UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

PRELIMINARY DETERMINATIONS OF HYDROBIOLOGICAL CONDITIONS IN THE VICINITY OF THE PROPOSED JETPORT AND OTHER AIRPORTS IN SOUTH FLORIDA, JULY 1969

By

Benjamin F. McPherson

OFR -FL70-004
USGS - 700210

OPEN-FILE REPORT

Prepared by
the U.S. Geological Survey
in cooperation with
the Dade County Port Authority
and the U. S. National Park Service

Tallahassee, Florida
February 1970

PROVISIONAL DATA

CONTENTS

ILLUSTRATIONS

TABLES

TABLES

OFR -FL70-004
USGS - 700210

PRELIMINARY DETERMINATIONS OF HYDROBIOLOGICAL AND CHEMICAL CONDITIONS IN THE VICINITY OF THE PROPOSED JETPORT AND OTHER AIRPORTS IN SOUTH FLORIDA, JULY 1969

by

Benjamin F. McPherson

INTRODUCTION

The Dade County Port Authority began construction on a Jetport located 36 miles due west of Miami, in September 1968. The Jetport is intended for use as a flight training center to remove this burden from the Miami International Airport. Initial construction is confined to the southern part of the 39-square mile parcel of Jetport land located in the Big Cypress Swamp just north of U. S. Highway 41, in Collier and Dade counties. The eastern edge of the property borders Conservation Area 3, of the Central and Southern Florida Flood Control District, and its southern edge is a few miles from Everglades National Park (fig. 1).

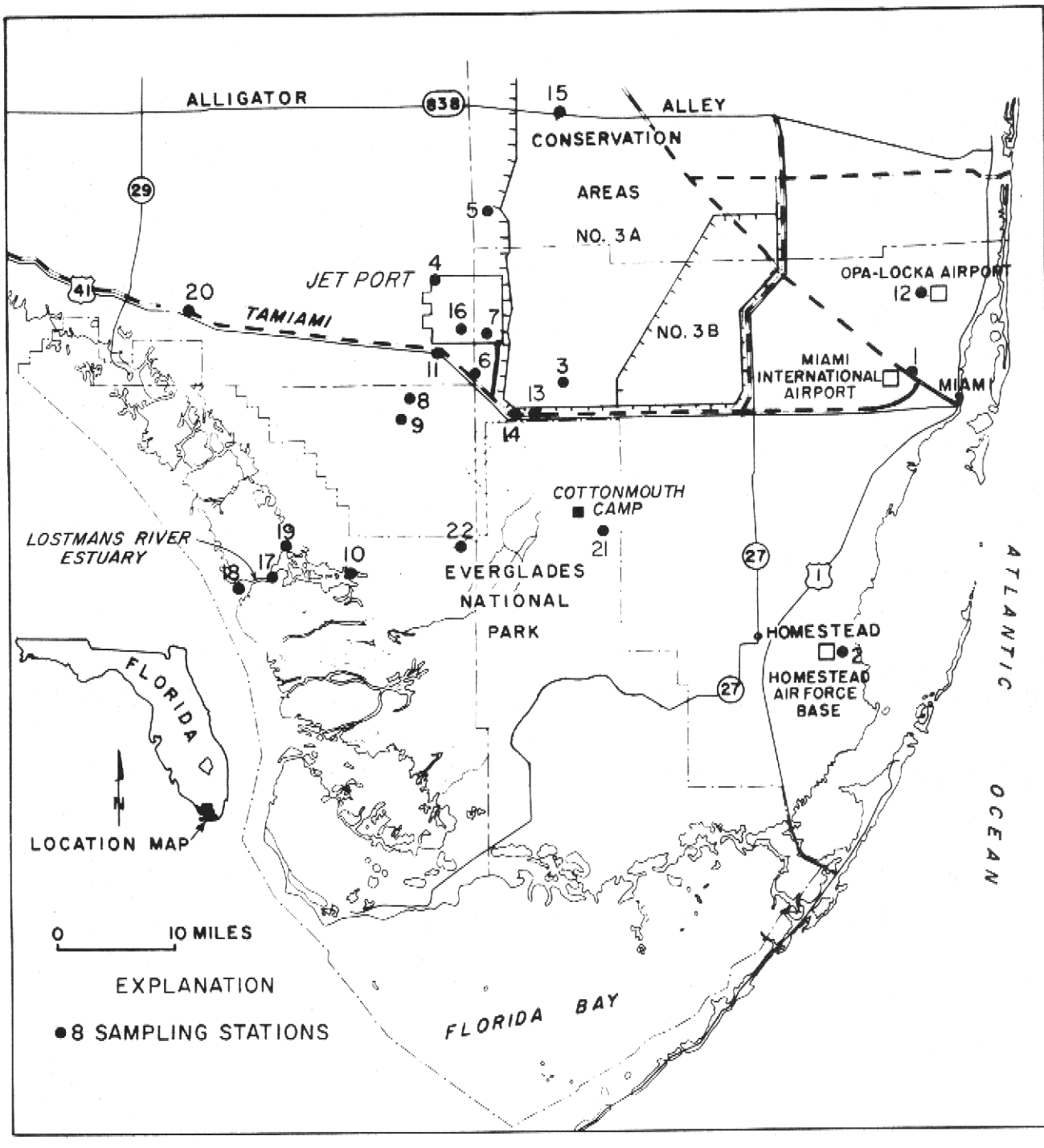

Figure 1. Map of South Florida showing location of sampling stations.

Individuals and groups have expressed concern over the possible hazards posed by the Jetport for Everglades National Park and the surrounding environment of south Florida. One concern is the effect this facility might have on the water quality and flow in south Florida. Historically, water flowed southward through Big Cypress Swamp and the Everglades into Everglades National Park. As the Park depends on a certain seasonal flow of unpolluted water, knowledge of the flow and quality conditions are needed so that any development to the north can include methods whereby flow and quality would not be altered to the extent of causing ecological damage. Before any assessment of biological or water-quality changes can be made, pre-flight conditions must be known.

At the request of the Dade County Port Authority and the National Park Service, the Geological Survey undertook to obtain the background information on hydrobiological conditions prior to the operation of the Jetport. Twenty-two stations were selected and sampled in April and July 1969. Three of these were at canals near existing commercial airports farther east (fig. 1). The remaining stations were located within a 30-mile radius of the Jetport (fig. 1). This report gives the results from the samples collected in July. An earlier report summarizes the April sampling (McPherson, 1969).

METHODS

The methods followed for the collection and analysis of the July samples are essentially the same as those described in the report for the April 1969 sampling (McPherson, 1969).

Samples of water were collected at 20 stations for determination of phenolic materials, and at 10 of these stations for determination of physical characteristics, common chemical constituents, trace elements, heavy metals, nutrients, and pesticides. Table 1 lists the chemical constituents and physical properties that were measured, and Table 2 lists the collection procedure. Samples of sediment and fish were also collected at some stations and analyzed for pesticides. Analyses for common chemical constituents, trace elements, heavy metals, and nutrients, were made at the Geological Survey, Water Quality Laboratory in Ocala, Florida, in accordance with currently recommended procedures (M. Beard, written communications, 1969). Temperature, specific conductance, hydrogen ion concentration (pH) and dissolved oxygen (D.O.) were measured in the field. Dissolved oxygen was measured by the Alsterberg modification of the Winkler method. Quantitative analyses for pesticides were made at the Geological Survey, Water Quality Laboratory in Washington, D. C. The methods used were those described by Lamar, Goerlitz and Law (1964) and Goerlitz and Lamar (1967). Chlorinated hydrocarbon compounds can be detected using these methods in as low a concentration as 0.001-0.1 µg/l, depending on the specific sensitivity level of each compound.

Table 1. Chemical constituents and physical properties determined for surface water samples collected at 10 stations in south Florida

Chemical constituents	Chemical constituents (cont'd)	Pesticides
Aluminum (Al)	Organic Nitrogen (as N)	Aldrin
Ammonia Nitrogen (as NH_4)	Orthophosphate (PO_4)	DDT, DDD, DDE
Arsenic (As)	Phenolic Materials	Dieldrin
Boron (B)	Potassium (K)	Endrin
Bromide (Br)	Silica (SiO_2)	Heplochlor
Calcium (Ca)	Sodium (Na)	Hextachlor
Chloride (Cl)	Strontium (Sr)	Epoxide
Chromium (Cr)	Sulfate (SO_4)	Lindane
Copper (Cu)	Tannin and Lignin	2,4-D
Dissolved Oxygen (DO)		2,4,5-T
Dissolved Solids	Physical properties	Silvex
Fluoride (F)		Toxaphene
Iodide (I)	Temperature	
Iron (Fe)	pH	
Lead (Pb)	Specific conductance	
Lithium (Li)	Turbidity	
Magnesium (Mg)		
Nitrate (NO_3)		
Nitrite (NO_2)		

Table 2.--Field water-quality collection procedures

Name of analysis or constituent	Volume Collected, Liters	Procedure	Preservative
Common chemical constituents	2	Unfiltered	None
Heavy Metals and trace elements	1	0.45μ Filter	HNO_3
Total Phosphorus	1	0.45μ Filter	NONE
Nitrogen Cycle	1	0.45μ Filter	$Hg\ Cl_2$
Turbidity	0.25	Unfiltered	$Hg\ Cl_2$
Pesticides	2	Unfiltered	Cooled
Phenolic Materials	1	Unfiltered	$Cu\ SO_4$

Biological samples were collected with a number 2 (0.37 mm aperture) and a number 20 (0.08 mm aperture) plankton net, a 6-foot throw net, (9.6 mm aperture), and a 12-foot sein (3.2 mm aperture). The number 2 plankton net (½ meter diameter) was used in Lostmans River estuary, in Everglades National Park, being pulled at the surface behind a boat. Five-minute plankton tows were made after dark at each station. The velocity of the water passing through the net was measured with a Price current meter. Because the time of each plankton tow was measured, the linear dimension of the water sampled could be computed. Volume of the water passing through the net was then determined by multiplying the known area of the net by this linear dimension. The number 20 plankton net was used at 12 stations to collect smaller organisms. A measured volume of water (between 6 and 10 liters) was poured through this net. Samples were collected during the day. The throw-net and sein were used to collect fishes for pesticide analysis.

Plankton samples were preserved in 2-5 percent formalin and returned to the laboratory for examination and counting. Quantitative determinations of the plankton species present in the samples were made following the method outlined by Welch (1948).

RAINFALL AND WATER LEVEL

Rainfall from January 1, 1969 to August 31, 1969 in the southern Everglades was in excess of the 29-year average by 14.00 inches. Rainfall during July, however, was below the 29-year average at the following stations:

Stations	29-year Average for July	July 1969
Homestead	8.12	5.78
Tamiami Canal 40-mile bend	7.98	6.03

Mean water level in July 1969 at Bridge 105 on U.S. Highway 41 was 0.54 feet above the 18-year average for July, and was the second highest level on record for this month.

RESULTS

The results of the July sampling are listed in ~~the following~~ tables 3-11 and figure 2.

Table 3. Dissolved oxygen, pH and temperature at 11 stations in southern Florida in July, 1969.

Station No.	Date	Time	pH	Temp °C	D.O. mg/l	Dissolved oxygen percentage saturation
4	16	0830	7.3	30	4.8	62
1	14	0900	7.2	29	1.5	12
2	14	0900	--	30	6.1	80
7	14	1000	6.5	32	7.5	100
9	15	1000	--	31	2.3	30
5	16	1010	7.2	30	5.0	65
6	16	1035	--	30	2.6	33
8	16	1300	7.8	32	7.2	97
3	16	1530	7.6	33	7.2	100
10	9	1600	--	33	4.7	65
10	9	1900	--	32	5.3	71
19	9	2100	--	33	5.5	75

Table 4 .-- Concentrations in mg/l of some chemical constituents, and turbidity in Jackson Turbidity Units at ten stations in southern Florida, July 9-16, 1969

Chemical Constituents / Stations	1	2	3	4	5	6	7	8	9	10
Calcium	73	79	32	32	35	38	39	34	36	37
Chloride	68	51	18	7.2	8.2	5.0	5.8	11	9.0	93
Dissolved Solids (residue)	371	326	152	125	138	126	141	138	142	310
Fluoride	0.3	0.3	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2
Iron (Total)	0.14	0.00	0.14	0.08	0.07	0.05	0.05	0.05	0.04	0.13
Magnesium	6.9	2.2	2.5	1.2	1.5	1.2	1.5	1.6	1.7	7.5
Potassium	2.1	3.7	0.5	0.9	0.4	0.7	0.7	0.6	0.4	2.2
Silica (SiO_2)	5.2	1.7	6.7	2.7	4.2	2.5	1.7	3.2	4.0	4.4
Sodium	39	28	11	4.2	5.6	3.4	4.0	7.6	6.7	49
Strontium	0.83	1.2	0.32	0.20	0.22	0.28	0.29	0.35	0.36	0.38
Sulfate	14	32	0.2	0.0	0.8	0.0	0.4	0.0	0.0	8.8
Tannin and Lignin	0.0	0.0	0.6	1.4	1.2	0.6	0.1	0.0	0.5	0.3
Turbidity (JTU)	5.6	15	45	1.5	43	28	14	8.8	0.3	4.1

Table 5 .--Nutrients (mg/l) in surface waters of southern Florida, July 9-16, 1969

Stations	Nitrate NO_3	Nitrite NO_2	Ammonia NH_4	Organic Nitrogen-N	Total Phosphorus (as PO_4)
1	0.9	0.21	0.23	0.44	0.02
2	0.3	0.05	1.2	0.06	2.0
3	0.1	0.01	0.05	0.60	0.02
4	0.1	0.01	0.01	0.59	0.02
5	0.0	0.00	0.01	0.69	0.01
6	0.1	0.01	0.01	0.64	0.01
7	0.1	0.01	0.02	0.15	0.01
8	0.1	0.01	0.02	0.87	0.00
9	0.1	0.01	0.12	0.37	0.00
10	0.1	0.01	0.01	0.28	0.04

Table 6 .--Concentrations in mg/l of trace elements and heavy metals at ten stations in southern Florida, July 9-16, 1969.

Constituent	Station 1	2	3	4	5	6	7	8	9	10
Aluminum	0.16	0.00	0.05	0.33	0.22	0.12	0.00	0.07	0.05	0.12
Arsenic	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Boron	0.08	0.06	0.04	0.4	0.03	0.02	0.05	0.02	0.02	0.07
Bromide	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00
Copper	0.00	0.02	0.01	0.00	0.01	0.01	0.02	0.01	0.00	0.00
Iodide	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lead	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Lithium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc	0.03	0.02	0.02	0.02	0.01	0.01	0.03	0.01	0.01	0.03

Table 7 .--Concentrations of pesticides in samples collected in July 9-16, 1969

	Water µg/l				Sediment µg/kg			
Stations	DDD	DDE	DDT	Others	DDD	DDE	DDT	Others
1	0.00	0.00	0.00	1/	19	16	22	2/
2	.02	.00	.00	.00	14	9.0	28	3/
3	.00	.01	.00	.00	.00	.00	.00	.00
4	.00	.00	.00	.00	3.6	2.2	7.0	.00
5	.00	.00	.00	.00	3.3	4.0	6.1	.00
6	.00	.02	.19	.00	.00	.00	.00	.00
7	.00	.00	.00	.00	2.5	.00	.00	.00
8	.00	.00	.00	.00	.00	.00	8.3	.00
9	.00	.00	.00	.00	.00	.00	.00	.00
10	.00	.00	.00	.00	1.4	.00	.00	.00

1/ 0.16 µg/l 2,4D

2/ 0.94 µg/kg Dieldrin

3/ 2.7 µg/kg Dieldrin

Table 8 .--Concentrations of insecticide (μg/kg) in aquatic plants in July 9-16, 1969.

Common name	Scientific name	Station	DDD	DDE	DDT	Others
Pickerelweed	Pontederia cordata	4	0.52	0.85	2.0	.00
Periphyton	--	7	1.3	.25	.00	.00
Pondweed	Najas sp	6	.53	.40	.00	.00
Pickerelweed	P. cordata	8	.43	.41	.00	.00
Pickerelweed	P. cordata	14	.38	.43	.00	.00
Sawgrass	Mariscus jamacensis	7	.00	.00	.00	.00
Fire flag	Thalia geniculata	14	.00	.00	.00	.00

Table 9 .--Concentrations of insecticides (μg/kg) in fish collected in July 9-16, 1969

Common name	Scientific name	Number	Station	DDD	DDE	DDT	Others
Sunfish	Lepomis sp.	2	14	86	67	110	.00
Sunfish	Lepomis sp.	1	13	39	99	56	.00
Yellowfin mojarra	Gerres cinereus	2	1	54	38	51	.00
Mosquitofish	Gambusia affinis	about 50	7	23	50	40	.00
Golden Shiner	Notemigonus crysoleucas	10	14	34	51	19	.00
Striped mullet	Mugil cephalus	8	18	31	25	14	.00
Mosquitofish	Gambusia affinis	50	6	.00	33	.00	.00
Sunfish	Lepomis sp.	1	4	.00	.00	.00	.00

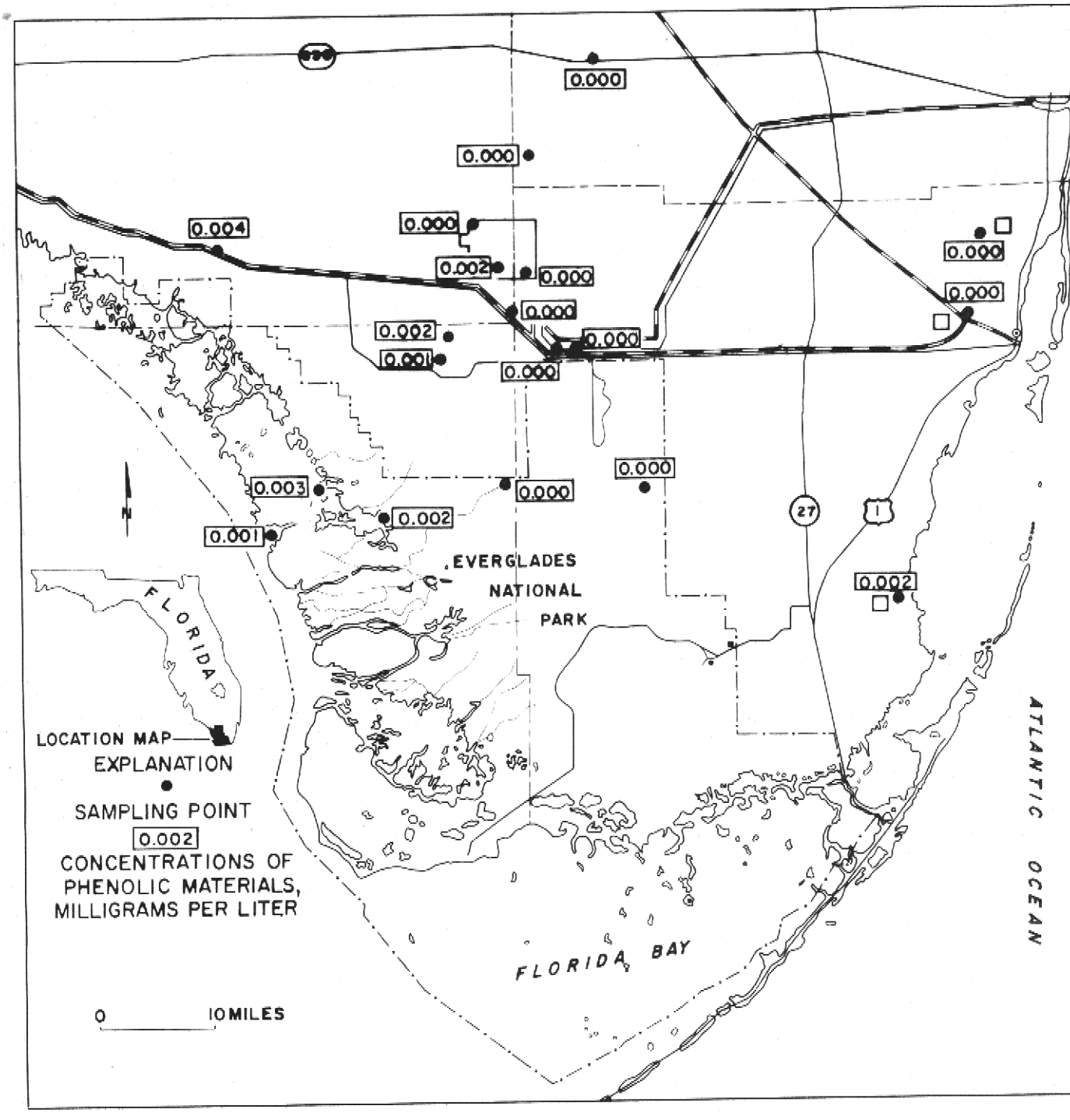

Figure 2. Concentrations of phenolic materials (mg/l) in South Florida in July 1969.

Table 10.--Number of 'net' planktonic organisms per cubic meter (X 10^3) collected with the number 20 plankton net at selected stations in south Florida in July 9-16, 1969.

Station Number	1	2	4	5	6	7	9	10	14	18	19	20
Time	0900	0930	0830	1010	1035	1000	1000	1600	1147	1200	1900	0830
Temp. °C	29	30	30	30	30	32	31	33	34	33	33	29
Sp. Cond., Micromhos @ 25°C	600	560	172	210	200	250	240	570	---	1280	1020	---
pH	7.2	---	7.3	7.2	---	6.5	---	6.8	---		---	---
D.O. mg/l	1.5	6.1	4.8	5.0	2.6	7.5	2.3	4.4	---		5.5	---
Unidentified algae	88	300									121	
Filamentous algae	35		7,000	12,000	49		Trace		35		35	31
Diatoms	17							41	53	14		62
Staurastrum sp.					74			21	18			
Micrasterias sp.			17	24	25				18			
Cosmarium sp.				24		19						
Other desmids				24								
Pediastrum sp.	26	137										
Actinastrum (?) sp.		7,600										

Table 10.--Number of 'net' planktonic organisms per cubic meter (X 10^3) collected with the number 20 plankton net at selected stations in South Florida in July 9-16, 1969. (cont't).

Station Number	1	2	4	5	6	7	9	10	14	18	19	20
Rotifers	26	200								14	51	
Crustacean nauplii	44		17	24						70		
Juvenile copepods	9			24					18			

Table 11.--Number of common planktonic animals per cubic meter collected with a number two plankton net in Lostmans River estuary, Everglades National Park on July 9, 1969.

Station Number	1	17	19
Temp. °C	32	32	33
Sp. Cond., Micromhos @ 25°C	500	950	1,020
Cyclopoid copepods	1		
Ostracods			1
Amphipods			
Corophium		3	
Melita (?)		2	
Others		3	3
Isopods		3	1
Mysids			
Mysidopsis almyra (?)		17	37
Larval shrimp		3	
Insect larvae (Chironomidae)		1	
Water mites	2		
Larval fish	1		

LITERATURE CITED

Goerlitz, D.F. and Lamar, W.L., 1967, Determination of phenoxy acid herbicide in water by electron capture and microcoulometric gas chromatography: U.S. Geol. Survey, Water Supply Paper 1817-C.

Lamar, W. L., Goerlitz, D. F. and Law, L. M., 1964, Identification and measurement of chlorinated organic pesticides in water by electron capture gas chromatography: U.S. Geol. Survey, Water Supply Paper 1817-B, 19 p.

McPherson, B.F., 1969, Preliminary determinations of hydrobiological and chemical conditions in the vicinity of the proposed jetport and other airports in south Florida. Open-file Report. U.S. Geological Survey.

Welch, P.S., 1948, Limnological methods: McGraw-Hill Book Company, Inc. New York, 381 p.

STATION AT WHICH WATER OR BIOLOGICAL SAMPLES WERE COLLECTED IN JULY, 1969

1 Tamiami Canal at LeJuene Road in Miami.

Location: Lat 25°47'35", long 80°15'52", sec.32, T.53 S., R.41 E., just east of Miami International Airport.

Samples collected for: Complete chemical analysis, plankton.

Date and time: July 14, 1969; 0900.

2 Military Canal at South Allapattah Road, nr. Homestead.

Location: Lat 25°29'20", long 80°21'49", sec.8, T.57 S., R.40 E., on the eastern edge of Homestead Air Force Base.

Samples collected for: Complete chemical analysis; plankton.

Date and time: July, 14, 1969; 1000.

3 Conservation Area 3, Corp. of Engineers Water level Station 3-30.

Location: Lat 25°46'05", long 80°43'00", sec.15, T.54 S., R.36 E., about ½-mile north of U.S. 41.

Samples collected for: Complete chemical analysis.

Date and time: July 16, 1969; 1530.

4 Cypress pond, northwest corner of Jetport.

Location: Lat 25°55'20", long 80°56'22", sec. 21, T.52 S., R.34 E.

Samples collected for: Complete chemical analysis, plankton.

Date and time: July 16, 1969; 0830.

Remarks: This pond is located about four and one half miles north of the training runway on the Jetport. There are no roads near the pond, however several swamp buggy trails pass nearby. The pond is located in the center of a large circular area where cypress trees (Taxodium) are reduced in number (fig. 3). The vegetation in this circular area consists of such forms as pickerel weed (Pontederia sp.), sawgrass (Mariscus jamacensis), and fire flag (Thalia geniculata). There are some custard apple (Annova glabra) and cypress trees adjacent to the deepest part of the pond.

5 L-28 tie back canal.

Location: Lat 26°00'50", long 80°53'20", sec.24, T.51 S. R.34 E. on western edge of Conservation Area 3.

Samples collected for: Complete chemical analysis, plankton.

Date and time: July 16, 1969; 1010.

9 Borrow Canal off State Highway 94, near Pinecrest.

Location: Lat 25°44'50", long 80°57'00", sec.20, T.54 S., R.34 E., approximately 15 miles from U.S. Highway 41 at Monroe Station.

Samples collected for: Complete chemical analysis, plankton.

Date and time: July 15, 1969; 1000.

10 2-2908.03 Lostmans Creek near Everglades, Fla.

Location: Lat 25°33'40", long 81°01'40", sec.28, T.56 S., R.33 E.

Samples collected for: Complete chemical analysis; plankton.

Date and time: July 9, 1969; 1600.

11 Tamiami Canal at Jetport entrance.

Location: Lat 25°50'45", long 80°56'00", sec.16, T.53 S., R.34 E.

Samples collected for: none collected here in July.

Date and time: ---

12 2-2863.2 Biscayne Canal at Red Road, near Opa-Locka.

Location: Lat 25°54'47", long 80°17'37", in NE¼ sec.24, T.52 S., R.40 E. Near Opa Locka Airport.

Samples collected for: Phenolic materials.

Date and time: July 15, 1969; 1640.

6 2-2889 Tamiami Canal at bridge 115.

Location: Lat 25°49'45", long 80°53'30" sec.24, T.53 S., R.34 E.

Samples collected for: Complete chemical analysis, plankton.

Date and time: July 16, 1969; 1035.

7 Borrow pit number 4 at Jetport.

Location: Lat 25°52'30", long 80°52'20", sec.18, T.52 S., R.35 E.

Samples Collected for: Complete chemical analysis, plankton

Date and time: July 14, 1969; 1000.

Remarks: This pit was dug during the winter of 1969. It is about 330 meters long, 25 meters wide and 10 meters deep.

8 Alligator pond near Pinecrest.

Location: Lat 25°44'50", long 80°56'50", sec.20, T.54 S., R.34 E.

Samples collected for: Complete chemical analysis,

Date and time: July 16, 1969; 1300.

Remarks: Dr. Oscar Owre, University of Miami, has been collecting ecological information, particularly in reference to bird populations, in the area of this pond since 1952. Two of his students, Barry Michaels and Jim Kushlan, have carried out biological studies in the vicinity of this pond. Mr. Michaels investigated fluctuations in fish populations, and the predation of birds on fishes. He began this work in March, 1967. Mr. Kushlan is studying the movement of animal populations in and around the pond. He began work in February, 1969. Figure 3 shows the pond.

13 L-29 Borrow Canal at Control Structure S-12A.

Location: Lat 25°45'50", long 80°49'20", sec.15, T.54 S., R.35 E.

Samples collected for: Phenolic materials; pesticides in fish.

Date and time: July 15, 1969; 1145.

14 Tamiami Canal above Control Structure 14.

Location: Lat 25°45'45", long 80°49'50", sec. 16, T.54 S., R.35 E.

Samples collected for: Phenolic materials; plankton; pesticides in plants and fish

Date and time: July 15, 1969; 1147.

15 Conservation Area No. 3A at Alligator Alley, Bridge 49.

Location: Lat 26°08'30", long 80°45'40", R.36 E., T.50 S., in Conservation Area 3.

Samples collected for: Phenolic materials

Date and time: July 16, 1969; 0930.

16 Well C-463 on Jetport.

Location: Lat 25°52'00", long 80°54'00", sec.10, T.53 S., R.34 E.

Samples collected for: Phenolic materials.

Date and time: July 15, 1969; 1100.

17 2909.2 Lostmans River.

Location: Lat 25°33'30", long 81°10'25", sec.26, T.56 S., R.31 E.

Samples collected for: Plankton.

Date and time: July 9, 1969; 2144.

18 Gulf of Mexico at Lostmans Ranger Station.

Location: 25°32'51", long 81°12'45", sec.33, T.56 S., R.31 E.

Samples collected for: Phenolic materials; plankton; pesticides in fish.

Dates: July 9, 1969; 1200

19 Onion Key Bay.

Location: 25°36'24", long 81°08'07", sec.8, T.56 S., R.32 E.

Samples collected for: Phenolic materials; plankton.

Date and time: July 9, 1969; 2100.

20 2-2888 Tamiami Canal outlets Monroe to Carnestown at Bridge 84 on U.S. Highway 41 (Turner River Canal)

Location: Lat 25°53°10", long 81°15'30", in NW¼ sec.6, T.53 S., R.31 E.

Samples collected for: Phenolic materials; plankton

Dates and time: July 15, 1969; 0830.

Remarks: This canal connects with the Turner River about a mile south of the sample site.

21 2-2908.15 Everglades P-33.

Location: Lat 25°36'30", long 80°41'30", sec.11, T.56 S., R.36 E.

Samples collected for: Phenolic materials.

Date and time: July 16, 1969; 1600.

22 2-2908.70 Everglades P-34.

Location: Lat 25°36'30", long 80°55'30", sec.9, T.56 S., R.34 E.

Samples collected for: Phenolic materials.

Date and time: July 16, 1969; 1700.