1

* Calculated from Organic Matter using a factor of 0.56 to convert to Carbon (Broadbent 1965)

DISCUSSION

Data in Table 27 show that nitrogen and phosphorus accumulate in the top 15 cm of the soil. This happens because the top 15 cm layer is the region where most roots grow and decompose to produce soil organic matter that contains a large portion of the soil nitrogen and phosphorus. (Buckman and Brady 1969).

The marsh and swamp zones contain more of the organic soils than the transition zone or upland area. Buckman and Brady (1969) state that most of the nitrogen in the surface soil is bound in organic compounds. One would expect that the marsh and swamp zones with their high organic matter contents would be higher in nitrogen concentration than the transition zone. Normally 75% of the phosphorus in the surface layer of a soil is bound up in organic compounds. (Buckman and Brady 1969). Therefore, one would expect that soils with a high organic matter content would contain higher concentrations of phosphorus than soils with relatively low inorganic matter contents. This is the case with the mean of phosphorus concentration in the swamp or marsh zones as compared to the transition zone which had a higher elevation and is sandier.

Differences between organic matter content to which organic phosphate content is related probably account for the phosphorus differences between the upland soils and the transition zone in the slough. The nitrogen content per unit area is about the same for both inorganic and organic soils since the low bulk density of the organic soils tend to compensate for the higher nitrogen concentrations.

The concentration of phosphorus in inorganic soils was generally lower than in organic soils. These findings go along with what is known about phosphorus. The P concentration of the one mixed soil in this group was below the mean of the inorganic soils. Since only one sample of this type was collected it is difficult to explain these results; however, it may be that with its high bulk density of 0.82 gm this sample is more like an inorganic soil.

The seasonal nitrogen and phosphorus data from the vegetation sampling sites show increases in the February samples that can only be accounted for if one assumes that fertilizer was added to the soil. A check with one of the land owners confirmed that fertilizer had been applied to the surrounding uplands. Based on the following information it seems that fertilizer nitrogen has moved to the sample sites. Tisdale and Nelson (1966) state that the carbon:nitrogen (C:N) of undisturbed top soil is between 10:1 and 12:1. Table 31 shows that at the February 1976 collection the C:N ratios were 7.4:1, 7.0:1, and 8.2:1, respectively, for samples from Sites 1, 2 and 3. This indicates that nitrogen fertilizer was added to the soil at the sample sites since an unaltered natural soil is not likely to have C:N ratios this low.

CONCLUSIONS

The highest nitrogen and phosphorus concentrations were in the top 15 cm of the soil. Phosphorus content per square meter was higher in the inorganic soils than in the organic soils. The concentration of nitrogen was lower in the inorganic soils than the organic soils. The seasonal soil samples were enriched by fertilization with nitrogen. There were no discernable seasonal trends for nitrogen or phosphorus.

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APPENDIX A

WATER CHEMISTRY ANALYTICAL METHODS

APPENDIX A

WATER CHEMISTRY ANALYTICAL METHODS

AUTOANALYZER

Determination	Method	Range	Sensitivity
Alkalinity	1. Methyl Orange; Technicon AutoAnalyzer II, method #111-71W	0-5 meq/l	0.1 meq/l 2% of full scale
	2. Potentiometric titration Ref. Standard Methods, 13th Edition, p. 52-56.	0-10 meq/l	0.3 meq/l
Ammonia	Berthelot reaction Technicon AA II, method #154-71W. Ref: D.D. Van Slyke & A. J. Hillen, Bio Chem. 102, p. 499, 1933; S. Kallman, Presentation, April 1967, San Diego, Calif; W. T. Bolleter, C. J. Bushman & P. N. Tidwell, Anal. Chem. 33, p. 592, 1961; J. A. Tellow & A. L. Wilson, Analyst, 89, p. 453, 1964; A. Tarugi & F. Lenci, Boll Chim Farm, 50, p. 907, 1912; FWPCA Methods of Chem. Anal. of Water & Waste Water, Nov. 1969, p.137.	0-0.50 ppm	0.010 ppm 2% of full scale
Chloride	Ferric Thiocyanate complex Technicon AA II, method #99-70W Ref: Automatic Analysis of Chlorides in Sewage, James E. O'Brien, Wastes Engineering, Dec. 1962; D. M. Zall, D. Fisher & M. D. Garner, Anal. Chem. 28, 1956, p. 1665	0-200 ppm	4.0 ppm 2% of full scale
Nitrite	Diazotization method which couples with N-1-napthylenediamine dihydrochloride. Technicon AA II; method #120-70W, modified for linear sensitivity. Ref. Standard Methods, 12th edition, 1965, p. 205	0-0.200 ppm	.004 ppm 2% of full scale
Nitrate	Same as Nitrite with Cadmium Reduction column Technicon AA II, method #100-70W, modified for linear sensitivity.	0-0.200 ppm	.004 ppm 2% of full scale
Nitrogen, Total Kjeldahl	Digestion with H_2SO_4 and HgO catalyst in Technicon BD-40 Block Digestor, Technicon AA II, Method 376-75W/A followed by Ammonia determination. Technicon AA II, Method 334-74A/A	0-5 or 10 mg/l	.10 or .20 mg/l 2% of full scale

APPENDIX A (Continued)

AUTOANALYZER

Determination	Method	Range	Sensitivity
Ortho-Phosphate	Phosphomolybdenum blue complex with ascrobic acid reduction Technicon AA II; method #155-71W Ref. J. Murphy & J. P. Riley, Anal. Chim. Acta, 27, p. 30, 1962.	0-0.100 ppm	.002 2% of full scale
Phosphate, Total	Same as Ortho-Phosphate with persulfate digestion. Modified Standard Methods procedure: 13th edition, p. 525, 1971. Technicon AA II; method #93-70W.	0-0.100 ppm	.002 2% of full scale
Silicate	Ascrobic acid reduction of silicomolybdate complex to "Molybdenum blue", Technicon AA II, method #105-71W.	0-20 ppm	0.4 ppm 2% of full scale
Sulfate	Barium chloride, Methylthmol Blue chelation, Technicon AA II, method #118-71W	0-250 mg/l	5 mg/l 2% of full scale

ATOMIC ABSORPTION

Parameter	Wavelength	Flame	Comments
Sodium	589.0 nm-vis. (SLIT 1.4 nm)	Air and acetylene	Dual capillary system (DCS) as described by T. H. Miller and W. H. Edwards, Atomic Absorption Newsletter 15, No. 3 (1976).
Potassium	766.5 nm-vis. (SLIT 1.4 nm)	Air and acetylene	Sample treatment as described for sodium
Calcium	422.7 nm-vis. (SLIT 0.7 nm)	Air and acetylene	Samples treated with La_2O_3/HCl using Dual Capillary System (DCS) as described by T. H. Miller and W. H. Edwards, Atomic Absorption Newsletter 15, No. 3 (1976).
Magnesium	285.2 nm-uv (SLIT 0.7 nm)	Air and acetylene	Sample treatment as described for calcium

APPENDIX B

CHANDLER SLOUGH WATER CHEMISTRY FIELD DATA

All parameters were measured at the surface.

Blank indicates missing data.

APPENDIX B FIELD PARAMETERS FOR SAMPLING DATES
1. CHANDLER SLOUGH AT C-38

Date Mo/Day/Yr	Time Hour /min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
9/10/73				155.	
10/ 2/73	1535.	26.5	7.4	200.	6.30
10/ 2/73	1535.	26.5	7.4	200.	6.20
11/ 7/73	1510.	22.5	6.4	220.	6.50
11/ 7/73	1510.	22.2	5.8	220.	6.40
12/ 5/73		21.5	7.8	215.	6.70
12/ 5/73		19.0	4.1	245.	6.40
12/ 5/73	1405.	21.5	8.2	215.	6.70
1/ 8/74	1430.	20.8	8.0	310.	6.55
3/ 5/74	1055.	20.0	9.3	200.	7.40
4/ 2/74	1030.	25.5	7.0	175.	6.65
5/ 7/74	1035.	25.0	6.7	180.	6.50
6/11/74	1035.	28.3	4.4	165.	6.50
7/ 9/74	1030.	26.8	0.6	200.	6.40
7/23/74	1000.				
7/23/74	1200.				
7/23/74	1500.				
7/23/74	1800.				
7/23/74	2400.				
7/24/74	300.				
7/24/74	1100.				
7/24/74	1510.				
7/25/74	910.				
7/25/74	1200.				
8/13/74	1115.	26.5	1.9	185.	6.50
9/10/74	1210.	25.3	2.6	160.	6.40
9/18/74	1200.				
9/18/74	1600.				
9/18/74	2000.				
9/18/74	2400.				
9/19/74	400.				
9/19/74	800.				
9/19/74	1200.				
9/19/74	1600.				
9/19/74	2000.				
9/19/74	2400.				
9/20/74	400.				
9/20/74	800.				
9/20/74	1200.				
9/20/74	1500.				

APPENDIX B-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
10/ 8/74	1030.	22.0	3.1	140.	6.30
11/ 5/74	1140.	21.5	5.4	160.	6.70
11/12/74	100.				
11/12/74	1700.				
11/12/74	2100.				
11/13/74	500.				
11/13/74	900.				
11/13/74	1300.				
11/13/74	1700.				
11/13/74	2100.				
11/14/74	100.				
11/14/74	500.				
11/14/74	900.				
11/14/74	1300.				
11/14/74	1700.				
11/14/74	2100.				
11/15/74	100.				
11/15/74	500.				
11/15/74	900.				
11/15/74	1100.				
12/ 2/74	1220.	16.5	7.6	90.	7.40
12/10/74	1245.	14.5	7.8	230.	7.20
1/ 7/75	1330.	20.3	6.1	260.	6.20
2/ 4/75	1040.	20.0	6.1	230.	7.10
3/ 4/75	1245.	16.8	6.6	230.	7.70
4/ 8/75	1345.	23.0	7.8	205.	7.45
5/ 6/75	1123.	25.3	7.3	155.	6.65
6/ 3/75	1100.	27.5	5.9	120.	6.65
6/12/75	1300.				
6/26/75	1800.				
6/26/75	2400.				
6/27/75	600.				
6/27/75	1200.				
6/27/75	1800.				
6/27/75	2400.				
6/28/75	600.				
6/28/75	1200.				
6/28/75	1800.				
6/28/75	2400.				
6/29/75	600.				

APPENDIX B-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/1	Sp. Cond. µmhos/cm	pH
7/15/75	950.	25.8	1.8	210.	5.95
7/24/75	1500.				
7/24/75	2100.				
7/25/75	300.				
7/25/75	900.				
7/25/75	1500.				
7/25/75	2100.				
7/26/75	300.				
7/26/75	900.				
7/26/75	1500.				
7/26/75	2100.				
7/27/75	300.				
7/27/75	900.				
7/27/75	1500.				
8/12/75	1050.	27.8	1.6	210.	6.20
9/12/75	930.	25.0	2.6	200.	6.65
9/19/75	1200.				
9/19/75	1800.				
9/19/75	2400.				
9/20/75	600.				
9/20/75	1200.				
9/20/75	1800.				
9/20/75	2400.				
9/21/75	600.				
9/21/75	1200.				
9/21/75	1800.				
9/21/75	2400.				
9/22/75	600.				
9/22/75	1200.				
10/16/75	1200.				
10/16/75	1800.				
10/16/75	2400.				
10/17/75	600.				
10/17/75	1200.				
10/17/75	1800.				
10/17/75	2400.				
10/18/75	600.				
10/18/75	1200.				
10/18/75	1800.				
10/18/75	2400.				

APPENDIX B-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
10/19/75	600.				
10/19/75	1200.				
10/28/75	1220.	24.5	4.0	135.	6.35
11/13/75	1200.				
11/13/75	1800.				
11/13/75	2400.				
11/14/75	600.				
11/14/75	1200.				
11/14/75	1800.				
11/14/75	2400.				
11/15/75	600.				
11/15/75	1200.				
11/15/75	1800.				
11/15/75	2400.				
11/16/75	600.				
11/16/75	1200.				
11/16/75	1620.				
2/10/76	1248.	17.5	7.5	270.	6.80
5/11/76	1242.	27.5	6.7	83.	6.95
6/11/76	1145.	23.5	3.1	110.	6.60
6/15/76	1345.				
6/16/76	1620.				
6/17/76	1105.				
6/18/76	1135.	27.0	2.5	160.	6.30
6/22/76	1220.	27.0	2.5	135.	5.90
7/ 2/76		25.7	2.0	170.	6.80
7/ 9/76	1200.	25.9	2.4	150.	5.60
7/16/76	1130.	28.3	2.2	140.	5.70
7/20/76	1205.	27.5	2.6	160.	6.60
7/23/76	1220.	28.1	3.2	140.	6.10
7/30/76	1200.	28.5	2.8	210.	6.40
8/ 6/76	1230.	28.0	3.3	190.	6.80
8/13/76	1120.	25.7	2.8	115.	6.40
8/16/76	1430.				
8/17/76	1400.				
8/18/76	1115.				
8/19/76	1050.				
8/20/76	1215.	26.0	3.4	120.	6.30
8/24/76	1200.	28.5	3.5	85.	5.90
8/27/76	1230.	28.3	1.1	90.	6.30

APPENDIX B-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
9/ 3/76	1215.	26.8	3.6	140.	
9/10/76	1230.	28.5	4.3	130.	
9/17/76	1230.	25.7	3.6	130.	6.00
9/21/76	1210.	25.5	3.6	145.	6.20
9/24/76	1245.	26.2	3.8	130.	6.40
10/ 1/76	1145.	24.0	5.6	140.	6.40
10/ 8/76	1335.	26.0	4.4	110.	4.70
10/11/76	1435.				
10/12/76	1145.				
10/13/76	1015.	20.3	4.7	110.	6.40
10/14/76	1100.	20.3	4.0	144.	6.40
10/15/76	1130.	20.8	5.9	140.	6.50
10/19/76	1200.	22.8	5.3	150.	5.60

APPENDIX B 2. FIELD PARAMETERS FOR SAMPLING DATES SOUTH BRIDGE STATION

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
5/ 7/74	1600.				
6/11/74	1530.				
7/ 9/74	1530.				
7/23/74	840.				
7/23/74	1200.				
7/23/74	1800.				
7/23/74	2100.				
7/23/74	2400.				
7/24/74	300.				
7/24/74	600.				
7/24/74	900.				
7/24/74	1200.				
7/24/74	1500.				
7/24/74	1800.				
7/24/74	2100.				
7/24/74	2400.				
7/25/74	930.				
7/25/74	1205.				
8/13/74	1600.				
9/10/74	1630.				
9/15/74	1030.	27.5	2.7	90.	5.90
9/16/74	1400.				
9/16/74	1800.				
9/16/74	2200.				
9/17/74	200.				
9/17/74	600.				
9/17/74	1800.				
9/17/74	2200.				
9/18/74	200.				
9/18/74	600.				
9/18/74	1000.				
9/18/74	1400.				
9/18/74	1800.				
9/18/74	2200.				
9/19/74	200.				
9/19/74	600.				
9/19/74	1000.				
9/19/74	1400.				
10/ 8/74	1600.				
10/17/74	1445.	23.0	0.3	125.	5.95

APPENDIX B-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
10/15/75	2400.				
10/16/75	600.				
10/16/75	1200.				
10/28/75	1635.				
11/10/75	1200.				
11/10/75	1800.				
11/10/75	2400.				
11/11/75	600.				
11/11/75	1200.				
11/11/75	1800.				
11/11/75	2400.				
11/12/75	600.				
11/12/75	1200.				
11/12/75	1800.				
11/12/75	2400.				
11/13/75	600.				
11/13/75	1200.				
11/19/75	1140.				
6/ 3/76					
6/11/76	1310.	22.9	3.6	70.	6.80
6/14/76	1500.				
6/15/76	1300.				
6/16/76	1125.				
6/17/76	950.				
6/18/76	1215.	25.0	1.4	140.	6.20
6/25/76	1150.	23.3	1.4	130.	6.60
7/ 2/76		26.0	1.2	170.	7.10
7/ 9/76	1400.	25.0	1.7	120.	6.90
7/16/76	1300.	27.5	1.2	180.	7.00
7/23/76		25.5	1.4	150.	6.20
7/30/76	1100.	25.7	2.1	200.	6.40
8/ 6/76	1145.	25.5	1.7	180.	6.30
8/13/76	1330.	24.5	2.8	115.	6.20
8/16/76	1555.				
8/17/76	1435.				
8/18/76	1200.				
8/19/76	1000.				
8/20/76	1030.	25.0	2.9	120.	6.40
8/27/76	1130.	26.5	1.6	90.	6.30
9/ 3/76	1135.	25.2	1.3	110.	

APPENDIX B-2 (Continued)

Date Mo/Day/Yr	Time Hour/ Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
9/10/76	1115.	26.5	3.7	75.	
9/17/76	1345.	24.5	2.1	150.	5.80
9/24/76	1045.	24.6	0.8	110.	6.40
10/ 1/76	1030.	24.6	1.8	100.	6.10
10/ 8/76	1145.	25.0	1.8	170.	6.10
10/11/76	1530.				
10/12/76	1215.	21.6	1.2	160.	6.20
10/13/76	945.	20.3	1.1	94.	6.20
10/14/76	930.	20.4	1.1	150.	6.40
10/15/76	1000.	20.5	0.4	140.	6.00

APPENDIX B FIELD PARAMETERS FOR SAMPLING DATES
3. NORTH BRIDGE STATION

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
5/ 7/74	1620.				
6/11/74	1545.				
7/ 9/74	1545.				
7/23/74	830.				
7/23/74	1700.				
7/24/74	1015.				
7/25/74	945.				
8/13/74	1020.				
9/1[illegible]/74	1645.				
9/16/74	1035.				
9/16/74	1400.				
9/16/74	1800.				
9/16/74	2200.				
9/17/74	200.				
9/17/74	600.				
9/17/74	1000.				
9/17/74	1200.				
9/17/74	1800.				
9/17/74	2200.				
9/18/74	200.				
9/18/74	600.				
9/18/74	1000.				
9/18/74	1400.				
9/18/74	1800.				
9/18/74	2200.				
9/19/74	200.				
9/19/74	600.				
9/19/74	1000.				
9/19/74	1400.				
10/ 3/74	1615.				
10/17/74	1500.	22.8	0.2	150.	6.05
10/17/74	1500.	22.8	0.9	150.	5.95
11/ 5/74	103[illegible].				
11/ 7/74	16[illegible].				
11/ 7/74	2400.				
11/ 8/74	600.				
11/ 8/74	1200.				
11/ 8/74	1800.				
11/ 8/74	2400.				
11/ 9/74	600.				

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
9/16/75	1200.				
9/16/75	1800.				
9/16/75	2400.				
9/17/75	1200.				
9/17/75	1800.				
9/17/75	2400.				
9/18/75	600.				
9/18/75	1200.				
9/18/75	1800.				
9/18/75	2400.				
9/19/75	600.				
9/19/75	1200.				
9/19/75	1500.				
10/28/75	1640.				
11/10/75	1200.				
11/10/75	1800.				
11/10/75	2400.				
11/11/75	600.				
11/11/75	1200.				
11/11/75	1800.				
11/11/75	2400.				
11/12/75	600.				
11/12/75	1200.				
11/12/75	1800.				
11/12/75	2400.				
11/13/75	600.				
11/13/75	1200.				
11/14/75	1130.				
6/ 3/76					
6/11/76	1245.	23.7	1.1	190.	7.00
6/14/76	1500.				
6/15/76	1305.				
6/16/76	1135.				
6/17/76	1500.				
6/18/76	1230.	25.0	0.7	230.	6.30
6/25/76	1135.	23.4	0.8	250.	6.80
7/ 2/76		26.5	0.8	250.	7.10
7/ 9/76	1410.	26.9	1.2	210.	7.10
7/16/76	1330.	28.5	1.0	230.	6.90
7/23/76		26.5	1.6	175.	6.10

APPENDIX B-3 (CONTINUED)

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
7/30/76	1115.	26.0	2.0	220.	6.40
8/ 6/76	1100.	26.0	1.8	200.	6.30
8/13/76	1315.	25.5	3.1	120.	6.30
8/16/76	1600.				
8/17/76	1445.				
8/18/76	1210.				
8/19/76	955.				
8/20/76	1045.	25.7	1.9	100.	6.20
8/27/76	1145.	26.6	3.5	160.	6.20
9/ 3/76	1145.	26.0	0.5	170.	
9/10/76	1130.	26.0	2.0	120.	
9/17/76	1330.	25.5	2.8	140.	5.80
9/24/76	1100.	25.2	2.0	130.	6.20
10/ 1/76	1045.	24.0	2.3	160.	6.00
10/ 8/76	1200.	25.8	1.7	150.	5.90
10/11/76	1545.				
10/12/76	1230.	21.8	3.1	190.	6.40
10/13/76	935.	20.4	2.6	117.	6.40
10/14/76	945.	20.9	2.6	180.	6.50
10/15/76	945.	20.9	2.6	180.	6.40

APPENDIX B. FIELD PARAMETERS FOR SAMPLING DATES
4. LAMBS ISLAND BRIDGE STATION

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
7/24/74	1545.				
7/25/74	955.				
7/25/74	1145.				
9/16/74	1045.				
9/16/74	1400.				
9/16/74	1800.				
9/16/74	2200.				
9/17/74	200.				
9/17/74	600.				
9/17/74	1[illegible]00.				
9/17/74	2000.				
9/17/74	2400.				
9/18/74	400.				
9/18/74	800.				
10/17/74	1420.	23.3	5.1	125.	6.40
10/17/74	142[illegible].	23.3	5.1	125.	6.50
11/ 5/74	1600.				
11/ 5/74	1600.				
11/ 5/74	2100.				
11/ 5/74	2400.				
11/ 6/74	300.				
11/ 6/74	600.				
11/ 6/74	900.				
11/ 6/74	1200.				
11/ 6/74	1500.				
11/ 6/74	1800.				
11/ 6/74	2100.				
11/ 6/74	2400.				
11/ 7/74	300.				
11/ 7/74	600.				
11/ 7/74	900.				
11/ 7/74	1800.				
11/ 7/74	2400.				
11/ 8/74	600.				
11/ 8/74	1200.				
11/ 8/74	1430.				
12/10/74	1645.				
1/ 9/75	1445.				
2/ 6/75	1240.				
3/ 5/75	1220.				

APPENDIX B-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µumhos/cm	pH
10/13/75	1200.				
10/13/75	1800.				
10/13/75	2400.				
10/14/75	600.				
10/14/75	1200.				
10/14/75	1800.				
10/14/75	2400.				
10/15/75	600.				
10/15/75	1200.				
10/15/75	1800.				
10/15/75	2400.				
10/16/75	600.				
10/16/75	1200.				
10/28/75	1630.	24.5		135.	
11/19/75	1150.				
6/ 3/76					
6/11/76	1330.	23.1	5.4	80.	7.20
6/14/76	1500.				
6/15/76	1250.				
6/16/76	1110.				
6/17/76	940.				
6/18/76	1200.	24.3	3.1	140.	6.90
6/25/76	1150.	23.0	3.4	120.	6.80
7/ 2/76		26.0	4.5	150.	6.90
7/ 9/76	1430.	24.7	5.6	120.	7.70
7/16/76	1400.	27.5	4.1	180.	6.90
7/23/76		25.1	4.8	170.	6.70
7/30/76	1045.	25.0	5.1	180.	6.80
8/ 6/76	1030.	25.0	4.2	195.	6.40
8/13/76	1345.	24.8	3.6	198.	6.30
8/16/76	1545.				
8/17/76	1425.				
8/18/76	1150.				
8/19/76	1065.				
8/20/76	1315.	24.7	3.6	120.	6.40
8/27/76	1115.	25.5	3.7	90.	6.40
9/ 3/76	1110.	24.6	4.5	100.	
9/10/76	1110.	26.0	3.5	80.	
9/17/76	1400.	24.5	4.0	150.	6.20
9/24/76	1030.	26.9	3.2	82.	6.30

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
10/ 1/76	1015.	24.0	3.6	78.	6.40
10/ 8/76	1130.	25.0	2.9	155.	6.20
10/11/76	1515.				
10/12/76	1200.	21.0	3.9	160.	6.40
10/13/76	1000.	19.6	4.4	137.	6.50
10/14/76	1000.	20.3	4.3	150.	6.60
10/15/76	930.	19.7	4.0	150.	6.40

APPENDIX B FIELD PARAMETERS FOR SAMPLING DATES
5. EAGLE ISLAND BRIDGE STATION

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
10/17/74	1510.	26.3	5.8	73.	6.05
10/17/74	1515.	25.3	4.0	80.	5.90
6/18/75	1400.				
6/19/75	1130.				
6/24/75	1600.				
6/24/75	2400.				
6/25/75	600.				
6/25/75	1200.				
6/25/75	1300.				
6/25/75	2400.				
6/26/75	600.				
6/26/75	1200.				
6/26/75	1600.				
6/26/75	2400.				
6/27/75					
6/27/75	1200.				
7/21/75	1400.				
7/21/75	2000.				
7/22/75	200.				
7/22/75	800.				
7/22/75	1400.				
7/22/75	2000.				
7/23/75	200.				
7/23/75	800.				
7/23/75	1400.				
7/23/75	2000.				
7/24/75	200.				
7/24/75	800.				
7/24/75	1400.				
9/16/75	1200.				
9/16/75	1600.				
9/16/75	2400.				
9/17/75	600.				
9/17/75	1200.				
9/17/75	1600.				
9/17/75	2400.				
9/18/75	600.				
9/18/75	1200.				
9/18/75	1600.				
9/18/75	2400.				

APPENDIX B-5 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Temp. Cent.	D.O. mg/l	Sp. Cond. µmhos/cm	pH
9/14/75	600.				
9/14/75	1200.				
6/15/76	1100.				
6/16/76	1200.				
6/17/76	1025.				
6/18/76	1300.	29.5	2.4	140.	6.40
6/25/76	1116.	26.6	2.5	130.	6.50
7/ 2/76		29.5	4.6	150.	6.50
7/ 9/76	1510.	31.4	6.8	160.	6.40
7/16/76	1430.	32.0	4.4	180.	6.50
7/23/76	1130.	27.5	2.6	180.	5.80
7/30/76	1400.	32.0	5.3	190.	6.50
8/ 6/76	1400.	31.0	3.4	202.	6.30
8/13/76	1415.	28.4	3.8	177.	6.40
8/16/76	1615.				
8/17/76	1500.				
8/18/76	1225.				
8/19/76	930.				
8/20/76	1315.	28.2	3.7	160.	6.50
8/27/76	1400.	30.1	5.3	130.	6.30
9/ 3/76	1330.	30.0	4.9	120.	
9/10/76	1400.	31.5	6.2	75.	
9/17/76	1120.	27.1	3.9	130.	6.00
9/24/76	1145.	29.0	3.3	69.	6.40
10/ 1/76	1300.	24.6	4.2	75.	6.20
10/ 8/76	1415.	28.5	5.1	185.	6.40
10/11/76	1600.				
10/12/76	1315.	22.5	6.6	152.	6.50
10/13/76	900.	20.6	3.9	155.	6.40
10/14/76	1315.	21.5	3.8	172.	6.50
10/15/76	1300.	22.9	6.1	140.	6.60

APPENDIX C

CHANDLER SLOUGH WATER CHEMISTRY LABORATORY DATA

Units in mg/l except as follows:

Nutrient forms: mg/N or P/l

Alkalinity: mg/l as $CaCO_3$

NO_x = $NO_2 + NO_3$

TN = Total Nitrogen

T PO_4 = Total Phosphorus

O PO_4 = Ortho Phosphorus

All samples were collected at the surface

Blank indicates missing data

< indicates results less than quoted limit of sensitivity.

APPENDIX C. LABORATORY RESULTS FOR SAMPLING DATES

1. CHANDLER SLOUGH AT C-38 STATION

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
9/10/73			0.004		0.05	
10/ 2/73	1535.	0.001	0.004	0.002	0.09	0.99
10/ 2/73	1535.					
11/ 7/73	1510.					
11/ 7/73	1510.	0.003	0.004	0.004	0.04	0.06
12/ 5/73						
12/ 5/73						
12/ 5/73	1405.	0.049	0.004	0.045	0.01	1.37
1/ 8/74	1430.	0.020	0.004	0.016	0.09	1.15
3/ 5/74	1055.	0.003	0.004	0.004	0.06	1.17
4/ 2/74	1030.					
5/ 7/74	1035.	0.024	0.004	0.020	0.04	1.11
6/11/74	1035.	0.003	0.004	0.004		0.11
7/ 9/74	1030.	0.023	0.006	0.017	0.05	1.44
7/23/74	1000.	0.003	0.004	0.004	0.03	1.56
7/23/74	1200.	0.009	0.005	0.004	0.03	8.88
7/23/74	1500.	0.003	0.004	0.004	0.04	
7/23/74	1800.	0.014	0.004	0.010	0.13	11.48
7/23/74	2400.	0.033	0.004	0.029	0.15	2.51
7/24/74	300.	0.029	0.004	0.025	0.17	
7/24/74	1100.	0.018	0.004	0.014	0.02	1.61
7/24/74	1510.	0.003	0.004	0.004	0.02	1.49
7/25/74	910.	0.008	0.004	0.004	0.02	1.65
7/25/74	1200.	0.008	0.004	0.004	0.03	1.24
8/13/74	1115.	0.003	0.004	0.008	0.03	1.60
9/10/74	1210.	0.041	0.004	0.037	0.02	1.29
9/18/74	1200.	0.069	0.004	0.065	0.03	
9/18/74	1600.	0.124	0.004	0.120	0.03	
9/18/74	2000.	0.056	0.004	0.052	0.01	
9/18/74	2400.	0.008	0.004	0.004	0.01	
9/19/74	400.	0.008	0.004	0.004	0.01	
9/19/74	800.	0.040	0.004	0.036	0.06	
9/19/74	1200.	1.850	0.004	1.846	0.03	
9/19/74	1600.	0.009	0.005	0.004	0.01	
9/19/74	2000.	0.009	0.004	0.005	0.02	
9/19/74	2400.	0.050	0.005	0.045	0.01	
9/20/74	400.	0.010	0.006	0.004	0.01	
9/20/74	800.	0.009	0.005	0.004	0.01	
9/20/74	1200.	0.009	0.005	0.004	0.01	
9/20/74	1500.	0.009	0.005	0.004	0.01	

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
9/10/73		0.208	0.233			
10/ 2/73	1535.	0.148	0.164	6.7	16.40	2.59
10/ 2/73	1535.					
11/ 7/73	1510.					
11/ 7/73	1510.	0.106	0.104	3.8	19.00	3.61
12/ 5/73						
12/ 5/73						
12/ 5/73	1405.	0.065	0.125	5.7	17.00	3.56
1/ 8/74	1430.		0.173	5.8	28.00	10.40
3/ 5/74	1955.	0.027	0.063	1.7	18.00	2.80
4/ 2/74	1030.					
5/ 7/74	1035.	0.016	0.051	1.8	13.00	1.60
6/11/74	1035.	0.006	0.089	2.6	13.00	1.50
7/ 9/74	1030.	0.696	0.844	10.5	12.70	5.10
7/23/74	1000.	0.399	0.404		14.00	3.70
7/23/74	1200.	0.312				
7/23/74	1500.	0.346	0.352			
7/23/74	1800.	0.194	0.670			
7/23/74	2400.	0.137	0.130			
7/24/74	300.	0.139	1.440			
7/24/74	1100.	0.402	0.480			
7/24/74	1510.	0.397	0.440			
7/25/74	910.	0.454	0.500			
7/25/74	1200.	0.431	0.480			
8/13/74	1115.	0.193	0.220	5.7	14.00	1.60
9/10/74	1210.	0.100	0.134	6.1	12.20	
9/18/74	1200.	0.098	0.137	5.1		
9/18/74	1600.	0.088	0.131	5.2		
9/18/74	2000.	0.090	0.124	5.2		
9/18/74	2400.	0.103	0.143	5.1		
9/19/74	400.	0.113	0.151	5.1		
9/19/74	800.	0.114	0.155	5.1		
9/19/74	1200.	0.106	0.136	5.2		
9/19/74	1600.	0.089	0.130	5.1		
9/19/74	2000.	0.092	0.128	5.2		
9/19/74	2400.	0.095	0.134	5.3		
9/20/74	400.	0.109	0.151	5.3		
9/20/74	800.	0.110	0.149	5.7		
9/20/74	1200.	0.106	0.139	5.4		
9/20/74	1500.	0.091	0.130	5.5		

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk. meq/l
9/10/73						
10/ 2/73	1535.	14.60	3.80			
10/ 2/73	1535.					
11/ 7/73	1510.					
11/ 7/73	1510.	15.10	3.90	43.4		
12/ 5/73						
12/ 5/73						
12/ 5/73	1405.	17.30	3.60	27.9		0.90
1/ 8/74	1430.			67.0	9.6	0.50
3/ 5/74	1055.	13.60	3.60	31.9	4.3	0.41
4/ 2/74	1030.					
5/ 7/74	1035.	10.00	3.20	20.1	7.9	0.48
6/11/74	1035.	11.20	3.80	18.8	6.6	0.62
7/ 9/74	1030.	18.00	3.80	49.7	12.2	0.12
7/23/74	1000.	14.20	3.20	20.6		
7/23/74	1200.			10.0		
7/23/74	1500.			30.7		
7/23/74	1800.			23.8		
7/23/74	2400.			19.8		
7/24/74	300.			21.2		
7/24/74	1100.			26.3		
7/24/74	1510.			20.8		
7/25/74	910.			15.7		
7/25/74	1200.			15.1		
8/13/74	1115.	15.60	3.60	29.8	3.0	0.59
9/10/74	1210.	11.40	2.80	29.1	6.0	0.61
9/18/74	1200.			15.7		
9/18/74	1600.			19.1		
9/18/74	2000.			15.9		
9/18/74	2400.			15.9		
9/19/74	400.			15.9		
9/19/74	800.			16.1		
9/19/74	1200.			23.7		
9/19/74	1600.			16.1		
9/19/74	2000.			16.7		
9/19/74	2400.			16.7		
9/20/74	400.			17.1		
9/20/74	800.			17.3		
9/20/74	1200.			17.1		
9/20/74	1500.			17.3		

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
10/ 8/74	1030.	0.009	0.005	0.004	0.01	1.02
11/ 5/74	1140.	0.041	0.008	0.033	0.04	1.40
11/12/74	100.	0.003	0.004	0.004	0.03	1.31
11/12/74	1700.	0.003	0.004	0.004	0.03	1.40
11/12/74	2100.	0.003	0.004	0.004	0.02	1.43
11/13/74	500.	0.003	0.004	0.004	0.04	1.34
11/13/74	900.	0.003	0.004	0.004	0.05	1.39
11/13/74	1300.	0.038	0.004	0.034	0.06	1.40
11/13/74	1700.	0.003	0.004	0.004	0.04	1.42
11/13/74	2100.	0.003	0.004	0.004	0.06	1.44
11/14/74	100.	0.003	0.004	0.004	0.05	1.42
11/14/74	500.	0.003	0.004	0.004	0.07	1.46
11/14/74	900.	0.003	0.004	0.004	0.04	1.42
11/14/74	1300.	0.003	0.004	0.004	0.07	1.44
11/14/74	1700.	0.003	0.004	0.004	0.03	1.30
11/14/74	2100.	0.003	0.004	0.004	0.03	1.32
11/15/74	100.	0.003	0.004	0.004	0.03	1.46
11/15/74	500.	0.011	0.004	0.007	0.04	1.32
11/15/74	900.	0.026	0.004	0.022	0.02	1.24
11/15/74	1100.	0.019	0.004	0.015	0.09	1.74
12/ 2/74	1220.	0.089	0.004	0.085	0.04	1.64
12/10/74	1245.	0.042	0.004	0.038	0.05	1.01
1/ 7/75	1330.	0.027	0.004	0.023	0.06	1.16
2/ 4/75	1040.	0.012	0.008	0.004	0.06	1.12
3/ 4/75	1245.	0.045	0.004	0.041	0.10	0.97
4/ 8/75	1345.	0.021	0.004	0.017	0.11	0.79
5/ 6/75	1123.	0.028	0.004	0.024	0.03	1.31
6/ 3/75	1100.	0.003	0.004	0.004	0.02	1.00
6/12/75	1300.	0.038	0.004	0.034	0.01	1.38
6/26/75	1800.		0.005		0.01	1.15
6/26/75	2400.		0.004		0.02	1.06
6/27/75	600.		0.005		0.05	1.14
6/27/75	1200.		0.005		0.04	1.26
6/27/75	1800.		0.006		0.04	1.28
6/27/75	2400.		0.006		0.02	1.32
6/28/75	600.		0.006		0.02	1.42
6/28/75	1200.		0.007		0.04	1.51
6/28/75	1800.		0.009		0.21	2.13
6/28/75	2400.		0.009		0.03	1.41
6/29/75	600.		0.008		0.03	1.62

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO4 mg/l	T-PO4 mg/l	SiO2 mg/l	Na mg/l	K mg/l
10/ 8/74	1030.	0.104	0.129	3.4	11.00	2.00
11/ 5/74	1140.	0.059	0.093	4.3		
11/12/74	100.	0.079	0.099	6.9	14.00	1.80
11/12/74	1700.	0.069	0.094	6.7	14.00	1.60
11/12/74	2100.	0.072	0.096	6.8	14.00	1.70
11/13/74	500.	0.079		7.1	14.10	1.90
11/13/74	900.	0.083		7.1	14.30	1.90
11/13/74	1300.	0.080		7.1	14.20	1.90
11/13/74	1700.	0.074	0.098	7.0	14.50	1.80
11/13/74	2100.	0.073	0.099	7.0	14.40	1.90
11/14/74	100.	0.073	0.096	7.1	14.50	1.90
11/14/74	500.	0.070	0.097	7.1	14.40	1.90
11/14/74	900.	0.067	0.093	7.2	14.40	1.90
11/14/74	1300.	0.066	0.093	7.2	14.60	1.90
11/14/74	1700.	0.048	0.079	8.4	14.40	1.70
11/14/74	2100.	0.055	0.081	7.2	14.60	1.80
11/15/74	100.	0.077		7.7	14.90	1.80
11/15/74	500.	0.061	0.098	7.2	14.00	1.70
11/15/74	900.	0.049	0.098	5.7	13.20	1.60
11/15/74	1100.	0.056	0.110	5.5	15.50	1.70
12/ 2/74	1220.	0.030	0.073	3.9	17.00	3.20
12/10/74	1245.	0.070	0.096	6.1		
1/ 7/75	1330.	0.164	0.192	7.0		
2/ 4/75	1040.	0.002	0.129	3.1		
3/ 4/75	1245.	0.043	0.071	2.5		
4/ 8/75	1345.	0.009	0.039	1.8		
5/ 6/75	1123.	0.012	0.045	1.3		
6/ 3/75	1100.	0.002	0.034	2.4		
6/12/75	1300.	0.008	0.035	5.0		
6/26/75	1800.	0.500	0.574	4.0	9.10	2.90
6/26/75	2400.	0.499	0.533	4.1	10.60	3.00
6/27/75	600.	0.565	0.613	4.2	7.50	2.90
6/27/75	1200.	0.581	0.650	4.6	7.50	3.00
6/27/75	1800.	0.551	0.546	4.4	9.10	3.00
6/27/75	2400.	0.575	0.617	4.8	9.20	3.10
6/28/75	600.	0.650	0.671	5.1	9.70	3.30
6/28/75	1200.	0.663	0.768	5.4	11.50	3.20
6/28/75	1800.	0.557	0.666	5.8	12.40	3.70
6/28/75	2400.	0.626	1.039	5.3	11.30	3.30
6/29/75	600.	0.699	0.828	5.9	11.80	3.60

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
10/ 8/74	1030.	10.00	2.40	18.1	5.0	0.54
11/ 5/74	1140.			24.6	5.0	0.37
11/12/74	100.	5.30	2.30	27.3	5.0	0.44
11/12/74	1700.	2.20	1.80	42.7	5.0	0.22
11/12/74	2100.	5.60	2.90	35.0	5.0	0.22
11/13/74	500.	6.00	2.30	27.3	5.0	0.42
11/13/74	900.	1.20	1.60	27.3	5.0	0.46
11/13/74	1300.	4.30	2.10	32.4	5.0	0.34
11/13/74	1700.	6.40	2.70	36.3	5.0	0.18
11/13/74	2100.	3.60	1.90	45.2	5.0	0.10
11/14/74	100.	2.90	1.30	74.7	5.0	0.10
11/14/74	500.	6.30	2.30	38.8	5.0	0.18
11/14/74	900.	1.20	1.40	33.7	5.0	0.32
11/14/74	1300.	7.70	2.20	32.4	5.0	0.38
11/14/74	1700.	2.20	1.50	28.6	5.0	0.42
11/14/74	2100.	5.50	2.90	58.1	5.0	0.10
11/15/74	100.	2.60	1.60	32.4	5.0	0.10
11/15/74	500.	8.70	2.80	26.0	5.0	0.50
11/15/74	900.	5.90	2.90	36.3	5.0	0.22
11/15/74	1100.	1.20	1.30	26.0	5.0	0.42
12/ 2/74	1220.	22.80	4.20	18.6	11.1	0.98
12/19/74	1245.			86.3	10.8	0.10
1/ 7/75	1330.			67.4	5.7	0.56
2/ 4/75	1040.			33.0	5.0	0.70
3/ 4/75	1245.			31.7	15.9	0.86
4/ 8/75	1345.			25.4	18.0	0.84
5/ 6/75	1123.			25.2	18.2	0.28
6/ 3/75	1100.			18.1	9.5	0.36
6/12/75	1300.			17.8	9.8	0.52
6/26/75	1800.	8.50	1.90	13.3	6.9	0.42
6/26/75	2400.	8.80	2.10	13.7	6.9	0.45
6/27/75	600.	9.50	2.10	14.7	6.9	0.37
6/27/75	1200.	9.90	2.20	13.5	5.7	0.39
6/27/75	1800.	9.90	2.30	13.5	5.4	0.45
6/27/75	2400.	11.30	2.30	14.7	5.7	0.45
6/28/75	600.	9.50	2.60	17.9	5.4	0.44
6/28/75	1200.	8.80	2.60	14.9	5.7	0.56
6/28/75	1800.	8.80	2.60	16.5	5.9	0.63
6/28/75	2400.	9.20	2.60	14.7	5.4	0.63
6/29/75	600.	10.20	2.90	15.7	5.9	0.69

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
7/15/75	950.	0.179	0.004	0.175	0.01	1.17
7/24/75	1500.	0.095	0.005	0.090	0.02	1.40
7/24/75	2100.	0.013	0.005	0.008	0.02	1.66
7/25/75	300.	0.028	0.006	0.022	0.02	1.55
7/25/75	900.		0.007		0.04	1.54
7/25/75	1500.	0.014	0.006	0.008	0.02	1.48
7/25/75	2100.	0.173	0.009	0.164	0.04	1.37
7/26/75	300.	0.077	0.006	0.071	0.04	1.57
7/26/75	900.	0.040	0.006	0.034	0.02	1.48
7/26/75	1500.	0.009	0.007	0.004	0.03	1.47
7/26/75	2100.	0.016	0.007	0.009	0.02	1.35
7/27/75	300.	0.132	0.006	0.126	0.02	1.41
7/27/75	900.	0.009	0.006	0.004	0.01	1.54
7/27/75	1500.	0.012	0.006	0.006	0.03	
8/12/75	1050.	0.011	0.004	0.007	0.06	1.45
9/12/75	930.	0.004	0.004	0.004	0.01	1.37
9/19/75	1200.	0.007	0.007	0.004	0.04	1.50
9/19/75	1800.	0.009	0.008	0.004	0.09	1.44
9/19/75	2400.	0.007	0.007	0.004	0.05	1.47
9/20/75	600.	0.010	0.008	0.004	0.03	1.52
9/20/75	1200.	0.011	0.007	0.004	0.03	1.29
9/20/75	1800.	0.012	0.008	0.004	0.08	1.26
9/20/75	2400.	0.007	0.009		0.03	1.29
9/21/75	600.	0.007	0.007	0.004	0.01	1.35
9/21/75	1200.	0.006	0.006	0.004	0.01	1.28
9/21/75	1800.	0.006	0.008		0.03	1.26
9/21/75	2400.	0.005	0.007		0.02	1.27
9/22/75	600.	0.005	0.007		0.01	1.34
9/22/75	1200.	0.009	0.009	0.004	0.07	1.34
10/16/75	1200.	0.167	0.008	0.159	0.04	1.24
10/16/75	1800.	0.011	0.008	0.004	0.02	1.26
10/16/75	2400.	0.004	0.008	0.004	0.01	1.29
10/17/75	600.	0.016	0.007	0.009	0.01	1.29
10/17/75	1200.	0.005	0.007		0.01	1.62
10/17/75	1800.	0.013	0.007	0.006	0.06	1.32
10/17/75	2400.	0.007	0.007	0.004	0.01	1.33
10/18/75	600.	0.009	0.008	0.004	0.02	1.36
10/18/75	1200.	0.020	0.007	0.013	0.02	1.31
10/18/75	1800.	0.081	0.008	0.073	0.01	1.20
10/18/75	2400.	0.010	0.008	0.004	0.05	1.18

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO4 mg/l	T-PO4 mg/l	SiO2 mg/l	Na mg/l	K mg/l
7/15/75	950.	0.183	0.273	5.6		
7/24/75	1500.	0.159	0.211	5.6	12.15	1.37
7/24/75	2100.	0.157	0.236	5.3	12.15	1.39
7/25/75	300.	0.154	0.232	5.1	11.51	1.39
7/25/75	900.	0.177	0.244	5.2	11.83	1.78
7/25/75	1500.	0.154	0.211	5.3	13.11	1.33
7/25/75	2100.	0.149	0.201	5.4	13.11	1.22
7/26/75	300.	0.171	0.223	5.2	12.95	1.26
7/26/75	900.	0.168	0.224	5.1	12.79	1.48
7/26/75	1500.	0.137	0.179	5.3	12.63	1.43
7/26/75	2100.	0.132	0.183	5.4	13.11	1.41
7/27/75	300.	0.156	0.207	5.3	13.27	1.45
7/27/75	900.	0.157	0.213	5.2	13.75	1.35
7/27/75	1500.	0.132	0.201	5.3	13.59	1.28
9/12/75	1050.	0.104	0.159	2.8		
9/12/75	930.	0.062	0.128	4.8		
9/19/75	1200.	0.106	0.136	4.6		
9/19/75	1800.	0.107	0.128	4.7		
9/19/75	2400.	0.109	0.139	4.9		
9/20/75	600.	0.106	0.145	5.0		
9/20/75	1200.	0.093	0.125	5.0		
9/20/75	1800.	0.096	0.122	5.2		
9/20/75	2400.	0.131	0.166	5.2		
9/21/75	600.	0.121	0.165	5.0		
9/21/75	1200.	0.096	0.127	5.0		
9/21/75	1800.	0.102	0.129	5.0		
9/21/75	2400.	0.102	0.141	5.0		
9/22/75	600.	0.106	0.143	5.0		
9/22/75	1200.	0.102	0.140	5.3		
10/16/75	1200.	0.072	0.110	4.0		
10/16/75	1800.	0.067	0.107	4.0		
10/16/75	2400.	0.080	0.121	3.9		
10/17/75	600.	0.089	0.132	3.8		
10/17/75	1200.	0.077	0.119	3.8		
10/17/75	1800.	0.084	0.125	3.8		
10/17/75	2400.	0.088	0.127	3.7		
10/18/75	600.	0.106	0.176	3.7		
10/18/75	1200.	0.096	0.140	3.6		
10/18/75	1800.	0.085	0.135	3.8		
10/18/75	2400.	0.101	0.149	3.8		

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
7/15/75	950.			26.3	8.8	0.59
7/24/75	1500.	14.27	3.32	23.2	7.4	0.57
7/24/75	2100.	14.10	3.41	22.7	7.1	0.54
7/25/75	300.	13.58	3.48	23.2	6.6	0.51
7/25/75	900.	14.44	3.41	24.1	8.6	0.50
7/25/75	1500.	13.93	3.41	24.1	7.9	0.50
7/25/75	2100.	13.93	3.35	32.3	6.6	0.46
7/26/75	300.	14.61	3.51	25.5	8.4	0.50
7/26/75	900.	15.29	3.57	26.5	7.9	0.56
7/26/75	1500.	15.29	3.57	26.6	7.4	0.56
7/26/75	2100.	14.78	3.54	28.3	7.9	0.55
7/27/75	300.	14.95	3.64	27.0	8.6	0.55
7/27/75	900.	14.61	3.57	26.9	8.1	0.56
7/27/75	1500.	14.61	3.57	27.4	8.6	0.54
8/12/75	1050.			21.5	5.0	0.78
9/12/75	930.			26.6		0.62
9/19/75	1200.			23.6		0.43
9/19/75	1800.			23.6		0.42
9/19/75	2400.			24.6		0.48
9/20/75	600.			24.6		0.48
9/20/75	1200.			28.3		0.35
9/20/75	1800.			38.5		0.38
9/20/75	2400.			24.6		0.48
9/21/75	600.			27.7		0.40
9/21/75	1200.			39.3		0.25
9/21/75	1800.			23.6		0.45
9/21/75	2400.			24.6		0.48
9/22/75	600.			27.5		0.45
9/22/75	1200.			26.1		0.45
10/16/75	1200.			31.7	5.0	0.57
10/16/75	1800.			27.7	5.0	0.58
10/16/75	2400.			27.5	5.0	0.57
10/17/75	600.			28.1	5.0	0.56
10/17/75	1200.			27.1	5.0	0.45
10/17/75	1800.			29.4	5.0	0.42
10/17/75	2400.			27.3	5.0	0.41
10/18/75	600.			27.5	5.0	0.39
10/18/75	1200.			27.1	5.0	0.43
10/18/75	1800.			29.4	5.0	0.42
10/18/75	2400.			31.7	5.0	0.35

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
10/19/75	600.	0.008	0.008	0.004	0.01	1.22
10/19/75	1200.	0.065	0.006	0.059	0.01	1.24
10/28/75	1220.	0.014	0.004	0.010	0.01	0.79
11/13/75	1200.	0.004	0.004	0.004	0.02	1.49
11/13/75	1800.	0.005	0.004	0.004	0.02	1.50
11/13/75	2400.	0.007	0.004	0.004	0.02	1.47
11/14/75	600.	0.005	0.004	0.004	0.01	1.16
11/14/75	1200.	0.004	0.004	0.004	0.01	1.23
11/14/75	1800.	0.004	0.004	0.004	0.01	1.23
11/14/75	2400.	0.006	0.004	0.004	0.01	1.21
11/15/75	600.	0.023	0.004	0.019	0.02	1.44
11/15/75	1200.	0.010	0.004	0.006	0.01	1.19
11/15/75	1800.	0.015	0.004	0.011	0.01	1.13
11/15/75	2400.	0.037	0.004	0.033	0.01	1.17
11/16/75	600.	0.007	0.004	0.004	0.01	1.19
11/16/75	1200.	0.011	0.004	0.007	0.05	1.05
11/18/75	1020.	0.011	0.004	0.007	0.04	1.34
2/18/76	1248.	0.009	0.004	0.005	0.03	1.27
5/11/76	1242.	0.004	0.008	0.004	0.04	1.83
6/11/76	1145.	< 0.004	0.004	< 0.004	< 0.01	1.08
6/15/76	1345.	0.233	0.007	0.226	0.02	1.46
6/16/76	1020.	0.009	0.007	< 0.004	0.03	1.35
6/17/76	1105.		0.010	< 0.004	0.02	1.37
6/18/76	1135.	0.008	0.010		0.02	1.25
6/22/76	1220.	0.032	0.011	0.021	0.23	1.45
7/ 2/76		0.017	0.008	0.009	< 0.13	1.69
7/ 9/76	1200.	0.009	0.008	< 0.004	< 0.13	1.52
7/16/76	1130.	0.159	0.009	0.150	0.03	1.54
7/20/76	1205.	0.015	0.007	0.008	0.03	1.62
7/23/76	1220.	< 0.008	0.006	< 0.008	0.03	1.31
7/30/76	1200.	< 0.004	0.006	< 0.004	0.06	1.54
8/ 6/76	1230.	0.005	0.007		0.06	1.53
8/13/76	1120.	0.006	< 0.004	< 0.004	0.02	1.29
8/16/76	1430.	0.004	0.006		0.02	1.14
8/17/76	1400.	0.012	0.008	< 0.004	0.02	1.05
8/18/76	1115.	0.006	0.008		< 0.01	1.15
8/19/76	1350.	0.027	0.008	0.019	0.04	1.06
8/20/76	1215.	0.014	0.009	0.005	< 0.01	1.16
8/24/76	1200.	0.007	0.006	0.004	0.01	1.72
8/27/76	1230.	0.012	0.011	< 0.004	< 0.01	1.67

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO4 mg/l	$T-PO_4$ mg/l	SiO_2 mg/l	Na mg/l	K mg/l
10/19/75	600.	0.099	0.142	3.6		
10/19/75	1200.	0.076	0.121	3.6		
10/28/75	1220.	0.064	0.096	3.7		
11/13/75	1200.	0.122	0.157	4.0		
11/13/75	1800.	0.126	0.154	3.6		
11/13/75	2400.	0.102	0.123	3.7		
11/14/75	600.	0.092	0.120	3.8		
11/14/75	1200.	0.083	0.110	3.6		
11/14/75	1800.	0.080	0.114	3.7		
11/14/75	2400.	0.083	0.113	3.7		
11/15/75	600.	0.089	0.114	4.0		
11/15/75	1200.	0.070	0.100	3.8		
11/15/75	1800.	0.065	0.092	3.8		
11/15/75	2400.	0.060	0.084	3.9		
11/16/75	600.	0.065	0.093	3.7		
11/16/75	1200.	0.071	0.099	3.8		
11/18/75	1020.	0.043	0.072	4.1		
2/10/76	1248.	0.073	0.116	1.2		
5/11/76	1242.	0.016	0.091	1.1		
6/11/76	1145.	0.203	0.275	3.9	7.63	2.39
6/15/76	1345.	0.345	0.406		9.68	2.96
6/16/76	1020.	0.350	0.420		13.14	3.53
6/17/76	1105.	0.346	0.426		9.68	2.85
6/18/76	1135.	0.322	0.381	4.1		
6/22/76	1220.	0.160	0.316	1.2	10.31	0.30
7/ 2/76		0.214	0.276	4.4	11.71	0.21
7/ 9/76	1200.	0.170	0.226	3.7	12.45	0.23
7/16/76	1130.	0.163	0.214	1.5	12.62	0.09
7/20/76	1205.	0.133	0.192	4.3	12.40	0.07
7/23/76	1225.	0.132	0.194	4.2	11.86	0.17
7/30/76	1200.	0.117	0.160	4.9	11.85	0.90
8/ 6/76	1230.	0.115	0.143	4.9	10.55	0.54
8/13/76	1125.	0.082	0.124	4.0	11.29	0.73
8/16/76	1430.	0.136	0.165	3.7	8.94	1.56
8/17/76	1400.	0.160	0.244	4.0	9.59	1.85
8/18/76	1115.	0.234	0.267	4.2	7.32	2.02
8/19/76	1050.	0.207	0.273	4.4	9.59	2.08
8/20/76	1215.	0.203	0.291	5.3	9.24	2.14
8/24/76	1200.	0.238	0.293	6.3	11.03	1.71
8/27/76	1230.	0.166	0.224	7.3	12.29	1.24

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
10/19/75	600.			29.8	5.0	0.34
10/19/75	1200.			27.7	5.0	0.31
10/28/75	1220.			28.8	5.0	0.64
11/13/75	1200.			31.3	5.0	0.47
11/13/75	1800.			26.5	5.0	0.47
11/13/75	2400.			25.3	5.0	0.47
11/14/75	600.			26.5	5.0	0.52
11/14/75	1200.			26.3	5.0	0.50
11/14/75	1800.			28.2	5.0	0.48
11/14/75	2400.			26.1	5.6	0.48
11/15/75	600.			31.0	5.6	0.36
11/15/75	1200.			24.7	5.3	0.46
11/15/75	1800.			26.5	5.0	0.46
11/15/75	2400.			25.1	5.1	0.45
11/16/75	600.			29.2	9.3	0.48
11/16/75	1200.			26.3	5.6	0.55
11/18/75	1020.			29.0	5.8	0.50
2/10/76	1248.			48.5	9.0	0.61
5/11/76	1242.			19.9		0.48
6/11/76	1145.	7.64	2.00	19.9	< 5.0	0.33
6/15/76	1345.	10.86		19.1		0.54
6/16/76	1020.	12.11		18.9		0.46
6/17/76	1105.	11.75		18.5		0.52
6/18/76	1135.			18.4	< 5.0	0.89
6/22/76	1220.	14.20	3.20	20.0	5.8	0.67
7/ 2/76		14.44	3.68	22.5	6.2	0.78
7/ 9/76	1200.	12.27	2.83	23.3	6.2	0.71
7/16/76	1130.	12.28	2.92	18.7	13.5	0.57
7/20/76	1205.	14.72	2.71	19.5	9.5	0.69
7/23/76	1220.	12.08	2.40	20.6	6.0	0.55
7/30/76	1200.	13.04	3.25	25.6	< 5.0	0.44
8/ 6/76	1230.	13.03	2.87	33.6	5.4	0.55
8/13/76	1120.	10.25	2.32	20.5	10.9	0.54
8/16/76	1430.	9.44	2.07	18.1	< 5.0	0.46
8/17/76	1400.	8.63	2.03	16.9	7.9	0.43
8/18/76	1115.	10.09	2.11	14.9	8.1	0.37
8/19/76	1350.	8.96	2.19	17.5	10.9	0.51
8/20/76	1215.	10.38	2.37	18.7	8.9	0.24
8/24/76	1200.	10.70	2.20	20.1	9.4	0.55
8/27/76	1230.	11.67	2.73	23.8	7.7	0.54

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
9/ 3/76	1215.	0.017	0.007	0.010	0.02	1.29
9/10/76	1230.	< 0.004	0.006	< 0.004	0.01	1.36
9/17/76	1230.	0.017	0.006	0.011	0.04	1.19
9/21/76	1210.	0.011	0.005	0.006	0.02	1.22
9/24/76	1245.	< 0.004	0.006	< 0.004	< 0.01	1.02
10/ 1/76	1145.	0.009	0.004	0.005	< 0.01	0.96
10/ 8/76	1335.	0.006	0.006	< 0.004	0.02	3.03
10/11/76	1435.	0.062	0.006	0.056	< 0.01	2.27
10/12/76	1140.	0.011	0.006	0.005	0.01	0.99
10/13/76	1015.	0.008	0.004	0.004	0.06	2.68
10/14/76	1100.	0.009	0.004	0.005	0.02	2.67
10/15/76	1130.	0.007	< 0.004	< 0.004	0.02	1.41
10/19/76	1200.	0.011	0.004	0.007	0.01	1.09

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	$O-PO_4$ mg/l	$T-PO_4$ mg/l	SiO_2 mg/l	Na mg/l	K mg/l
9/ 3/76	1215.	0.161	0.188	6.9	13.39	1.03
9/10/76	1230.	0.209	0.249	4.9	< 3.05	1.13
9/17/76	1230.	0.136	0.148		10.30	1.05
9/21/76	1215.	0.099	0.149	4.3	10.96	0.80
9/24/76	1245.	0.116	0.156	5.8	11.85	0.82
10/ 1/76	1145.	0.121	0.176	5.7	3.64	2.13
10/ 8/76	1335.	0.108	0.158	5.0	12.24	2.09
10/11/76	1435.	0.103	0.161	5.3	14.47	2.83
10/12/76	1140.	0.101	0.138	5.4	15.58	2.98
10/13/76	1315.	0.095	0.124	5.3	15.11	2.87
10/14/76	1100.	0.084	0.120	5.4	14.66	2.61
10/15/76	1130.	0.097	0.112	5.2	14.72	2.60
10/19/76	1230.	0.076	0.115	6.1	15.92	2.43

APPENDIX C-1 (Continued)

Date Mo/Day/Yr	Time Hour/Min	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
9/ 3/76	1215.	11.50	2.84	22.4	8.0	0.80
9/10/76	1230.	9.87	2.43	20.3	9.1	0.53
9/17/76	1230.	11.51	2.28	21.3	< 5.0	0.60
9/21/76	121[illegible].	12.12	2.31	19.8	6.1	0.42
9/24/76	1245.	10.87	2.32	19.5	9.5	0.48
10/ 1/76	1145.	10.54	2.45	23.6	< 5.0	0.46
10/ 8/76	1335.	11.02	2.61	26.7	< 5.0	0.63
10/11/76	1435.	14.83	2.91	28.1	5.1	0.67
10/12/76	114[illegible].	13.24	2.78	28.6	5.1	0.60
10/13/76	1015.	12.77	3.21	28.4	< 5.0	0.57
10/14/76	1100.	12.29	2.20	27.7	< 5.0	0.74
10/15/76	1130.	13.10	2.89	32.5	6.1	0.60
10/19/76	1200.	17.19	3.10	32.5	5.0	0.78

APPENDIX C. LABORATORY RESULTS FOR SAMPLING DATES

2. SOUTH BRIDGE STATION

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
5/ 7/74	1600.	0.018	0.004	0.014	0.20	1.44
5/11/74	1530.	0.022	0.004	0.018	0.02	8.11
7/ 9/74	1530.	0.017	0.006	0.011	0.03	1.10
7/23/74	640.	0.003	0.004	0.004	0.01	
7/23/74	1200.	0.016	0.004	0.012	0.06	1.32
7/23/74	1600.	0.009	0.005	0.004	0.05	1.56
7/23/74	2100.	0.009	0.005	0.004	0.01	
7/23/74	2400.	0.009	0.005	0.004	0.01	1.49
7/24/74	300.	0.008	0.004	0.004	0.03	
7/24/74	600.	0.008	0.004	0.004	0.03	
7/24/74	900.	0.010	0.004	0.006	0.03	
7/24/74	1200.	0.009	0.005	0.004	0.02	1.11
7/24/74	1500.	0.009	0.005	0.004	0.03	1.37
7/24/74	1600.	0.008	0.004	0.004	0.02	
7/24/74	2100.	0.008	0.004	0.004	0.03	
7/24/74	2400.	0.103	0.004	0.099	0.03	
7/25/74	930.	0.023	0.005	0.018	0.02	1.46
7/25/74	1205.	0.009	0.005	0.004	0.02	1.44
8/13/74	1630.	0.012	0.004	0.008	0.06	0.93
9/13/74	1630.	0.014	0.004	0.010	0.05	1.46
9/16/74	1030.	0.014	0.004	0.010	0.05	
9/16/74	1400.	0.020	0.004	0.016	0.02	
9/16/74	1600.	0.003	0.004	0.004	0.02	
9/16/74	2200.	0.024	0.004	0.020	0.01	
9/17/74	200.	0.015	0.004	0.011	0.02	
9/17/74	600.	0.003	0.004	0.004	0.01	
9/17/74	1600.	0.010	0.004	0.006	0.01	
9/17/74	2200.	0.003	0.004	0.004	0.01	
9/18/74	200.	0.003	0.004	0.004	0.01	
9/18/74	600.	0.003	0.004	0.004	0.01	
9/18/74	1000.	0.003	0.004	0.004	0.01	
9/18/74	1400.	0.021	0.004	0.017	0.01	
9/18/74	1300.	0.061	0.004	0.057	0.01	
9/18/74	2200.	0.008	0.004	0.004	0.02	
9/19/74	200.	0.003	0.004	0.004	0.04	
9/19/74	500.	0.270	0.004	0.266	0.01	
9/19/74	1000.	0.009	0.005	0.004	0.03	
9/19/74	1400.	0.143	0.004	0.139	0.04	
10/ 8/74	1600.	0.038	0.005	0.033	0.01	0.98
10/17/74	1445.					

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
5/ 7/74	1600.	0.046	0.152	4.6	28.00	0.40
6/11/74	1530.	0.515	0.660	2.3	29.00	2.30
7/ 9/74	1530.	0.688	0.740	0.4	11.90	4.10
7/23/74	840.	0.300	0.408		12.00	3.90
7/23/74	1200.	0.960	1.040			
7/23/74	1800.	0.555	0.620			
7/23/74	2100.	0.730	0.830			
7/23/74	2400.	0.660	0.820			
7/24/74	300.	0.690	0.760			
7/24/74	600.	0.650				
7/24/74	900.	0.560	0.590			
7/24/74	1200.	0.484	0.650			
7/24/74	1500.	0.508	0.630			
7/24/74	1800.	0.520	0.680			
7/24/74	2100.	0.544	0.690			
7/24/74	2400.	0.572	0.650			
7/25/74	930.	0.536	0.640			
7/25/74	1205.	0.536	0.680			
8/13/74	1600.	0.297	0.360	7.7	13.00	2.60
9/10/74	1630.	0.090	0.233	6.1	13.00	
9/16/74	1030.	0.353	0.446	3.3		
9/16/74	1400.	0.185	0.331	6.8		
9/16/74	1800.	0.195	0.279	6.6		
9/16/74	2200.	0.236	0.311	7.2		
9/17/74	200.	0.226	0.309	7.3		
9/17/74	600.	0.225	0.298	7.1		
9/17/74	1800.	0.197	0.255	5.3		
9/17/74	2200.	0.208	0.278	5.4		
9/18/74	200.	0.214	0.285	5.5		
9/18/74	600.	0.222	0.291	5.5		
9/18/74	1000.	0.218	0.311	5.7		
9/18/74	1400.	0.202	0.249	4.5		
9/18/74	1800.	0.180	0.229	5.6		
9/18/74	2200.	0.180	0.238	5.5		
9/19/74	200.	0.206	0.248	5.6		
9/19/74	600.	0.209	0.259	5.7		
9/19/74	1000.	0.199	0.257	5.9		
9/19/74	1400.	0.200	0.249	5.8		
10/ 8/74	1600.		0.183	2.6	10.00	1.90
10/17/74	1445.					

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
5/ 7/74	1600.	27.80	4.20	94.3	5.7	0.44
6/11/74	1530.	26.00	4.20	60.1	10.3	1.52
7/ 9/74	1530.	16.00	3.80	25.7	7.2	0.10
7/23/74	840.	14.20	3.30	11.9		
7/23/74	1200.			17.9		
7/23/74	1800.			23.8		
7/23/74	2100.			16.9		
7/23/74	2400.			19.0		
7/24/74	300.			15.9		
7/24/74	600.			21.8		
7/24/74	900.			18.8		
7/24/74	1200.			14.3		
7/24/74	1500.			14.9		
7/24/74	1800.			14.9		
7/24/74	2100.			14.5		
7/24/74	2400.			16.3		
7/25/74	930.			18.8		
7/25/74	1205.			16.3		
8/13/74	1600.	14.60	3.40	29.8	3.0	0.85
9/10/74	1630.	11.80	3.10	26.1	6.0	0.74
9/16/74	1030.			17.9		0.10
9/16/74	1400.			17.7		
9/16/74	1800.			17.3		
9/16/74	2200.			19.1		
9/17/74	200.			19.3		
9/17/74	600.			19.1		
9/17/74	1800.			18.9		
9/17/74	2200.			19.1		
9/18/74	200.			19.5		
9/18/74	600.			19.9		
9/18/74	1000.			20.7		
9/18/74	1400.			19.9		
9/18/74	1800.			20.1		
9/18/74	2200.			20.9		
9/19/74	200.			35.1		
9/19/74	600.			20.1		
9/19/74	1000.			20.3		
9/19/74	1400.			13.9		
10/ 8/74	1600.	7.70	2.00	13.6	5.0	0.44
10/17/74	1445.					

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
10/17/74	1445.	0.024	0.004	0.020	0.01	0.68
10/17/74	1445.					
11/ 5/74	1615.	0.022	0.008	0.014	0.01	1.14
11/ 7/74	1800.	0.003	0.004	0.004	0.01	1.32
11/ 7/74	2400.	0.003	0.004	0.004	0.01	1.31
11/ 8/74	600.	0.003	0.004	0.004	0.01	0.99
11/ 8/74	1200.	0.003	0.004	0.004	0.01	1.18
11/ 8/74	1800.	0.003	0.004	0.004	0.01	1.12
11/ 8/74	2400.	0.003	0.004	0.004	0.01	1.52
11/ 9/74	600.	0.003	0.004	0.004	0.01	1.14
11/ 9/74	1200.	0.003	0.004	0.004	0.02	1.06
11/ 9/74	1800.	0.003	0.004	0.004	0.01	1.09
11/10/74	600.	0.003	0.004	0.004	0.02	1.05
11/10/74	1200.	0.003	0.004	0.004	0.02	1.02
11/10/74	1800.	0.101	0.004	0.097	0.01	1.13
11/10/74	2400.	0.003	0.004	0.004	0.01	1.06
11/11/74	600.	0.003	0.004	0.004	0.01	1.03
11/11/74	1200.	0.003	0.004	0.004	0.03	1.08
12/10/74	1700.	0.255	0.004	0.251	0.05	0.57
1/ 9/75	1420.	0.013	0.004	0.009	0.10	0.83
2/ 6/75	1230.	0.018	0.009	0.009	0.05	0.79
3/ 5/75	1210.	0.016	0.004	0.012	0.03	0.73
4/ 8/75	940.	0.043	0.007	0.036	0.12	0.74
6/11/75	1100.	0.025	0.006	0.019	0.02	2.26
6/12/75	1510.	0.011	0.007	0.004	0.01	2.12
6/18/75	1530.		0.009		0.01	1.91
6/19/75	1030.		0.007		0.01	2.11
6/24/75	1800.		0.004			0.98
6/24/75	2400.		0.004		0.08	0.94
6/25/75	600.		0.004		0.08	1.01
6/25/75	1200.		0.004		0.07	1.05
6/25/75	1800.		0.004		0.17	1.04
6/25/75	2400.		0.004		0.18	1.10
6/26/75	600.		0.004		0.12	1.10
6/26/75	600.		0.006		0.10	1.52
6/26/75	1200.		0.004		0.16	1.25
6/26/75	1200.		0.006		0.12	1.43
6/26/75	1800.		0.004		0.21	1.25
6/26/75	2400.		0.004		0.15	1.34
7/15/75	1440.	0.025	0.012	0.013	0.01	1.33

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
10/17/74	1445.	0.192	0.210	2.2	9.90	1.70
10/17/74	1445.					
11/ 5/74	1615.	0.082	0.104	2.4		
11/ 7/74	1800.	0.066	0.077	2.7	12.70	0.70
11/ 7/74	2400.	0.061	0.070	2.8	12.90	0.60
11/ 8/74	600.	0.053	0.069	2.8	12.50	0.60
11/ 8/74	1200.	0.058	0.077	3.1	12.50	0.70
11/ 8/74	1800.	0.049	0.070	2.7	12.90	0.70
11/ 8/74	2400.	0.045	0.075	3.1	12.70	0.60
11/ 9/74	600.	0.049	0.063	3.1	12.40	0.50
11/ 9/74	1200.	0.053	0.072	2.8	12.70	0.60
11/ 9/74	1800.	0.050	0.065	3.0	12.50	0.50
11/10/74	600.	0.051	0.063	2.9	12.60	0.50
11/10/74	1200.	0.058	0.076	2.9	12.90	0.60
11/10/74	1800.	0.057	0.085	2.8	12.70	0.80
11/10/74	2400.	0.043	0.054	3.1	13.00	0.50
11/11/74	600.	0.052	0.064	3.0	15.60	0.60
11/11/74	1200.	0.056	0.065	2.9	12.90	0.60
12/10/74	1700.	0.040	0.052	3.9		
1/ 9/75	1420.	0.058	0.069	3.2		
2/ 6/75	1230.	0.058	0.091	3.5		
3/ 5/75	1210.	0.055	0.079	6.4		
4/ 8/75	940.	0.032	0.072	1.5		
6/11/75	1100.	0.520	0.547	8.5		
6/12/75	1510.	0.410	0.438	12.3		
6/18/75	1530.	0.224	0.295	5.8	35.99	4.10
6/19/75	1030.	0.277	0.381	5.7	35.10	4.40
6/24/75	1800.		0.292	3.7	11.40	1.90
6/24/75	2400.	0.205	0.286	3.7	10.70	2.00
6/25/75	600.	0.223	0.300	3.8	11.30	1.90
6/25/75	1200.	0.199	0.284	4.0	11.60	2.00
6/25/75	1800.	0.202	0.254	4.3	12.00	2.00
6/25/75	2400.	0.209	0.259	4.3	11.70	2.10
6/26/75	000.	0.211	0.286	4.4	11.10	2.00
6/26/75	600.	0.254	0.342	5.6	10.90	2.20
6/26/75	1200.	0.217	0.282	4.4	11.10	2.00
6/26/75	1200.	0.257	0.313	6.1	11.40	2.30
6/26/75	1800.	0.221	0.294	4.7	11.10	2.10
6/26/75	2400.	0.232	0.304	4.9	11.00	2.20
7/15/75	1440.	0.212	0.288	6.5		

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
10/17/74	1445.	10.00	2.40	16.8		0.48
10/17/74	1445.					
11/ 5/74	1615.			17.0	5.0	0.70
11/ 7/74	1800.	9.20	2.70	24.0	5.0	0.46
11/ 7/74	2400.	2.70	1.60	30.6	5.0	0.30
11/ 8/74	600.	8.50	2.60	22.7	5.0	0.48
11/ 8/74	1200.	8.50	2.70	39.7	5.0	0.12
11/ 8/74	1800.	2.00	1.60	20.1	5.0	0.52
11/ 8/74	2400.	8.20	2.70	29.3	5.0	0.32
11/ 9/74	600.	6.20	2.70	20.1	5.0	0.54
11/ 9/74	1200.	15.00	1.20	25.4	5.0	0.11
11/ 9/74	1800.	8.50	2.60	26.7	5.0	0.39
11/10/74	600.	8.40	2.70	25.4	5.0	0.31
11/10/74	1200.	8.40	2.60	43.6	5.0	0.39
11/10/74	1800.	8.40	2.60	35.8	5.0	4.00
11/10/74	2400.	9.00	2.70	24.0	5.0	0.41
11/11/74	600.	8.70	3.00	28.0	5.0	0.41
11/11/74	1200.	5.30	2.10	21.4	5.0	0.43
12/10/74	1700.			51.3	9.5	0.38
1/ 9/75	1420.			76.4	18.7	0.61
2/ 6/75	1230.			86.7	17.2	0.68
3/ 5/75	1210.			81.1	9.3	0.66
4/ 8/75	940.			111.2	18.0	0.85
6/11/75	1100.			70.6	15.4	0.61
6/12/75	1510.			66.6	14.3	0.65
6/18/75	1530.	21.10	5.50	71.2	10.5	1.04
6/19/75	1030.	23.00	5.90	73.4	11.5	1.09
6/24/75	1800.	7.80	1.70	20.3	7.9	0.29
6/24/75	2400.	7.40	1.80	19.2	7.4	0.28
6/25/75	600.	8.10	1.90	19.2	7.6	0.30
6/25/75	1200.	8.80	2.00	19.9	7.4	0.35
6/25/75	1800.	9.20	2.30	19.9	7.6	0.39
6/25/75	2400.	9.90	2.10	19.9	7.6	0.41
6/26/75	600.	9.90	2.20	19.4	6.4	0.40
6/26/75	600.	11.00	2.10	19.4	7.6	0.54
6/26/75	1200.	10.20	2.30	20.5	6.6	0.39
6/26/75	1200.	11.70	2.20	19.4	7.1	0.63
6/26/75	1800.	10.60	2.30	19.4	6.6	0.43
6/26/75	2400.	11.00	2.30	21.5	6.9	0.50
7/15/75	1440.			25.8	8.2	0.55

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NOx mg/l	NO_2 mg/l	NO_3 mg/l	NH4 mg/l	TKN mg/l
7/21/75	1300.	0.013	0.005	0.008	0.01	
7/21/75	1900.		0.027		0.01	
7/22/75	100.	0.043	0.008	0.035	0.01	
7/22/75	700.	0.006	0.006	0.004	0.01	
7/22/75	1300.	0.006	0.009		0.01	
7/22/75	1900.	0.006	0.006	0.004	0.01	1.48
7/23/75	100.	0.019	0.008	0.011	0.01	1.31
7/23/75	700.	0.055	0.015	0.040	0.01	1.26
7/23/75	1300.	0.018	0.008	0.010	0.02	1.39
7/23/75	1900.	0.014	0.007	0.007	0.04	1.27
7/24/75	100.	0.040	0.008	0.032	0.04	1.23
7/24/75	700.	0.017	0.008	0.009	0.02	1.37
7/24/75	1300.	0.018	0.007	0.011	0.03	
7/24/75		0.141	0.007	0.134	0.06	1.23
8/12/75	1515.	0.010	0.005	0.005	0.05	1.48
8/14/75	1315.	0.325	0.006	0.319	0.01	1.22
9/11/75	1140.	0.005	0.004	0.004	0.01	1.21
9/16/75	1200.	0.004	0.006	0.004	0.05	1.11
9/16/75	1800.	0.016	0.020		0.03	1.01
9/16/75	2400.	0.005	0.007		0.04	1.17
9/17/75	600.	0.010	0.008	0.004	0.06	1.10
9/17/75	1200.	0.004	0.007	0.004	0.01	1.09
9/17/75	1800.	0.016	0.010	0.006	0.11	1.08
9/17/75	2400.	0.005	0.007		0.04	1.15
9/18/75	600.	0.004	0.004	0.004	0.04	1.10
9/18/75	1200.	0.004	0.004	0.004	0.09	1.15
9/18/75	1800.	0.004	0.004	0.004	0.09	1.19
9/18/75	2400.	0.004	0.004	0.004	0.05	1.22
9/19/75	600.	0.004	0.004	0.004	0.05	1.15
9/19/75	1200.	0.064	0.004	0.060	0.06	1.19
10/13/75	1200.	0.004	0.006	0.004	0.07	1.10
10/13/75	1800.	0.009	0.010		0.10	1.07
10/13/75	2400.	0.009	0.006	0.004	0.09	1.10
10/14/75	600.	0.010	0.007	0.004	0.10	1.10
10/14/75	1200.	0.014	0.007	0.007	0.17	1.12
10/14/75	1800.	0.012	0.009	0.004	0.07	1.10
10/14/75	2400.	0.004	0.007	0.004	0.08	1.07
10/15/75	600.	0.006	0.005	0.004	0.05	1.03
10/15/75	1200.	0.004	0.004	0.004	0.04	0.99
10/15/75	1800.	0.013	0.006	0.007	0.08	1.03

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
7/21/75	1300.	0.229	0.273	7.6	12.47	2.08
7/21/75	1900.	0.229	0.307	7.7	12.95	1.99
7/22/75	100.	0.228	0.251	7.8	12.95	2.10
7/22/75	700.	0.221	0.269	8.0	12.95	2.01
7/22/75	1300.	0.221	0.280	7.9	13.91	2.08
7/22/75	1900.	0.214	0.271	8.2	13.27	2.31
7/23/75	100.	0.231	0.278	8.1	13.75	1.99
7/23/75	700.	0.233	0.279	7.3	13.75	2.08
7/23/75	1300.	0.233	0.278	7.6	13.75	2.14
7/23/75	1900.	0.214	0.266	7.6	16.95	1.93
7/24/75	100.	0.222	0.277	7.6	16.95	1.71
7/24/75	700.	0.226	0.281	7.6	17.59	1.86
7/24/75	1300.	0.224	0.271	8.0	17.11	1.78
7/29/75		0.220	0.264	6.3	11.73	1.59
8/12/75	1515.	0.179	0.236	7.4		
8/14/75	1315.	0.165	0.495	5.6		
9/11/75	1140.	0.173	0.225	4.5		
9/16/75	1200.	0.128	0.164	3.7		
9/16/75	1800.	0.139	0.180	3.8		
9/16/75	2400.	0.146	0.184	4.0		
9/17/75	600.	0.141	0.175	4.2		
9/17/75	1200.	0.127	0.166	4.3		
9/17/75	1800.	0.165	0.183	4.5		
9/17/75	2400.	0.152	0.195	4.5		
9/18/75	600.	0.143	0.187	4.7		
9/18/75	1200.	0.137	0.171	4.8		
9/18/75	1800.	0.136	0.176	5.0		
9/18/75	2400.	0.148	0.190	4.9		
9/19/75	600.	0.148	0.191	5.0		
9/19/75	1200.	0.120	0.159	5.1		
10/13/75	1200.	0.102	0.162	4.1		
10/13/75	1800.	0.121	0.158	4.0		
10/13/75	2400.	0.119	0.160	4.0		
10/14/75	600.	0.120	0.156	3.9		
10/14/75	1200.	0.121	0.158	3.8		
10/14/75	1800.	0.110	0.145	3.8		
10/14/75	2400.	0.117	0.152	3.6		
10/15/75	600.	0.148	0.200	3.6		
10/15/75	1200.	0.101	0.143	3.6		
10/15/75	1800.	0.106	0.147	3.5		

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO4 mg/l	Alk meq/l
7/21/75	1300.	16.31	3.41	24.9	6.1	0.57
7/21/75	1900.	16.31	3.48	26.6	5.9	0.60
7/22/75	100.	17.00	3.54	26.2	6.6	0.64
7/22/75	700.	16.31	3.57	26.6	5.9	0.63
7/22/75	1300.	15.29	3.54	28.7	6.9	0.55
7/22/75	1900.	15.63	3.64	28.1	6.4	0.61
7/23/75	100.	15.12	3.73	28.7	6.6	0.58
7/23/75	700.	15.80	3.86	28.2	6.1	0.64
7/23/75	1300.	15.63	3.86	28.6	6.1	0.59
7/23/75	1900.	15.29	3.73	28.7	5.9	0.57
7/24/75	100.	14.78	3.73	29.9	8.1	0.58
7/24/75	700.	14.61	3.67	29.9	6.4	0.58
7/24/75	1300.	14.61	3.80	29.1	8.4	0.59
7/29/75		12.20	2.21	23.1		0.44
8/12/75	1515.			18.7	5.1	0.63
8/14/75	1315.			17.5	8.2	0.36
9/11/75	1145.			30.5		0.59
9/16/75	1200.			20.7	7.3	0.64
9/16/75	1800.			22.1	7.5	0.63
9/16/75	2400.			22.5	8.5	0.69
9/17/75	600.			30.2	19.1	0.51
9/17/75	1200.			27.0	17.1	0.59
9/17/75	1800.			27.4	14.3	0.60
9/17/75	2400.			26.0	14.8	0.71
9/18/75	600.			26.2	12.5	0.69
9/18/75	1200.			26.2	17.3	0.51
9/18/75	1800.			24.9	15.1	0.53
9/18/75	2400.			33.0	18.6	0.30
9/19/75	600.			26.2	20.1	0.51
9/19/75	1200.			27.2	17.1	0.57
10/13/75	1200.			25.9	5.0	0.72
10/13/75	1800.			25.5	5.0	0.71
10/13/75	2400.			27.8	5.0	0.81
10/14/75	600.			25.9	5.0	0.96
10/14/75	1200.			27.2	5.0	1.02
10/14/75	1800.			26.3	5.0	0.10
10/14/75	2400.			25.3	5.0	0.10
10/15/75	600.			26.3	5.0	0.23
10/15/75	1200.			25.1	5.0	0.28
10/15/75	1800.			25.3	5.0	0.28

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NOx mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
10/15/75	2400.	0.005	0.006	0.004	0.01	1.03
10/16/75	600.	0.006	0.005	0.004	0.01	1.03
10/16/75	1200.	0.005	0.004	0.004	0.07	1.09
10/28/75	1635.	0.024	0.004	0.020	0.01	1.06
11/10/75	1200.	0.004	0.004	0.004	0.04	1.08
11/10/75	1800.	0.030	0.004	0.026	0.23	1.00
11/10/75	2400.	0.005	0.004	0.004	0.02	1.09
11/11/75	600.	0.004	0.004	0.004	0.02	1.06
11/11/75	1200.	0.006	0.004	0.004	0.02	1.06
11/11/75	1800.	0.006	0.004	0.004	0.03	1.05
11/11/75	2400.	0.012	0.004	0.008	0.04	1.02
11/12/75	600.	0.017	0.004	0.013	0.01	1.01
11/12/75	1200.	0.024	0.004	0.020	0.02	1.04
11/12/75	1800.	0.022	0.004	0.018	0.01	1.18
11/12/75	2400.	0.064	0.004	0.060	0.01	1.20
11/13/75	600.	0.412	0.004	0.408	0.02	0.96
11/13/75	1200.	0.018	0.005	0.013	0.02	1.23
11/19/75	1140.	0.014	0.006	0.008	0.01	0.88
6/ 3/76		0.011	0.007	< 0.004	0.06	
6/11/76	1310.	0.006	0.005	< 0.004	0.01	0.85
6/14/76	1500.	0.012	0.006	0.006	0.03	1.24
6/15/76	1300.	0.017	0.007	0.010	0.06	1.29
6/16/76	1125.	0.014	0.009	0.005	0.03	1.32
6/17/76	950.	0.041	0.009	0.032	0.03	1.33
6/18/76	1215.	0.017	0.010	0.007	0.03	1.79
6/25/76	1150.	0.064	0.010	0.054	< 0.01	1.63
7/ 2/76		0.014	0.009	0.005	< 0.13	1.39
7/ 9/76	1400.	0.023	0.008	0.015	0.17	1.31
7/16/76	1300.	< 0.004	0.006	< 0.004	0.02	1.29
7/23/76		0.024	0.006	0.018	< 0.01	1.25
7/30/76	1100.	0.026	0.007	0.019	0.03	1.33
8/ 6/76	1045.	0.017	0.006	0.011	0.03	1.57
8/13/76	1330.	0.022	< 0.004	0.018	< 0.01	1.33
8/16/76	1555.	0.014	0.006	0.008	0.02	1.08
8/17/76	1435.	0.017	0.008	0.009	< 0.01	1.14
8/18/76	1200.	0.014	0.007	0.007	< 0.01	1.11
8/19/76	1000.	0.017	0.008	0.009	0.02	1.11
8/20/76	1030.	0.021	0.007	0.014	< 0.01	1.16
8/27/76	1130.	0.038	0.011	0.027	< 0.01	1.18
9/ 3/76	1135.	0.026	0.007	0.019	< 0.01	1.21

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
10/15/75	2400.	0.116	0.157	3.7		
10/16/75	600.	0.139	0.150	3.5		
10/16/75	1230.	0.116	0.159	3.4		
10/22/75	1635.	0.080	0.102	2.7		
11/10/75	1200.	0.121	0.150	2.9		
11/10/75	1800.		0.175	2.7		
11/10/75	2400.	0.145	0.171	2.7		
11/11/75	600.	0.147	0.174	2.6		
11/11/75	1200.	0.138	0.165	2.6		
11/11/75	1800.	0.133	0.154	2.5		
11/11/75	2400.	0.142	0.167	2.5		
11/12/75	600.	0.149	0.177	2.6		
11/12/75	1200.	0.143	0.172	2.7		
11/12/75	1500.	0.132	0.159	2.7		
11/12/75	2400.	0.139	0.167	2.7		
11/13/75	600.	0.150	0.181	2.9		
11/13/75	1200.	0.151	0.180	2.9		
11/14/75	1140.	0.070	0.090	2.6		
6/ 3/76		0.297	0.309	6.9	18.11	4.86
6/11/76	1315.	0.230	0.270	4.1	6.51	2.43
6/14/76	1530.	0.336	0.397		7.95	3.21
6/15/76	1330.	0.298	0.357		8.73	3.10
6/16/76	1125.		0.330		8.42	3.43
6/17/76	955.	0.307	0.362		7.63	3.33
6/18/76	1215.	0.294	0.340	6.7		
6/25/76	1155.		0.292	7.0	8.88	0.32
7/ 2/76		0.226	0.314	6.3	11.21	0.20
7/ 9/76	1430.	0.167	0.209	4.8	10.63	0.21
7/16/76	1300.	0.250	0.309	3.6	14.55	0.18
7/23/76		0.211	0.289	5.3	11.21	0.23
7/30/76	1100.	0.162	0.212	5.2	10.55	2.20
8/ 6/76	1345.	0.184	0.214	5.2	10.23	1.40
8/13/76	1330.	0.150	0.177	3.1	9.76	1.72
8/16/76	1555.	0.221	0.249	4.1	7.65	2.08
8/17/76	1435.	0.241	0.295	4.6	8.13	2.64
8/18/76	1220.	0.257	0.270	5.1	7.97	2.71
8/19/76	1500.	0.253	0.300	5.3	8.62	2.66
8/20/76	1030.	0.242	0.303	6.4	8.93	2.52
8/27/76	1130.	0.304	0.350	6.8	10.82	1.72
9/ 3/76	1135.	0.247	0.289	6.1	11.53	1.64

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
10/15/75	2400.			25.3	5.0	0.31
10/16/75	600.			26.1	5.0	0.28
10/16/75	1200.			27.1	5.0	0.22
10/28/75	1635.			33.6	5.0	0.45
11/10/75	1200.			26.0	5.0	0.53
11/10/75	1800.			28.0	5.0	0.43
11/10/75	2400.			22.8	5.0	0.48
11/11/75	600.			22.8	5.0	0.50
11/11/75	1200.			22.4	5.0	0.50
11/11/75	1800.			22.0	5.0	0.53
11/11/75	2400.			21.8	5.0	0.54
11/12/75	600.			22.0	5.0	0.56
11/12/75	1200.			23.2	5.0	0.45
11/12/75	1800.			22.2	5.0	0.45
11/12/75	2400.			22.8	5.0	0.45
11/13/75	600.			23.8	5.0	0.45
11/13/75	1200.			24.0	5.0	0.48
11/14/75	114 .			25.9	5.0	0.60
6/ 3/76		17.53	3.72	28.7	8.6	0.61
6/11/76	131[illegible].	6.38	1.36	11.3	< 5.0	0.28
6/14/76	15[illegible].	11.75		16.6		0.41
6/15/76	1300.	10.14		22.0		0.53
6/16/76	1125.	10.86		17.2		0.45
6/17/76	950.	11.21		16.2		0.47
6/18/76	1215.			15.6	< 5.0	0.85
6/25/76	1150.	12.96	2.13	17.5	5.9	0.59
7/ 2/76		14.75	2.83	19.5	7.0	0.67
7/ 9/76	140[illegible].	8.78	2.32	16.5	6.2	0.54
7/16/76	1300.	16.05	2.87	21.8	7.9	0.57
7/23/76		11.59	2.36	19.8	7.8	0.51
7/30/76	11[illegible].	12.28	3.04	24.6	5.6	0.36
8/ 6/76	1[illegible]45.	11.24	2.79	21.2	6.1	0.55
8/13/76	133[illegible].	15.74	2.11	18.3	10.5	0.33
8/16/76	1555.	8.31	2.07	20.1	< 5.0	0.38
8/17/76	1435.	8.63	2.32	15.7	7.9	0.55
8/18/76	1200.	9.28	2.36	17.1	6.9	0.47
8/19/76	1300.	20.75	3.12	18.3	6.9	0.36
8/20/76	1[illegible]3[illegible].	11.33	2.33	17.1	< 5.0	0.27
8/27/76	113[illegible].	11.51	2.43	19.6	7.2	0.51
9/ 3/76	1135.	11.98	2.75	21.4	6.1	0.84

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/1	NO_2 mg/1	NO_3 mg/1	NH_4 mg/1	TKN mg/1
9/10/76	1115.	0.026	0.006	0.020	0.01	1.22
9/17/76	1345.	0.046	0.006	0.040	0.07	1.13
9/24/76	1045.	0.010	< 0.004	0.006	< 0.01	1.27
10/ 1/76	1030.	0.009	0.004	0.005	0.14	1.40
10/ 8/76	1145.	0.018	0.006	0.012	0.03	2.28
10/11/76	1530.	0.016	0.005	0.011	0.08	2.30
10/12/76	1215.	0.016	0.006	0.010	0.07	0.81
10/13/76	945.	0.011	0.004	0.007	0.11	1.54
10/14/76	930.	0.059	0.005	0.054	0.15	2.61
10/15/76	1000.	< 0.004	< 0.004	< 0.004	0.03	1.44

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	$O-PO_4$ mg/l	$T-PO_4$ mg/l	SiO_2 mg/l	Na mg/l	K mg/l
9/10/76	1115.	0.244	0.303	4.3	10.75	1.63
9/17/76	1345.	0.204	0.260		10.30	2.18
9/24/76	1045.	0.277	0.378	4.2	11.85	2.15
10/ 1/76	1030.	0.267	0.260	3.7	5.27	3.19
10/ 8/76	1145.	0.190	0.238	4.5	12.24	3.31
10/11/76	1530.	0.170	0.213	4.4	12.24	3.01
10/12/76	1215.	0.172	0.224	4.4	13.51	3.34
10/13/76	945.	0.174	0.217	4.5	13.83	2.81
10/14/76	930.	0.170	0.217	4.2	14.50	3.29
10/15/76	1000.	0.094	0.121	4.8	13.06	3.07

APPENDIX C-2 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/1	Mg mg/1	C1 mg/1	SO4 mg/1	Alk meq/1
9/10/76	1115.	11.16	2.22	19.3	7.1	0.54
9/17/76	1345.	11.20	2.23	25.9	< 5.0	0.64
9/24/76	1045.	13.06	2.61	21.7	9.7	0.58
10/ 1/76	1030.	11.33	2.78	25.6		0.56
10/ 8/76	1145.	12.77	2.82	26.1	< 5.0	0.80
10/11/76	1530.	11.97	2.61	25.7	5.1	0.62
10/12/76	1215.	12.77	2.74	24.7	5.1	0.67
10/13/76	945.	13.56	3.12	26.9	< 5.0	0.63
10/14/76	930.	14.83	2.41	25.7	< 5.0	0.78
10/15/76	1000.	11.69	2.39	29.4	5.8	0.60

APPENDIX C. LABORATORY RESULTS FOR SAMPLING DATES

3. North Bridge Station

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
5/ 7/74	1620.	0.003	0.004	0.004	1.43	2.21
6/11/74	1545.	0.008	0.004	0.004	0.52	1.69
7/ 9/74	1545.	0.107	0.009	0.098	0.08	2.01
7/23/74	850.	0.022	0.005	0.017	0.05	1.70
7/23/74	1700.	0.009	0.005	0.004	0.04	1.32
7/24/74	1015.	0.009	0.005	0.004	0.04	
7/25/74	945.	0.010	0.006	0.004	0.04	
8/13/74	1620.	0.010	0.006	0.004	0.05	2.56
9/10/74	1645.	0.009	0.005	0.004	0.04	1.58
9/16/74	1035.	0.012	0.004	0.008	0.03	
9/16/74	1400.	0.012	0.004	0.008	0.04	
9/16/74	1800.	0.024	0.004	0.020	0.04	
9/16/74	2200.	0.031	0.004	0.027	0.03	
9/17/74	200.	0.022	0.004	0.018	0.03	
9/17/74	600.	0.017	0.004	0.013	0.03	
9/17/74	1000.	0.015	0.004	0.011	0.02	
9/17/74	1200.	0.019	0.005	0.014	0.02	
9/17/74	1800.	0.012	0.005	0.007	0.03	
9/17/74	2200.	0.010	0.005	0.005	0.02	
9/18/74	200.	0.013	0.005	0.008	0.01	
9/18/74	600.	0.009	0.005	0.004	0.01	
9/18/74	1000.	0.014	0.006	0.008	0.01	
9/18/74	1400.					
9/18/74	1800.					
9/18/74	2200.					
9/19/74	200.					
9/19/74	600.					
9/19/74	1000.					
9/19/74	1400.					
10/ 8/74	1615.	0.013	0.009	0.004	0.01	1.40
10/17/74	1500.					
10/17/74	1500.	0.014	0.004	0.010	0.06	1.40
11/ 5/74	1630.	0.007	0.008	0.008	0.17	1.92
11/ 7/74	1800.	0.003	0.004	0.004	0.13	2.15
11/ 7/74	2400.	0.003	0.004	0.004	0.12	1.82
11/ 8/74	600.	0.003	0.004	0.004	0.15	1.84
11/ 8/74	1200.	0.003	0.004	0.004	0.16	1.99
11/ 8/74	1800.	0.003	0.004	0.004	0.10	2.12
11/ 8/74	2400.	0.039	0.014	0.025	0.08	
11/ 9/74	600.	0.026	0.013	0.013	0.09	

Date Mo/Day/Yr.	Time Hour/Min.	O-PO4 mg/l	T-PO4 mg/l	SiO2 mg/l	Na mg/l	K mg/l
5/ 7/74	1620.	0.136	0.300	5.6	22.00	1.30
6/11/74	1545.	0.166	0.298	4.4	21.00	3.20
7/ 9/74	1545.	0.732	0.832	9.7	18.50	4.70
7/23/74	850.	0.469	0.492		11.00	3.60
7/23/74	1700.	0.446	0.488			
7/24/74	1015.	0.387	0.420			
7/25/74	945.	0.496	0.590			
8/13/74	1620.	0.246	0.280	3.8	9.00	1.40
9/10/74	1645.	0.040	0.289	6.1	14.20	
9/16/74	1035.	0.296	0.408	5.0		
9/16/74	1400.	0.228	0.354	5.2		
9/16/74	1800.	0.217	0.303	5.1		
9/16/74	2200.	0.242	0.322	5.3		
9/17/74	200.	0.252	0.312	4.3		
9/17/74	600.	0.272	0.391	5.4		
9/17/74	1000.	0.261	0.332	5.4		
9/17/74	1200.	0.251	0.279	5.5		
9/17/74	1800.	0.226	0.313	5.3		
9/17/74	2200.	0.220	0.310	5.4		
9/18/74	200.	0.225	0.304	5.4		
9/18/74	600.	0.243	0.322	5.5		
9/18/74	1000.	0.237		5.6		
9/18/74	1400.					
9/18/74	1800.					
9/18/74	2200.					
9/19/74	200.					
9/19/74	600.					
9/19/74	1000.					
9/19/74	1400.					
10/ 8/74	1615.		0.231	6.6	14.00	2.10
10/17/74	1500.					
10/17/74	1500.	0.196	0.254	4.6	17.50	1.90
11/ 5/74	1630.	0.143	0.188	4.5		
11/ 7/74	1800.	0.005	0.024	4.2	20.00	1.60
11/ 7/74	2400.	0.059	0.140	3.9	18.80	1.10
11/ 8/74	600.	0.088		4.1	18.00	1.30
11/ 8/74	1200.	0.096		3.9	17.80	1.20
11/ 8/74	1800.	0.079	0.100	3.8	17.80	1.20
11/ 8/74	2400.	0.068	0.170	3.9		
11/ 9/74	600.	0.056	0.160	3.7	18.00	1.40

APPENDIX C-3 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
5/ 7/74	1620.	26.60	3.80	101.8	3.9	0.10
6/11/74	1545.	23.20	3.80	53.5	10.0	1.23
7/ 9/74	1545.	17.40	4.00	29.7	10.0	0.10
7/23/74	850.	12.60	3.10	23.8		
7/23/74	1700.			23.2		
7/24/74	1015.			18.8		
7/25/74	945.			24.6		
8/13/74	1620.	9.80	2.20	27.3	3.0	0.55
9/10/74	1645.	14.80	3.20	24.1	6.0	0.82
9/16/74	1035.			15.9		
9/16/74	1400.			5.1		
9/16/74	1800.			16.1		
9/16/74	2200.			17.1		
9/17/74	200.			18.1		
9/17/74	600.			20.1		
9/17/74	1000.			17.7		
9/17/74	1200.			17.9		
9/17/74	1800.			19.7		
9/17/74	2200.			18.9		
9/18/74	200.			18.9		
9/18/74	600.			18.3		
9/18/74	1000.			19.7		
9/18/74	1400.					
9/18/74	1800.					
9/18/74	2200.					
9/19/74	200.					
9/19/74	600.					
9/19/74	1000.					
9/19/74	1400.					
10/ 8/74	1615.	13.70	3.10	24.0	5.0	0.76
10/17/74	1500.					
10/17/74	1500.	15.80	3.70	33.0		0.74
11/ 5/74	1630.			32.6	5.0	0.70
11/ 7/74	1800.	13.10	3.20	99.4	5.0	0.49
11/ 7/74	2400.	13.10	3.30	47.5	5.0	0.25
11/ 8/74	600.	13.60	3.30	55.3	5.0	0.11
11/ 8/74	1200.	13.80	3.30	63.1	5.0	0.10
11/ 8/74	1800.	7.40	3.40	63.1	5.0	0.10
11/ 8/74	2400.					0.10
11/ 9/74	600.	7.30	3.40	38.4	5.0	0.43

APPENDIX C-3 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NOx mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
11/ 9/74	1200.	0.009	0.004	0.005	0.16	1.99
11/ 9/74	1800.	0.010	0.004	0.006	0.16	1.95
11/ 9/74	2400.	0.012	0.004	0.008	0.17	1.98
11/10/74	600.	0.009	0.004	0.005	0.14	2.01
11/10/74	1200.	0.009	0.004	0.005	0.11	1.82
11/10/74	1800.	0.013	0.004	0.009	0.12	1.83
11/10/74	2400.	0.031	0.004	0.027	0.26	1.80
11/11/74	600.	0.016	0.004	0.012	0.13	1.81
11/11/74	1200.	0.027	0.004	0.023	0.13	1.71
12/10/74	1715.	0.565	0.004	0.561	0.16	0.96
1/ 9/75	1400.	0.117	0.004	0.113	0.10	1.11
2/ 6/75	1220.	0.022	0.012	0.010	0.07	1.24
3/ 5/75	1200.	0.033	0.004	0.029	0.11	1.21
4/ 8/75	950.	0.003	0.004	0.004	0.08	1.24
6/11/75	1110.	0.012	0.008	0.004		5.99
6/12/75	1500.	0.014	0.010	0.004	0.03	2.62
6/18/75	1515.		0.015		0.01	3.30
6/19/75	1045.		0.012		0.08	3.27
6/24/75	1800.		0.005		0.19	1.21
6/24/75	2400.		0.006		0.10	1.22
6/25/75	600.		0.007		0.09	1.34
6/25/75	1200.		0.007		0.12	1.15
6/25/75	1400.		0.007		0.17	1.66
6/26/75	1400.		0.009		0.15	1.52
6/26/75	2000.		0.008		0.15	1.96
6/27/75	200.		0.009			1.69
6/27/75	800.		0.009		0.48	1.61
7/15/75	1500.	0.026	0.011	0.015	0.01	1.78
7/22/75	1000.	0.014	0.010	0.004	0.04	1.80
7/22/75	1600.	0.010	0.012		0.01	1.64
7/22/75	2200.	0.009	0.007	0.004	0.01	1.68
7/23/75	400.	0.016	0.007	0.009	0.06	1.51
7/23/75	1000.	0.012	0.010	0.004	0.01	1.67
7/23/75	1600.	0.394	0.009	0.385	0.04	1.73
7/23/75	2200.	0.010	0.007	0.004	0.01	1.50
7/24/75	400.	0.074	0.009	0.065	0.01	1.73
7/29/75		0.015	0.006	0.009	0.06	1.53
8/12/75	1530.	0.026	0.006	0.020	0.05	1.74
8/14/75	1300.	0.025	0.009	0.016	0.08	1.81
9/11/75	1150.	0.013	0.007	0.006	0.02	1.61

APPENDIX C-3 (Continued)

Date Mo/Day/Yr	Time Hour/Min	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
11/ 9/74	1200.	0.077		3.6	18.20	1.20
11/ 9/74	1800.	0.099		4.1	18.00	1.20
11/ 9/74	2400.	0.061	0.085	3.5	18.50	1.20
11/10/74	600.	0.080		3.6	17.90	1.30
11/10/74	1200.	0.089		3.6	17.80	1.20
11/10/74	1800.	0.094		3.6	18.10	1.30
11/10/74	2400.	0.081	0.086	4.0	17.90	1.30
11/11/74	600.	0.081		3.7	17.70	1.30
11/11/74	1200.	0.069	0.070	3.7	18.10	1.30
12/10/74	1715.	0.117	0.136	5.8		
1/ 9/75	1400.	0.082	0.113	7.8		
2/ 6/75	1220.	0.114	0.155	8.3		
3/ 5/75	1200.	0.080	0.108	7.9		
4/ 8/75	950.	0.035	0.076	4.1		
6/11/75	1110.	2.026	1.982	8.8		
6/12/75	1500.	0.781				
6/18/75	1510.	0.750	2.395	10.7	35.99	7.60
6/19/75	1045.	0.909	0.984	10.8	37.10	7.90
6/24/75	1800.	0.155	0.269	2.9	5.20	1.60
6/24/75	2400.	0.266	0.352	4.3	4.60	1.60
6/25/75	600.	0.281	0.346	3.5	4.60	1.50
6/25/75	1200.	0.276	0.348	2.8	4.60	1.50
6/25/75	1400.	0.304	0.384	3.3	5.40	1.60
6/26/75	1400.	0.404	0.405	4.6	6.50	2.00
6/26/75	2000.	0.294	0.409	4.5	6.50	2.30
6/27/75	200.		0.525	4.4	6.20	2.00
6/27/75	800.	0.431	0.506	4.8	6.60	2.00
7/15/75	1500.	0.378	0.499	6.8		
7/22/75	1000.	0.364	0.442	6.8	9.75	1.69
7/22/75	1600.	0.357	0.434	6.9	10.39	1.84
7/22/75	2200.	0.382	0.455	7.0	10.39	1.91
7/23/75	400.	0.391	0.475	7.2	10.87	1.86
7/23/75	1000.	0.369	0.450	7.2	11.67	1.91
7/23/75	1600.	0.389	0.471	7.2	12.47	2.01
7/23/75	2200.	0.406	0.511	7.5	12.47	2.19
7/24/75	400.	0.429	0.491	7.6	12.95	2.19
7/29/75		0.478	0.570	7.1	18.30	4.66
8/12/75	1530.	0.428	0.491	7.7		
8/14/75	1300.	0.417		8.0		
9/11/75	1150.	0.228	0.307	7.6		

APPENDIX C-3 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
11/ 9/74	1200.	7.80	3.40	42.3	5.0	0.41
11/ 9/74	1800.	13.10	3.20	44.8	5.0	0.33
11/ 9/74	2400.	11.10	3.00	39.7	5.0	0.43
11/10/74	600.	13.80	3.40	48.8	5.0	0.23
11/10/74	1200.	5.30	2.00	39.7	5.0	0.39
11/10/74	1800.	5.30	2.00	51.4	5.0	0.19
11/10/74	2400.	6.30	2.10	52.7	5.0	0.15
11/11/74	600.	14.10	3.40	52.7	5.0	0.43
11/11/74	1200.	13.10	3.40	42.3	5.0	0.30
12/10/74	1715.			88.3	6.3	0.10
1/ 9/75	1400.			82.0	32.4	1.02
2/ 6/75	1220.			80.0	18.5	0.98
3/ 5/75	1200.			95.0	15.9	1.09
4/ 8/75	950.			107.7	14.6	0.15
6/11/75	1115.			86.6	32.8	0.96
6/12/75	1500.			61.8	21.0	1.04
6/18/75	1510.	32.40	6.40	70.8	13.3	1.66
6/19/75	1045.	32.60	8.90	69.8	14.8	1.71
6/24/75	1800.	6.70	1.00	14.6	5.7	0.28
6/24/75	2400.	6.00	1.00	10.4	6.4	0.34
6/25/75	600.	6.40	1.10	8.8	6.6	0.36
6/25/75	1200.	4.30	1.00	8.4	5.9	0.39
6/25/75	1400.	4.60	1.10	8.4	6.2	0.41
6/26/75	1400.	6.70	1.50	10.6	6.9	0.50
6/26/75	2000.	7.40	1.70	11.0	7.4	0.27
6/27/75	200.	6.70	1.60	10.0	7.4	0.24
6/27/75	800.	8.80	1.50	10.8	7.9	0.25
7/15/75	1500.			24.1	9.0	0.56
7/22/75	1000.	13.07	3.12	19.5	5.9	0.49
7/22/75	1600.	12.39	3.06	18.9	7.1	0.49
7/22/75	2200.	12.73	2.93	19.0	7.1	0.41
7/23/75	400.	13.24	2.99	20.2	8.1	0.42
7/23/75	1000.	13.07	3.09	20.5	7.1	0.43
7/23/75	1600.	13.75	3.16	25.6	6.4	0.50
7/23/75	2200.	14.27	3.35	23.5	7.4	0.51
7/24/75	400.	14.27	3.61	29.1	7.9	0.58
7/29/75		19.86	3.67	36.9		0.73
8/12/75	1530.			40.9	6.7	1.18
8/14/75	1300.			39.1	8.7	0.97
9/11/75	1150.			31.7		0.94

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
9/16/75	1200.	0.006	0.004	0.004	0.04	1.31
9/16/75	1800.	0.021	0.006	0.015	0.07	1.41
9/16/75	2400.	0.006	0.007		0.03	1.46
9/17/75	1200.	0.008	0.007	0.004	0.06	1.60
9/17/75	1800.	0.009	0.008	0.004	0.09	1.66
9/17/75	2400.	0.015	0.007	0.008	0.29	1.70
9/18/75	600.	0.017	0.008	0.009	0.03	1.66
9/18/75	1200.	0.021	0.008	0.013	0.09	1.76
9/18/75	1800.	0.007			0.04	1.77
9/18/75	2400.	0.006	0.007		0.08	1.77
9/19/75	600.	0.009	0.008	0.004	0.04	1.73
9/19/75	1200.	0.007	0.008		0.03	1.79
9/19/75	1500.	0.005	0.007		0.04	1.73
10/28/75	1640.	0.018	0.004	0.014	0.03	1.36
11/10/75	1200.	0.007	0.005	0.004	0.01	1.53
11/10/75	1800.	0.007	0.005	0.004	0.04	1.43
11/10/75	2400.	0.007	0.006	0.004	0.03	1.37
11/11/75	600.	0.006	0.005	0.004	0.05	1.39
11/11/75	1200.	0.038	0.005	0.033	0.02	1.35
11/11/75	1800.	0.005	0.006		0.02	1.30
11/11/75	2400.	0.009	0.006	0.004	0.01	1.22
11/12/75	600.	0.006	0.006	0.004	0.03	1.28
11/12/75	1200.	0.007	0.006	0.004	0.01	1.24
11/12/75	1800.	0.006	0.006	0.004	0.01	1.04
11/12/75	2400.	0.008	0.007	0.004	0.04	1.23
11/13/75	600.	0.006	0.007		0.01	1.11
11/13/75	1200.	0.014	0.007	0.007	0.01	1.02
11/19/75	1130.	0.014	0.007	0.007	0.02	0.91
6/ 3/76		0.018	0.009	0.009	0.05	
6/11/76	1245.	0.009	0.008	< 0.004	< 0.01	1.66
6/14/76	1500.	0.012	0.009	< 0.004	0.05	1.69
6/15/76	1305.	0.018	0.008	0.010	0.07	1.93
6/16/76	1135.	0.012	0.011	< 0.004	0.03	1.93
6/17/76	1000.	0.010	0.012		0.03	2.08
6/18/76	1230.	0.014	0.012	< 0.004	0.09	1.38
6/25/76	1135.	0.034	0.010	0.024	0.05	1.80
7/ 2/76		0.012	0.009	< 0.004	< 0.13	2.62
7/ 9/76	1410.	0.026	0.009	0.017	< 0.13	1.66
7/16/76	1330.	0.005	0.008		0.05	1.77
7/23/76		0.031	0.009	0.022	0.03	1.51

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
9/16/75	1200.	0.141	0.189	4.7		
9/16/75	1800.	0.173	0.201	5.1		
9/16/75	2400.	0.158	0.215	5.4		
9/17/75	1200.	0.170	0.226	5.6		
9/17/75	1800.	0.174	0.228	5.8		
9/17/75	2400.	0.181	0.236	5.9		
9/18/75	600.	0.175	0.239	6.1		
9/18/75	1200.	0.181	0.252	6.2		
9/18/75	1800.	0.175	0.246	6.3		
9/18/75	2400.	0.179	0.235	6.2		
9/19/75	600.	0.178	0.250	6.1		
9/19/75	1200.	0.180	0.252	6.1		
9/19/75	1500.	0.178	0.251	6.0		
10/28/75	1640.	0.087	0.123	4.8		
11/10/75	1200.	0.273	0.320	3.3		
11/10/75	1800.	0.223	0.260	3.2		
11/10/75	2400.	0.221	0.258	3.1		
11/11/75	600.	0.234	0.269	3.2		
11/11/75	1200.	0.227	0.267	3.2		
11/11/75	1800.	0.213	0.254	3.3		
11/11/75	2400.	0.221	0.263	3.4		
11/12/75	600.	0.228	0.269	3.6		
11/12/75	1200.	0.222	0.264	3.7		
11/12/75	1800.	0.213	0.254	3.8		
11/12/75	2400.	0.221	0.257	3.9		
11/13/75	600.	0.232	0.277	4.0		
11/13/75	1200.	0.225	0.271	3.8		
11/19/75	1130.	0.089	0.113	4.6		
6/ 3/76		0.575	0.798	8.0	19.16	5.51
6/11/76	1245.	0.486	0.557	5.5	16.92	4.79
6/14/76	1500.	0.507	0.576		16.29	4.42
6/15/76	1305.	0.641	0.656		16.76	4.43
6/16/76	1135.	0.708	0.753		17.71	3.33
6/17/76	1000.	0.808	0.855		17.86	4.81
6/18/76	1230.	0.689	0.781	4.8		
6/25/76	1135.		0.270	6.6	22.69	0.40
7/ 2/76		0.351	0.425	5.5	25.33	0.19
7/ 9/76	1410.	0.234	0.303	6.7	18.18	0.23
7/16/76	1330.	0.335	0.399	5.1	21.16	0.18
7/23/76		0.188	0.249	4.1	13.14	0.18

APPENDIX C-3 (Continued)

Date Mo/Day/Yr	Time Hour/Min	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
9/16/75	1200.			25.3	18.8	0.36
9/16/75	1800.			24.5	25.1	0.46
9/16/75	2400.			24.1	20.1	0.63
9/17/75	1200.			27.0	22.4	0.53
9/17/75	1800.			26.0	22.6	0.61
9/17/75	2400.			44.2	22.4	0.28
9/18/75	600.			31.2	26.1	0.51
9/18/75	1200.			39.8	27.6	0.30
9/18/75	1800.			39.2	27.4	0.33
9/18/75	2400.			30.0	25.9	0.64
9/19/75	600.			36.6	30.4	0.51
9/19/75	1200.			30.2	29.4	0.82
9/19/75	1500.			30.0	20.1	0.80
10/28/75	1640.			37.4	5.0	1.03
11/10/75	1200.			29.4	5.0	0.71
11/10/75	1800.			25.8	5.0	0.60
11/10/75	2400.			26.0	5.1	0.59
11/11/75	600.			25.0	5.0	0.61
11/11/75	1200.			27.0	5.0	0.61
11/11/75	1800.			25.2	5.0	0.61
11/11/75	2400.			25.8	5.0	0.65
11/12/75	600.			26.0	5.0	0.66
11/12/75	1200.			26.0	5.0	0.68
11/12/75	1800.			26.0	5.0	0.70
11/12/75	2400.			27.6	5.0	0.73
11/13/75	600.			27.4	5.0	0.76
11/13/75	1200.			27.0	5.1	0.73
11/19/75	1130.			32.7	8.1	0.91
6/ 3/76		17.97	2.92	32.8	9.8	0.71
6/11/76	1245.	16.94	4.91	28.9	8.5	0.71
6/14/76	1500.	19.62		34.8		0.79
6/15/76	1305.	19.26		40.6		0.83
6/16/76	1135.	18.01		41.0		0.77
6/17/76	1000.	18.73		31.8		0.84
6/18/76	1230.			36.5	< 5.0	1.55
6/25/76	1135.	21.18	5.24	39.9	6.4	1.01
7/ 2/76		23.29	5.85	41.2	7.5	1.23
7/ 9/76	1410.	16.71	4.89	34.0	8.7	0.91
7/16/76	1330.	15.40	4.34	30.5	7.6	0.90
7/23/76		15.61	3.25	23.4	9.3	0.64

APPENDIX C-3 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
7/31/76	1115.	0.010	0.009	< 0.004	0.08	2.02
8/ 6/76	1100.	0.016	0.009	0.007	0.04	1.75
8/13/76	1315.	< 0.004	< 0.004	< 0.004	< 0.01	1.46
8/16/76	1600.	0.007	0.009		0.03	1.30
8/17/76	1445.	0.017	0.011	0.006	0.03	1.32
8/18/76	1215.	0.025	0.011	0.014	0.02	1.43
8/19/76	955.	0.010	0.010	< 0.004	< 0.01	1.42
8/20/76	1045.	0.026	0.010	0.016	< 0.01	1.31
8/27/76	1145.	0.013	0.012	< 0.004	< 0.01	1.32
9/ 3/76	1145.	0.007	0.009		0.01	1.40
9/10/76	1130.	0.006	0.007		0.01	1.45
9/17/76	1330.	0.029	0.006	0.023	0.02	1.28
9/24/76	1100.	0.011	0.007	< 0.004	< 0.01	1.40
10/ 1/76	1045.	0.013	0.005	0.008	0.04	1.15
10/ 8/76	1200.	0.015	0.006	0.009	0.01	2.50
10/11/76	1545.	0.014	0.005	0.009	0.06	2.90
10/12/76	1230.	0.013	< 0.004	0.009	< 0.01	1.49
10/13/76	935.	0.013	0.004	0.009	0.05	1.80
10/14/76	945.	0.014	0.005	0.009	0.04	2.50
10/15/76	945.	0.012	< 0.004	0.008	0.03	1.60

APPENDIX C-3 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
7/3 /76	1115.	0.176	0.222	4.7	13.95	1.13
8/ 6/76	1100.	0.135	0.185	4.5	10.39	0.89
8/13/76	1315.	0.121	0.159	4.0	8.78	1.20
8/16/76	1000.	0.430	0.475	4.9	9.43	3.75
8/17/76	1445.	0.627	0.667	5.5	10.41	4.44
8/18/76	1210.	0.710	0.758	5.9	11.71	5.40
8/19/76	955.	0.682	0.678	6.4	12.03	5.04
8/20/76	1045.	0.136	0.265	4.3	7.57	1.48
8/27/76	1145.	0.234	0.301	6.1	11.47	1.62
9/ 3/76	1145.	0.263	0.320	6.8	12.46	1.88
9/10/76	1130.	0.247	0.296	4.6	11.24	1.49
9/17/76	1330.	0.146	0.212		10.14	1.18
9/24/76	1100.	0.179	0.244	4.8	11.41	1.88
10/ 1/76	1045.	0.383	0.410	5.6	6.25	2.78
10/ 8/76	1200.	0.294	0.351	6.6	16.22	2.49
10/11/76	1545.	0.202	0.239	5.3	16.38	3.15
10/12/76	1230.	0.158	0.204	5.2	17.49	2.48
10/13/76	930.	0.149	0.189	5.0	17.81	2.65
10/14/76	945.	0.148	0.190	4.7	17.48	2.72
10/15/76	945.	0.140	0.186	4.7	17.28	2.58

APPENDIX C-3 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO4 mg/l	$T-PO_4$ mg/l	SiO2 mg/l	Na mg/l	K mg/l
7/30/76	1115.	16.20	4.03	24.6	5.6	0.73
8/ 6/76	1100.	14.17	3.45	20.4	6.4	0.70
8/13/76	1315.	11.06	2.44	17.7	11.4	0.48
8/16/76	1600.	11.87	2.95	19.9	6.6	0.59
8/17/76	1445.	11.54	2.82	33.7	9.9	0.62
8/18/76	1210.	10.57	3.20	23.8	8.6	0.48
8/19/76	955.	11.87	3.41	25.0	9.6	0.52
8/23/76	1045.	8.18	2.16	14.9	< 5.0	0.12
8/27/76	1145.	11.51	2.95	21.2	7.7	0.64
9/ 3/76	1145.	15.66	3.73	24.7	8.5	0.97
9/10/76	1130.	12.77	3.28	20.3	11.4	0.64
9/17/76	1330.	13.97	2.45	24.9	< 5.0	0.52
9/24/76	1100.	14.00	2.83	18.1	8.9	0.65
10/ 1/76	1045.	11.33	2.82	23.4	< 5.0	0.53
10/ 8/76	1200.	15.94	3.42	35.6	< 5.0	0.91
10/11/76	1545.	18.32	3.81	33.8	5.1	0.74
10/12/76	1230.	16.26	3.38	31.6	5.1	0.83
10/13/76	930.	15.78	3.72	36.0	5.1	0.69
10/14/76	945.	17.37	3.00	32.0	< 5.0	0.94
10/15/76	945.	16.40	3.56	36.8	7.3	0.82

APPENDIX C. LABORATORY RESULTS FOR SAMPLING DATES

4. LAMBS ISLAND BRIDGE STATION

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
7/24/74	1545.	0.028	0.004	0.024	0.01	0.94
7/25/74	955.	0.019	0.006	0.013	0.04	1.46
7/25/74	1145.	0.033	0.006	0.027	0.04	1.26
9/16/74	1040.	0.011	0.004	0.007	0.03	
9/16/74	1400.	0.003	0.004	0.004	0.03	
9/16/74	1800.	0.085	0.004	0.081	0.04	
9/16/74	2200.	0.012	0.004	0.008	0.04	
9/17/74	200.	0.009	0.004	0.005	0.03	
9/17/74	600.	0.010	0.004	0.006	0.02	
9/17/74	1000.	0.008	0.004	0.004	0.02	
9/17/74	2000.	0.003	0.004	0.004	0.01	
9/17/74	2400.	0.009	0.004	0.005	0.03	
9/18/74	400.	0.014	0.004	0.010	0.02	
9/18/74	800.	0.009	0.004	0.005	0.02	
10/17/74	1425.					
10/17/74	1420.	0.016	0.004	0.012	0.03	1.26
11/ 5/74	1600.	0.054	0.008	0.046	0.03	1.11
11/ 5/74	1800.	0.007	0.008	0.008	0.03	1.15
11/ 5/74	2100.	0.016	0.008	0.008	0.04	0.90
11/ 5/74	2400.	0.007	0.008	0.004	0.05	0.90
11/ 6/74	300.	0.007	0.008	0.004	0.04	0.91
11/ 6/74	600.	0.007	0.008	0.004	0.04	0.90
11/ 6/74	900.	0.092	0.008	0.084	0.05	1.03
11/ 6/74	1200.	0.007	0.008	0.004	0.02	1.15
11/ 6/74	1500.	0.037	0.008	0.029	0.02	0.24
11/ 6/74	1800.	0.007	0.008	0.004	0.01	1.18
11/ 6/74	2100.	0.007	0.008	0.004	0.04	1.19
11/ 6/74	2400.	0.007	0.008	0.004	0.05	1.19
11/ 7/74	300.	0.007	0.008	0.004	0.04	1.21
11/ 7/74	600.	0.007	0.008	0.004	0.07	1.15
11/ 7/74	900.	0.007	0.008	0.004	0.04	1.28
11/ 7/74	1800.	0.003	0.004	0.004	0.04	0.92
11/ 7/74	2400.	0.003	0.004	0.004	0.01	1.07
11/ 8/74	600.	0.003	0.004	0.004	0.01	1.15
11/ 8/74	1200.	0.003	0.004	0.004	0.01	1.04
11/ 8/74	1430.	0.003	0.004	0.004	0.01	1.30
12/10/74	1645.	0.015	0.004	0.011	0.02	0.41
1/ 9/75	1445.	0.013	0.004	0.009	0.05	0.63
2/ 6/75	1240.	0.013	0.009	0.004	0.04	0.94
3/ 5/75	1220.	0.024	0.004	0.020	0.02	0.74

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min	O-PO4 mg/l	T-PO4 mg/l	SiO2 mg/l	Na mg/l	K mg/l
7/24/74	1545.	0.413	0.490		9.00	3.40
7/25/74	955.	0.544	0.690			
7/25/74	1145.	0.528	0.690			
9/16/74	1040.	0.424	0.496	5.2		
9/16/74	1400.	0.462	0.576	5.3		
9/16/74	1800.	0.488	0.584	5.2		
9/16/74	2200.	0.497	0.576	3.9		
9/17/74	200.	0.399	0.499	4.6		
9/17/74	600.	0.410	0.509	4.5		
9/17/74	1000.	0.462	0.596	4.6		
9/17/74	2000.	0.420	0.688	5.7		
9/17/74	2400.	0.564	0.732	5.7		
9/18/74	400.	0.383	0.482	6.0		
9/18/74	800.	0.398	0.490	6.0		
10/17/74	1420.					
10/17/74	1420.	0.410		2.3	9.90	1.70
11/ 5/74	1600.	0.104	0.122	1.6		
11/ 5/74	1800.	0.096		1.6	11.00	1.20
11/ 5/74	2100.	0.097		1.5	10.00	1.00
11/ 5/74	2400.	0.092		1.4	12.00	0.90
11/ 6/74	300.	0.085	0.101	1.3	11.00	1.20
11/ 6/74	600.	0.089	0.108	1.6	12.00	1.30
11/ 6/74	900.	0.102		1.3	12.00	1.40
11/ 6/74	1200.	0.105		1.7	10.00	1.10
11/ 6/74	1500.	0.087	0.104	1.3	12.00	1.30
11/ 6/74	1800.	0.089		1.7	11.00	1.10
11/ 6/74	2100.	0.099		1.3	12.00	1.30
11/ 6/74	2400.	0.094		1.3	12.00	1.20
11/ 7/74	300.	0.094	0.109	1.3	12.00	1.20
11/ 7/74	600.	0.094	0.104	1.3	12.00	1.20
11/ 7/74	900.	0.105		1.3	13.00	1.30
11/ 7/74	1800.	0.090	0.101	1.6	13.60	1.00
11/ 7/74	2400.	0.087		1.7	13.50	1.20
11/ 8/74	600.	0.093		1.7	13.60	1.10
11/ 8/74	1200.	0.084	0.103	1.6	13.60	1.10
11/ 8/74	1430.	0.067	0.083	1.6	13.70	1.00
12/10/74	1645.	0.029	0.039	2.2		
1/ 9/75	1445.	0.036	0.047	1.7		
2/ 6/75	1240.	0.039	0.092	2.8		
3/ 5/75	1220.	0.014	0.035	2.6		

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/1	Mg mg/1	C1 mg/1	SO4 mg/1	Alk meq/1
7/24/74	1545.	9.40	2.40	26.3		
7/25/74	955.			22.8		
7/25/74	1145.			18.4		
9/16/74	1040.			18.1		
9/16/74	1400.			17.3		
9/16/74	1800.			16.1		
9/16/74	2200.			16.7		
9/17/74	200.			18.9		
9/17/74	600.			19.1		
9/17/74	1000.			20.1		
9/17/74	2000.			20.9		
9/17/74	2400.			17.9		
9/18/74	400.			21.1		
9/18/74	800.			21.5		
10/17/74	1420.					
10/17/74	1420.	10.80	2.40	16.4		0.50
11/ 5/74	1600.			22.7	5.0	0.65
11/ 5/74	1800.	12.50	2.80	17.6	5.0	0.76
11/ 5/74	2100.	12.90	2.70	18.5	5.0	0.76
11/ 5/74	2400.	12.50	2.60	17.6	5.0	0.45
11/ 6/74	300.	14.20	3.00	17.6	5.0	0.50
11/ 6/74	600.	9.20	2.00	18.5	5.0	0.50
11/ 6/74	900.	10.00	2.20	19.5	5.0	0.47
11/ 6/74	1200.	12.10	2.50	18.5	5.0	0.45
11/ 6/74	1500.	12.50	2.80	18.5	5.0	0.45
11/ 6/74	1800.	12.90	2.80	18.5	5.0	0.45
11/ 6/74	2100.	12.90	2.70	17.6	5.0	0.45
11/ 6/74	2400.	12.90	2.60	18.5	5.0	0.39
11/ 7/74	300.	10.80	2.30	18.5	5.0	0.71
11/ 7/74	600.	13.80	2.80	18.5	5.0	0.71
11/ 7/74	900.	13.80	2.80	17.6	5.0	0.71
11/ 7/74	1800.	8.50	2.70	33.2	5.0	0.28
11/ 7/74	2400.	8.90	2.80	30.6	5.0	0.32
11/ 8/74	600.	8.50	2.70	29.3	5.0	0.36
11/ 8/74	1200.	9.20	2.90	26.7	5.0	0.42
11/ 8/74	1430.	6.60	2.30	38.4	5.0	0.22
12/18/74	1645.			135.3	12.1	0.10
1/ 9/75	1445.			93.4	22.5	0.94
2/ 6/75	1240.			97.4	21.0	1.11
3/ 5/75	1225.			77.1	10.3	1.67

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
4/ 8/75	930.	0.003	0.004	0.004	0.10	0.81
6/18/75	1545.		0.006		0.02	1.81
6/19/75	1000.		0.007		0.01	1.78
6/24/75	1800.		0.017		0.01	1.22
6/24/75	2400.		0.004		0.01	1.21
6/25/75	600.		0.004		0.01	1.24
6/25/75	1200.		0.005		0.01	1.19
6/25/75	1800.		0.006		0.05	1.39
6/25/75	2400.		0.005		0.07	1.35
6/26/75	600.		0.006		0.07	1.32
6/26/75	1200.		0.006		0.01	1.36
6/26/75	1800.		0.009		0.01	1.38
6/26/75	2400.		0.010		0.05	1.57
6/27/75	600.		0.009		0.02	1.47
7/15/75	1420.	0.022	0.009	0.013	0.01	1.23
7/22/75	2400.	0.023	0.006	0.017	0.09	1.69
7/23/75	1400.	0.013	0.004	0.009	0.02	1.44
7/23/75	2000.	0.052	0.006	0.046	0.03	1.37
7/24/75	200.	0.028	0.005	0.023	0.04	1.16
7/24/75	600.	0.089	0.004	0.085	0.03	1.20
7/24/75	1400.	0.041	0.005	0.036	0.01	1.36
7/25/75	2000.	0.082	0.005	0.077	0.01	1.37
7/26/75	200.	0.052	0.005	0.047	0.02	1.32
7/26/75	800.	0.037	0.008	0.029	0.02	1.39
8/12/75	1500.	0.026	0.006	0.020	0.03	1.42
8/14/75	1330.	0.022	0.006	0.016	0.01	1.23
9/11/75	1130.	0.018	0.005	0.013	0.01	1.19
9/16/75	1200.	0.004	0.005	0.004	0.02	1.16
9/16/75	1800.	0.004	0.005	0.004	0.03	1.17
9/16/75	2400.	0.078	0.005	0.073	0.01	1.22
9/17/75	600.	0.004	0.005	0.004	0.01	1.19
9/17/75	1200.	0.004	0.005	0.004	0.04	1.28
9/17/75	1800.	0.004	0.005	0.004	0.11	1.17
9/17/75	2400.	0.004	0.004	0.004	0.03	1.23
9/18/75	600.	0.004	0.005	0.004	0.01	1.18
9/18/75	1200.	0.119	0.005	0.114	0.16	1.34
9/18/75	1800.		0.010		0.05	
9/18/75	2400.	0.012	0.010		0.06	
9/19/75	600.	0.004	0.006	0.004	0.10	1.54
9/19/75	1200.	0.004	0.005		0.03	

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
4/ 8/75	930.	0.011	0.051	0.4		
6/18/75	1545.	0.100	0.181	4.1	33.60	3.30
6/19/75	1000.	0.116	0.187	3.9	33.10	3.50
6/24/75	1800.	0.170	0.259	4.2	10.60	1.80
6/24/75	2400.	0.186	0.273	4.5	10.40	2.00
6/25/75	600.	0.190	0.257	4.6	10.90	1.80
6/25/75	1200.	0.187	0.271	4.6	10.60	1.90
6/25/75	1800.	0.183	0.271	4.6	10.20	2.00
6/25/75	2400.	0.208	0.275	4.6	9.20	2.00
6/26/75	600.	0.230	0.296	4.9	9.60	2.00
6/26/75	1200.	0.201	0.304	5.5	10.00	2.40
6/26/75	1800.	0.208	0.317	5.9	10.50	2.30
6/26/75	2400.	0.260	0.373	7.2	13.10	2.70
6/27/75	600.	0.232	0.375	6.5	12.10	2.50
7/15/75	1420.	0.219	0.299	7.4		
7/22/75	2400.	0.212	0.303	7.6	12.79	2.44
7/23/75	1400.	0.208	0.277	8.0	14.55	2.42
7/23/75	2000.	0.228	0.289	9.0	17.59	1.99
7/24/75	200.	0.222	0.291	9.1	14.71	2.25
7/24/75	800.	0.217	0.291	7.9	14.39	2.23
7/24/75	1400.	0.214	0.289	7.9	14.23	2.12
7/25/75	2000.	0.222	0.297	7.9	14.07	2.14
7/26/75	200.	0.220	0.292	7.9	14.55	2.12
7/26/75	800.	0.210	0.295	8.0	14.71	2.12
8/12/75	1500.	0.197	0.243	7.2		
8/14/75	1330.	0.159	0.199	5.2		
9/11/75	1130.	0.161	0.207	5.8		
9/16/75	1200.	0.137	0.167	4.3		
9/16/75	1800.	0.132	0.157	4.3		
9/16/75	2400.	0.129	0.168	4.5		
9/17/75	600.	0.123	0.156	4.7		
9/17/75	1200.	0.120	0.160	4.7		
9/17/75	1800.	0.116	0.151	4.8		
9/17/75	2400.	0.109	0.162	5.0		
9/18/75	600.	0.109	0.150	5.3		
9/18/75	1200.	0.119	0.156	5.3		
9/18/75	1800.	0.125	0.165	5.4		
9/18/75	2400.	0.127	0.177	5.4		
9/19/75	600.	0.119	0.160	5.3		
9/19/75	1200.	0.127	0.161	5.2		

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO4 mg/l	Alk meq/l
4/ 8/75	930.			103.3	15.9	0.86
6/18/75	1545.	19.80	5.60	65.4	7.9	0.99
6/19/75	1000.	22.40		21.3	9.2	1.04
6/24/75	1800.	8.10	1.60	16.7	6.9	0.37
6/24/75	2400.	7.10	1.70	16.9	6.4	0.34
6/25/75	600.	7.80	1.90	16.9	6.6	0.40
6/25/75	1200.	7.40	1.90	16.5	6.6	0.43
6/25/75	1800.	8.10	2.00	17.3	6.4	0.42
6/25/75	2400.	7.40	1.90	15.7	6.4	0.40
6/26/75	600.	8.10	2.10	16.3	6.4	0.41
6/26/75	1200.	11.70	2.30	20.5	6.9	0.34
6/26/75	1800.	10.20	2.40	18.1	6.9	0.41
6/26/75	2400.	12.00	3.00	27.7	9.1	0.50
6/27/75	600.	11.70	2.80	20.5	6.1	0.50
7/15/75	1420.			22.8	8.0	0.64
7/22/75	2400.	15.29	3.73	30.8	7.6	0.61
7/23/75	1400.	15.29	3.86	29.1	6.4	0.63
7/23/75	2300.	14.61	3.57	30.0	6.1	0.58
7/24/75	200.	18.19	4.15	35.8	7.1	0.58
7/24/75	600.	15.97	3.96	29.5	6.4	0.59
7/24/75	1400.	15.63	4.06	29.2	6.9	0.60
7/25/75	2000.	16.31	3.99	29.4	7.6	0.60
7/26/75	200.	15.29	3.96	28.7	7.6	0.59
7/26/75	800.	16.14	3.93	29.2	6.9	0.65
8/12/75	1500.			18.7	5.4	0.56
8/14/75	133 .			17.1	5.0	0.30
9/11/75	1130.			27.6		0.59
9/16/75	1200.			32.0	15.3	0.69
9/16/75	1800.			25.5	14.8	0.70
9/16/75	2400.			24.7		0.65
9/17/75	600.			27.0	14.8	0.68
9/17/75	1200.			31.0	16.1	0.59
9/17/75	1800.			27.4	25.1	0.74
9/17/75	2400.			52.4	17.6	0.10
9/18/75	600.			25.5	24.9	0.76
9/18/75	1200.			26.4	15.8	0.79
9/18/75	1800.			30.0	18.6	0.74
9/18/75	2400.			28.0	16.1	0.80
9/19/75	600.			29.4	20.8	0.70
9/19/75	1200.			28.8	21.1	0.74

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
10/13/75	1200.	0.004	0.004	0.004	0.04	0.97
10/13/75	1800.	0.004	0.004	0.004	0.09	0.96
10/13/75	2400.	0.015	0.004	0.011	0.04	0.92
10/14/75	600.	0.009	0.004	0.005	0.03	0.92
10/14/75	1200.	0.005	0.004	0.004	0.03	0.95
10/14/75	1800.	0.004	0.004	0.004	0.06	0.90
10/14/75	2400.	0.004	0.004	0.004	0.08	0.95
10/15/75	600.	0.004	0.004	0.004	0.09	0.95
10/15/75	1200.	0.004	0.004	0.004	0.07	0.96
10/15/75	1800.	0.004	0.004	0.004	0.05	0.95
10/15/75	2400.	0.005	0.005	0.004	0.08	0.95
10/16/75	600.	0.004	0.005	0.004	0.03	1.03
10/16/75	1200.	0.065	0.006	0.059	0.08	
10/28/75	1630.	0.005	0.004	0.004	0.01	1.01
11/19/75	1150.	0.004	0.005	0.004	0.01	0.86
6/ 3/76		0.017	0.008	0.009	0.09	
6/11/76	1330.	0.005	0.006		0.02	0.95
6/14/76	1500.	0.021	0.007	0.014	0.04	1.27
6/15/76	1250.	0.019	0.007	0.012	0.05	1.33
6/16/76	1110.	0.020	0.008	0.012	0.06	1.31
6/17/76	940.		0.009		0.47	1.35
6/18/76	1200.	0.025	0.010	0.015	0.03	1.72
6/25/76	1150.	0.031	0.009	0.022	0.03	1.52
7/ 2/76		0.061	0.009	0.052	< 0.13	1.52
7/ 9/76	1430.	0.019	0.009	0.010	< 0.13	1.15
7/16/76	1400.	0.038	0.006	0.032	0.02	1.29
7/23/76		0.144	0.008	0.136	< 0.01	1.23
7/30/76	1045.	0.014	0.007	0.007	0.02	1.38
8/ 6/76	1030.	0.032	0.007	0.025	0.10	1.56
8/13/76	1345.	0.035	< 0.004	0.031	0.12	1.30
8/16/76	1545.	0.014	0.005	0.009	0.03	0.98
8/17/76	1425.	0.012	0.008	< 0.004	< 0.01	1.12
8/18/76	1150.	0.020	0.006	0.014	< 0.01	1.03
8/19/76	1005.	0.019	0.008	0.011	0.01	1.23
8/20/76	1015.	0.011	0.007	< 0.004	0.02	1.21
8/27/76	1115.	0.038	0.010	0.028	< 0.01	1.27
9/ 3/76	1110.	0.019	0.008	0.011	0.01	1.21
9/10/76	1110.	0.005	0.006		< 0.01	1.46
9/17/76	1400.	0.028	0.006	0.022	0.13	1.13
9/24/76	1030.	0.004	0.006		< 0.01	1.11

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
10/13/75	1200.	0.086	0.126	4.1		
10/13/75	1800.	0.087	0.121	4.1		
10/13/75	2400.	0.079	0.117	4.0		
10/14/75	600.	0.083	0.320	4.0		
10/14/75	1200.	0.083	0.118	3.9		
10/14/75	1800.	0.085	0.309	3.9		
10/14/75	2400.	0.087	0.124	3.8		
10/15/75	600.	0.089	0.140	3.9		
10/15/75	1200.	0.092	0.126	3.8		
10/15/75	1800.	0.091	0.150	3.7		
10/15/75	2400.	0.103	0.140	3.7		
10/16/75	600.	0.096	0.156	3.7		
10/16/75	1200.	0.104	0.148	3.6		
10/28/75	1630.	0.067	0.099			
11/19/75	1150.	0.040	0.064	1.9		
6/ 3/76		0.234	0.310	7.8	18.11	4.23
6/11/76	1330.	0.267	0.303	4.7	5.27	2.49
6/14/76	1500.	0.302	0.365		6.84	3.10
6/15/76	1250.	0.301	0.361		8.42	3.04
6/16/76	1110.	0.290	0.342		7.63	5.11
6/17/76	940.	0.286	0.331		8.58	2.84
6/18/76	1200.	0.265	0.322	7.3		
6/25/76	1150.		0.266	6.6	8.26	0.32
7/ 2/76		0.229	0.286	6.1	11.99	0.20
7/ 9/76	1430.	0.168	0.213	3.9	8.16	0.25
7/16/76	1400.	0.249	0.291	4.2	17.77	0.21
7/23/76		0.179	0.239	4.8	11.86	0.21
7/30/76	1045.	0.190	0.230	4.9	11.20	2.55
8/ 6/76	1030.	0.162	0.197	5.0	11.52	1.86
8/13/76	1345.	0.187	0.218	3.2	8.62	2.03
8/16/76	1545.	0.161	0.192	4.0	7.97	2.19
8/17/76	1425.	0.215	0.259	4.8	8.78	2.58
8/18/76	1150.	0.191	0.237	4.8	8.94	2.60
8/19/76	1005.	0.190	0.479	5.6	9.59	2.29
8/20/76	1015.	0.252	0.327	6.1	8.63	2.73
8/27/76	1115.	0.180	0.220	6.4	11.47	1.45
9/ 3/76	1110.	0.251	0.277	6.2	12.62	1.90
9/13/76	1110.	0.337	0.376	4.0	10.75	2.49
9/17/76	1400.	0.177	0.220		10.63	2.13
9/24/76	1030.	0.224	0.254	4.2	11.70	2.02

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk. meq/l
10/13/75	1200.			29.8	5.0	0.26
10/13/75	1800.			25.7	5.0	0.28
10/13/75	2400.			25.7	5.0	0.23
10/14/75	600.			25.5	5.0	0.22
10/14/75	1200.			25.1	5.0	0.26
10/14/75	1800.			25.1	5.0	0.34
10/14/75	2400.			25.3	5.0	0.31
10/15/75	600.			27.2	5.0	0.42
10/15/75	1200.			26.1	5.0	0.56
10/15/75	1800.			25.1	5.0	0.56
10/15/75	2400.			25.7	5.0	0.67
10/16/75	600.			25.7	5.0	0.64
10/16/75	1200.			25.7	5.0	0.68
10/28/75	1630.			28.6	5.0	0.57
11/19/75	1150.			25.1	5.0	0.59
6/ 3/76		18.14	4.18	29.8	7.4	0.64
6/11/76	1330.	8.35	1.87	11.3	< 5.0	0.26
6/14/76	1500.	10.50		21.7		0.49
6/15/76	1250.	12.11		18.3		0.55
6/16/76	1110.	11.39		19.5		0.44
6/17/76	940.	11.75		25.0		0.46
6/18/76	1200.			15.6	< 5.0	0.90
6/25/76	1150.	11.34	2.05	14.4	5.9	0.56
7/ 2/76		13.65	2.83	22.1	6.0	0.67
7/ 9/76	1430.	9.38	2.19	20.9	5.8	0.37
7/16/76	1400.	17.50	3.08	22.9	10.5	0.61
7/23/76		12.40	2.70	24.2	6.5	0.56
7/30/76	1045.	12.13	2.83	22.0	9.1	0.46
8/ 6/76	1030.	13.68	3.20	26.6	6.4	0.57
8/13/76	1345.	10.90	1.94	16.9	10.4	0.37
8/16/76	1545.	10.90	2.19	16.3	< 5.0	0.48
8/17/76	1425.	9.60	2.36	16.9	7.9	0.60
8/18/76	1150.	10.25	2.44	20.8	6.9	0.49
8/19/76	1005.	10.25	2.49	17.9	10.9	0.66
8/20/76	1015.	8.81	2.33	16.7	< 5.0	0.21
8/27/76	1115.	11.51	2.52	21.4	6.2	0.60
9/ 3/76	1110.	12.14	2.75	25.1	10.5	0.69
9/10/76	1110.	9.87	2.56	22.7	5.9	0.53
9/17/76	1400.	11.20	2.32	22.9	< 5.0	0.62
9/24/76	1030.	14.16	2.70	30.0	8.4	0.58

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
10/ 1/76	1015.	0.181	0.004	0.177	0.24	
10/ 8/76	1130.	< 0.004	0.004	< 0.004	0.01	2.90
10/11/76	1515.	0.010	0.004	0.006	0.01	2.41
10/12/76	1200.	0.006	< 0.004	< 0.004	< 0.01	3.27
10/13/76	1000.	0.004	< 0.004	< 0.004	< 0.01	2.48
10/14/76	1000.	0.006	< 0.004	< 0.004	0.02	2.79
10/15/76	930.	0.005	< 0.004	< 0.004	0.03	1.41

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO4 mg/l	T-PO4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
10/ 1/76	1015.	0.231	0.265	4.0	4.46	3.05
10/ 8/76	1130.	0.141	0.184	4.1	13.04	2.87
10/11/76	1515.	0.126	0.159	4.0	12.24	2.75
10/12/76	1200.	0.100	0.143	4.1	13.67	2.98
10/13/76	1000.	0.061	0.126	4.0	14.63	3.05
10/14/76	1000.	0.105	0.108	3.6	13.25	2.87
10/15/76	930.	0.076	0.104	3.3	14.26	3.24

APPENDIX C-4 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l		SO_4 mg/l	Alk meq/l
10/ 1/76	1015.	11.02	2.73	23.8	<	5.0	0.54
10/ 8/76	1130.	12.77	2.78	29.2	<	5.0	0.79
10/11/76	1515.	11.97	2.87	25.1		5.1	0.63
10/12/76	1200.	12.77	2.99	25.7		5.1	0.69
10/13/76	1000.	11.97	3.17	27.9	<	5.0	0.60
10/14/76	1000.	13.56	2.20	28.0	<	5.0	0.78
10/15/76	930.	14.83	2.81	30.9	<	5.0	0.69

APPENDIX C. LABORATORY RESULTS FOR SAMPLING DATES

5. EAGLE ISLAND BRIDGE STATION

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
10/17/74	1510.					
10/17/74	1510.	1.252	0.004	1.248	0.16	2.28
6/18/75	1400.		0.004		0.01	1.56
6/19/75	1130.		0.004		0.21	1.60
6/24/75	1800.		0.004		0.03	0.97
6/24/75	2400.		0.004		0.01	1.04
6/25/75	600.		0.004		0.01	1.25
6/25/75	1200.		0.004		0.07	1.21
6/25/75	1300.		0.004		0.01	0.97
6/25/75	2400.		0.004		0.13	1.22
6/26/75	600.		0.004		0.01	1.04
6/26/75	1200.		0.004		0.01	1.09
6/26/75	1800.		0.004		0.01	1.30
6/26/75	2400.		0.004		0.01	1.16
6/27/75			0.004		0.01	1.09
6/27/75	1200.		0.004		0.01	1.25
7/21/75	1400.	0.006	0.004	0.004	0.01	1.37
7/21/75	2000.	0.048	0.007	0.041	0.01	1.37
7/22/75	200.	0.005	0.004	0.004	0.01	1.46
7/22/75	800.	0.014	0.005	0.009	0.02	1.47
7/22/75	1400.	0.008	0.004	0.004	0.02	1.49
7/22/75	2000.		0.005		0.08	1.37
7/23/75	200.	0.017	0.006	0.011	0.06	1.37
7/23/75	800.		0.005		0.09	1.31
7/23/75	1400.	0.008	0.006	0.008	0.01	1.59
7/23/75	2000.	0.067	0.006	0.061	0.04	1.43
7/24/75	200.	0.069	0.006	0.063	0.02	1.28
7/24/75	800.	0.017	0.009	0.008	0.02	1.47
7/24/75	1400.	0.313	0.006	0.307	0.02	1.40
9/16/75	1200.	0.014	0.008	0.006	0.05	1.53
9/16/75	1800.	0.019	0.008	0.011	0.07	1.75
9/16/75	2400.	0.015	0.008	0.007	0.07	1.58
9/17/75	600.	0.011	0.008	0.004	0.06	1.69
9/17/75	1200.	0.086	0.005	0.081	0.09	1.70
9/17/75	1800.	0.026	0.008	0.018	0.07	1.50
9/17/75	2400.	0.027	0.005	0.022	0.06	1.61
9/18/75	600.	0.020	0.007	0.013	0.05	1.52
9/18/75	1200.	0.019	0.007	0.012	0.05	1.57
9/18/75	1800.	0.026	0.008	0.018	0.04	1.57
9/18/75	2400.	0.022	0.009	0.013	0.04	1.78

APPENDIX C-5 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO4 mg/l	T-PO4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
10/17/74	1515.					
10/17/74	1515.	0.028	0.057	1.2	8.50	0.70
6/18/75	1400.	0.105	0.190	2.3	22.30	2.00
6/19/75	1130.	0.115	0.181	2.0	21.90	2.00
6/24/75	1800.	0.164	0.257	5.4	8.50	1.70
6/24/75	2400.	0.201	0.425	4.5	10.90	1.60
6/25/75	600.	0.264	0.561	4.7	10.70	1.70
6/25/75	1200.	0.289	0.488	4.9	8.10	2.20
6/25/75	1300.	0.237	0.211	5.0	8.60	2.20
6/25/75	2400.	0.231	0.217	4.9	8.00	2.10
6/26/75	600.	0.302	0.375	5.4	8.20	2.50
6/26/75	1200.	0.312	0.398	5.6	8.60	2.70
6/26/75	1800.	0.259	0.352	5.6	8.90	2.70
6/26/75	2400.	0.200	0.313	5.5	9.40	2.70
6/27/75		0.215	0.370	5.7	10.00	2.80
6/27/75	1200.	0.261	0.451	6.3	10.40	2.90
7/21/75	1400.	0.103	0.160	7.4	16.63	2.46
7/21/75	2000.	0.091	0.164	7.5	16.79	2.53
7/22/75	200.	0.093	0.169	7.7	19.35	2.62
7/22/75	800.	0.101	0.203	7.6	18.39	2.55
7/22/75	1400.	0.091	0.159	7.5	15.51	2.40
7/22/75	2000.	0.085	0.153	7.4	15.03	2.38
7/23/75	200.	0.104	0.197	7.2	16.15	2.51
7/23/75	800.	0.102	0.210	7.3	16.63	2.55
7/23/75	1400.	0.092	0.212	6.8	15.51	2.51
7/23/75	2000.	0.102	0.214	6.8	17.43	2.10
7/24/75	200.	0.095	0.192	6.7	17.59	2.03
7/24/75	600.	0.081	0.154	6.9	13.91	2.29
7/24/75	1400.	0.097	0.179	6.9	13.75	2.19
9/16/75	1200.	0.121	0.171	5.1		
9/16/75	1800.	0.104	0.154	4.8		
9/16/75	2400.	0.126	0.203	4.9		
9/17/75	600.	0.173	0.307	5.0		
9/17/75	1200.	0.167	0.309	5.1		
9/17/75	1800.	0.096	0.155	4.8		
9/17/75	2400.	0.101	0.147	4.8		
9/18/75	600.	0.117	0.184	5.0		
9/18/75	1200.	0.119	0.179	5.1		
9/18/75	1800.	0.088	0.131	5.0		
9/18/75	2400.	0.102	0.140	4.9		

APPENDIX C-5 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
10/17/74	1510.					
10/17/74	1510.	5.60	1.50	13.8		0.20
6/18/75	1400.	16.40	5.80	42.2	11.3	0.89
6/19/75	1130.	18.70		41.4	12.0	0.91
6/24/75	1800.	10.20	2.40	17.1	7.1	0.50
6/24/75	2400.	9.90	2.40	15.1	6.4	0.51
6/25/75	600.	11.00	2.40	40.7	5.9	0.10
6/25/75	1200.	12.40	2.70	15.3	6.9	0.60
6/25/75	1300.	12.00	2.60	14.9	6.4	0.57
6/25/75	2400.	12.70	2.60	14.9	6.4	0.60
6/26/75	600.	14.10	2.90	16.3	7.4	0.69
6/26/75	1200.	14.80	3.00	16.7	7.4	0.76
6/26/75	1800.	14.10	2.90	17.3	6.6	0.71
6/26/75	2400.	14.10	3.10	18.1	6.4	0.71
6/27/75		15.50	3.30	19.9	6.9	0.75
6/27/75	1200.	16.20	3.40	20.9	6.9	0.85
7/21/75	1400.	18.02	4.28	35.6	8.6	0.78
7/21/75	2000.	18.02	4.41	39.6	7.6	0.79
7/22/75	200.	21.78	4.89	39.6	7.4	1.00
7/22/75	800.	20.75	4.70	41.0	7.6	0.93
7/22/75	1400.	18.02	4.22	36.2	7.6	0.75
7/22/75	2000.	17.34	4.15	33.8	8.4	0.72
7/23/75	200.	18.19	4.38	37.7	8.9	0.76
7/23/75	800.	20.58	4.70	43.4	8.9	0.76
7/23/75	1400.	16.66	4.09	31.6	7.4	0.66
7/23/75	2000.	15.97	3.83	34.8	8.4	0.60
7/24/75	200.	15.97	3.73	34.5	7.6	0.62
7/24/75	800.	15.46	3.73	31.8	8.4	0.59
7/24/75	1400.	15.29	3.64	63.7	7.4	0.51
9/16/75	1200.			33.0	19.8	0.51
9/16/75	1800.			24.1	23.6	0.76
9/16/75	2400.			30.0	20.1	0.73
9/17/75	600.			24.3	17.8	0.71
9/17/75	1200.			90.3	19.8	0.10
9/17/75	1800.			35.2	26.9	0.18
9/17/75	2400.			59.3	22.4	0.10
9/18/75	600.			22.7	23.6	0.51
9/18/75	1200.			23.1	19.8	0.45
9/18/75	1800.			23.9	18.8	0.44
9/18/75	2400.			24.3	21.1	0.51

APPENDIX C-5 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH_4 mg/l	TKN mg/l
9/19/75	600.	0.014	0.007	0.007	0.03	1.55
9/19/75	1200.	0.013	0.009	0.004	0.06	1.61
6/15/76	1100.	0.017	0.005	0.012	0.06	1.44
6/16/76	1200.	0.005	0.008		0.04	1.48
6/17/76	1025.	0.022	0.008	0.014	0.11	1.47
6/18/76	1300.	0.141	0.011	0.130	0.04	0.70
6/25/76	1115.	0.006	0.009		0.05	1.73
7/ 2/76		0.007	0.008		< 0.13	1.77
7/ 9/76	1510.	0.060	0.009	0.051	< 0.13	1.70
7/16/76	1430.	0.005	0.006		0.01	1.63
7/23/76	1130.	0.035	0.006	0.029	< 0.01	1.67
7/30/76	1400.	0.006	0.007		0.13	1.76
8/ 6/76	1400.	0.006	0.006	< 0.004	0.06	1.84
8/13/76	1415.	0.005	< 0.004	< 0.004	0.06	1.29
8/16/76	1615.	0.008	0.005	< 0.004	0.04	1.25
8/17/76	1500.	0.012	0.007	0.005	0.03	1.29
8/18/76	1225.	0.010	0.006	0.004	0.01	1.31
8/19/76	930.	0.093	0.006	0.087	0.06	1.19
8/20/76	1315.	0.013	0.018		0.04	1.34
8/27/76	1400.	0.018	0.009	0.009	0.03	2.02
9/ 3/76	1300.	0.012	0.006	0.006	0.02	1.41
9/10/76	1400.	0.012	0.005	0.007	< 0.01	1.42
9/17/76	1125.	0.030	0.006	0.024	0.05	1.33
9/24/76	1145.	0.039	0.007	0.032	< 0.01	1.35
10/ 1/76	1300.	0.005	0.005	< 0.004	< 0.01	
10/ 8/76	1415.	0.057	0.008	0.049	0.04	3.32
10/11/76	1600.	0.074	0.007	0.067	0.04	2.65
10/12/76	1315.	0.143	0.008	0.135	< 0.01	1.36
10/13/76	900.	0.165	0.006	0.159	0.02	2.33
10/14/76	1015.	0.053	0.007	0.046	0.03	2.22
10/15/76	1330.	0.053	0.005	0.048	< 0.01	1.71

Date Mo/Day/Yr	Time Hour/Min.		O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
9/19/75	600.		0.132	0.189	4.9		
9/19/75	1200.		0.187	0.256	5.1		
6/15/76	1100.		0.272	0.353		6.21	3.12
6/16/76	1200.		0.293	0.338		7.16	3.33
6/17/76	1025.		0.117	0.459		6.69	3.60
6/18/76	1300.		0.104	0.187	4.8		
6/25/76	1116.	<	0.002	0.323	5.9	9.81	0.32
7/ 2/76			0.069	0.115	3.7	12.14	0.20
7/ 9/76	1510.		0.160	0.228	3.6	10.78	0.28
7/16/76	1430.		0.120	0.161	4.8	14.39	0.19
7/23/76	1130.		0.057	0.120	4.4	16.68	0.28
7/30/76	1400.		0.087	0.123	5.6	8.77	2.02
8/ 6/76	1400.		0.034	0.075	3.7	12.01	1.58
8/13/76	1415.		0.185	0.226	4.1	12.68	2.61
8/16/76	1015.		0.128	0.169	3.6	13.49	2.28
8/17/76	1500.		0.111	0.166	4.3	12.19	2.19
8/18/76	1225.		0.151		5.0	11.38	2.49
8/19/76	930.		0.218	0.262	6.0	8.46	2.82
8/20/76	1315.		0.060	0.272	5.0	14.53	2.28
8/27/76	1400.		0.050	0.095	4.9	10.98	1.12
9/ 3/76	1300.		0.012	0.047	3.8	14.17	0.76
9/10/76	1400.		0.011	0.038	3.4	11.56	0.90
9/17/76	1120.		0.023	0.049		10.63	0.81
9/24/76	1145.		0.022	0.103	3.2	14.78	1.33
10/ 1/76	1300.		0.109	0.213	3.9	5.76	3.41
10/ 8/76	1415.		0.038	0.084	2.6	16.54	1.89
10/11/76	1500.		0.036	0.062	2.5	17.49	1.68
10/12/76	1315.		0.103	0.150	5.3	10.02	2.76
10/13/76	900.		0.089	0.343	4.8	10.17	2.71
10/14/76	1015.		0.097	0.145	4.6	7.75	2.68
10/15/76	1300.		0.029	0.079	2.1	17.88	1.95

APPENDIX C-5 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO4 mg/l	Alk meq/l
9/19/75	600.			20.3	19.8	0.54
9/19/75	1200.			22.5		0.52
6/15/76	1100.	12.29		14.2		0.59
6/16/76	1200.	13.00		16.2		0.52
6/17/76	1025.	14.08		14.0		0.63
6/18/76	1300.			19.2	< 5.0	0.54
6/25/76	1116.	12.31	1.89	16.9	5.9	0.53
7/ 2/76		9.93	2.19	21.5	6.5	0.42
7/ 9/76	1510.	10.76	2.79	22.7	9.7	0.55
7/16/76	1430.	19.27	2.79	21.2	7.3	0.54
7/23/76	1130.	14.16	3.89	34.6	11.0	0.60
7/30/76	1400.	11.53	2.25		6.1	0.50
8/ 6/76	1400.	10.43	2.46	23.0	5.4	0.41
8/13/76	1415.	15.10	3.16	26.3	8.1	0.74
8/16/76	1615.	11.38	3.41	29.7	5.6	0.58
8/17/76	1500.	11.54	2.82	23.5	6.1	0.54
8/18/76	1225.	12.51	2.95	21.8	6.9	0.63
8/19/76	930.	13.48	2.91	18.3	6.9	0.72
8/20/76	1315.	12.43	3.35	29.3	< 5.0	0.34
8/27/76	1400.	10.87	2.09	20.2	8.2	0.53
9/ 3/76	1300.	11.34	2.71	25.3	6.3	0.61
9/10/76	1400.	10.19	2.22	19.1	< 5.0	0.46
9/17/76	1120.	9.66	2.28	23.5	< 5.0	0.55
9/24/76	1145.	14.00	2.53	24.1	7.2	0.56
10/ 1/76	1300.	10.86	2.73	28.8	< 5.0	0.39
10/ 8/76	1415.	12.61	2.95	35.2	< 5.0	0.78
10/11/76	1600.	12.61	3.21	33.0	5.1	0.57
10/12/76	1315.	14.83	2.35	17.8	5.1	0.67
10/13/76	900.	11.97	2.40	19.1	5.1	0.62
10/14/76	1015.	10.55	1.57	15.8	< 5.0	0.77
10/15/76	1300.	12.48	2.89	37.0	< 5.0	0.64

APPENDIX C. LABORATORY RESULTS FOR SAMPLING DATES

6. CHANDLER SLOUGH MARSH STATION

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/l	NO_2 mg/l	NO_3 mg/l	NH4 mg/l	TKN mg/l
11/21/75	1230.	0.009	0.007	0.004	0.01	2.41
6/14/76	1630.	0.012	0.007	0.005	0.05	
6/14/76	2030.	0.005	0.007		0.03	
6/15/76	430.	0.005	0.007		0.08	
6/15/76	830.	0.010	0.008	< 0.004	0.02	
6/15/76	1230.	0.007	0.007	< 0.004	< 0.01	
6/15/76	1630.	0.005	0.009		0.05	1.34
6/15/76	2030.	0.010	0.010	< 0.004	0.20	1.34
6/15/76	2430.	0.005	0.007		0.02	
6/16/76	430.	0.169	0.009	0.160	0.17	1.35
6/16/76	830.	0.006	0.009		< 0.01	1.39
6/16/76	1230.	0.005	0.010		0.01	1.37
6/16/76	1630.		0.011	< 0.004	0.04	1.46
6/16/76	2030.		0.011	< 0.004	0.03	1.41
6/16/76	2430.	0.005	0.010		0.01	1.43
6/17/76	430.	0.006	0.006	< 0.004	0.08	1.40
6/17/76	830.	0.008	0.006	< 0.004	0.04	1.34
6/17/76	1230.	0.008	0.006	< 0.004	0.08	1.41
6/17/76	2430.	0.007	0.006	< 0.004	0.04	1.38
8/16/76	1330.	< 0.004	0.006	< 0.004	0.02	1.35
8/16/76	1630.	0.008	0.006	< 0.004	0.02	1.12
8/16/76	1930.	0.256	0.006	0.250	0.09	1.09
8/16/76	2230.	0.008	0.007	< 0.004	0.04	1.05
8/17/76	130.	0.008	0.007	< 0.004	0.04	1.28
8/17/76	430.	0.006	0.007		0.05	1.17
8/17/76	730.	0.007	0.007	< 0.004	0.03	1.14
8/17/76	1330.	0.006	0.007		0.02	1.29
8/18/76	1430.	0.007	0.009		0.04	1.25
8/18/76	1730.	0.007	0.009		0.05	1.25
8/18/76	2030.	0.746	0.010	0.736	0.07	1.16
8/18/76	2330.	0.011	0.009	< 0.004	0.02	1.27
8/19/76	230.	0.010	0.009	< 0.004	0.04	1.16
8/19/76	530.	0.020	0.009	0.011	0.11	1.27
8/19/76	830.	0.015	0.009	0.006	0.10	1.15
8/19/76	1130.	0.011	0.009	< 0.004	0.06	1.58
10/11/76	1430.	0.008	0.006	< 0.004	< 0.01	3.07
10/11/76	1730.	0.007	0.005	< 0.004	0.02	2.79
10/11/76	2130.	0.010	0.006	0.004	< 0.01	2.66
10/12/76	30.	0.011	0.007	< 0.004	0.02	2.60
10/12/76	330.	0.010	0.006	0.004	0.02	0.66

APPENDIX C-6 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
11/21/75	1230.	0.131		2.9		
6/14/76	1630.	0.357	0.437		9.52	2.99
6/14/76	2030.	0.370	0.445		9.83	2.94
6/15/76	430.	0.390	0.454		9.83	3.41
6/15/76	830.	0.412	0.534		11.57	3.54
6/15/76	1230.	0.377			10.15	3.21
6/15/76	1630.	0.371	0.428		10.62	3.38
6/15/76	2030.	0.360	0.436		10.31	3.33
6/15/76	2430.	0.390	0.455		9.99	3.09
6/16/76	430.	0.368	0.438		10.78	3.45
6/16/76	830.	0.367	0.429		10.94	3.38
6/16/76	1230.	0.353	0.421		10.94	3.17
6/16/76	1630.	0.332	0.404		11.41	3.26
6/16/76	2030.	0.343	0.412		9.99	3.02
6/16/76	2430.	0.368	0.436		10.31	3.38
6/17/76	430.	0.358	0.428		10.62	3.09
6/17/76	830.	0.350	0.410		9.99	3.01
6/17/76	1230.	0.335	0.392		10.78	3.17
6/17/76	2430.	0.367	0.436		10.78	3.12
8/16/76	1330.	0.182	0.207	3.8	12.03	2.70
8/16/76	1630.	0.175	0.203	3.7	8.13	1.87
8/16/76	1930.	0.119	0.211	2.4	7.97	1.77
8/16/75	2230.	0.113	0.222	3.8	7.97	1.82
8/17/76	130.	0.176	0.235	3.9	8.62	1.96
8/17/76	430.	0.208	0.243	4.0	9.27	2.03
8/17/76	730.	0.163	0.255	4.0	10.41	2.19
8/17/76	1330.	0.262	0.319	4.3	7.97	2.32
8/18/76	1430.	0.318	0.370	4.4	10.41	2.76
8/18/76	1730.	0.313	0.357	4.4	9.92	2.56
8/18/76	2030.	0.262	0.319	4.3	10.24	2.44
8/18/76	2330.	0.278	0.313	4.4	8.78	2.42
8/19/76	230.	0.276	0.320	4.6	10.08	2.88
8/19/76	530.	0.283	0.325	4.6	8.94	2.50
8/19/76	830.	0.272	0.307	4.6	8.78	2.41
8/19/76	1130.	0.252	0.295	4.7	9.11	2.54
10/11/76	1430.	0.137	0.189	5.0	12.72	2.98
10/11/76	1730.	0.137	0.177	4.9	13.83	2.96
10/11/76	2130.	0.127	0.167	5.0	13.83	2.99
10/12/76	30.	0.128	0.166	5.0	13.67	2.87
10/12/76	330.	0.124	0.166	5.0	13.20	2.88

APPENDIX C-6 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	Ca mg/l	Mg mg/l	Cl mg/l	SO_4 mg/l	Alk meq/l
11/21/75	1230.			81.2	5.8	0.43
6/14/76	1630.	12.11		19.1		0.52
6/14/76	2030.	13.36		18.9		0.53
6/15/76	430.	14.61		18.1		0.48
6/15/76	830.	12.64		20.5		0.51
6/15/76	1230.	13.72		18.9		0.48
6/15/76	1630.	12.82		21.3		0.48
6/15/76	2030.	19.26		20.1		0.47
6/15/76	2430.	13.54		18.5		0.51
6/16/76	430.	19.80		20.1		0.45
6/16/76	830.	14.08		18.9		0.44
6/16/76	1230.	11.75		18.9		0.49
6/16/76	1630.	13.54		19.1		0.52
6/16/76	2030.	13.36		19.1		0.52
6/16/76	2430.	13.72		20.1		0.46
6/17/76	430.	13.54		21.1		0.57
6/17/76	830.	12.64		18.7		0.57
6/17/76	1230.	12.29		19.9		0.55
6/17/76	2430.	12.29		20.1		0.51
8/16/76	1330.	11.54	3.07	18.9	5.4	0.49
8/16/76	1630.	9.44	2.03	16.3	5.4	0.45
8/16/76	1930.	8.31	1.90	11.9	< 5.0	0.32
8/16/76	2230.	7.99	2.07	15.7	11.7	0.36
8/17/76	130.	8.63	2.07	16.9	8.4	0.39
8/17/76	430.	10.09	1.98	16.1	7.9	0.41
8/17/76	730.	14.13	2.07	17.1	7.9	0.43
8/17/76	1330.	9.76	2.07	19.1	10.2	0.35
8/18/76	1430.	8.63	2.28	18.7	11.1	0.51
8/18/76	1730.	8.31	2.28	16.9	11.1	0.48
8/18/76	2030.	9.28	2.28	16.7	11.4	0.48
8/18/76	2330.	8.31	2.32	17.5	11.7	0.52
8/19/76	230.	8.63	2.07	17.9	11.7	0.48
8/19/76	530.	8.96	2.28	17.9	11.7	0.48
8/19/76	830.	11.22	2.40	18.7	< 5.0	0.48
8/19/76	1130.	10.25	2.44	19.1	5.0	0.53
10/11/76	1430.	12.29	3.12	27.7	5.1	0.57
10/11/76	1730.	12.45	3.21	27.7	5.1	0.56
10/11/76	2130.	12.45	3.21	27.1	5.1	0.56
10/12/76	30.	12.61	3.17		5.1	0.63
10/12/76	330.	12.77	3.08	26.7	5.1	0.60

APPENDIX C-6 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	NO_x mg/1	NO_2 mg/1	NO_3 mg/1	NH_4 mg/1	TKN mg/1
10/12/76	630.	0.009	0.005	< 0.004	0.03	1.03
10/12/76	930.	0.008	0.005	< 0.004	< 0.01	0.64
10/12/76	1230.	0.009	0.005	< 0.004	0.02	2.46
10/12/76	1530.	< 0.004	< 0.004	< 0.004	0.02	2.39
10/12/76	1830.	< 0.004	< 0.004	< 0.004	0.02	2.55
10/12/76	2130.	0.031	0.005	0.026	0.02	1.81
10/13/76	30.	0.009	0.004	0.005	0.01	4.41
10/13/76	330.	0.027	0.004	0.023	0.03	2.22
10/13/76	630.	0.007	0.005	< 0.004	0.01	1.78
10/13/76	930.	0.010	0.005	0.005	0.02	1.75
10/13/76	1230.	0.009	0.006	< 0.004	0.03	1.89
10/13/76	1530.	0.691	0.004	0.687	0.05	2.06
10/13/76.	1830.	0.015	0.004	0.011	0.01	6.60
10/13/76	2130.		0.004		0.10	
10/14/76	30.	0.015	0.004	0.011	0.01	2.53
10/14/76	330.	0.014	0.004	0.010	0.04	2.63
10/14/76	630.	0.007	0.006	< 0.004	0.01	1.49
10/14/76	930.	0.006	0.004	< 0.004	0.02	0.93
10/14/76	1230.	0.008	0.005	< 0.004	0.03	

APPENDIX C-6 (Continued)

Date Mo/Day/Yr	Time Hour/Min.	O-PO_4 mg/l	T-PO_4 mg/l	SiO_2 mg/l	Na mg/l	K mg/l
10/12/76	630.	0.129	0.168	5.0	13.99	3.07
10/12/76	930.	0.127	0.168	5.0	15.42	2.93
10/12/76	1230.	0.120	0.176	5.0	14.15	3.09
10/12/76	1530.	0.115	0.183	5.0	13.67	2.96
10/12/76	1830.	0.111	0.174	5.0	14.31	2.84
10/12/76	2130.	0.107	0.199	4.9	14.31	2.82
10/13/76	30.	0.102	0.190	4.9	13.83	2.93
10/13/76	330.	0.106	0.142	4.9	13.83	2.87
10/13/76	630.	0.109	0.144	4.9	12.62	2.98
10/13/76	930.	0.109	0.148	4.9	14.81	3.03
10/13/76	1230.	0.110	0.145	4.8	14.66	2.86
10/13/76	1530.	0.101	0.140	5.0	15.13	2.72
10/13/76	1830.	0.101	0.133	5.0	15.44	2.69
10/13/76	2130.	0.099	0.127	5.1	15.60	2.73
10/14/76	30.	0.093	0.127	4.8	13.40	2.72
10/14/76	330.	0.098	0.140	5.0	14.81	3.16
10/14/76	630.	0.095	0.136	4.9	13.87	2.73
10/14/76	930.	0.102	0.138	4.9	14.19	2.72
10/14/76	1230.	0.102	0.140	6.5	13.25	2.99

Date Mo/Day/Yr	Time Hour/Min	Ca mg/l	Mg mg/l	Cl mg/l	SO4 mg/l	Alk meq/l
10/12/76	630.	12.77	3.21	27.3	5.1	0.60
10/12/76	930.	12.77	2.74	29.6	5.1	0.60
10/12/76	1230.	12.61	3.29	27.7	< 5.0	0.60
10/12/76	1530.	13.24	3.42	28.6	< 5.0	0.60
10/12/76	1830.	12.45	3.17	29.4	< 5.0	0.63
10/12/76	2130.	12.77	3.17	27.7	< 5.0	0.63
10/13/76	30.	12.93	3.12	27.1	< 5.0	0.65
10/13/76	330.	12.77	3.17	27.7	< 5.0	0.63
10/13/76	630.	12.45	2.74	27.1	< 5.0	0.65
10/13/76	930.	13.24	2.49	28.0	< 5.0	0.71
10/13/76	1230.	13.08	2.41	27.7	< 5.0	0.74
10/13/76	1530.	11.82	2.62	28.6	< 5.0	0.69
10/13/76	1830.	11.97	2.58	28.0	< 5.0	0.69
10/13/76	2130.	11.50	2.49	28.4	< 5.0	0.63
10/14/76	30.	11.97	2.66	27.7	< 5.0	0.66
10/14/76	330.	11.97	2.74	28.6	< 5.0	0.71
10/14/76	630.	11.82	2.62	27.7	< 5.0	0.74
10/14/76	930.	12.45	2.74	27.7	< 5.0	0.74
10/14/76	1230.	14.35	2.70	28.4	< 5.0	0.80

APPENDIX D

DESCRIPTION OF PLANT COMMUNITIES IN CHANDLER SLOUGH

1. Dense Cypress Zone

Taxodium distichum (bald cypress) is the top story in this zone, with a density of about one tree per five m^2. Several species of ephiphytes, including Tillandsia spp. and Encyclia tampensis (butterfly orchid), grow on the cypress. Other large plants include Fraxinus caroliniana (pop ash) and Cephalanthus occidentalis (buttonbush). There is little understory vegetation except during the summer and autumn when Eichhornia crassipes (water hyacinth) becomes abundant. Some open water areas have Polygonum sp. (smartweed) or Sagittaria subulata.

2. Sparse Cypress Zone

Bald cypress is less dense than in the first zone, although occasional cypress heads are present. Much of the understory vegetation is comprised of Polygonum sp., Pontederia lanceolata (pickerelweed), and Sagittaria lancifolia (arrowhead). Water hyacinths are abundant during the summer and autumn. Cyperus articulatus, Cephalanthus occidentalis, Iris hexagona (prairie iris) and several species of submergent plants are also present.

3. Broadleaf Marsh Zone

This zone is dominated by several aquatic broadleaf plants, including Pontederia lanceolata, Sagittaria lancifolia, and Thalia geniculata. Smartweed is usually present, Typha sp. (cattail), Ludwigia peruviana (primrose willow), and Scirpus californicus (bulrush) occur occasionally. Submergents such as Ludwigia repens and Bacopa caroliniana (aromatic figwort) are frequently observed.

4. Buttonbush Zone

The central portion of Chandler Slough is dominated by buttonbush plants that are one to two meters tall. Buttonbush usually grows in association with Sagittaria lancifolia, Panicum hemitomon (maidencane), and Mikania scandens (climbing hempweed). Buttonbush density averages about 0.25 plants/m^2. Marsh vegetation between the buttonbush plants includes P. lanceolata, Leersia hexandra (cut grass), I. hexagona, C. articulatis, and Polygonum sp.

5. Tall Grass - Wet Prairie Zone

The southern portion of Chandler Slough is dominated by aquatic grasses, Panicum repens (torpedo grass), or P. hemitomon. Other grass species that occur occasionally include Andropogon sp. (broom sedge), L. hexandra and Sacciolepis striata (false maidencane).

An understory of smaller plants consists of Aster spp., Bacopa caroliniana, Centella asiatica L. (coinwort), Cyperus haspan, Dichromena latifolia (white top sedge), Hydrocotyle umbellata (pennywort) and Lindernia anagallidea.

Patches of P. lanceolata, S. lancifolia, L. peruviana, S. californicus, Myrica cerifera (wax myrtle), and T. geniculata are scattered throughout this zone.

6. Soft Rush Zone

The soft rush zone is located slightly upland from, and on the east and west borders of the buttonbush community. Juncus effusus (soft rush) grows in large, spreading clumps that are about a meter tall, and individual plants are usually spaced a meter or more apart. Ground cover in this area is composed of Hypericum mutilum, L. repens, Pluchea purpurescens, I. hexagona, L. anagallidea, and P. lanceolata.

7. Switchgrass Zone

A zone dominated by Spartina bakerii(switchgrass) is situated between an oak hammock in the western portion of Chandler Slough, and the buttonbush and soft rush zones. Switchgrass grows in spreading clumps up to two meters in height. *Mikania scadens* is sometimes found growing on *Spartina bakerii*. Ground cover consists of some small, unidentified grasses and sedges, and *L. anagallidea* and *H. mutilum*.

8. Broomsedge Zone

A zone that is dominated by *Andropogon sp*. (broomsedge) is located west of the major tall grass/wet prairie associations. Ground elevations are slightly higher than in the wet prairie zone. Other species includes *P. hemitomon*, *M. cerifera*, *P. lanceolata*, and *S. lancifolia*.

9. Wax Myrtle Zone

The large tree-like shrub, *Myrica cerifera* (wax myrtle), forms dense stands that often occupy an elevated knoll. The canopy becomes complete and eliminates most understory vegetation from this association.

10. Primrose Willow Zone

A few scattered locations in the slough are characterized by thickets of *Ludwigia peruviana* (primrose willow). Associated vegetation in these areas consists of common wetland plants such as *Pontederia lanceolata* and *Sagittaria lancifolia*.

11. Low Grass Zone

There are slight ridges and small knolls in Chandler Slough which support a ground cover of small grasses, sedges, and herbaceous plants such as *L. anagallidea* and *H. mutilum*. These areas are grazed by cattle during the dry season. When water levels rise, the vegetation shifts to a more aquatic community that is characterized by smartweed, pickerelweed, and submergents like *Hydrochloa caroliniensis* and *Bacopa monnieri*.

APPENDIX E

AVERAGE PHYSICAL CHARACTERISTICS OF PLANT SPECIES SAMPLED FROM CHANDLER SLOUGH, May 1975 - October 1976

Average Physical Characteristics of Plant Species Sampled from Chandler Slough, May 1975 - October 1976.

Date Sampled	Total length or height (cm)	Blade length or leaf diameter (cm)	Stem diameter (cm)	Average wet weight per stem (g)	Number of leaves per stem	Volume Displacement at 15 cm depth (cc)	30 cm	45 cm	60 cm	Submergent species displ. per gram wet weight (cc)
ASTER SP.										
10-75	111		0.5	12.1		2.5	5.0	7.0	9.0	
BACOPA CAROLINIANA										
2-76	14			0.5						
6-76	25	1.5		1.7	24					1.09
BACOPA MONNIERI										
6-76										1.21
CEPHALANTHUS OCCIDENTALIS										
5-75	165					2150	3550	6400	7700	
2-76	131		360 [1]			1120	1740	2450		
4-76	98		295 [1]	971 [2]						
6-76	145		350 [1]	1624 [2]						
8-76	160		305 [1]	282 [2]						
CYPERUS ARTICULATUS										
5-75	115			11.2		6.1	10.9	15.0		
CYPERUS HASPAN										
10-75	71		0.4	3.2		1.5	2.8	4.0	4.6	
2-76	31			0.7						
6-76	72		0.8	6.3			9.0	11.8		
8-76	92			4.5			5.0		8.5	
DIODIA VIRGINIANA										
10-75	93	2.0×0.6		6.5	19					0.99
6-76	25			2.9	32					0.85

[1] Circumference of the plant
[2] Wet weight of new growth

Average Physical Characteristics of Plant Species Sampled from Chandler Slough, May 1975 - October 1976.

Date Sampled	Total length or height (cm)	Blade length or leaf diameter (cm)	Stem diameter (cm)	Average wet weight per stem (g)	Number of leaves per stem	Volume Displacement at 15 cm depth (cc)	Volume Displacement at 30 cm depth (cc)	Volume Displacement at 45 cm depth (cc)	Volume Displacement at 60 cm depth (cc)	Submergent species displ. per gram wet weight (cc)
HYPERICUM MUTILUM										
10-75	36	1.0		1.4	2.1					1.18
2-76	13			0.4						
IRIS HEXAGONA										
5-75	47			3.7		3.4	5.2	6.1		
2-76	43		1.6	4.2						
4-76	67		2.6	15.1		12.7				
JUNCUS EFFUSUS										
10-76	83		0.5	3.4		2.7	5.4			
LEERSIA HEXANDRA										
5-75	25			0.4		0.4	0.6			
6-76	61			1.3			1.0	1.4		
LIPPIA NODIFLORA										
6-76										1.13
LUDWIGIA REPENS										
10-75	43	1.0		4.3	29					1.12
6-76	24	1.5		1.4	18					1.14
8-76	35			9.0	35					1.02
MIKANIA SCANDENS										
5-75										
2-76	8			0.2						1.34

Average Physical Characteristics of Plant Species Sampled from Chandler Slough, May 1975 - October 1976.

Date Sampled	Total length or height (cm)	Blade length or leaf diameter (cm)	Stem diameter (cm)	Average wet weight per stem (g)	Number of leaves per stem	Volume Displacement at 15 cm depth (cc)	Volume Displacement at 30 cm depth (cc)	Volume Displacement at 45 cm depth (cc)	Volume Displacement at 60 cm depth (cc)	Submergent species displ. per gram wet weight (cc)
PANICUM HEMITOMON										
5-75	23			1.0		1.0	1.3			
10-75	71			2.1		0.6	1.1	1.6	2.0	
6-76	70			3.2			1.8	1.3		
8-76	76			3.5			1.7		3.3	
PANICUM REPENS										
6-76										1.17
POLYGONUM SP.										
5-75										1.09
2-76	32			0.7						
8-76	106	10		31.3	19					0.95
PONTEDERIA LANCEOLATA										
5-75	35			3.3		4.7	6.5	6.6		
10-75	111	21.9		32.6		32.6	58.5	76.6	90.1	
2-76	20			3.1		5.7				
4-76	39	9.8		4.5		5.3				
6-76	69	12.6		8.8			19.0	24.6		
8-76	95	21.0		19.9			39.0		56.0	
10-76	101	20.0		19.1		21.0	35.0			
SAGITTARIA LANCIFOLIA										
5-75	55			12.0		9.8	14.6	17.5		
10-75	123	22.0		58.3		42.6	73.0	93.0	106.3	
4-76	71	23.9		31.3		25.9				
6-76	89	21.9		38.9			68.6	81.7		
8-76	115	23.0		64.4			85.0		126.0	
10-76	106	21.0		44.9		42.0	68.0			

Average Physical Characteristics of Plant Species Sampled from Chandler Slough, May 1975 - October 1976.

Date Sampled	Total length or height	Blade length or leaf diameter	Stem diameter	Average wet weight per stem	Number of leaves per stem	Volume Displacement at 15 cm depth	30 cm	45 cm	60 cm	Submergent species displ. per gram wet weight
	(cm)	(cm)	(cm)	(g)		(cc)				(cc)
SAGITTARIA SUBLATA										
10-75				0.83						
6-76										1.53
THALIA GENICULATA										
6-75	91			30.0		26.9	47.3	59.6		
10-75	181	44.5		164.8		112.5	212.5	288.0	343.0	
10-76	152	34.0		85.5		60.0	109.0			

APPENDIX F

SOIL CHEMISTRY DATA

APPENDIX F

CHEMICAL COMPOSITION OF SOIL SAMPLES COLLECTED FROM THE TOP 15 CM OF THE SOIL IN APRIL 1976

Site No.	Ca %	K %	Mg %	P %	N %
15	0.16	0.04	0.03	0.026	0.35
16	0.21	0.03	0.03	0.030	
17	0.06		< 0.01	0.008	0.21
18	0.19	0.05	0.04	0.013	0.38
19	0.18	0.08	0.07	0.040	0.89
20	0.06	0.03	< 0.01	0.006	0.19
21	0.16	0.06	0.05	0.017	0.27
22	0.17	0.03	0.02	0.012	0.13
23	0.15	0.01	0.02	0.014	0.24
24	0.11	0.05	0.06	0.024	0.32
25	0.10	0.07	0.07	0.019	
26	0.14	0.06	0.08	0.024	
27	0.14	0.06	0.07	0.031	0.58
28	0.13	0.05	0.04	0.021	0.32
29	0.12	0.06	0.07	0.018	0.35
30	0.10	0.06	0.08	0.019	0.40
31	0.18	0.08	0.07	0.034	0.86
32	0.17	0.08	0.06	0.029	
33	< 0.04	0.01	< 0.01	0.004	0.10
34	0.15	0.02	0.02	0.016	0.14
35	0.17	0.06	0.05	0.030	0.49
36	0.10	0.04	0.03	0.015	0.33
37	0.17	0.03	0.02	0.013	0.22
38	< 0.04	0.01	< 0.01	0.013	0.07

APPENDIX F

PHOSPHORUS AND NITROGEN CONCENTRATIONS OF SOIL SAMPLES
COLLECTED AUGUST 1975 FROM THE TOP IS CM.

Site No.	Phosphorus %	Nitrogen %
1	0.018	0.31
2	0.020	0.41
3	0.017	0.15
4	0.018	0.18
5	0.014	0.08
6	0.015	0.36
7	0.018	0.69
9	0.038	0.57
11	0.030	0.55

APPENDIX F

CHEMICAL COMPOSITION OF SOIL SAMPLES COLLECTED DURING MAY 1975

Site	Depth	Ca %	K %	Mg %	N %	P %
1	0-15 cm	0.07	0.08	0.05	0.94	0.019
	30-46 cm	0.05	0.09	0.02	0.07	0.010
	61-76 cm	< 0.03	< 0.03	0.04	0.07	0.005
2	0-15 cm	< 0.04	0.04	0.06	0.21	0.011
	30-46 cm	0.05	0.06	0.03	0.03	0.005
	61-76 cm	0.07	0.08	0.04	< 0.03	0.005
3	0-15 cm	0.07	0.06	0.05	0.16	0.018
	30-46 cm	0.07	0.05	0.09	0.12	0.008
	61-76 cm	0.10	0.05	0.12	< 0.03	0.006
4	0-15 cm	0.08	0.06	0.06	0.13	0.019
	30-46 cm	0.04	0.05	0.04	< 0.03	0.008
	61-76 cm	0.07	0.05	0.10		0.005
5	0-15 cm	0.06	0.09	0.06	0.14	0.025
	30-46 cm	< 0.04	0.04	0.07	0.09	0.007
	61-76 cm	0.07	0.04	0.04	< 0.06	0.004
6	0-15 cm	0.05	0.06	0.06	0.33	0.016
	30-46 cm	0.05	< 0.04	0.07	< 0.03	0.007
	61-76 cm	0.07	0.04	0.09	0.03	0.006
7	0-15 cm	0.17	0.10	0.09	0.64	0.049
	30-46 cm	< 0.04	< 0.04	0.08	0.16	0.007
	61-76 cm	< 0.04	< 0.04	0.08	0.12	0.005
8	0-15 cm	< 0.01	0.04	0.01	< 0.03	0.019
	30-46 cm	< 0.01	0.03	0.02	< 0.03	0.014
	61-76 cm	< 0.01	0.04	0.02	< 0.03	0.008
10	0-15 cm	0.15	0.05	0.07	0.70	0.037
	30-46 cm	0.04	0.04	0.06	< 0.03	0.007
	61-76 cm	< 0.04	0.06	0.07	0.11	0.007
11	0-15 cm	0.05	0.12	0.04	0.31	0.026
	30-46 cm	0.04	0.11	0.05	0.19	0.013
	61-76 cm	< 0.01	0.13	0.05	< 0.03	0.013
13	0-15 cm	< 0.02	0.04	< 0.03	0.07	0.020
	30-46 cm	< 0.02	0.02	< 0.03	< 0.03	0.002
	61-76 cm	< 0.02	0.03	< 0.03	< 0.03	0.008
	below 76 cm	< 0.02	0.03	< 0.03	< 0.03	0.007