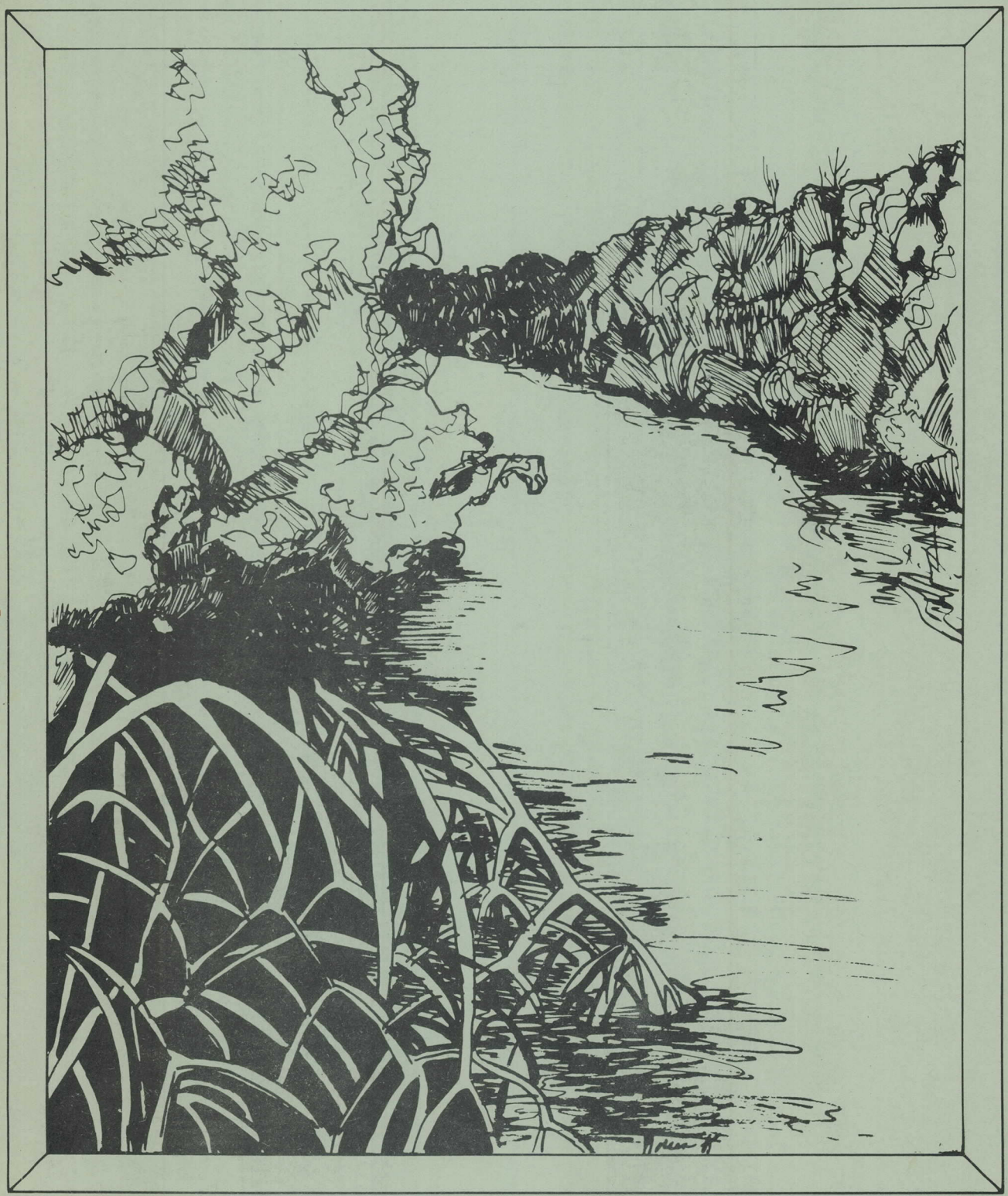
Table

WATER CONDITIONS IN THE SHARK RIVER ESTUARY OF EVERGLADES NATIONAL PARK



AUGUST 1966

MONTHLY ANALYSIS OF WATER CONDITIONS IN SHARK RIVER ESTUARY, AUGUST 1966

Milton C. Kolipinski and Aaron L. Higer

Statements in this report should be considered provisional. Full review has been curtailed so that the data can be presented on a current basis.

CHLORINITY:

The overall monthly range of chlorinity in the Shark River estuary was the lowest for August since the beginning of record in 1962. During the month the 500 ppm (parts per million) isochlor (fresh-brackish water line) fluctuated between mid-Tarpon Bay and the upper Shark River. This represents little or no change from last month.

DISSOLVED OXYGEN:

The amount of dissolved oxygen in the estuarine waters was negligibly higher than it was in July, but it was still rather uniformly low. Daytime values at a water depth of three feet ranged from 2.0 to 3.8 ppm as shown in the following table:

DISSOLVED OXYGEN IN SHARK RIVER ESTUARY
Transect of August 17, 1966: 10 AM to 2 PM

	Shark River		Tarpon Bay		Rookery Branch	
	lower	upper	middle	upper	middle	upper
Miles from Ponce de Leon Bay	4.0	7.3	10.8	13.4	15.3	20.0
dissolved oxygen (ppm)	3.8	2.4	2.4	2.4	2.0	3.1
oxygen saturation (%)	49	30	30	30	27	41

Analyses of dissolved oxygen during the current, high, fresh-water outflow period indicate that at night the dissolved oxygen content falls to lower values upstream than it does downstream. For example, the lowest value obtained in 24 hours beginning June 16, 1966 was 1.3 ppm at the P-35 station (upper Rookery Branch) and 3.2 ppm at the Shark River station (upper Shark River).

TURBIDITY:

The average turbidity at six stations in the estuary on August 17, 1966 was 4 ppm as compared to 3 ppm on July 13, 1966. These values were too low to have lethal effects on the fish. The persistent turbidity probably has been largely responsible for the lack of a fauna attached to the bottom sediments in the deeper, downstream channels of the estuary. The turbidity causes insufficient illumination for photosynthesis.

TEMPERATURE:

As in July 1966, temperature in the estuary varied little. The monthly ranges at the continuously recording stations at the upper Shark River and Rookery Branch stations were 30.6 to 33.9 and 28.9 to 31.7°C, respectively.

PLANKTON:

The following chart summarizes the analyses of plankton populations in the estuary on August 17, 1966. Samples were collected between 10 A.M. and 2 P.M. at a depth of one foot:

NUMBER OF INDIVIDUALS PER LITER

	Shark River		Tarpon Bay	Rookery Branch	
	lower	upper	upper	middle	upper
Miles from Ponce de Leon Bay	4.0	7.3	13.4	15.3	20.0
Biological Group					
Algae	1,500	0	0	6,000	trace
Diatoms	trace	trace	0	trace	0
Crustacean larvae	28	0	0	0	0
Snail larvae	14	8	0	0	0
Copepods	34	0	0	0	0

In the upper fresh-water portion of the estuary phytoplankton was generally sparse and zooplankton was absent; downstream, phytoplankton was also sparse but zooplankton was fairly abundant. The standing crop in the brackish water at the most seaward station in the lower Shark River was 76 zooplankters per liter. The zooplankton consisted of various marine invertebrate larvae and copepods.

NITRATE AND PHOSPHATE:

Determinations were made for nitrate (nitrate nitrogen) and phosphate (total orthophosphate reported as PO_4) from water samples collected on August 17, 1966. Nitrate values along the transect line ranged between 1.1 and 1.4 ppm, except in the lower Shark River where the nitrate content was 9.0 ppm. A similar distribution of nitrate occurred on July 13, 1966, when 1.4 ppm of nitrate or less was present in the estuary except at the lower Shark River station where an unusual 12.0 ppm was present.

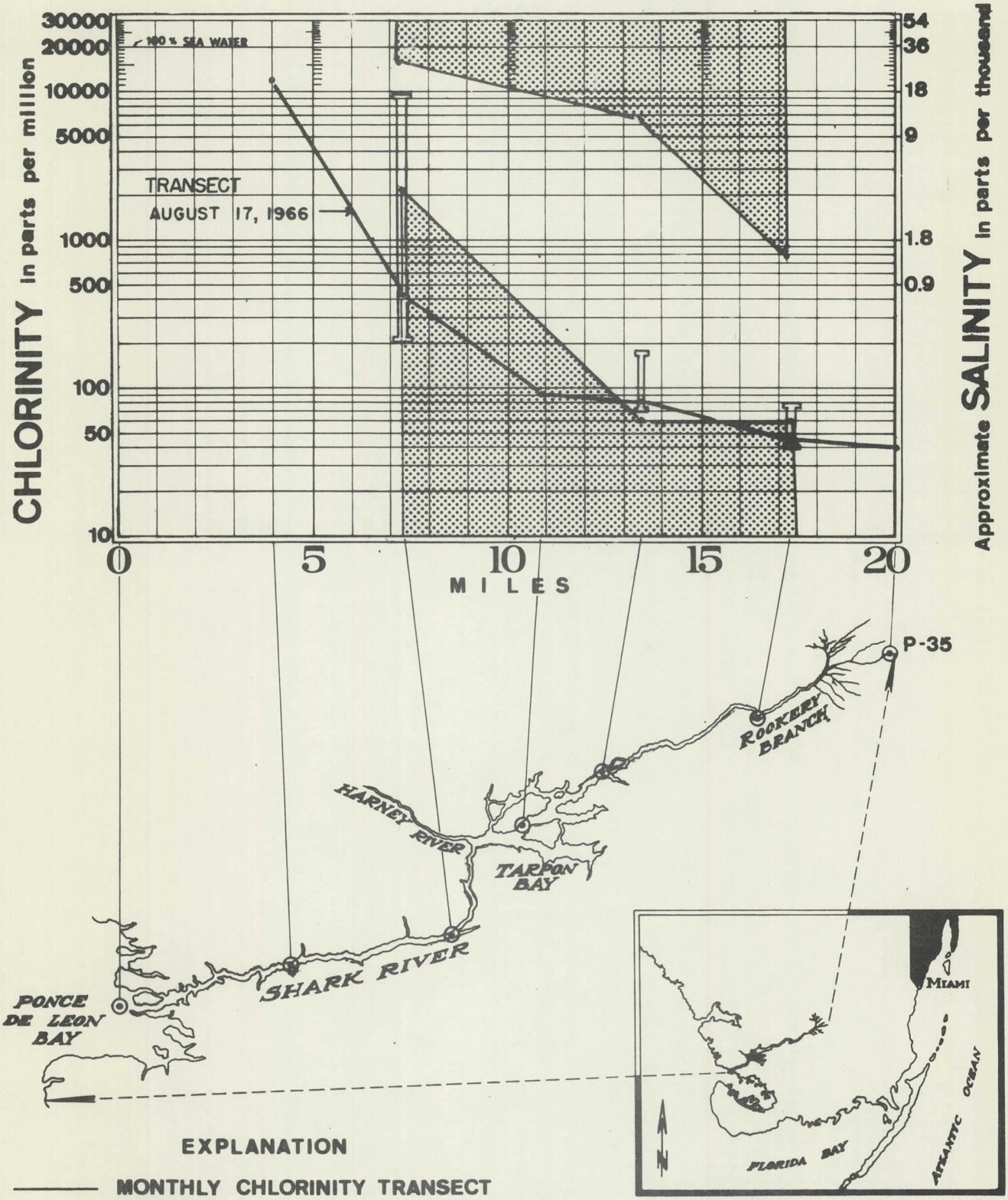
Phosphate, having fallen below the limit of detectability by the phosphomolybdate method of analysis, was 0.00 at the six sampling points in the estuary. The depletion of phosphate is caused, at least partially, by phosphate uptake by attached aquatic plants in the shallow waters of the estuary. In Rookery Branch the bottom was densely covered, in general, with stands of plants such as pondweed (Najas) and muskgrass (Chara).

WATER LEVELS:

The mean water level at Station P-35 for the month was 2.58 feet above msl (mean sea level), the highest mean for August since the beginning of record in 1953. The previous high for August was 2.44 feet above msl in 1958.

The unusually high water level in the Shark River Slough during August 1966 was reflected at Station P-33, where the mean gage height was 6.85 feet above msl. This average water level in August has been exceeded only 5 percent of the time for the period of record beginning in October 1953 [based on duration curves in Preliminary Evaluation of Hydrologic Situation in Everglades National Park, by Hartwell, Klein, and Joyner (1963)].

CHLORINITY
IN SHARK RIVER ESTUARY



EXPLANATION

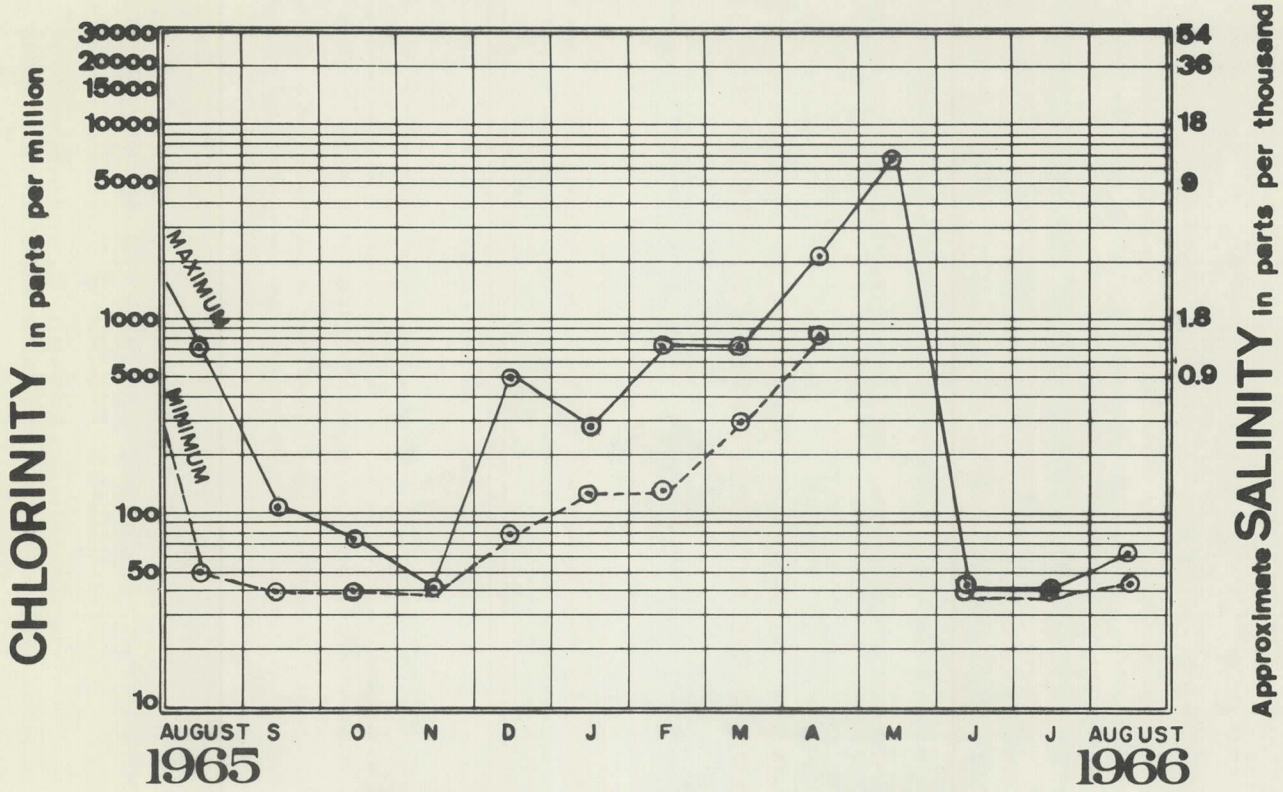
——— MONTHLY CHLORINITY TRANSECT

MAXIMUM
RANGE OF CURRENT MONTH
MINIMUM

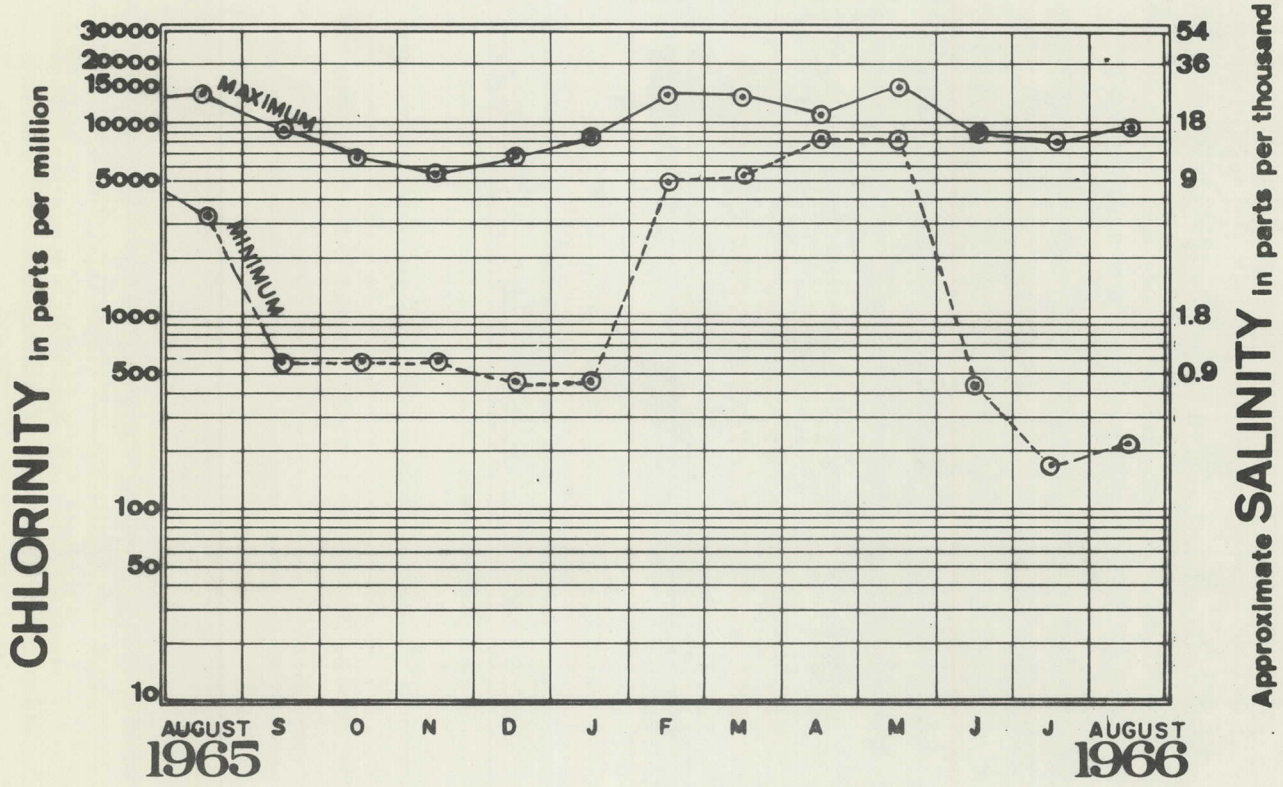
UNSHADED PORTION SHOWS HIGHEST AND LOWEST OF RECORD IN AUGUST since 1962

CHLORINITY

ROOKERY BRANCH STATION

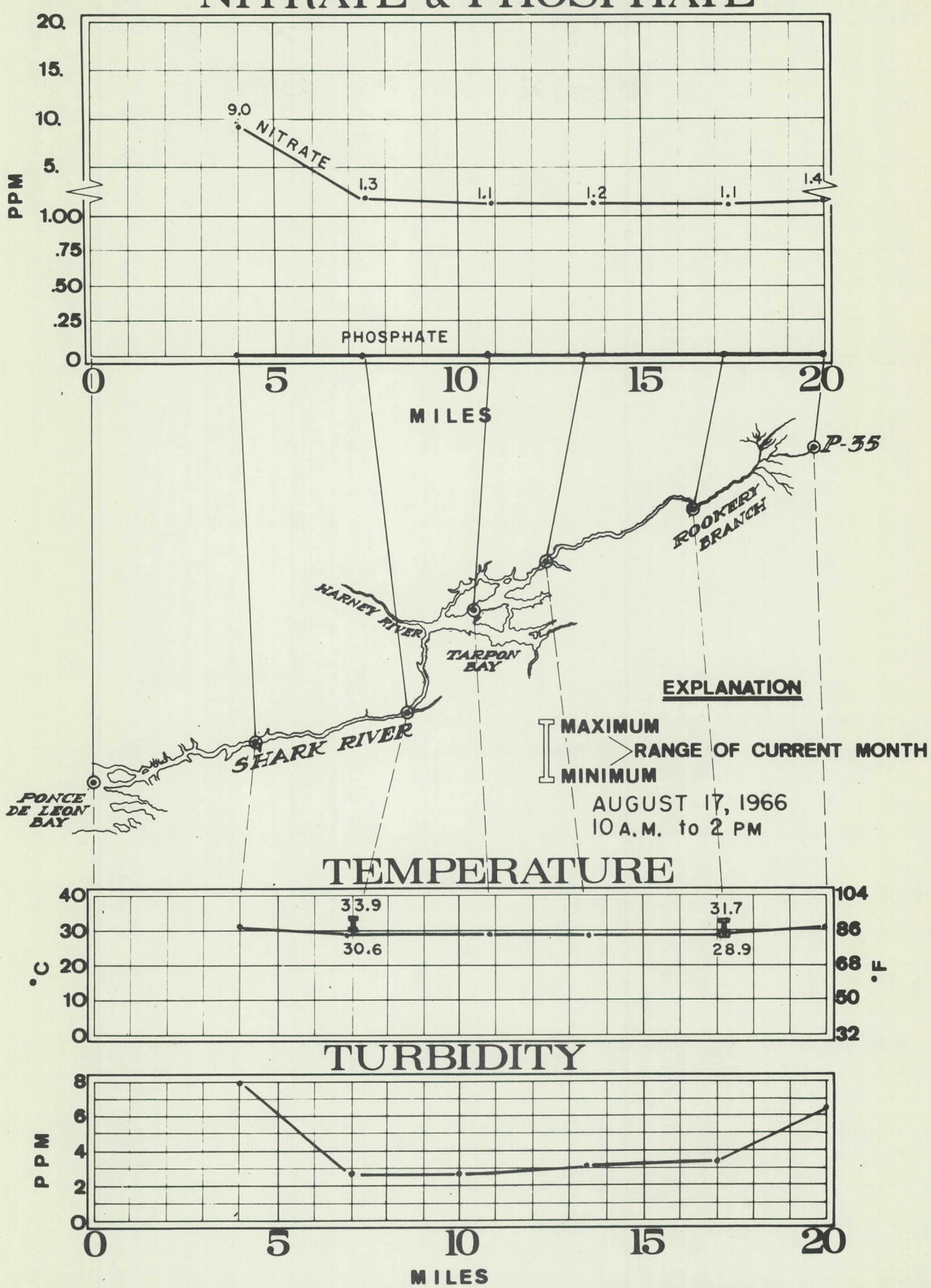


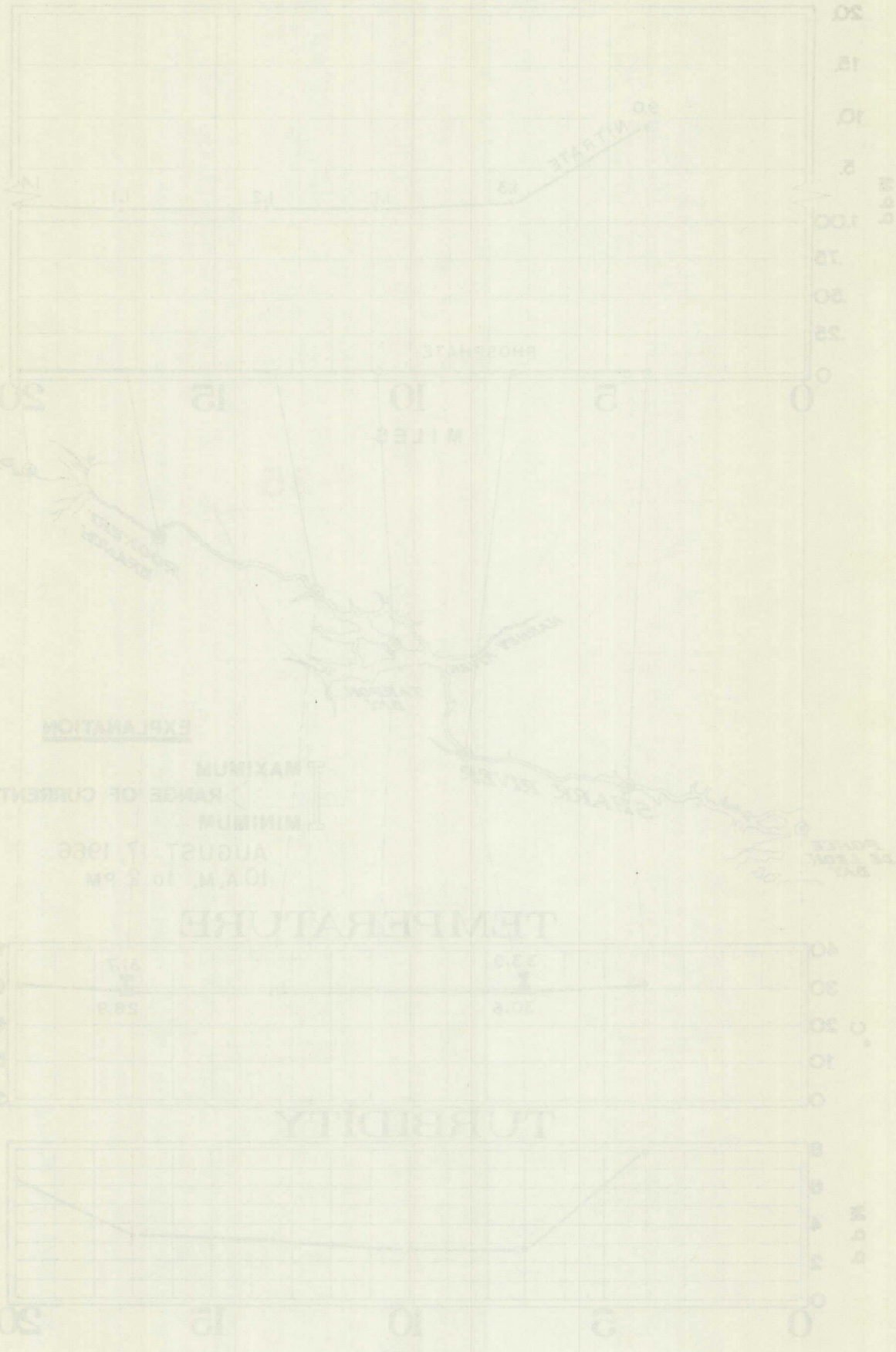
SHARK RIVER STATION



CHLORINITY
ROOKERY BRANCH STATION
SALINITY
SHARK RIVER STATION

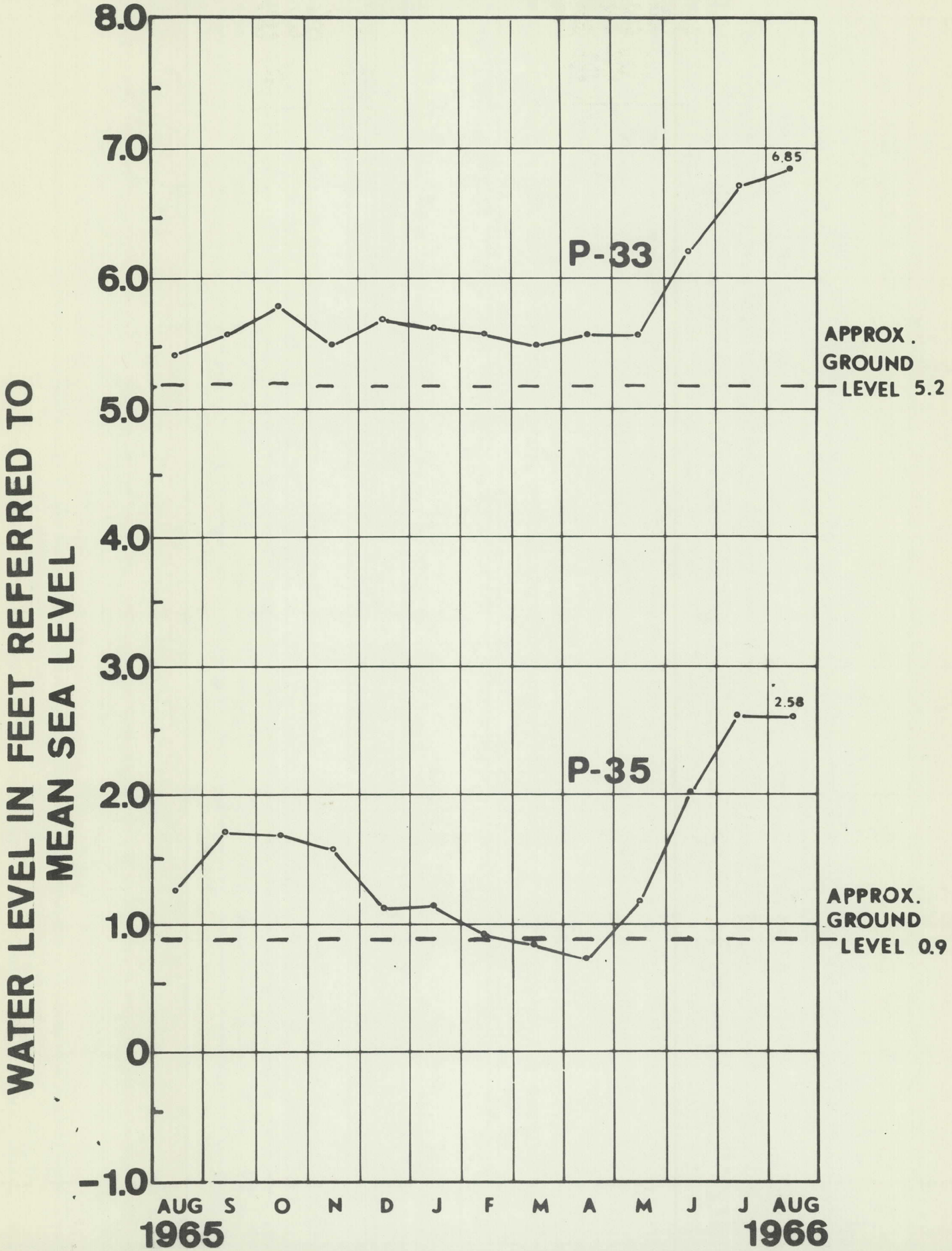
WATER QUALITY TRANSECT



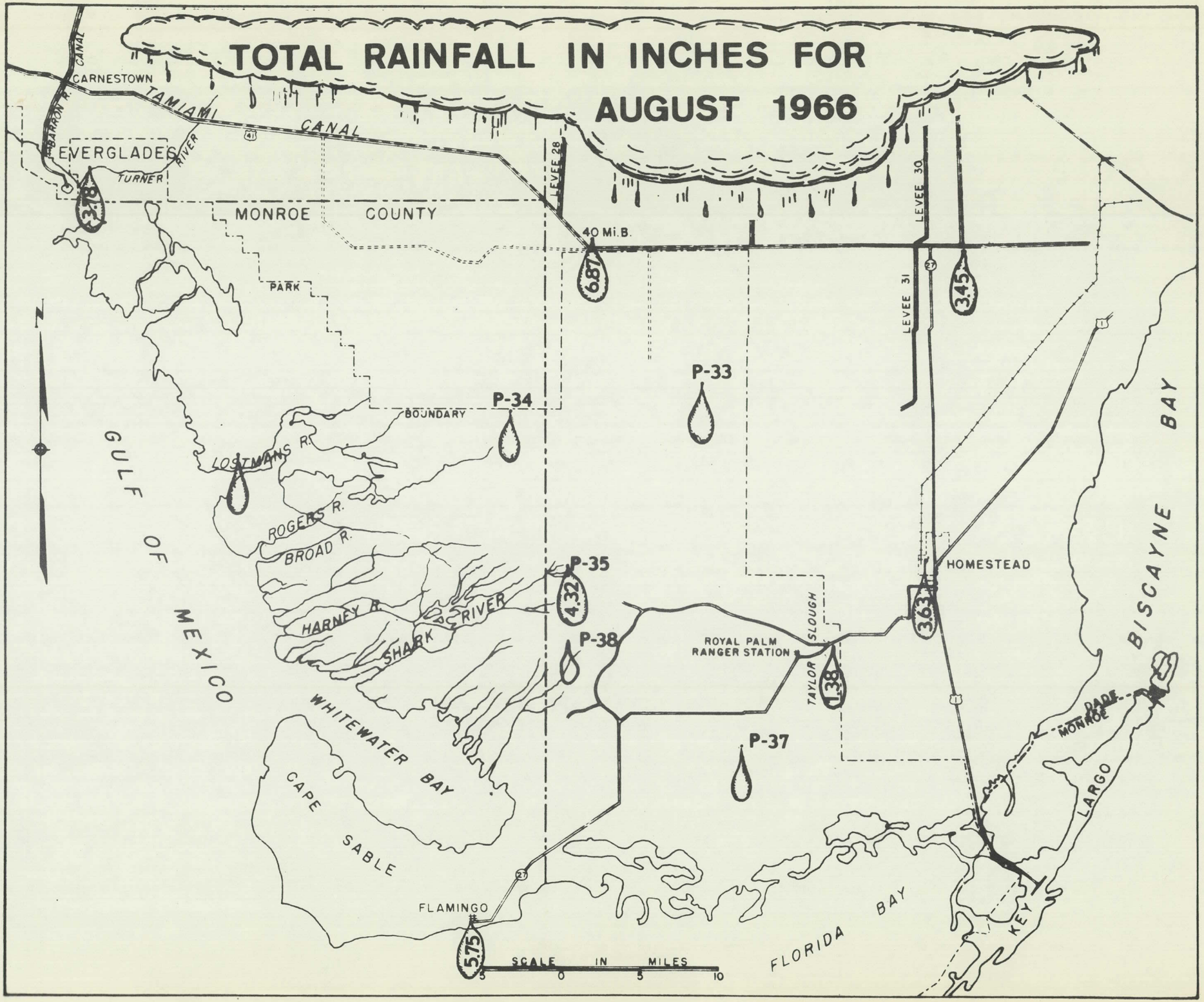


MONTHLY MEAN WATER LEVEL

AT P-33 AND P-35



8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
-1.0
P-33
P-35
APPROX. GROUND LEVEL 5.2
APPROX. GROUND LEVEL 3.9
MEAN WATER LEVEL IN FEET REFERRED TO


TOTAL RAINFALL IN INCHES FOR
AUGUST 1966
CARNESTOWN
TAMIAMI CANAL
BARRON R. CANAL
EVERGLADES
TURNER RIVER
3.78
MONROE COUNTY
LEVEE 28
40 Mi.B.
6.87
LEVEE 30
LEVEE 31
3.45
PARK
P-33
P-34
BOUNDARY
LOSTMANS R.
ROGERS R.
BROAD R.
P-35
4.32
HARNEY R.
SHARK RIVER
P-38
GULF OF MEXICO
WHITEWATER BAY
CAPE SABLE
ROYAL PALM RANGER STATION
TAYLOR SLOUGH
1.38
3.63
HOMESTEAD
BISCAYNE BAY
P-37
MONROE
DADE
LARGO
KEY
FLAMINGO
5.75
FLORIDA BAY
SCALE IN MILES
5 0 5 10

TOTAL RAINFALL IN INCHES FOR
AUGUST 1981

METHODS OF ANALYSIS

Methods of chemical analyses used during monthly transects of the estuary are those outlined by F. H. Rainwater and L. L. Thatcher in Methods for collection and analysis of water samples: U.S. Geol. Survey Water-Supply Paper 1454, 1960 with the following exception: Dissolved oxygen was determined by the Alsterberg modification of the Winkler method as described by Keith V. Slack in A micro kit for dissolved oxygen determination: (U.S. Geological Survey) Water Resources Division Bulletin, February 1965.

At the three stations in the estuary monthly chlorinity ranges are determined from specific conductivity data recorded continuously. Automatically recording instruments provide water level and discharge and temperature data.

PREPARED BY

U S GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

IN COOPERATION WITH

U S FISH & WILDLIFE SERVICE

BUREAU OF SPORT FISHERIES AND WILDLIFE

AND

NATIONAL PARK SERVICE

EVERGLADES NATIONAL PARK

Tabb

WATER CONDITIONS IN THE SHARK RIVER ESTUARY OF EVERGLADES NATIONAL PARK

NOVEMBER 1966

PREPARED BY

U S GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

IN COOPERATION WITH

U S FISH & WILDLIFE SERVICE

BUREAU OF SPORT FISHERIES AND WILDLIFE

AND

NATIONAL PARK SERVICE

EVERGLADES NATIONAL PARK

MONTHLY ANALYSIS OF WATER CONDITIONS IN SHARK RIVER ESTUARY, NOVEMBER 1966

Aaron L. Higer and Milton C. Kolipinski

Statements in this report should be considered provisional. Full review has been curtailed so that the data can be presented on a current basis.

DISSOLVED OXYGEN:

Dissolved oxygen along the Shark River transect was sampled between 11 A.M. and 3 P.M. on November 1, 1966, with the following results:

DISSOLVED OXYGEN IN SHARK RIVER ESTUARY AND GLADES

	Shark River			Tarpon Bay		Rookery Branch	
	Mouth	Lower	Upper	Middle	Upper	Middle	Upper
Miles from Ponce deLeon Bay	0.0	4.0	7.3	10.8	13.4	17.3	20.0
Dissolved oxygen (ppm)	4.7	4.7	4.5	4.0	2.6	2.8	3.4
Oxygen saturation (%)	55	55	53	49	30	32	41

The oxygen content of the water generally was higher than the analyses indicated in the previous four months in Shark River proper and Tarpon Bay.

PLANKTON:

The following table summarizes the analyses of plankton populations in the estuary on November 1, 1966. Samples were collected between 11 A.M. and 3 P.M. at a depth of one foot:

NUMBER OF INDIVIDUALS PER LITER

	Shark River		Rookery Branch	
Miles from Ponce deLeon Bay	mouth 0.0	middle 4.0	middle 17.3	upper 20.0
Biological Group				
Algae	6,600	2	240	56
Diatoms	820	0	4	7
Copepods	7	6	0	0
Crustacean larvae	9	2	0	0
Polychaete larvae	0	2	0	0

In the mouth of the Shark River at Ponce de Leon Bay 7400 phytoplankters per liter were present. Although relatively low, this figure represents the largest population of algae and diatoms in the estuary since the beginning of these analyses in July 1966. However, the large population was found at the mouth of the river only. The phytoplankton was extremely sparse farther upstream in the brackish and fresh waters.

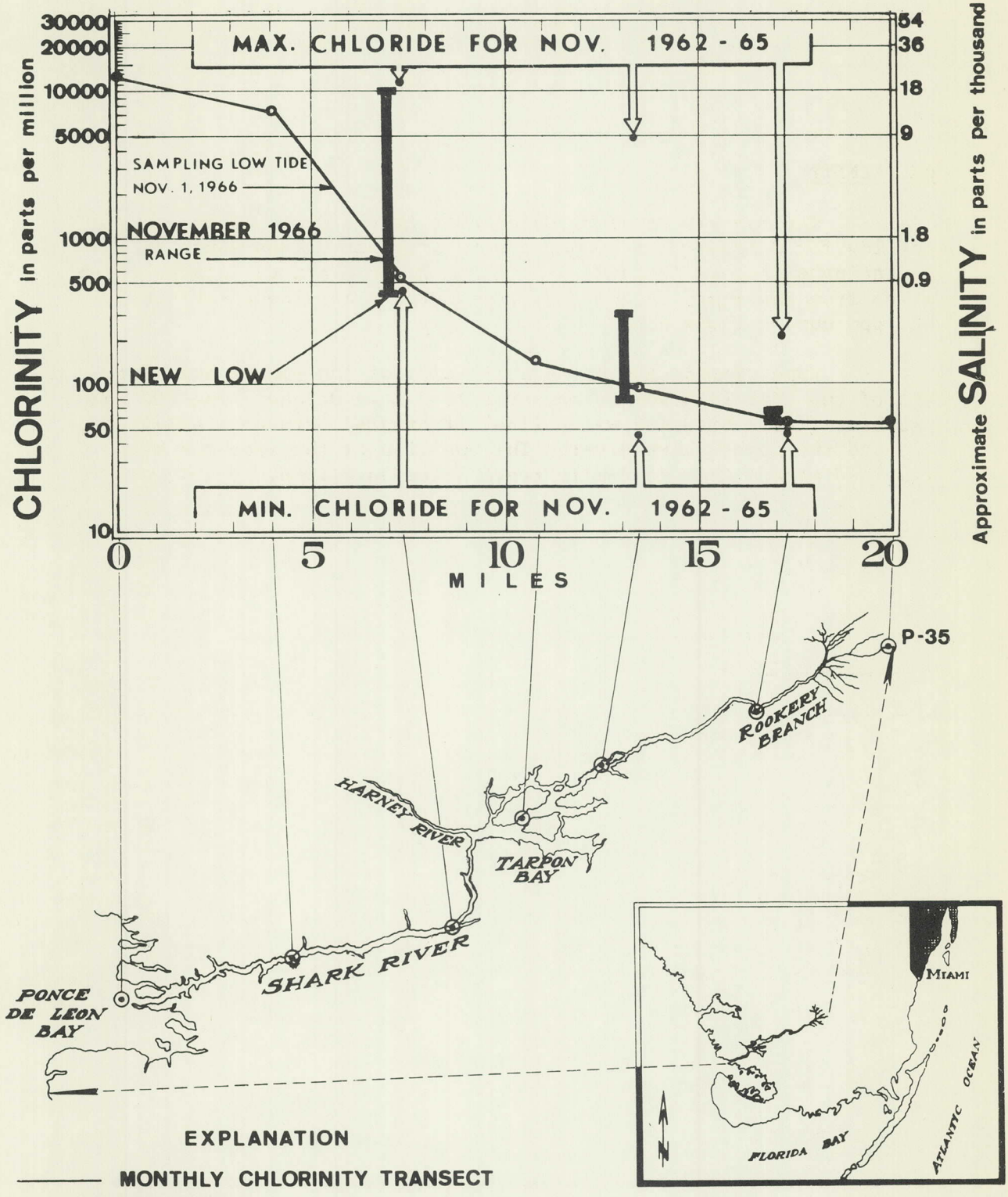
At the mouth of the river only 16 zooplankters per liter were present in November compared with 83 per liter in October.

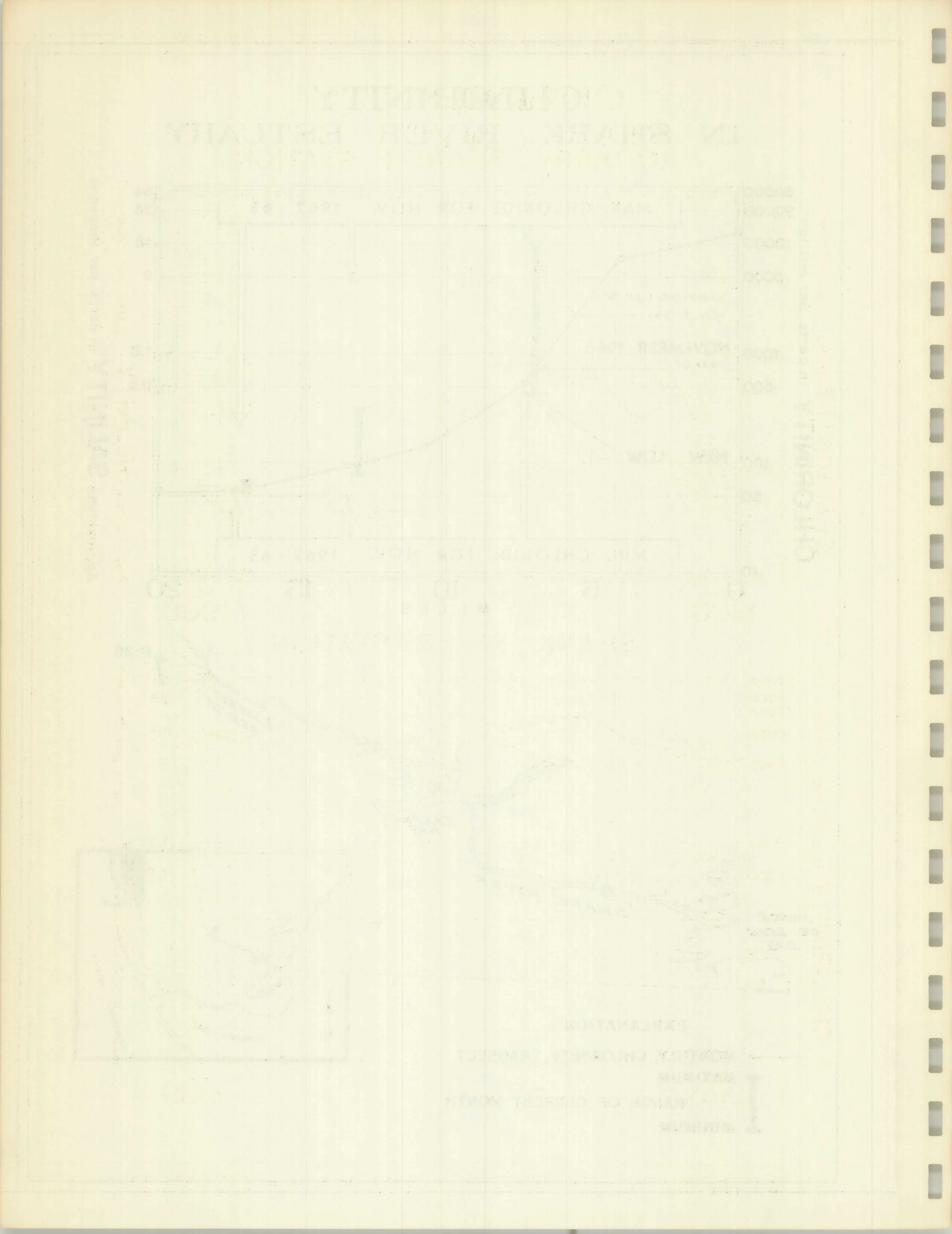
CHLORINITY:

The monthly range of chlorinity in the Shark River estuary was low for October when compared with previous values since the beginning of record in 1962. The Shark River station, located seven miles from the mouth of the river, recorded a new low chlorinity of 425 ppm during the month.

Upper Tarpon Bay had a chlorinity of 150 ppm or less for 38% of the time in November compared to 73% in October; the 500 ppm isochlor (fresh-brackish water line) fluctuated between mid-Tarpon Bay and the upper Shark River. The position of the isochlor has remained within this four-mile reach since July 1966.

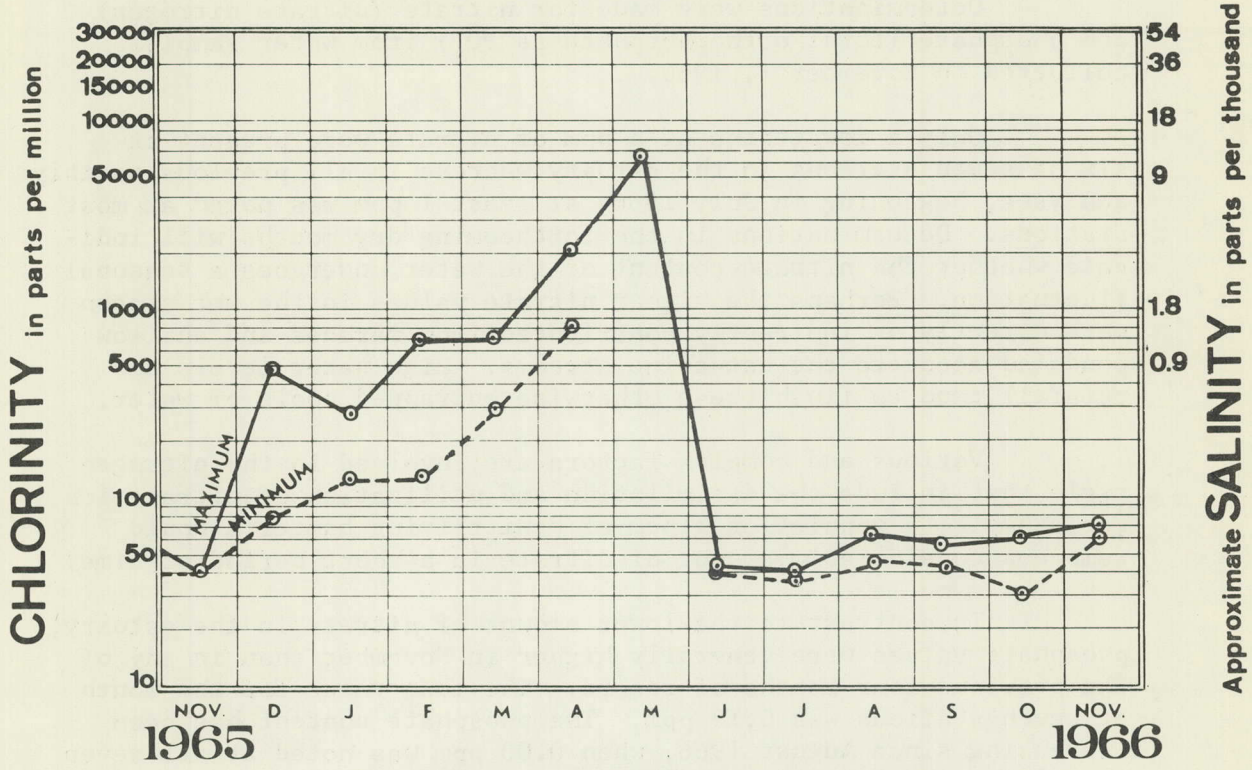
CHLORINITY
IN SHARK RIVER ESTUARY



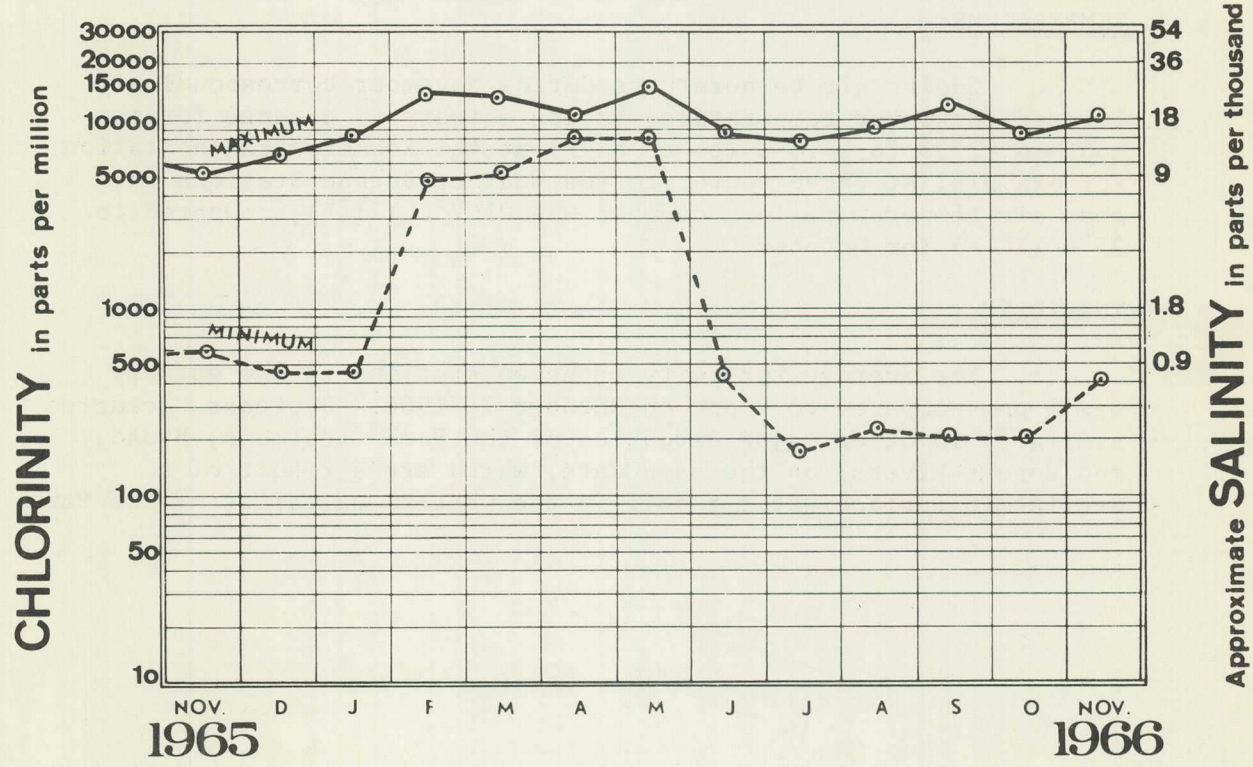


CHLORINITY

ROOKERY BRANCH STATION



SHARK RIVER STATION



NITRATE AND PHOSPHATE:

Determinations were made for nitrate (nitrate nitrogen) and phosphate (total orthophosphate as PO_4) from water samples collected on November 1, 1966.

Only a few tenths of a ppm of nitrate were present at six of seven stations in the estuary whereas in all previous monthly analyses, beginning in July 1966, at least 1 ppm was noted at most stations. Determinations in the forthcoming dry months will indicate whether the nitrate content of the water undergoes a seasonal fluctuation. Perhaps the higher nitrate values in the wet season were directly or indirectly contributed from marshes and shallow ponds adjacent to the estuarine streams. High water levels and rainfall tend to flush these otherwise entrapped pools of water.

Various and complex factors are involved in the nitrogen cycle that include the assimilation and utilization of nitrate ion. For example, a population bloom of denitrifying bacteria could remove a considerable amount of nitrate in a short period of time.

In contrast to the lower amount of nitrate in the estuary, phosphate values were generally higher in November than in any of the previous four months of record. The mean value for the month at seven stations was 0.19 ppm. The phosphate content has been increasing since August 1966, when 0.00 ppm was noted at all seven stations.

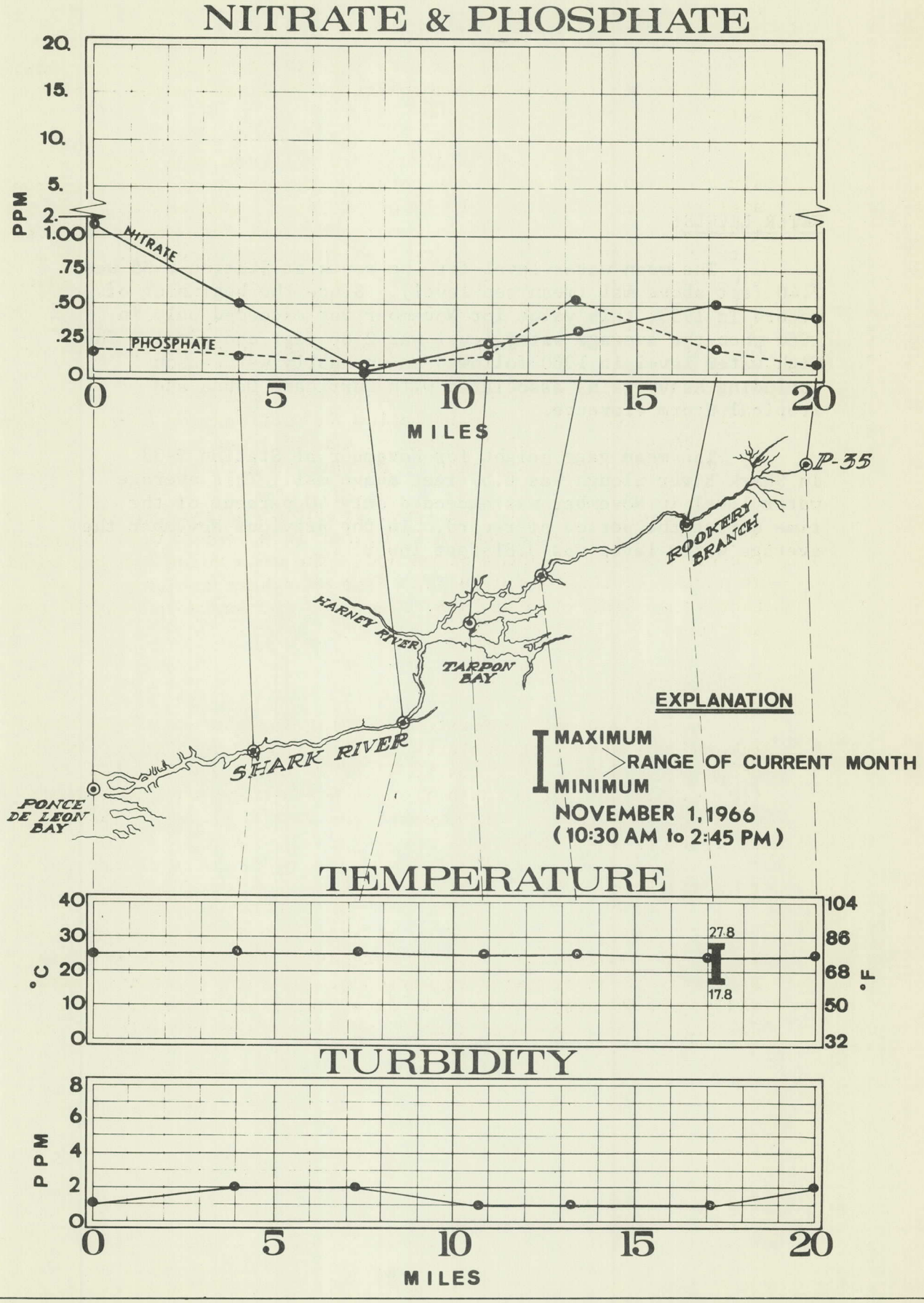
TEMPERATURE:

Cooler air temperatures during November correspondingly lowered the water temperatures in the estuary to a range for the month of 17.8 to 27.8°C (64 to 82°F) at the Rookery Branch Station. For example, at three south Florida Weather Bureau Stations the mean air temperature for November was 21.7°C (71°F), compared to 25°C (77°F) for October.

TURBIDITY:

The average turbidity at seven stations in the estuary was 1 ppm compared to 7 ppm on October 7, 1966. Decreases occurred similarly in other major estuaries of the Park (Lostmans, Broad, and Rogers Rivers) on the same date, which are a result of a decline in surface water runoff in the western estuaries of the Park.

WATER QUALITY TRANSECT

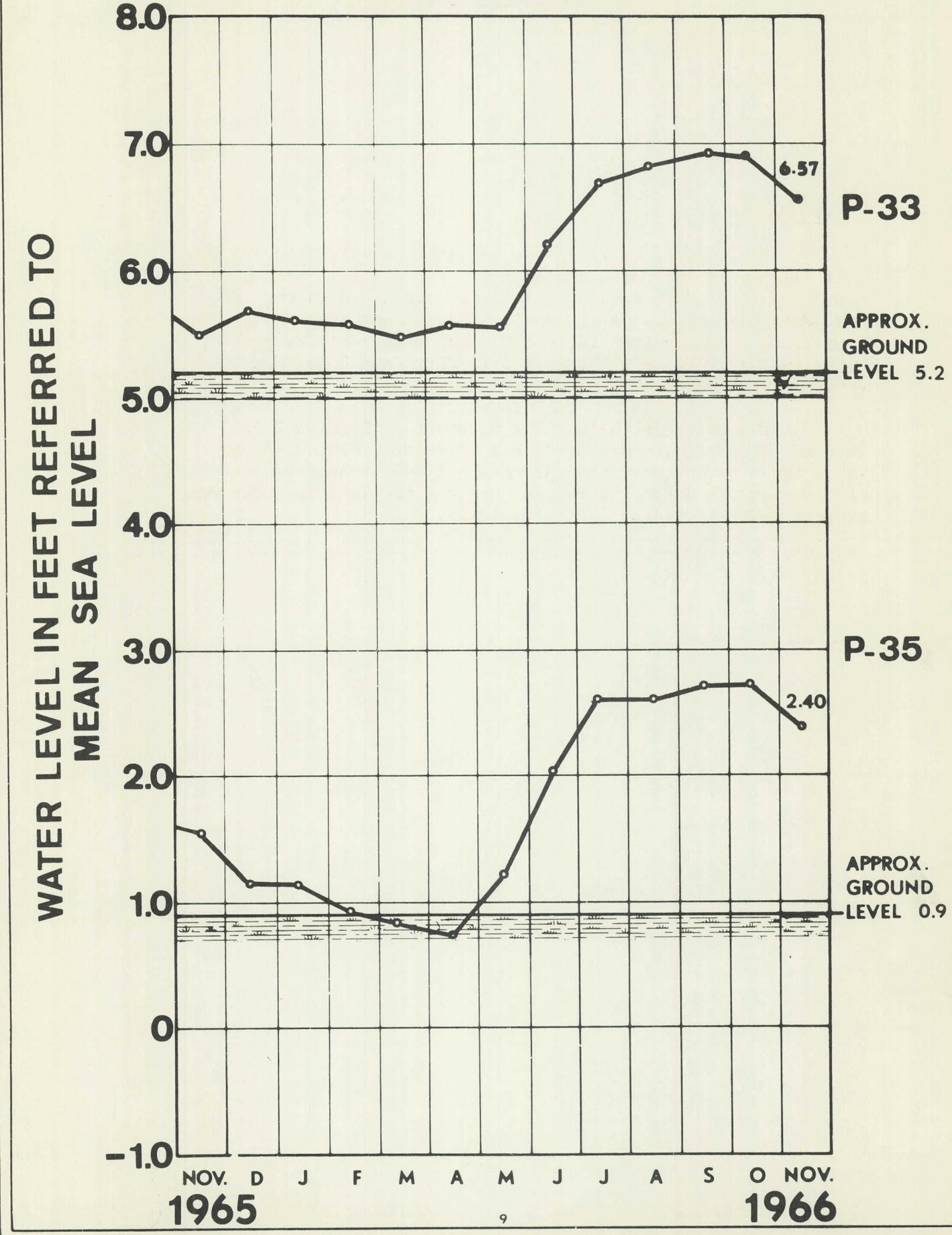


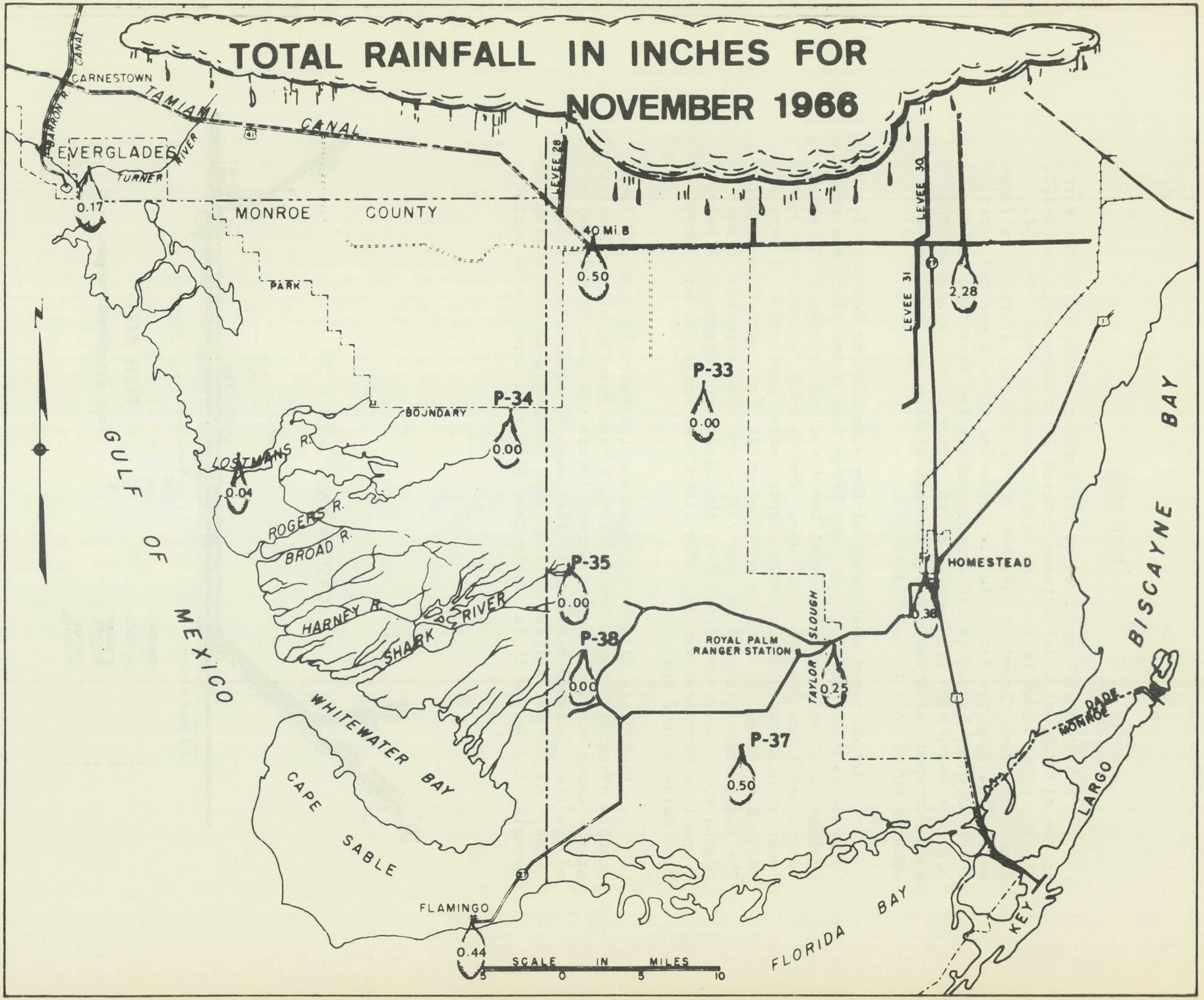
WATER LEVELS:

The mean water level for the month at Station P-35 was 2.40 feet above msl (mean sea level). Since the beginning of record in 1953, this value for November was exceeded only in 1960 when the average water level was 2.86 feet above msl. The high water level in 1960 followed an unusually wet season including heavy rains associated with Hurricane Donna and Tropical Storm Florence.

The mean gage height for November at Station P-33 in Shark River Slough was 6.57 feet above msl. This average water level in November was exceeded only 40 percent of the time during the period of record. In the previous November the average water level was 0.81 feet lower.

MONTHLY MEAN WATER LEVEL AT P-33 AND P-35



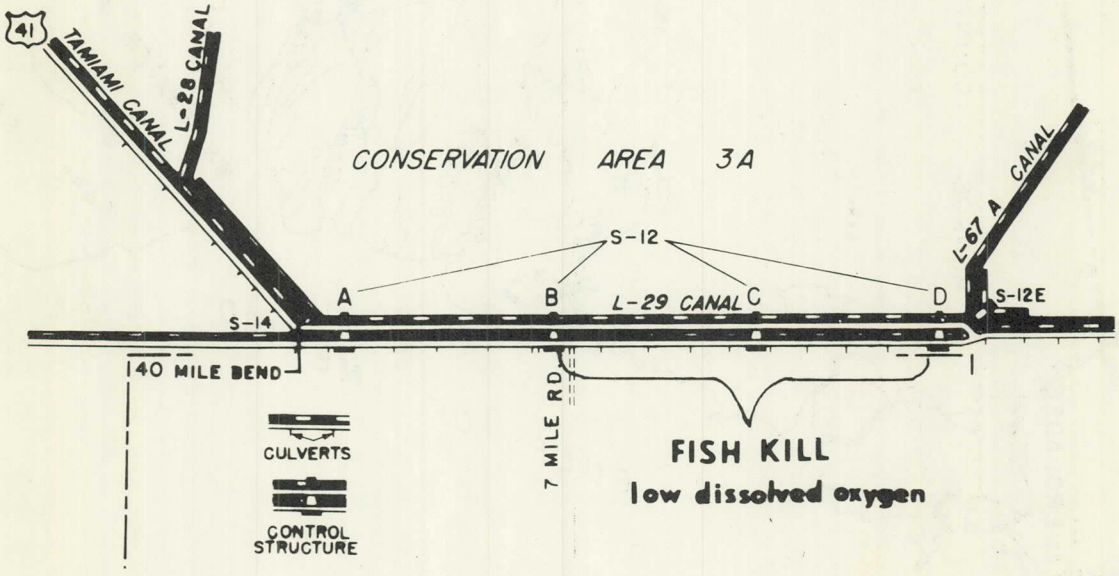

TOTAL RAINFALL IN INCHES FOR
NOVEMBER 1966
CARNESTOWN
TAMIAMI CANAL
BARRON R. CANAL
EVERGLADES
TURNER RIVER
0.17
MONROE COUNTY
PARK
LEVEE 28
LEVEE 30
LEVEE 31
40 Mi B
0.50
2.28
P-33
0.00
P-34
0.00
BOUNDARY
LOSTMANS R.
0.04
ROGERS R.
BROAD R.
P-35
0.00
HARNEY R.
SHARK RIVER
P-38
0.00
GULF OF MEXICO
WHITEWATER BAY
CAPE SABLE
FLAMINGO
0.44
ROYAL PALM RANGER STATION
TAYLOR SLOUGH
0.25
HOMESTEAD
0.36
P-37
0.50
BISCAYNE BAY
DADE
MONROE
KEY LARGO
FLORIDA BAY
SCALE IN MILES
5 0 5 10

FISH KILL

A fish kill occurred at the northern boundary of the Park in the old Tamiami Canal between Control Structures S-12B and S-12D. The mortality began in the last week of November 1966. The S-12 Structures were closed on November 9th essentially stopping surface-water flow into the Park. In the following three weeks the water level south of Structure 12C dropped nearly two feet from 9.2 to 7.3 feet above mean sea level. As the water in the glades to the south dropped, apparently large numbers of fish and other aquatic animals moved into the old canal.

During a reconnaissance of the situation on December 1, 1966, hundreds of dead catfish, bass, and bream were found along the canal. Analyses that morning showed that the dissolved oxygen of the water in the canal was less than 0.5 ppm. Undoubtedly, values were even lower at night when the aquatic plants ceased production of oxygen while biological, as well as non-biological, consumption continued. The respiratory activity of many fishes and other aquatic animals begins to be severely affected as the dissolved oxygen falls below 3 ppm in subtropical waters. Few fishes can exist for any length of time below 1 or 2 ppm.

Inadequate dissolved oxygen was indicated by numerous large schools of catfish and a few individual bass gulping air or "mouthing" at the water surface. Such distress lowers the general well-being of the fish, because basic activities such as feeding practically cease. As the water level in the canal continues to drop during the normally dry season it is likely that fish will continue to perish.



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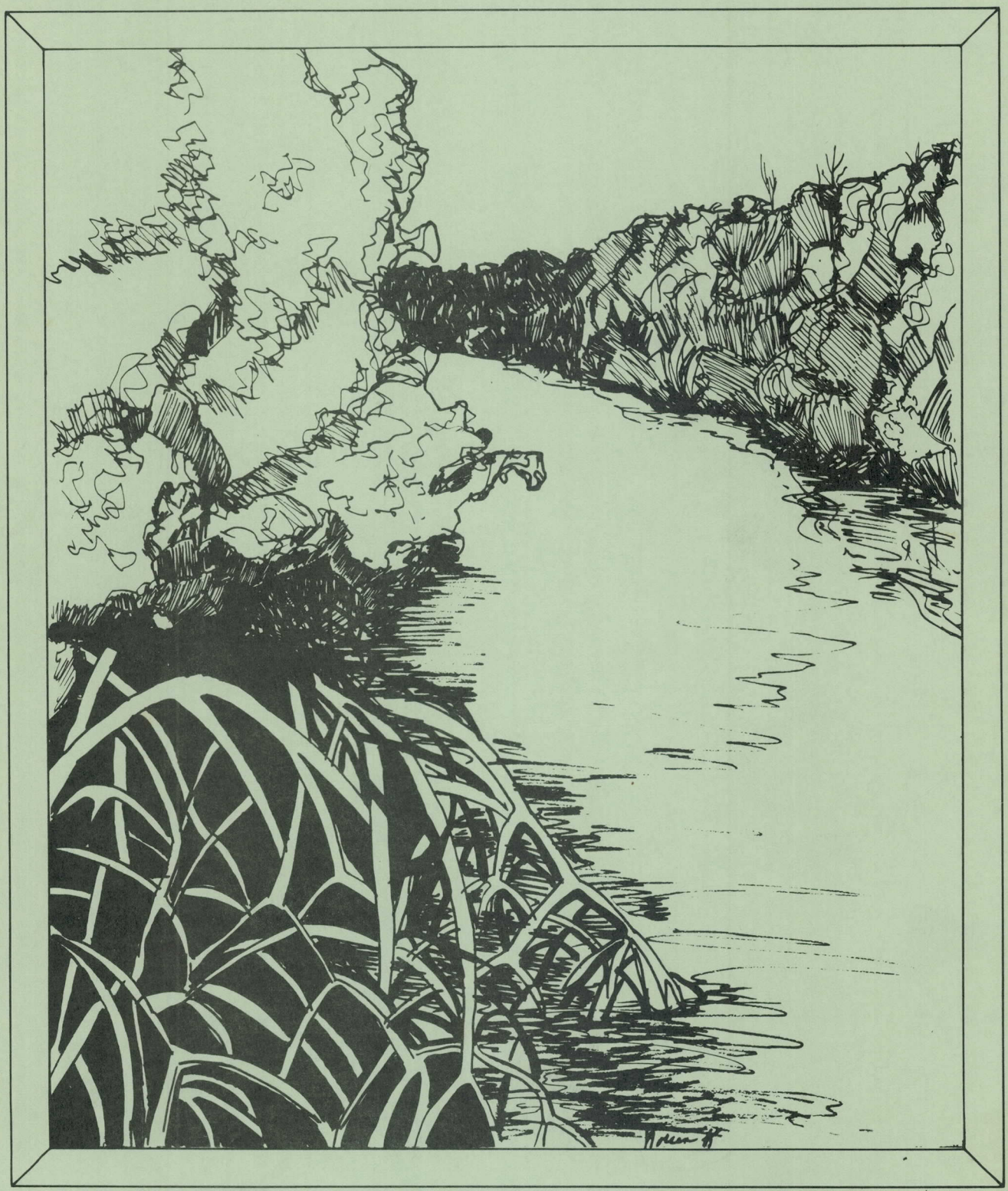
At the three stations in the estuary monthly chlorinity ranges are determined from specific conductivity data recorded continuously. Automatically recording instruments provide water level and discharge and temperature data.

Tabb

WATER CONDITIONS IN THE SHARK RIVER ESTUARY OF EVERGLADES NATIONAL PARK



DECEMBER 1966

PREPARED BY

U S GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

IN COOPERATION WITH

U S FISH & WILDLIFE SERVICE

BUREAU OF SPORT FISHERIES AND WILDLIFE

AND

NATIONAL PARK SERVICE

EVERGLADES NATIONAL PARK

MONTHLY ANALYSIS OF WATER CONDITIONS IN SHARK RIVER ESTUARY, DECEMBER 1966

Milton C. Kolipinski, Aaron L. Higer and Frederick W. Meyer

Statements in this report should be considered provisional. Full review has been curtailed so that the data can be presented on a current basis.

DISSOLVED OXYGEN:

Dissolved oxygen along the Shark River transect was sampled between 12 noon and 4 P.M. on December 1, 1966, with the following results:

DISSOLVED OXYGEN IN SHARK RIVER ESTUARY AND GLADES

	Shark River			Tarpon Bay		Rookery Branch	
	Mouth	Lower	Upper	Middle	Upper	Middle	Upper
Miles from Ponce deLeon Bay	0.0	4.0	7.3	10.8	13.4	17.3	20.0
Dissolved oxygen (ppm)	3.2	6.0	5.1	4.2	5.5	6.0	5.7
Oxygen saturation (%)	33	64	54	45	55	60	57

The oxygen content of the water generally was higher than the analyses indicated in the previous five months in Shark River proper and Tarpon Bay.

Adequate dissolved oxygen is essential to the wellbeing of estuarine organisms. The respiratory activity of many fishes and other aquatic animals begins to be severely affected as the dissolved oxygen falls below 3 ppm in subtropical waters. Few fishes can exist for any length of time below 1 or 2 ppm.

PLANKTON:

The following table summarizes the analyses of plankton populations in the estuary on December 1, 1966. Samples were collected between 12 noon and 4 P.M. at a depth of one foot:

NUMBER OF INDIVIDUALS PER LITER

Miles from Ponce de Leon Bay	Shark River mouth 0.0	Shark River middle 4.0	Rookery Branch middle 17.3	Rookery Branch upper 20.0
Biological Group				
Algae	180	4	660	1800
Diatoms	60	16	0	300
Copepods	8	0	0	0
Crustacean larvae	14	4	2	4
Insect larvae	0	0	1	2
Rotifers	0	0	0	4

Based on quantitative counts at four stations, phytoplankton was rather sparse throughout the estuary, except at upper Rookery Branch, where 1800 algae and 300 diatoms per liter were present. The algal count was composed largely of long, filamentous, green forms, including Spirogyra.

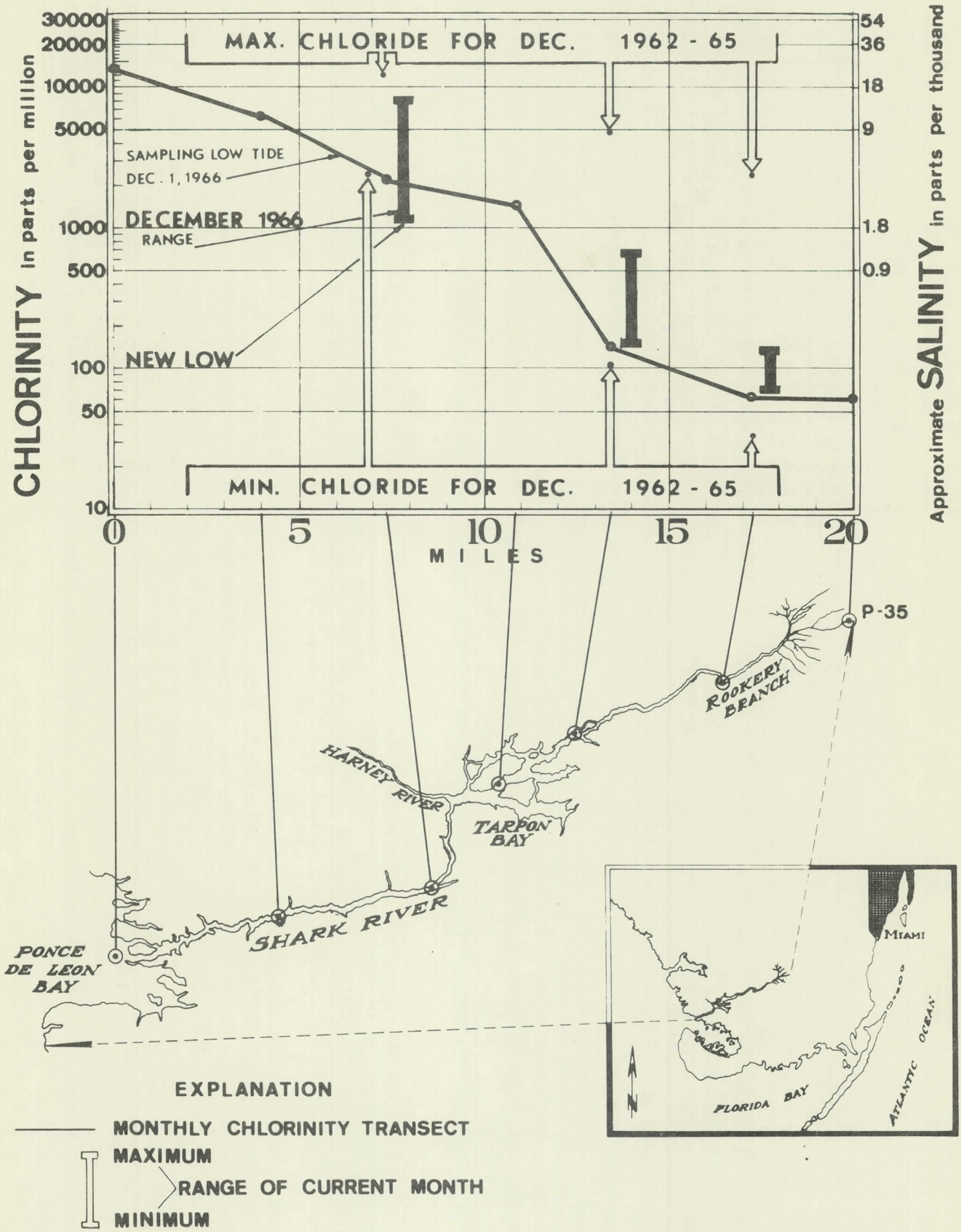
Various zooplankters were present in small numbers throughout the estuary.

CHLORINITY:

The monthly range of chlorinity in the Shark River estuary was low for December when compared with previous values since the beginning of record in 1962. The Shark River station, located seven miles from the mouth of the river, recorded a new low chlorinity of 1,100 ppm (parts per million) for the month of December. This station has recorded new monthly lows since June 1966.

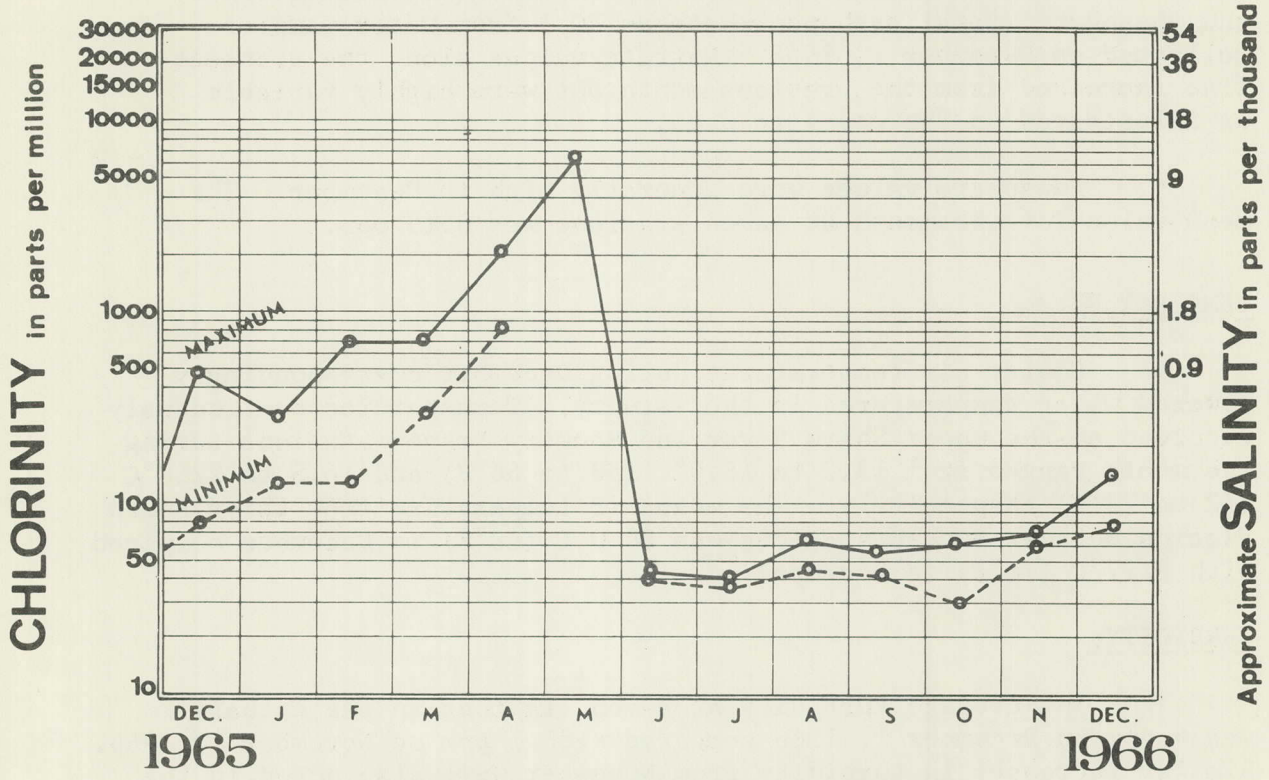
During the month the 500 ppm isochlor, essentially the fresh-brackish water line, fluctuated between mid-Rookery Branch and mid-Tarpon Bay. In December the average position of this index isochlor shifted northeast toward the river head waters about four miles from its mean position during the previous five months. From July until November 1966 the 500 ppm isochlor never moved toward the glades beyond mid-Tarpon Bay. The shift in position of the isochlor in December was associated with a lower outflow of fresh water from the glades.

CHLORINITY
IN SHARK RIVER ESTUARY

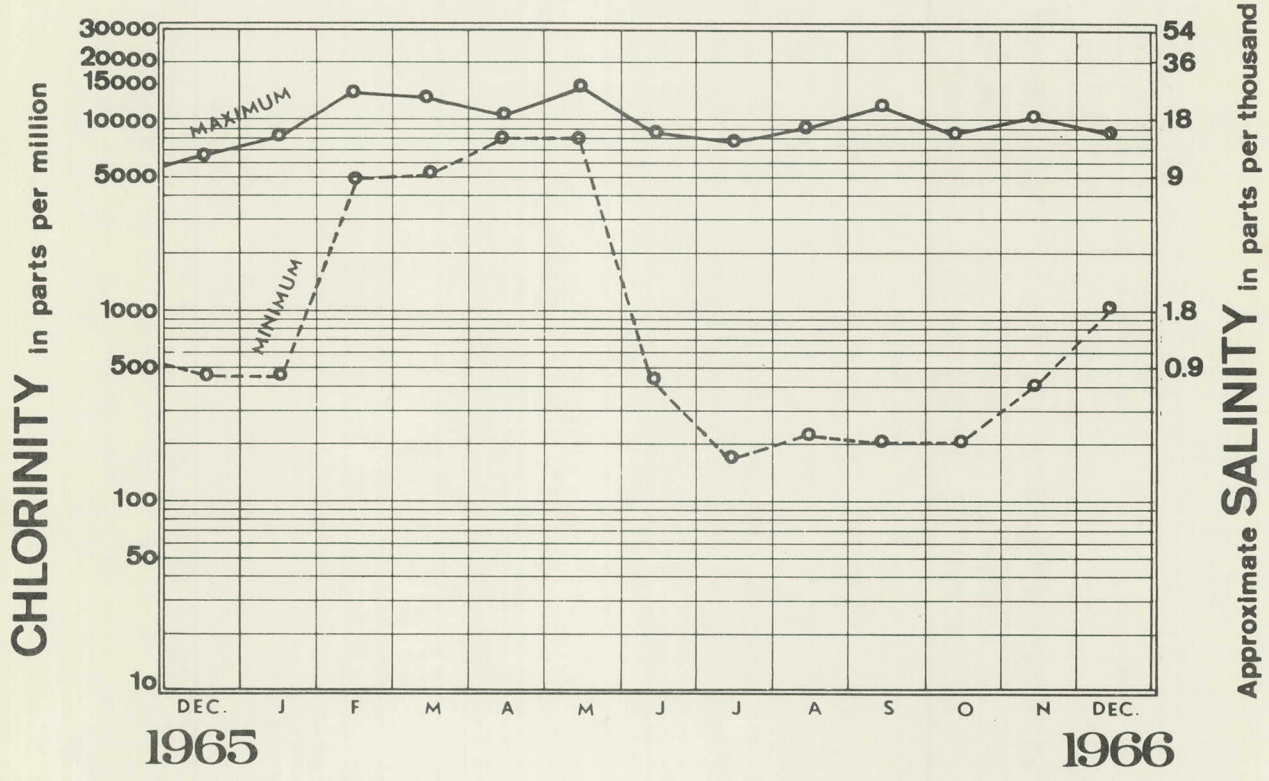


CHLORINITY

ROOKERY BRANCH STATION



SHARK RIVER STATION



NITRATE AND PHOSPHATE:

Determinations were made for nitrate (nitrate nitrogen) and phosphate (total orthophosphate as PO_4) from water samples collected on December 1, 1966. Nitrate values along the transect line increased from the previous month but were highly variable as illustrated on the opposite page.

Phosphate values were generally high in December. The mean value for the month at seven stations was 0.15 ppm.

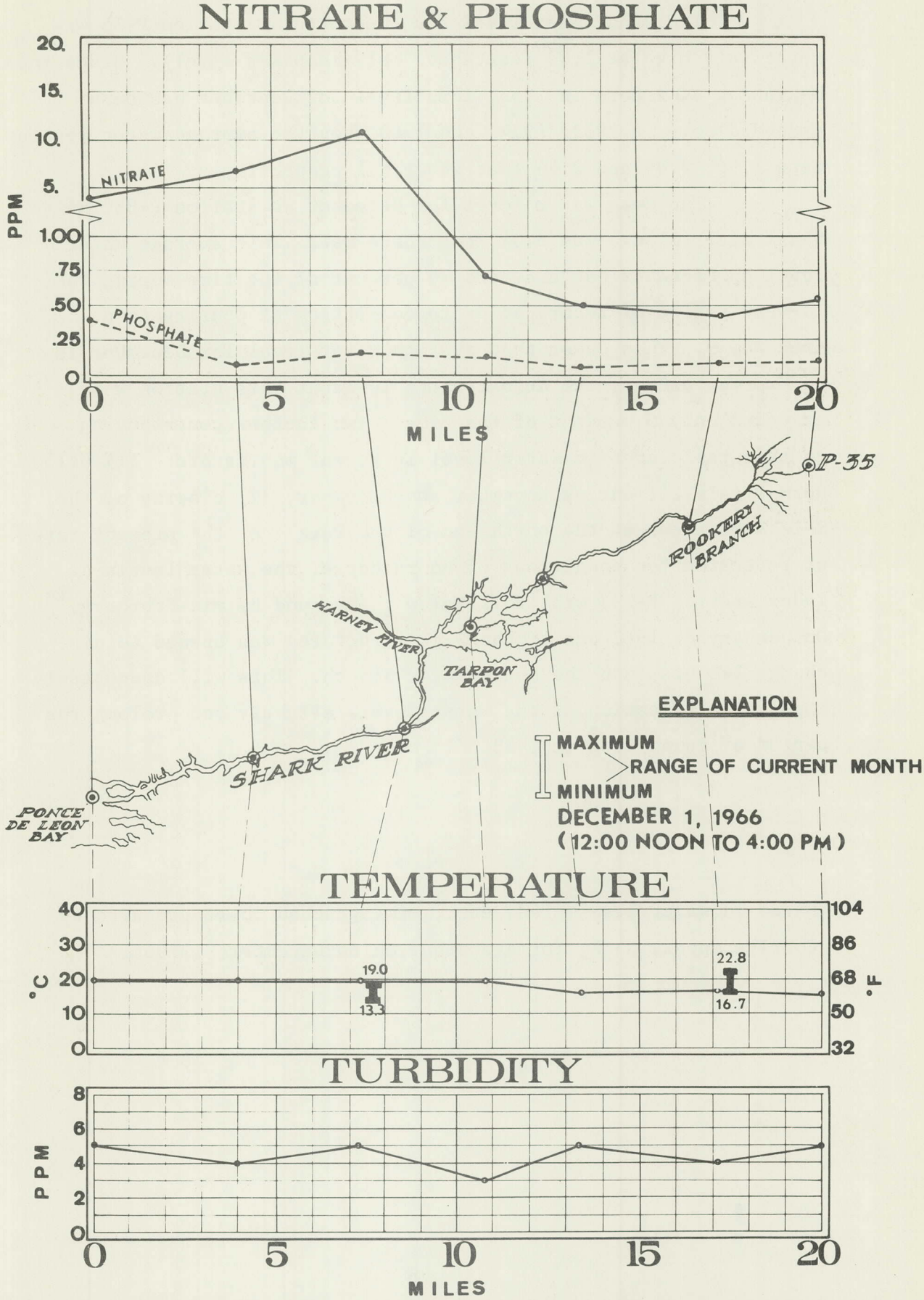
TEMPERATURE:

Cooler air temperatures during December correspondingly lowered water temperatures in the estuary. Temperatures continuously recorded at the upper Shark River and Rookery Branch stations during the month ranged from 13.3 to 18.9°C (58 to 66°F) and 16.8 to 22.8°C (62 to 73°F) respectively. The mean air temperature from three south Florida Weather Bureau stations was 20.0°C (68°F) in December compared with 21.7°C (71°F) in November.

TURBIDITY:

The average turbidity at seven stations in the estuary was 4 ppm on December 1, 1966 compared with 1 ppm on November 1, 1966. Similar increases in turbidity from November were also noted in the Lostmans, Broad, and Rogers Rivers.

WATER QUALITY TRANSECT



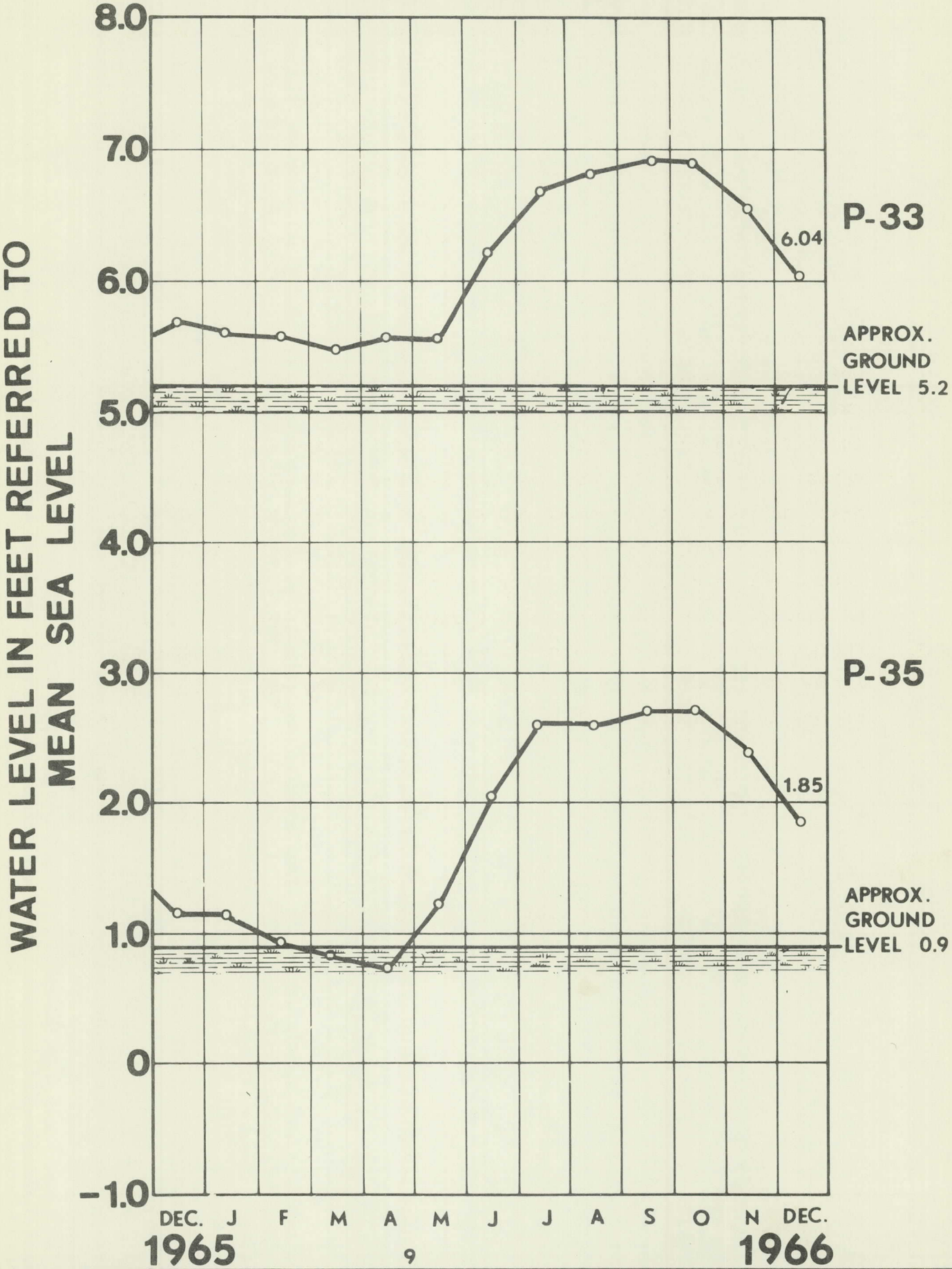
Water Levels:

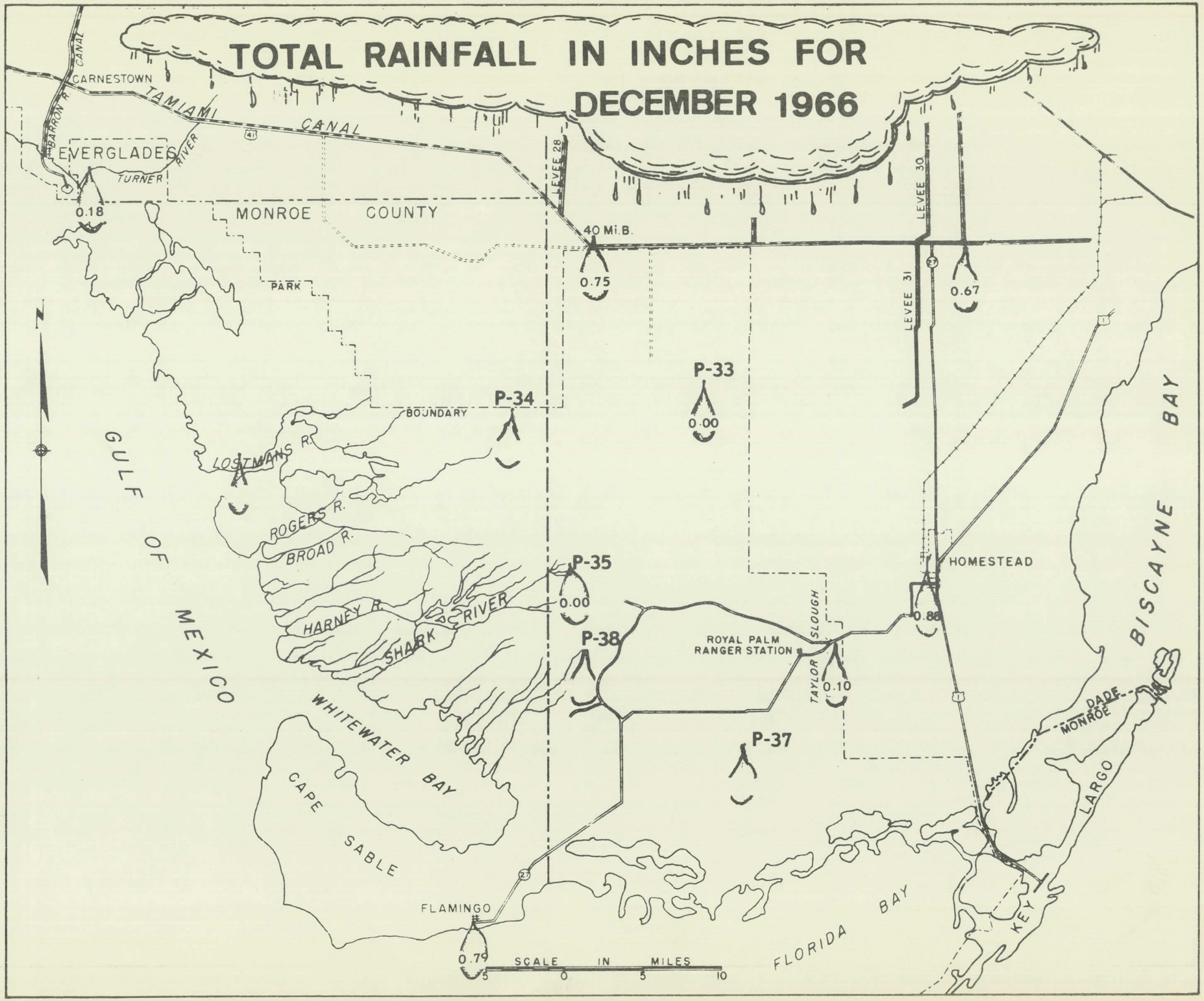
The mean water level for the month at station P-35 was relatively high at 1.85 feet above msl (mean sea level). Since the beginning of record in 1953, this level for December has been exceeded only in 1953, 1954, and 1960 when the average water levels were 1.96, 2.04 and 2.44 feet above msl respectively.

The mean water level for December at station P-33 in Shark River Slough was 6.04 feet above msl. This average water level in December was exceeded 70 percent of the time during the 10-year period of record prior to completion of Conservation Area No. 3. This lower than average water level for December is noteworthy because the August water level at this station was exceeded only 5 percent of the time. Two factors contributing to this rapid drop in water level in recent months are: (1) below normal rainfall during November and December, (2) closing of the S-12 structures at the north end of the Park. At the present rate of recession for conditions of no recharge, the water levels at index station P-33, will fall below the ground by mid-February.[1] On January 3, 1967 one of the S-12 structures was opened to discharge 140 cfs into the Shark River Slough. This will undoubtedly impede the recession of the water levels slightly and prolong the period of inundation at P-33.

1 Based on water level pred. etc., mimeographed chart prepared by Charles Appel, USGS, for distribution on December 8, 1966.

MONTHLY MEAN WATER LEVEL AT P-33 AND P-35




TOTAL RAINFALL IN INCHES FOR DECEMBER 1966
CARNESTOWN
BARRON R. CANAL
TAMIAMI CANAL
EVERGLADES
TURNER RIVER
0.18
MONROE COUNTY
PARK
LEVEE 28
40 Mi.B.
0.75
LEVEE 30
LEVEE 31
0.67
P-33
0.00
P-34
BOUNDARY
LOSTMANS R.
ROGERS R.
BROAD R.
P-35
0.00
HARNEY R.
SHARK RIVER
P-38
ROYAL PALM RANGER STATION
TAYLOR SLOUGH
0.10
HOMESTEAD
0.88
GULF OF MEXICO
WHITEWATER BAY
CAPE SABLE
P-37
FLAMINGO
0.79
FLORIDA BAY
BISCAYNE BAY
DADE
MONROE
LARGO
KEY
SCALE IN MILES
5 0 5 10

ARTESIAN WATER -- AN EMERGENCY WATER SUPPLY FOR EVERGLADES NATIONAL PARK [1]

By

Frederick W. Meyer
Geophysicist, U.S. Geological Survey

January 13, 1967

During the summer of 1965, the U.S. Geological Survey, in cooperation with the U.S. National Park Service drilled a deep test well in the Everglades National Park in Taylor Slough near the Royal Palm Ranger Station. The purpose of the well is to supply sufficient mineralized artesian water to a nearby 2-acre experimental plot where effects on the fresh-water biota can be examined. If no material changes in the biota result from the inundation then consideration will be given to the use of artesian water in small critical areas as an emergency supply during prolonged droughts.

Drilling of the well began in June 1964 and funds were exhausted in September 1964 at a depth of 1,126 feet without producing the required flow for the study. In July 1965 the well was deepened to 1,333 feet and flowed at a rate of about 2.3 million gallons per day from the 8-inch casing at ground level.

Due to difficulties in maintaining circulation in the top hundred feet of limestone, the drilling contractor elected to drive the standard 8-inch black iron casing to a depth of 620 feet where it was seated in a moderately hard layer of sandy limestone of the Tampa Formation. Then, a 7 5/8-inch open hole was drilled with a rotary rig to a depth of 1,333 feet. Samples of the rock were collected and filed with the Florida Geological Survey (W-7363). Measurements were also made of hydrostatic pressure and water quality at various depths in the well during drilling.

Various types of hydrogeologic logs (see fig. 1) show some of the physical and chemical characteristics of the stratigraphy penetrated by the well. It was generally assumed that large quantities of artesian water containing less than 1,200 ppm (parts per million) chloride could be obtained at depths less than 1,200 feet. Data from this well contradicts this assumption and indicates that the Tampa and Suwannee are part of the aquiclude and the Avon Park Limestone or Ocala Group form the top of the Floridan aquifer.

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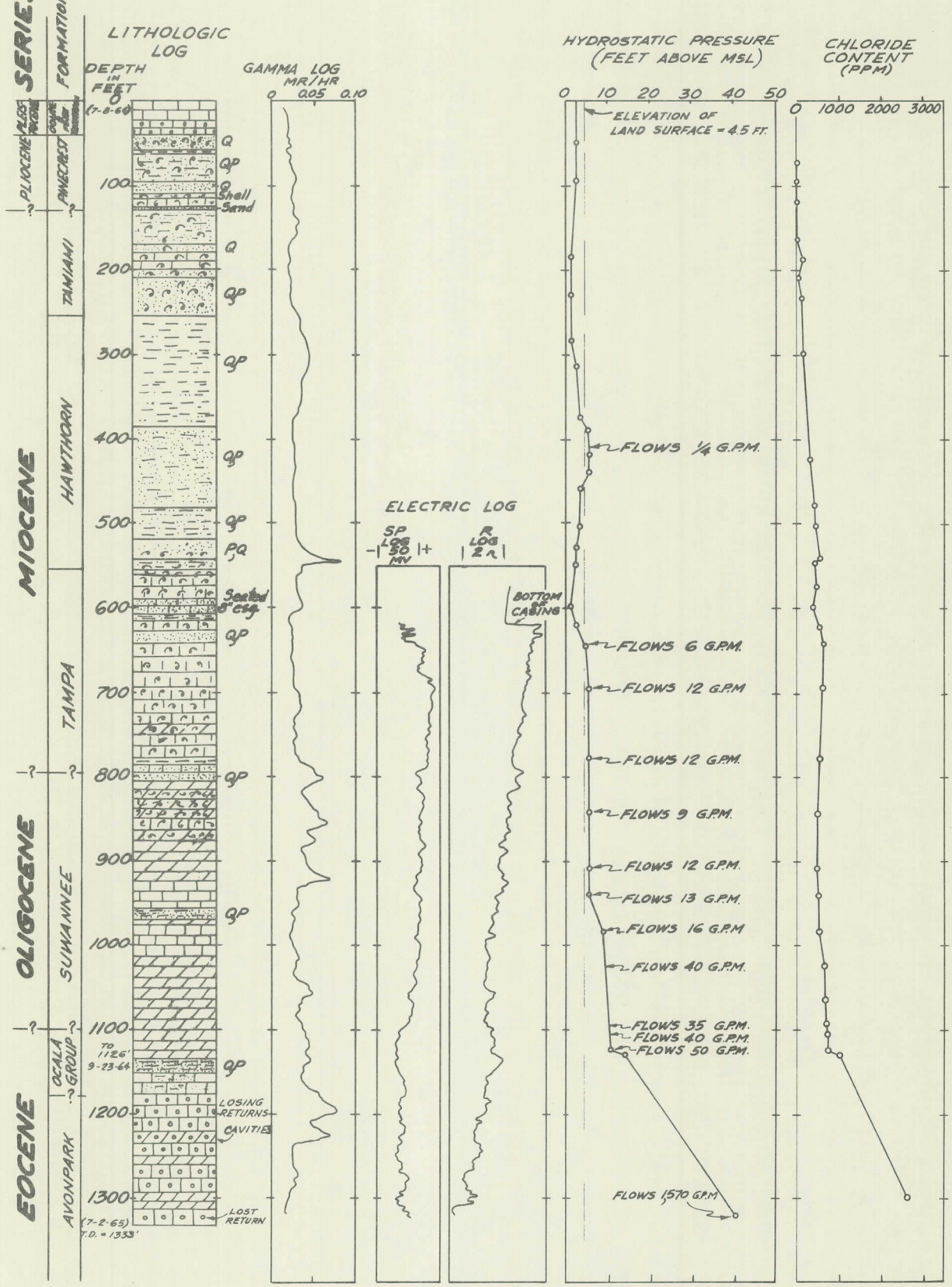
[1] Data is provisional and subject to revision.

Stiff diagrams (see fig. 2) of the artesian water from 641 to 1,063 feet indicate most of the flow originated from an aquifer in the Tampa Formation and confirms the presence of at least two artesian aquifers in the area. The high concentration of magnesium in the artesian water from 1,333 feet could be related to deep circulation of sea water. This, however, is improbable because the artesian water at Key Largo contains less magnesium. Comparison of the diagrams indicate that the artesian well at Grossman's Hammock obtains only half its flow from the Floridan aquifer. This infers an increase in the permeability in the Tampa/Suwannee section toward the north.

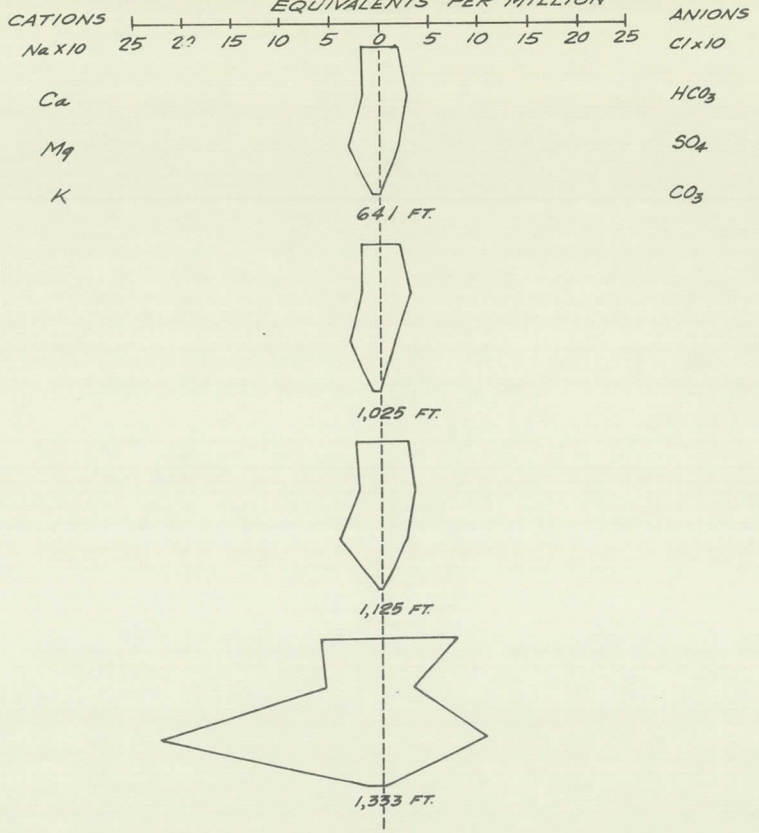
Only minor amounts of relatively fresh artesian water can be obtained from the Tampa Formation in the area. Perhaps the yield of a well in this formation could be increased by acidizing techniques.

During 1966, artesian water flowed into the experimental area at a rate of about 2 acre feet per day with no significant increase in salinity (see fig. 2).

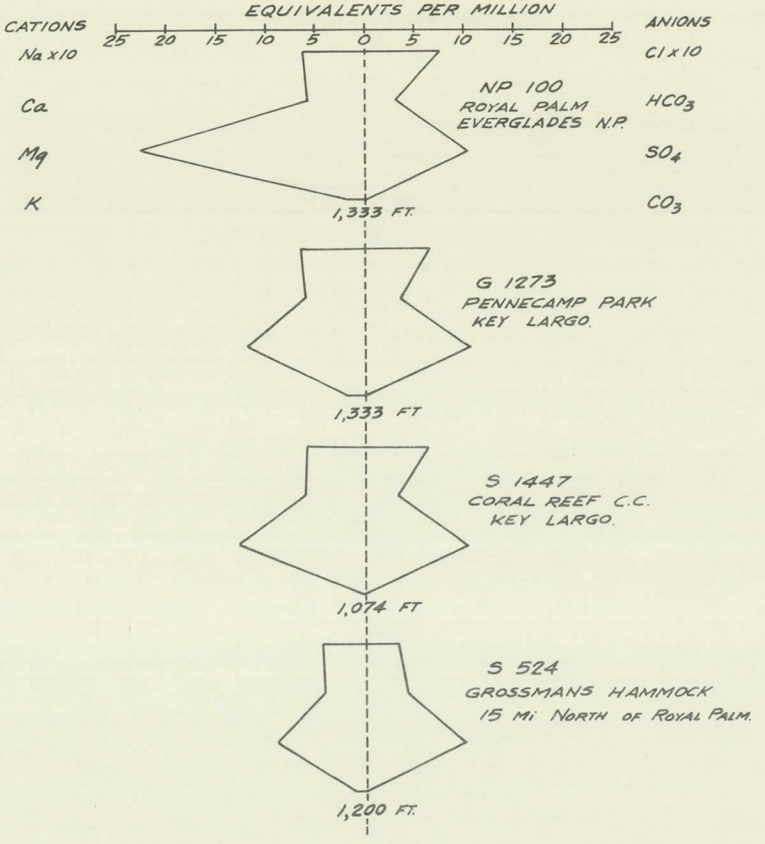


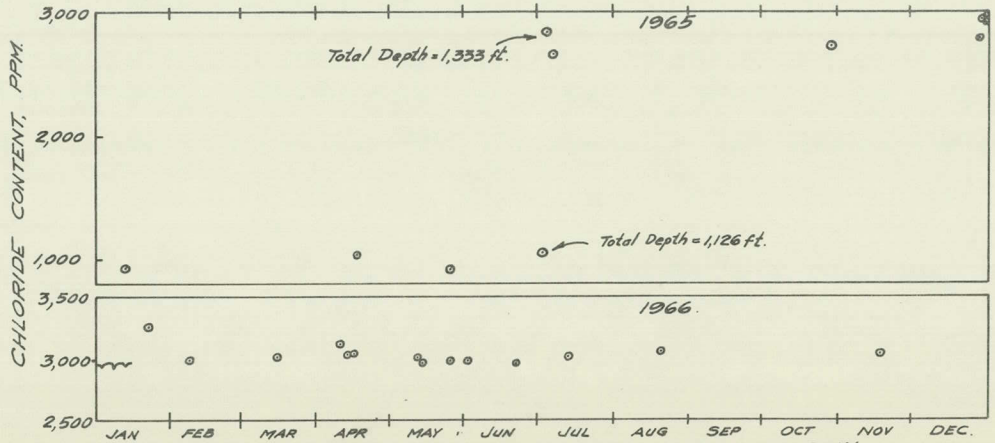
F. W. MEYER
1-12-67

STIFF DIAGRAMS OF ARTESIAN WATER FROM WELL (NP-100) EVERGLADES NATIONAL PARK, FLA.



STIFF DIAGRAMS OF ARTESIAN WATER IN TOP OF FLORIDAN AQUIFER IN SOUTH FLORIDA.





CHLORIDE CONCENTRATION IN ARTESIAN WATER AT ROYAL PALM RANGER STATION.

METHODS OF ANALYSIS

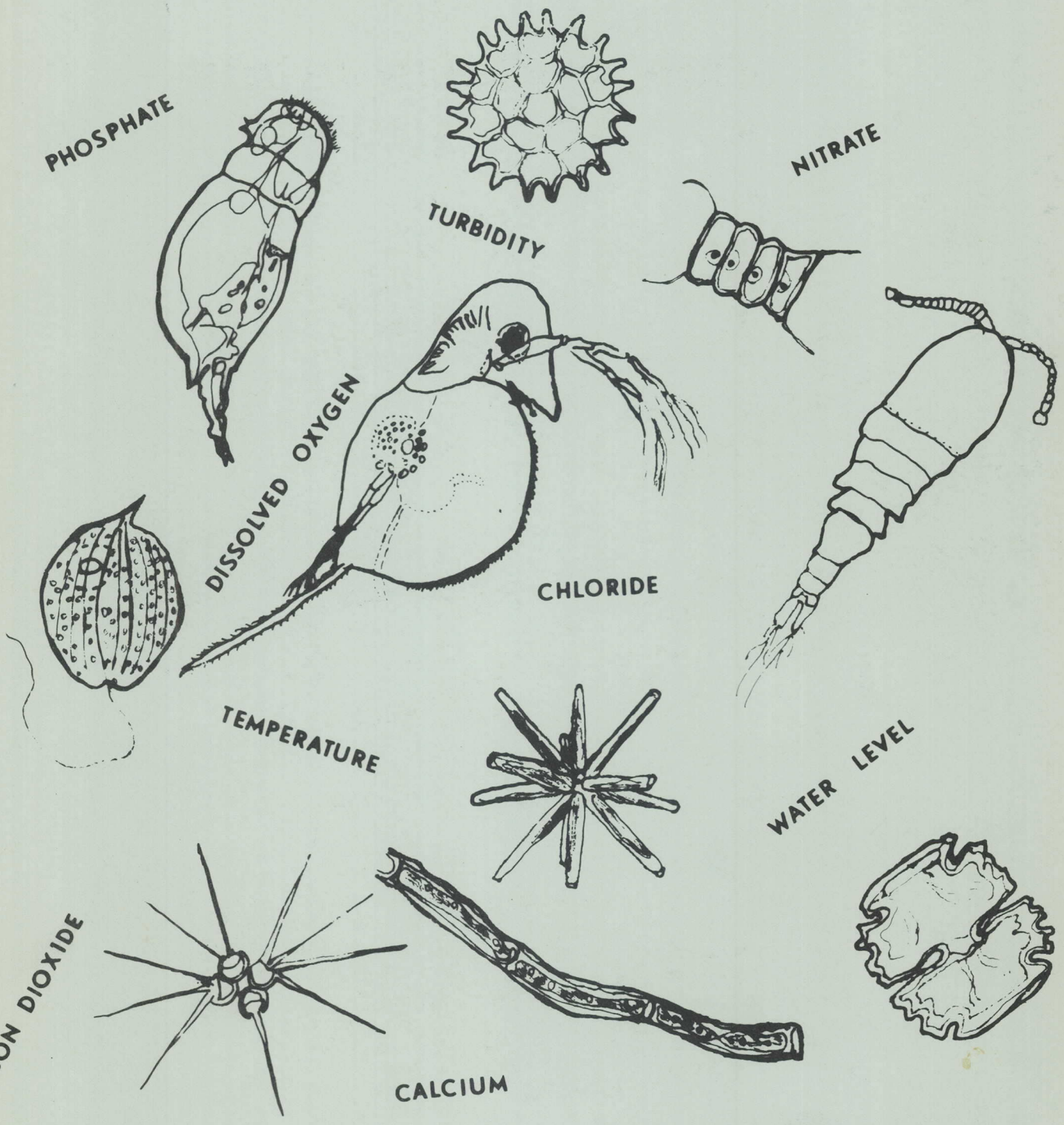
Methods of chemical analyses used during monthly transects of the estuary are those outlined by F. H. Rainwater and L. L. Thatcher in Methods for collection and analysis of water samples: U.S. Geol. Survey Water-Supply Paper 1454, 1960 with the following exception: Dissolved oxygen was determined by the Alsterberg modification of the Winkler method as described by Keith V. Slack in A micro kit for dissolved oxygen determination: (U.S. Geological Survey) Water Resources Division Bulletin, February 1965.

At the three stations in the estuary monthly chlorinity ranges are determined from specific conductivity data recorded continuously. Automatically recording instruments provide water level and discharge and temperature data.

Tabb

WATER CONDITIONS

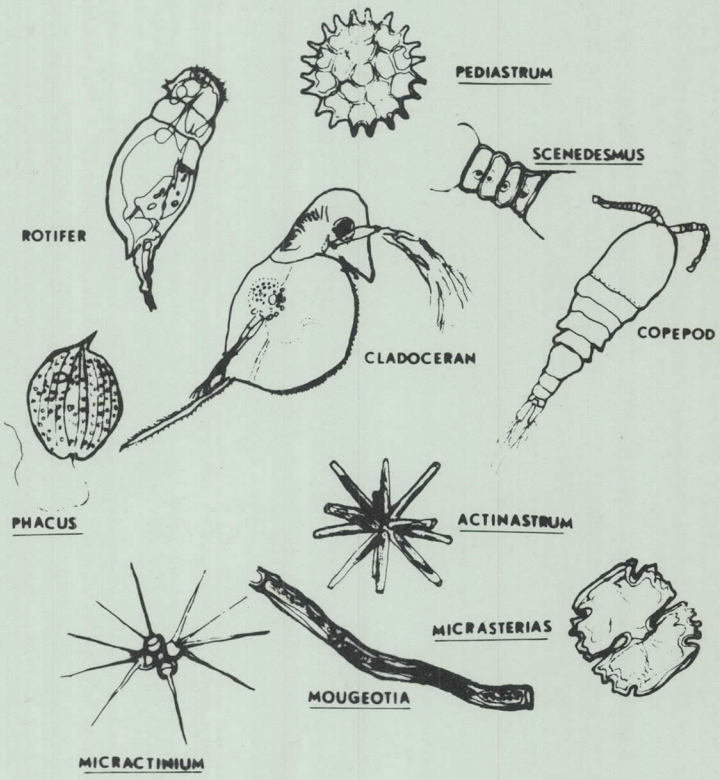
EVERGLADES NATIONAL PARK



JANUARY 1967

WATER CONDITIONS

EVERGLADES NATIONAL PARK



1967

COVER ILLUSTRATION: This cover reduction lists the names of representative planktonic organisms that occur in the estuaries, rivers, sloughs and alligator holes of Everglades National Park. These plants and animals are only a fraction of a millimeter in size. They effect and are affected by water conditions in the system.

INFORMATION MEMO March 2, 1967

From : Aaron L. Higer, U.S. Geological Survey, WRD, Miami, Fla.

Subject: CURRENT DATA REPORT

Beginning with this issue reported data will encompass all of Everglades National Park rather than just the Shark River Estuarine Systems. Consequently, the title of the current data report has been changed from "WATER CONDITIONS IN THE SHARK RIVER ESTUARY OF EVERGLADES NATIONAL PARK" to "WATER CONDITIONS EVERGLADES NATIONAL PARK". The cover illustration has also been changed for easier differentiation of 1966 and 1967 issues.

Aaron L. Higer

Attch.

MONTHLY ANALYSIS OF WATER CONDITIONS IN EVERGLADES NATIONAL PARK, JANUARY 1967

By

Aaron L. Higer and Milton C. Kolipinski

Statements in this report should be considered provisional. Full review has been curtailed so that the data can be presented on a current basis.

DISSOLVED OXYGEN:

Dissolved oxygen along the Shark River transect was sampled between noon and 4 P.M. on January 5, 1967 with the following results:

DISSOLVED OXYGEN IN SHARK RIVER ESTUARY AND GLADES

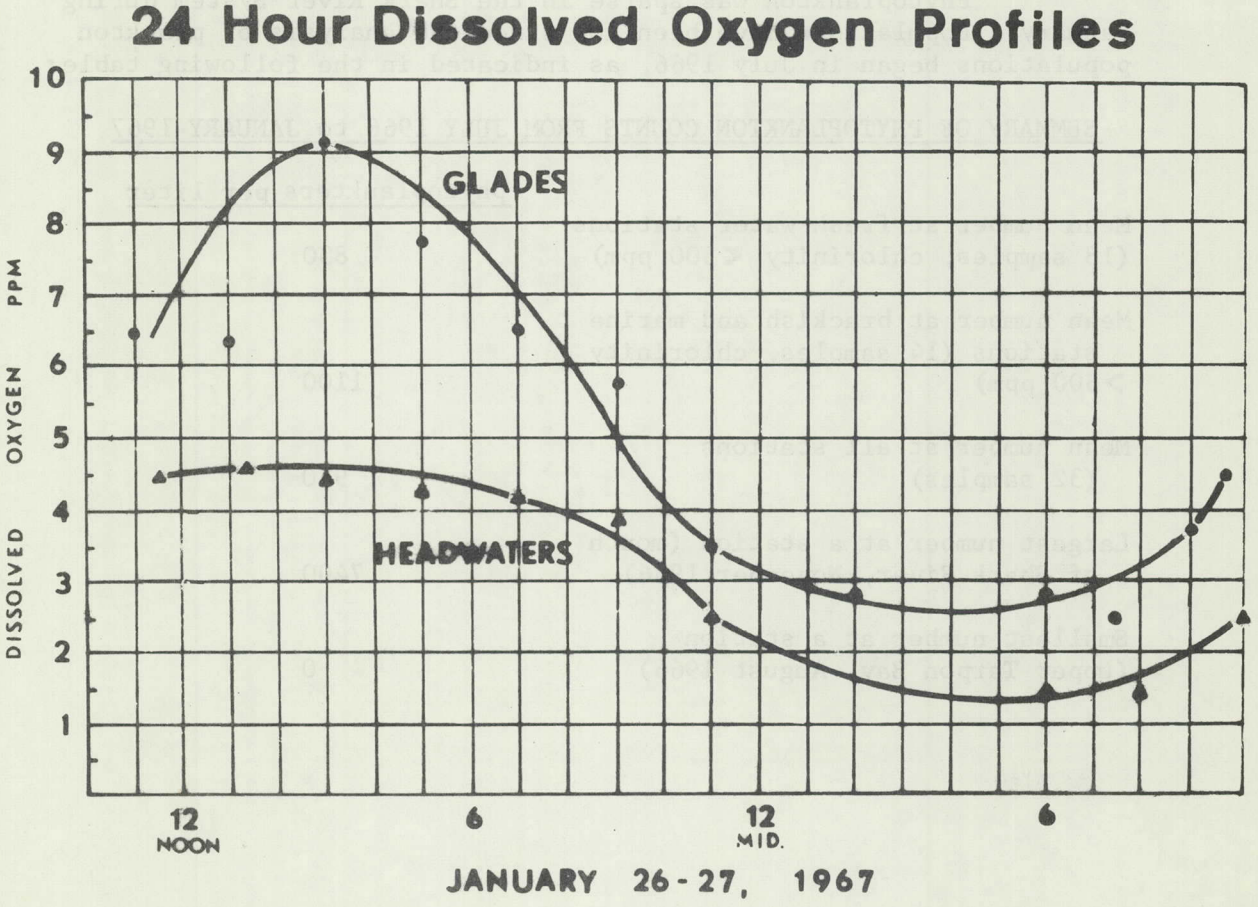
	Shark River			Tarpon Bay		Rookery Branch		Sawgrass Marsh
	Mouth	Lower	Upper	Middle	Upper	Middle	Upper	Adjacent to river
Miles from Ponce deLeon Bay	0.0	4.0	7.3	10.8	13.4	17.3	20.0	20.0
Dissolved oxygen (ppm)	5.7	5.1	6.0	3.6	5.1	3.2	4.9	5.1
Oxygen saturation (%)	64	57	66	39	54	33	51	52

The overall oxygen content of the water in the system on January 5, 1967 was comparable to the amount present during sampling in the previous month.

The chart below portrays diurnal profiles of dissolved oxygen in the surface waters (10 cm depth) of an open glades site and of a mid-stream site in the headwaters of the Shark River. The glades site is in a sawgrass-bladderwort marsh in Shark River Slough at Cottonmouth Camp, located approximately 15 miles northeast of the headwaters of Shark River. The headwaters site is situated at upper Rookery Branch adjacent to the P-35 data-collecting station.

The diurnal oxygen pulse at the glades site covered a range of nearly 7 ppm, while at the headwaters site it covered only 3 ppm. The relatively high oxygenation of water at the open glades station apparently resulted mainly from the photosynthetic oxygen production of the abundant bottom algal mat and surrounding submerged bladderwort plants. During the sampling sequence the water depth at the site was only 15 cm. Thus, an abundant aquatic flora was photosynthesizing and respiring in a comparatively small volume of water.

By way of comparison, the mid-stream station had a sparsity of attached bottom plants and phytoplankton coupled with deeper water of approximately 125 cm that on the basis of volume tends to buffer the effects of oxygen change.



PLANKTON:

The following table summarizes the analyses of plankton populations in the estuary on January 5, 1967. Samples were collected between 12 noon and 4 P.M. at a depth of one foot:

NUMBER OF INDIVIDUALS PER LITER

Miles from Ponce de Leon Bay	Shark River mouth 0.0	Shark River middle 4.0	Rookery Branch middle 17.3	Rookery Branch upper 20.0
Biological Group				
Algae	4800	3	340	3700
Diatoms	49	0	0	8
Copepods	14	8	2	0
Crustacean larvae	38	11	10	16
Insect larvae	0	0	1	0
Snail larvae	3	0	0	0
Rotifers	0	0	0	8

Phytoplankton was sparse in the Shark River System during January. Populations have been low since the analysis of plankton populations began in July 1966, as indicated in the following table:

SUMMARY OF PHYTOPLANKTON COUNTS FROM JULY 1966 to JANUARY 1967

	phytoplankters per liter
Mean number at fresh-water stations (18 samples, chlorinity < 500 ppm)	830
Mean number at brackish and marine stations (14 samples, chlorinity > 500 ppm)	1100
Mean number at all stations (32 samples)	950
Largest number at a station (mouth of Shark River, November 1966)	7400
Smallest number at a station (upper Tarpon Bay, August 1966)	0

To date the phytoplankton in the Shark River System appears to be impoverished in comparison to the numbers recorded in other estuaries and fresh-water rivers. For example, the Waccasassa, virtually an unpolluted estuary, is similar to the Shark River Estuary in many respects. The Waccasassa River empties into the Gulf of Mexico about 280 miles to the northwest of the Shark River. During an intensive microbiological study[1] of the Waccasassa System during 1963, numbers of photosynthetic suspended organisms regularly totaled many thousands per liter. Organisms bloomed (exceeded 500,000 per liter) on numerous occasions during the year. Yet even these numbers of planktonic algae were considered to be conspicuously low and exerted either no effect or a small effect on oxygen levels in the estuary.

Despite the phytoplankton sparsity in the Shark River System during January 1967, plantonic invertebrates, especially crustacean larvae, were relatively numerous and occurred at all sampling stations.

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1 A Study of Estuarine Pollution Problems on a Small Unpolluted Estuary and a Small Polluted Estuary in Florida by Thorndike Saville. Bulletin Series No. 125, Florida Engineering and Industrial Experiment Station, Gainesville. August 1966.

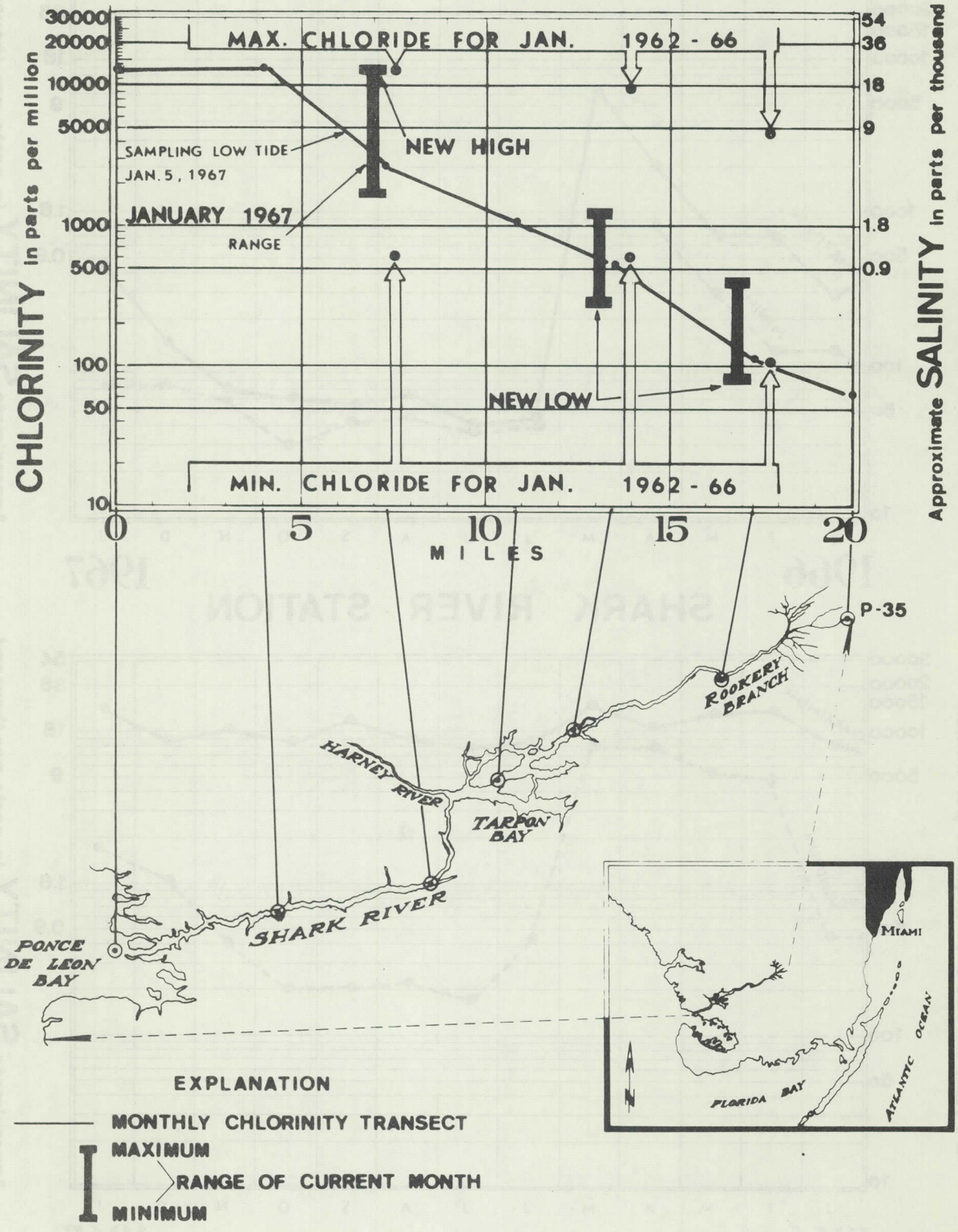
CHLORINITY:

During January 1967 a new high chlorinity of 14,000 ppm or 72% of full sea water was established at the Shark River station, located seven miles from the mouth of the river. The new high is for the month of January since the period of record began in 1962.

Approximately five inches of rain fell in the vicinity of upper Rookery Branch during the last ten days of January 1967. At upper Tarpon Bay the chlorinity averaged about 1500 ppm before the rain, then dropped to a mean of 450 ppm for the last six days of the month. Similarly, at the Rookery Branch station the pre-rain average of 175 ppm chlorinity declined to an average of 100 ppm for the last six days of the month. Because of the considerable precipitation, new low chlorinities were established at both stations during the month of January for the period of record.

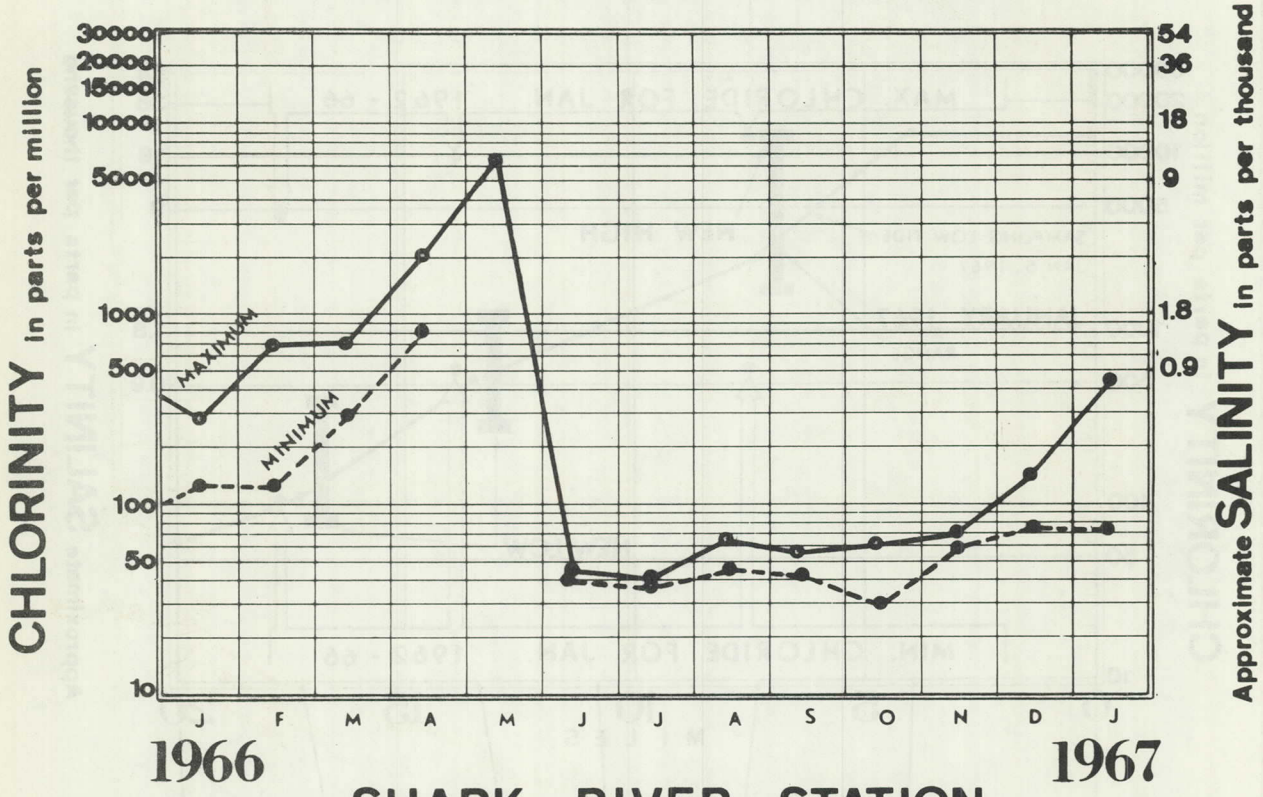
During the month the 500 ppm isochlor, essentially the fresh-brackish water line, fluctuated through a four-mile range between 12 and 16 miles from the mouth of the Shark River (for locations see illustration on opposite page). This represents little or no change in position from last month.

CHLORINITY
IN SHARK RIVER ESTUARY

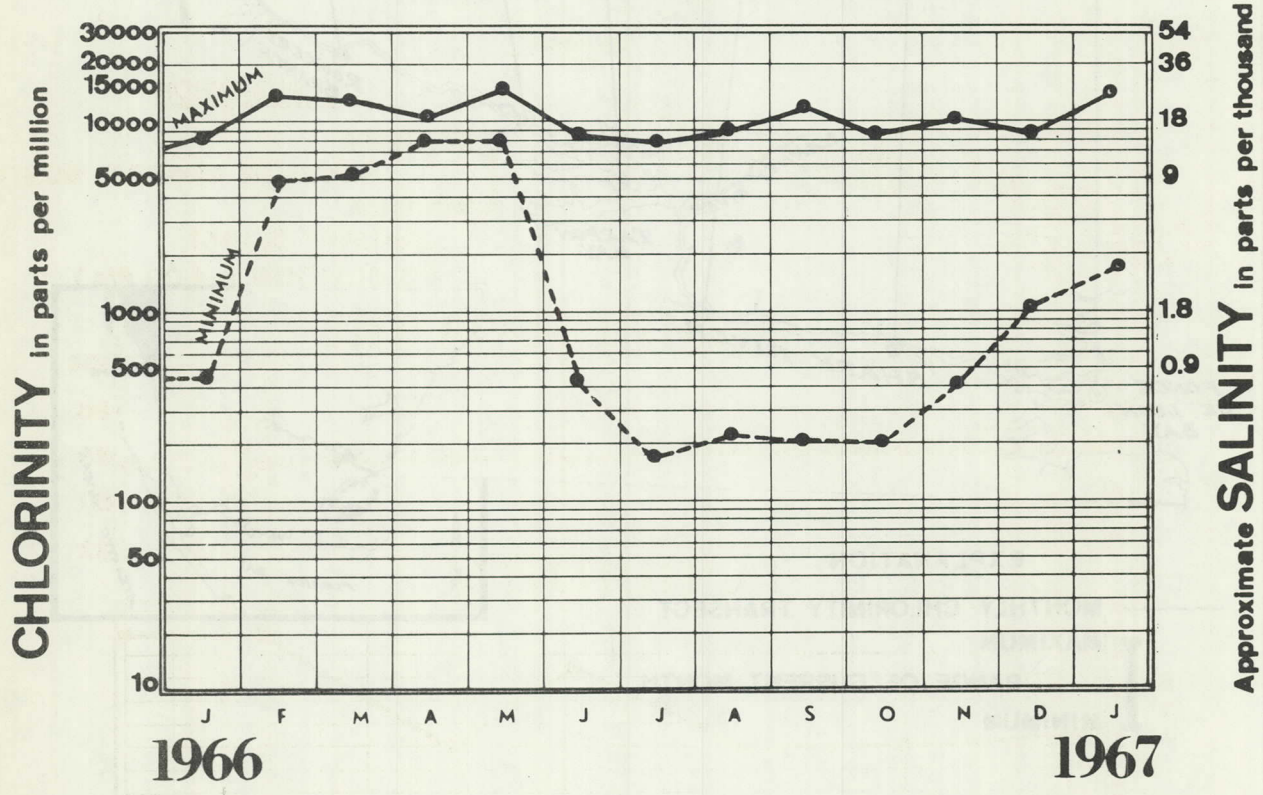


CHLORINITY

ROOKERY BRANCH STATION

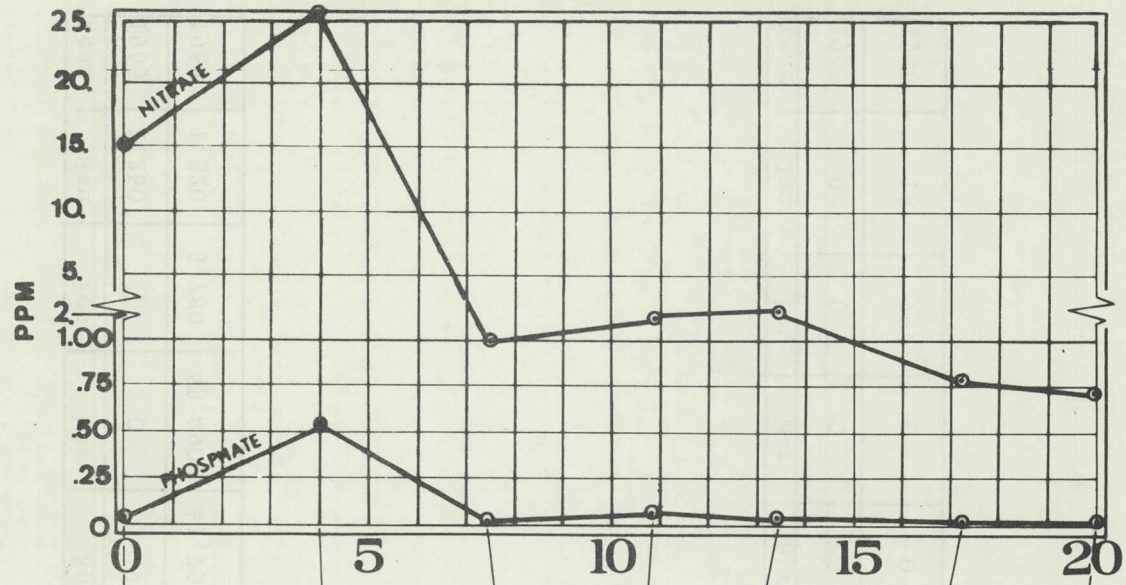


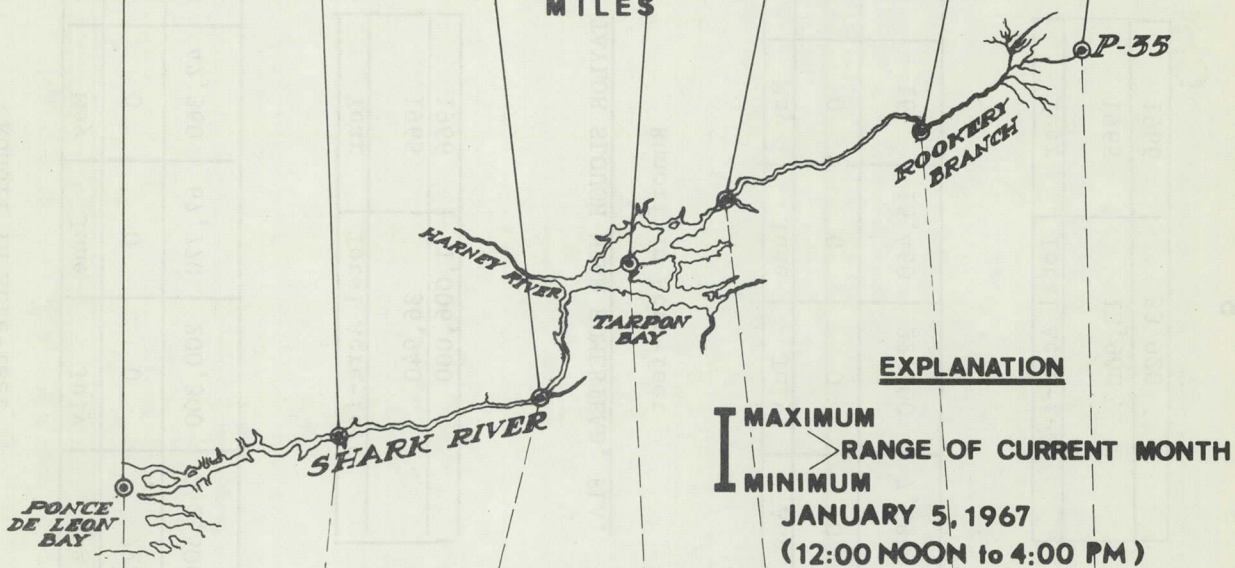
SHARK RIVER STATION



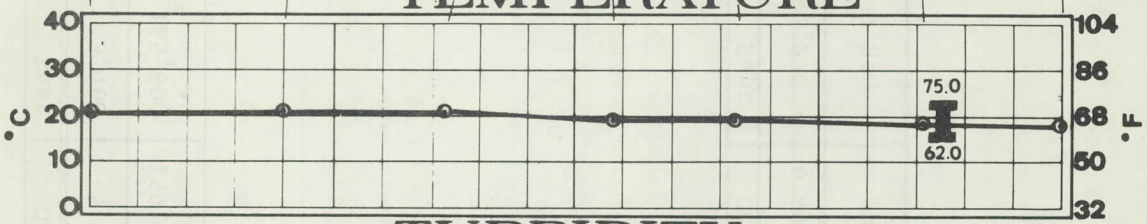
WATER QUALITY TRANSECT

NITRATE & PHOSPHATE

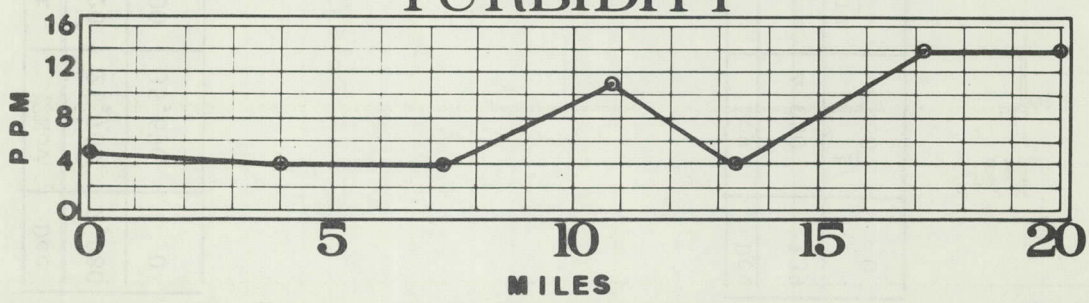




TEMPERATURE



TURBIDITY



TAMIAMI CANAL OUTLETS, LEVEE 67A TO 40-MILE BEND, NEAR MIAMI, FLA.

Runoff in Acre-feet

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1965	2,260	0	0	93	0	0	0	728	3,460	5,720	21,700	2,980
1966	1,320	5,780	43,490	41,750	42,360	67,770	200,300	242,500	165,600	159,900	35,690	0

Year	Total Acre-feet
1965	36,940
1966	1,006,000

TAYLOR SLOUGH NEAR HOMESTEAD, FLA.

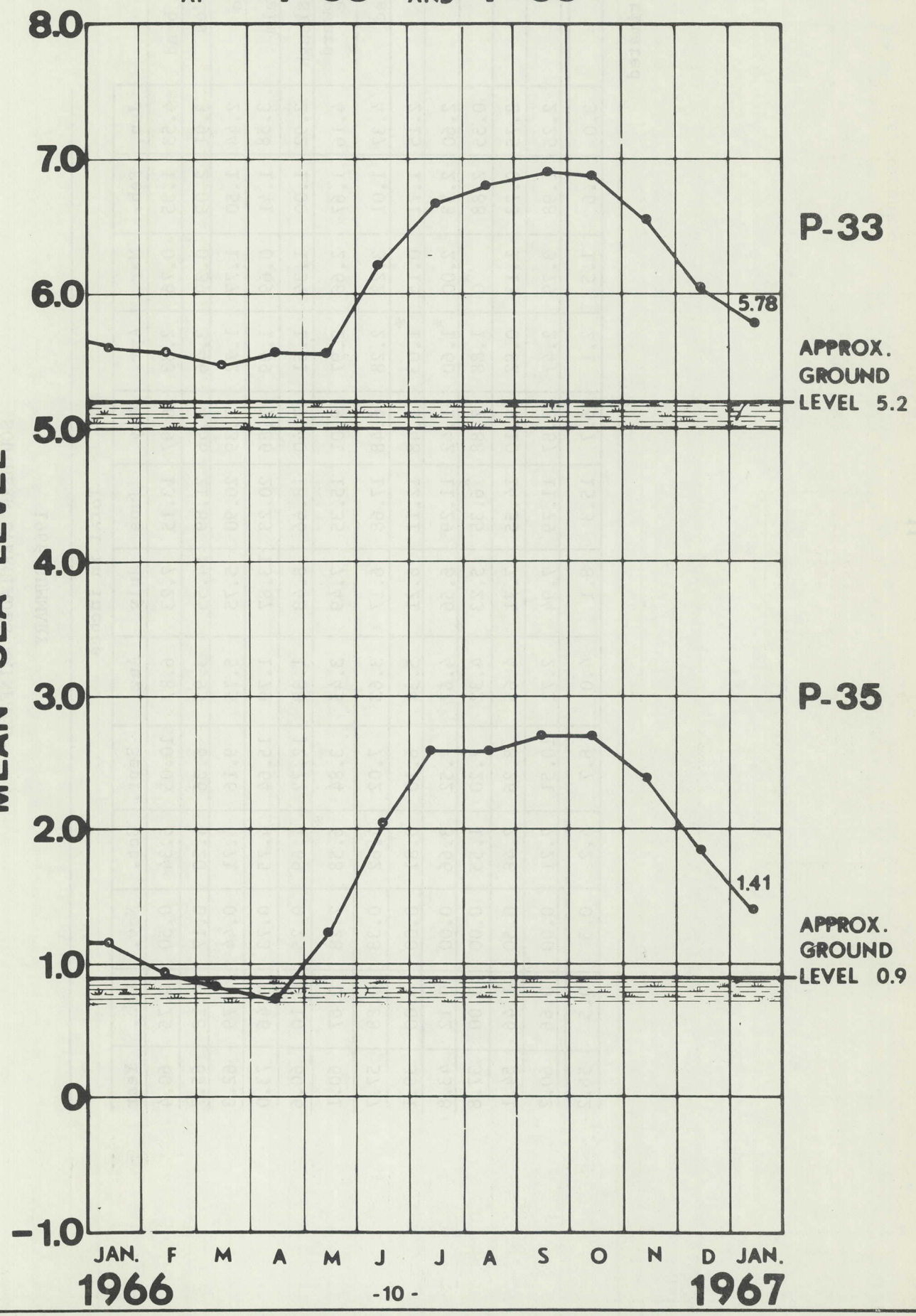
Runoff in Acre-feet

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1965	0	0	0	0	0	0	0	0	3,270	6,440	4,050	139
1966	18	79	0	0	16	15,460	22,500	7,690	7,820	280 1/	60 1/	0

Year	Total Acre-feet
1965	13,900
1966	53,920

1/ Provisional data

MONTHLY MEAN WATER LEVEL AT P-33 AND P-35



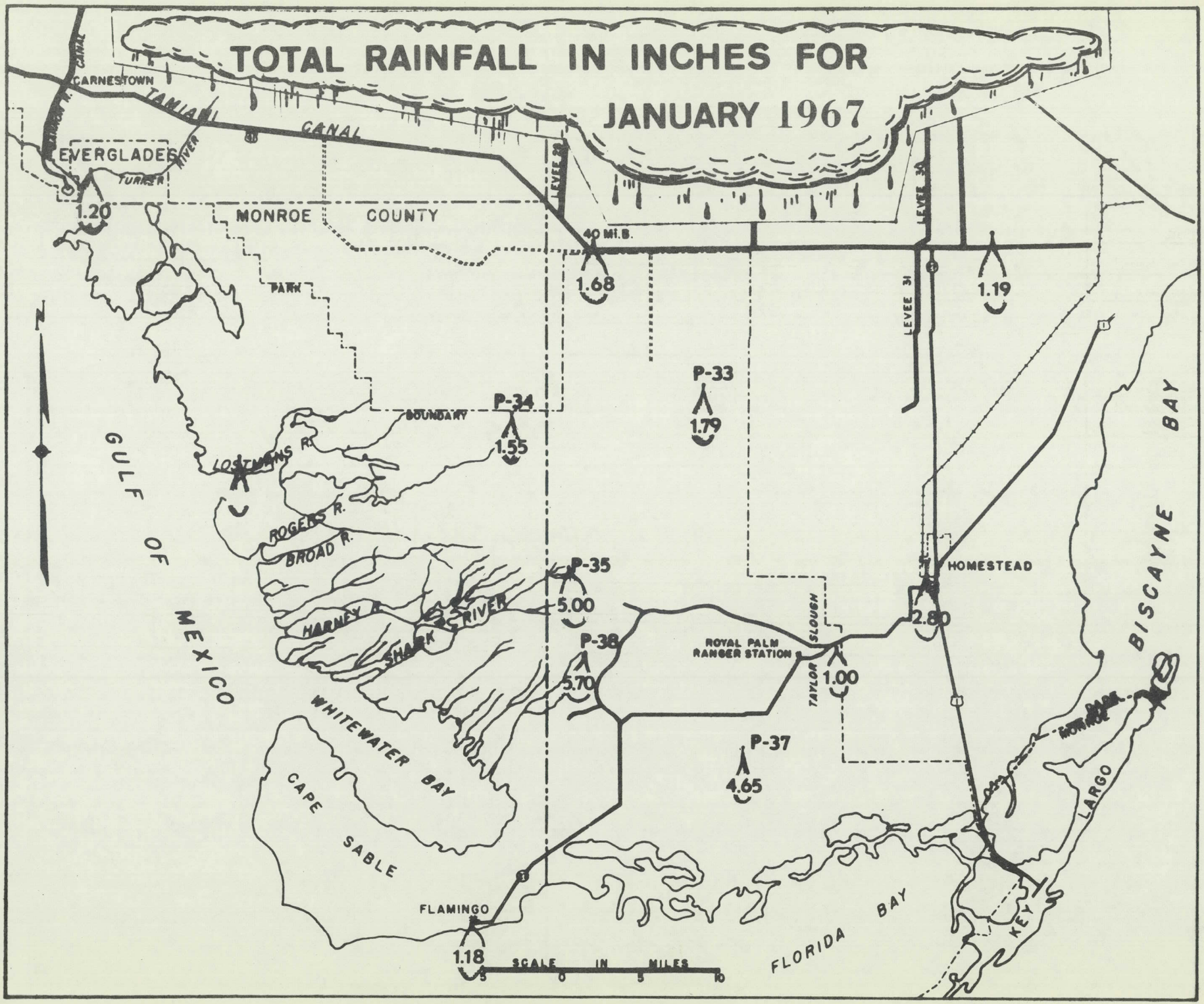
SOUTHERN EVERGLADES RAINFALL

1966 SUMMARY

Total in inches

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
40-mile bend	4.53	1.35	0.76	2.83	6.97	13.15	7.23	6.87	10.05	5.34	0.50	0.75	60.4
Everglades	3.91	2.09	0.39	3.46	4.56	21.89	14.55	3.95	6.36	4.20	0.17	0.18	65.7
Flamingo	2.44	1.50	1.77	1.72	7.39	20.90	5.75	5.75	9.16	4.71	0.44	0.79	62.3
Royal Palm	3.58	1.41	0.69	1.99	7.86	20.23	13.87	1.79	15.64	4.75	0.73	0.46	73.0
Taylor Slough	2.92	1.00	1.34	1.61	7.40	18.66	8.48	1.38	12.72	4.69	0.25	0.10	60.6
Dade-Broward Levee	4.16	1.67	2.66	2.97	9.01	15.35	7.49	3.45	3.84	*6.58	2.28	0.67	60.1
Homestead	4.37	1.01	3.22	2.28	6.48	17.68	6.17	3.63	7.02	4.62	0.38	0.88	57.7
P-33	2.15	1.71	0.15	*1.03	3.48	12.11	6.21	5.34	6.10	0.81	0.00	0.00	39.1
P-34	2.60	2.33	2.00	*1.60	1.42	11.29	6.56	4.67	7.52	3.66	0.00	0.12	43.8
P-35	0.55	2.88	*0	1.88	7.88	*6.35	5.23	4.32	7.20	1.55	0.00	0.00	37.8
P-37	2.75	0.73	1.13	0.82	9.10	14.55	7.71	4.65	8.26	2.48	0.50	1.46	54.1
P-38	2.25	1.98	3.79	2.47	8.87	11.79	7.94	2.71	10.51	7.21	0.00	0.66	60.2
Average	3.0	1.6	1.5	2.1	6.7	15.3	8.1	4.0	8.7	4.2	0.5	0.5	56.2

* Estimated


TOTAL RAINFALL IN INCHES FOR
JANUARY 1967
CARNESTOWN
TAMIAMI CANAL
EVERGLADES
TURNER RIVER
1.20
MONROE COUNTY
PARK
40 MI. B.
LEVEE 29
LEVEE 31
1.68
1.19
P-33
1.79
P-34
1.55
BOUNDARY
LOSTMANS R.
ROGERS R.
BROAD R.
P-35
5.00
HARNEY R.
SHARK RIVER
P-38
5.70
WHITEWATER BAY
CAPE SABLE
FLAMINGO
1.18
P-37
4.65
ROYAL PALM RANGER STATION
TAYLOR SLOUGH
1.00
HOMESTEAD
2.80
GULF OF MEXICO
BISCAYNE BAY
FLORIDA BAY
KEY LARGO
SCALE IN MILES
5 0 5 10

METHODS OF ANALYSIS

Methods of chemical analyses used during monthly transects of the estuary are those outlined by F. H. Rainwater and L. L. Thatcher in Methods for collection and analysis of water samples: U.S. Geol. Survey Water-Supply Paper 1454, 1960 with the following exception: Dissolved oxygen was determined by the Alsterberg modification of the Winkler method as described by Keith V. Slack in A micro kit for dissolved oxygen determination: (U.S. Geological Survey) Water Resources Division Bulletin, February 1965.

At the three stations in the estuary monthly chlorinity ranges are determined from specific conductivity data recorded continuously. Automatically recording instruments provide water level and discharge and temperature data.

PREPARED BY

U S GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

IN COOPERATION WITH

U S FISH & WILDLIFE SERVICE

BUREAU OF SPORT FISHERIES AND WILDLIFE

AND

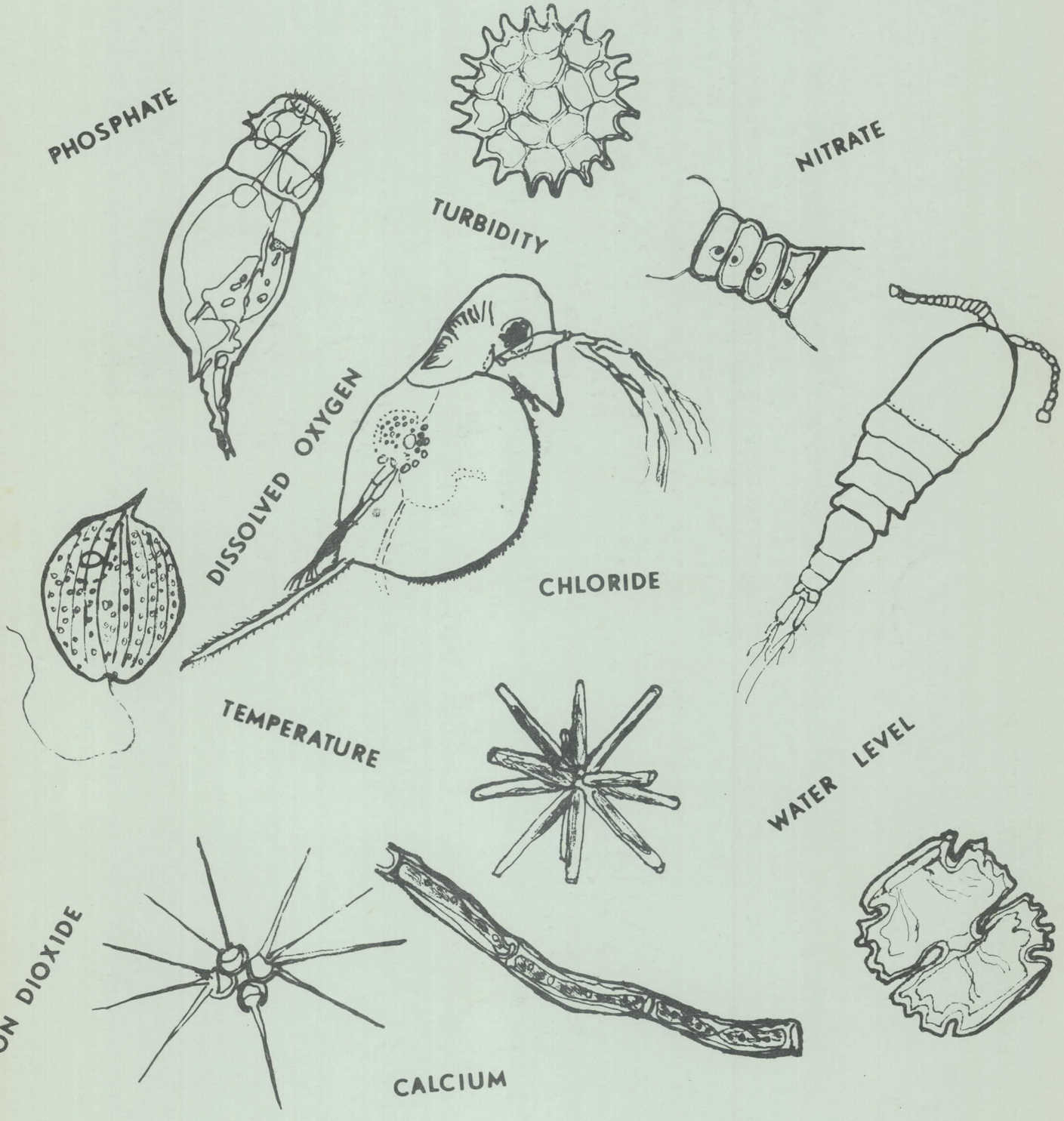
NATIONAL PARK SERVICE

EVERGLADES NATIONAL PARK

Tabb

WATER CONDITIONS

EVERGLADES NATIONAL PARK



FEBRUARY 1967