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SALINITY VARIATION AT FINE GUICH CREEK
FOR THE PERIOD
7 OCTOBER 1968 TO 5 JANUARY 1969

Biology 20A Project
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Fajans method involves the adsorption of the titrated ion, chloride, unto a much larger molecule, fluorescein. The fluorescein has a stable color with the titrated ion, in this case green. When the point is reached where all of the titrated ion has been removed by the titrating ion, silver nitrate, the fluorescein then changes color to pink. See the sample calculation for the chemical formulae.

Solutions were made as follows: approximately 17 grams of dry silver nitrate crystals were dissolved in a liter flask filled with distilled water. This solution is standardized against a known weight of chemically pure sodium chloride. The indicator solution is made up by dissolving 0.1 grams of fluorescein in 100 ml of water.

A volume of sample is placed in a titrating flask with 0.3 ml of the fluorescein solution and 0.1 gm of dextran, the whole volume coming to 50 ml. This volume is then titrated against the silver nitrate solution. The volume is selected by trying several volumes until the pink color is produced by 2 to 15 ml of the silver nitrate solution. This volume is then weighed and exactly titrated against the silver nitrate solution three times.

An ideal salinity variation cycle has been sketched into graph I. The basis of this sketch is that the higher the tide is the greater the volume of higher saline water will be and conversely the lower the tide the smaller the volume of higher saline water will be until there is no additive effect.

As can be seen by examination of Graph I, the lower high tide has a sufficient spread to allow comprehensive titration for each station. Therefore, lower high tide was selected as the one to be followed for the course of the semester.

OBSERVATIONS:

It was observed in October that the Scirpus, which grows along the bank of the creek, was limited to within one foot of the edge and between stations four and seven. The Scirpus did not grow higher than 18 inches. By January, however, the Scirpus had reached a height of over 24 inches and had enlarged its territory above station #4. Also, Scirpus had become the predominant plant in the area between stations #1 and #4.

Pachygrapsus crassipes was observed in October at station #4. By January, none were observed at this station.

There were two major problems with the titration. These were lack of sensitivity at the lower end of the salinity scale and lack of sensitivity when the titre is incorrect. This titration method is sensitive to 0.2 O/00 which was reached as a steady state when the rains started. When a volume was selected to match the titre then the color shift was observed to be either from green to pink or from green to yellow-orange.

The salinity variation of station #1 was a single cycle in every 24 hours with a maximum variation of 24 O/00 in October to 10/00 in January. The salinity variation of station #4 was $1\frac{1}{2}$ cycles with a spread of 15 O/00 in October and was non cyclic with no spread in January. The salinity variation of station #7 was two cycle ninety degrees out of phase with the ideal cycle in 24 hours with a spread of 2 O/00 in October and was two cycle, in phase with the ideal cycle, with a spread of 0.1 O/00 in January. The change seemed to have occurred by October 15, after the first big rain. See the accompanying Graphs.

CONCLUSIONS:

Scirpus growth was considerably augmented by the continual fresh water that it received after the rains started.

The pot hole at station #4 was completely washed out to a fresh water state. bottom?

Until the rains started the tidal cycle had a definite effect on variation of salinity. After the rains started the creek became totally fresh.

Suggestions for further study are:

- 1) The same set of experiments should be followed using more stations. This would map a better outline of varying saline concentrations.
- 2) A study of the salinity variation for a full year should be undertaken.
- 3) The approximate date at which the tide loses and gains its effect on the creek should be established.
- 4) That height that the tide must obtain in order to have effect on various stations as well as the delay time from the Golden Gate Bridge should be determined.

Bibliography:

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Table I

time	station	AgNO ₃ ml	sample wt- gm	chlorinity xl.805	salinity ‰
6-7 Oct 68					
1130	1	5.47	2.09	26.903	26.936
1813	1	3.25	10.01	3.331	3.361
0030	1	12.13	51.25	2.431	2.461
0600	1	6.47	10.04	6.612	6.642
1130	4	4.21	2.03	21.287	21.317
1813	4	3.99	2.04	20.059	20.089
0030	4	2.51	2.02	12.791	12.821
0600	4	5.23	2.05	26.247	26.277
1130	7	3.56	49.91	0.773	0.803
1813	7	16.17	50.03	3.317	3.347
0030	7	4.92	49.96	1.012	1.042
0600	7	17.68	50.14	3.619	3.649
4-5 Jan 69					
1830	1	0.50	50.00	0.103	
0148	1	0.50	50.00	0.103	
0542	1	0.50	50.00	0.103	
1136	1	1.29	10.03	1.320	
1830	4	0.50	50.00	0.103	
0148	4	0.50	50.00	0.103	
0542	4	0.50	50.00	0.103	
1136	4	0.50	50.00	0.103	
1830	7	0.72	50.05	0.152	
0148	7	0.50	50.00	0.103	
0542	7	0.75	50.07	0.154	
1136	7	0.50	50.00	0.103	

Table II

date	station	AgNO ₃ ml	sample wt- gm	chlorinity x1.805
7 Oct 68	1	12.13	51.25	2.431
	4	2.51	2.02	12.791
	7	4.92	49.96	1.012
15 Oct 68	1	1.95	10.01	2.029
	4	1.10	50.07	0.226
	7	1.01	50.08	0.238
10 Nov 68	1	0.98	10.01	0.978
	4	1.68	50.06	0.374
	7	1.01	50.05	0.235
18 Nov 68	1	1.48	50.08	0.334
	4	1.05	50.00	0.246
	7	1.10	50.04	0.256
26 Nov 68	1	1.01	50.07	0.235
	4	1.05	50.03	0.246
	7	0.80	50.00	0.157
30 Nov 68	1	2.98	50.12	0.639
	4	1.30	50.03	0.297
	7	0.80	50.00	0.157
5 Jan 69	1	0.50	50.00	0.103
	4	0.50	50.00	0.103
	7	0.50	50.00	0.103

2.431

SAMPLE CALCULATION

$$(\text{ml})\text{AgNO}_3 \text{ times (normality)}\text{AgNO}_3 = \text{millimoles Cl}^-$$

$$3.25\text{ml} \quad \text{times } 0.1604\text{N} \quad = 0.5213 \text{ mM Cl}^-$$

$$\text{mM Cl}^- \quad \text{times g. atomic wt Cl}^- = \text{milligrams Cl}^-$$

$$0.5213\text{mM} \quad \text{times } 35.457\text{mg/mM} \quad = 18.4837 \text{ mg}$$

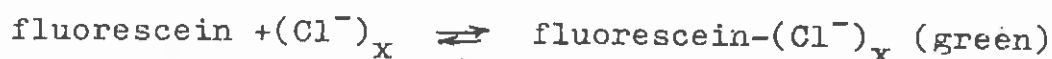
$$\text{mg Cl}^- / \text{gm sample} \quad = \text{Chlorinity}$$

$$18.4837\text{mg}/10.01\text{gm} \quad = 1.83650 \text{ O/00}$$

$$1.805(\text{Chlorinity}) + 0.03 \quad = \text{Salinity}$$

$$(1.805)(1.8365) + 0.03 \quad = 3.361 \text{ O/00}$$

$$\text{OR } (\text{ml AgNO}_3/\text{gm sample})(10.2656) + 0.03 = 3.361 \text{ O/00}$$



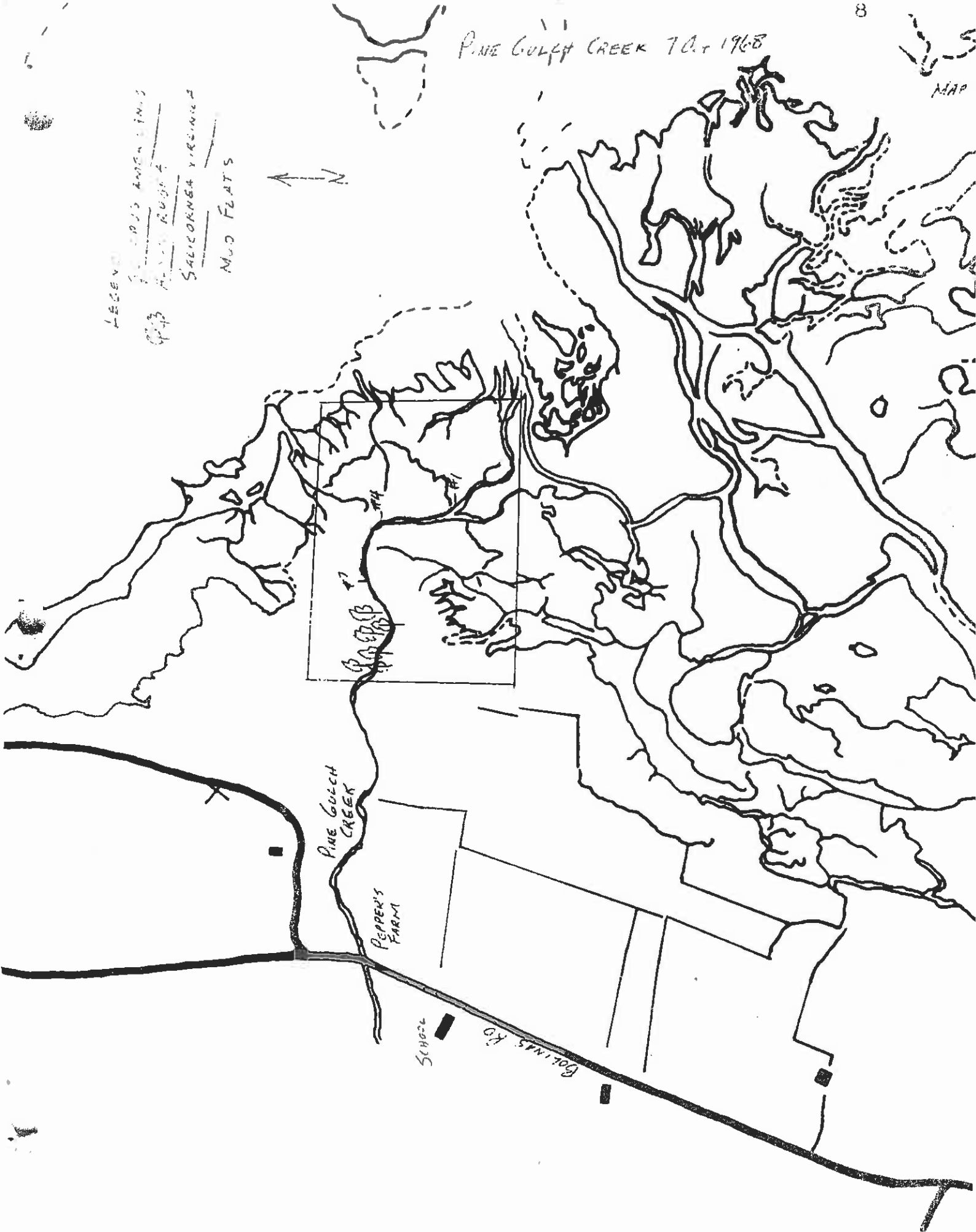
Do other ions interfere?
2. Logsum high in NO_3^- & PO_4^{3-}

PINE GULCH CREEK T.O.T 1968

MAP

LEGEND

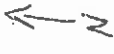
- OLD AND NEW
- ROAD
- SALICORNIA VIRGINICA
- MUD FLATS



PINE GULCH CREEK JAN 1969

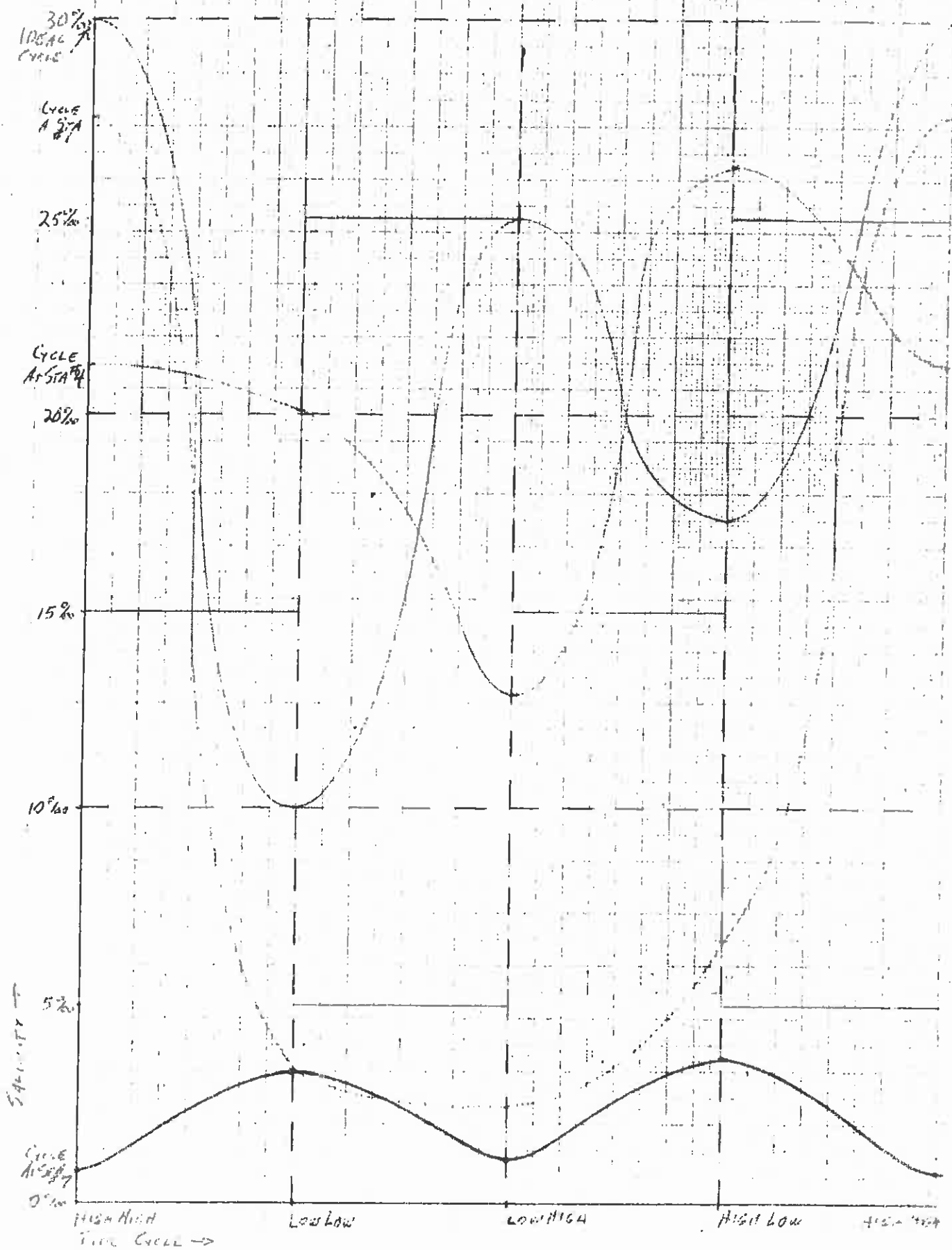
MAP

- LEGEND
- SCIRPUS AMERICANUS
 - ALNUS RUBRA
 - SALICORHEA VIRGINICA
 - MUD FLATS



6-7 October 1968¹⁰

GRAPH I

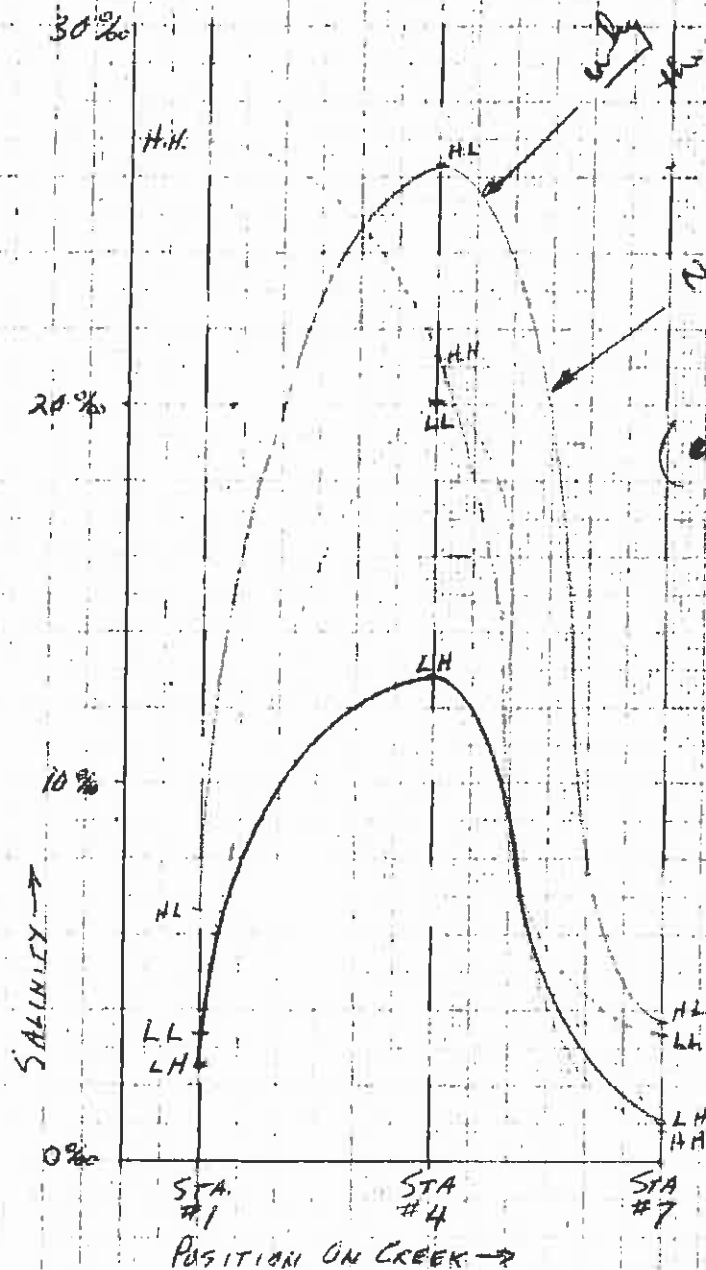


6-7 Oct 1963

11

4.5 - 5.5

GRAPH II



GRAPH III

CHLORINITY VERSUS TIME AT HIGH LOW & HIGH
TIDE FOR THE PERIOD 7 Oct 1968 To 5 JAN 1969
"same" tide condition



GRAPH IV

TIDAL CYCLE FOR 7 OCT 1968 AND 4 JAN 1969

7 OCT 1968 4 JAN 1969 FOR STATION #1



GRAPH II

TIDAL CYCLE FOR 7 OCT. 1968 AND 4 JAN. 1969
7 OCT. 1968 4 JAN. 1969 FOR STATION #4



GRAPH VI

TIDAL CYCLE FOR 7 OCT. 1968 AND 4 JAN. 1969

7 OCT 1968 4 JAN 1969 FOR STATION # 7

A TIDAL CHLORINITY CYCLE

CHLORINITY IN
PARTS PER THOUSAND