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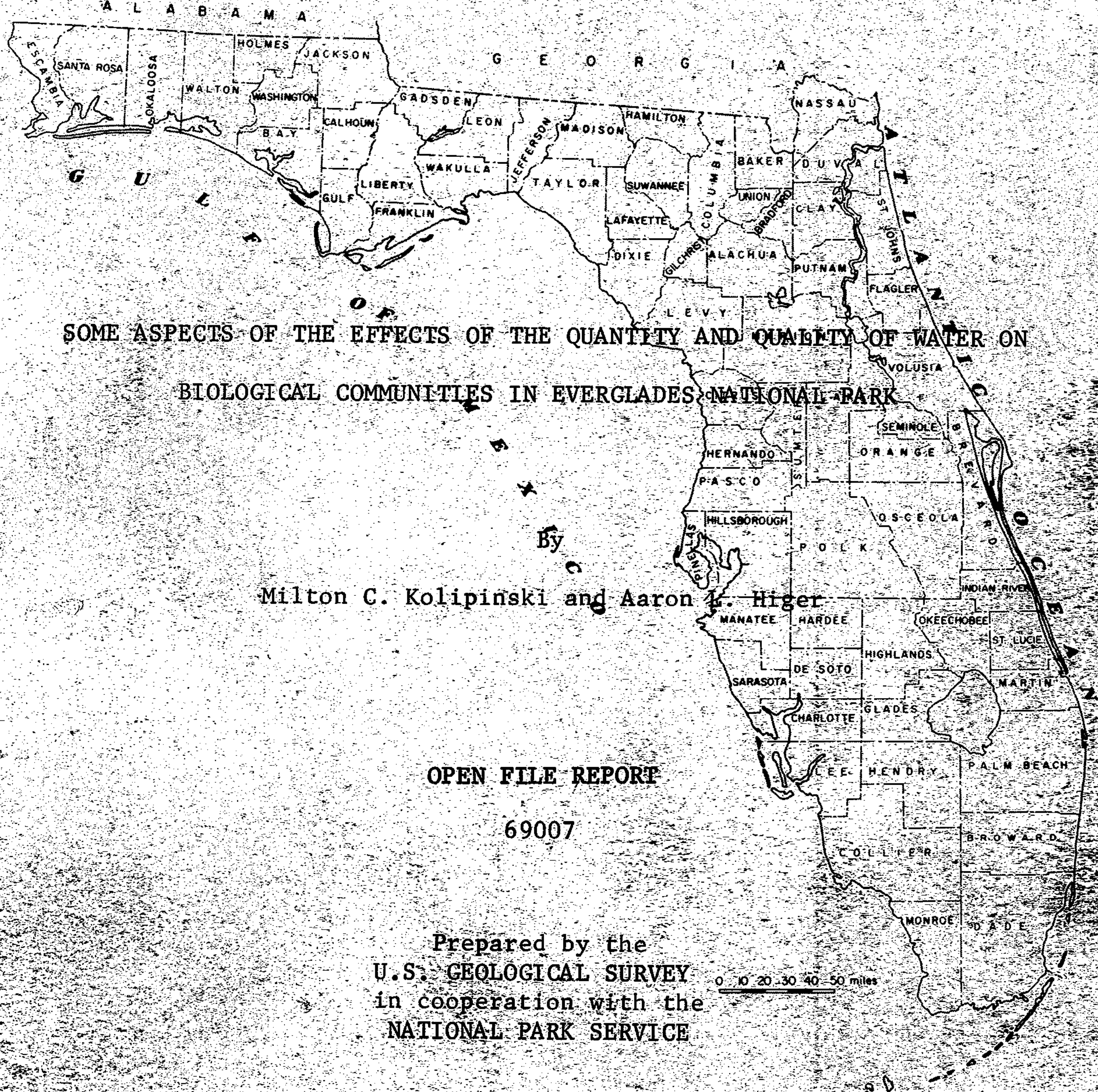

SOME ASPECTS OF THE EFFECTS OF THE QUANTITY AND QUALITY OF WATER ON BIOLOGICAL COMMUNITIES IN EVERGLADES NATIONAL PARK

By

Milton C. Kolipinski and Aaron L. Higer

OPEN FILE REPORT

69007

Prepared by the
U.S. GEOLOGICAL SURVEY
in cooperation with the
NATIONAL PARK SERVICE

Tallahassee, Florida

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SOME ASPECTS OF THE EFFECTS OF THE QUANTITY AND QUALITY OF WATER ON BIOLOGICAL COMMUNITIES IN EVERGLADES NATIONAL PARK[1]

Milton C. Kolipinski and Aaron L. Higer[2]

ABSTRACT

Hydrobiological investigations in Everglades National Park are summarized under four main topics: (1) vegetative changes, (2) population dynamics of animals, (3) repopulation of small aquatic animals after droughts, and (4) water-quality characteristics.

Changes of vegetation in Shark River Slough from 1940 to 1964, as determined from analysis of aerial photographs, showed a decrease in acreage of wet prairie communities and an increase in sawgrass marshes and woody vegetation. The apparent reasons for the changes are shortened wet periods, increase in fires, and loss of soil.

A long-range program of quantitative sampling of small fishes and aquatic invertebrates in Shark River Slough began in 1965. Preliminary findings indicate that long wet periods result (1) in an abundance of small aquatic animals, and (2) the successful formation of wading bird rookeries.

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1 Prepared in cooperation with the National Park Service.

2 Aquatic Biologist and Hydraulic Engineer respectively, Water Resources Division, U.S. Geological Survey, Miami, Fla.

The recovery of aquatic populations after drought depends on duration and extent to which the aquatic habitats dry. Animals burrows were shown to serve as survival holes for small fishes during droughts of short duration.

The chemical constituents of the surface waters in Everglades National Park compare favorably with other naturally occurring waters in the United States that support a mixed fish fauna. Dissolved oxygen during periods of low water in alligator holes decreases to below 2 mg/l (milligrams per liter) during most of each 24-hour period, causing a mortality of susceptible fishes, such as the centrachids.

An average of 0.02 μg/l (micrograms per liter) of DDT+DDD+DDE was found in the surface waters of the park. Several aquatic plants and animals exhibited biological magnification of insecticides. For example, mosquitofish contained 700 μg/kg (micrograms per kilogram) of the DDT family which is 4 orders of magnitude greater than that found in the waters.

INTRODUCTION

A continuing program of water-resources investigations in the Everglades National Park in southern Florida was begun by the U.S. Geological Survey in 1959, at the request of and in cooperation with the National Park Service. In 1964 the program was expanded with the aim of determining the relation between basic biological communities within the park and seasonal and periodical fluctuations of water levels, dissolved gases, nutrients, pesticides, chloride content, and other chemical and physical characteristics of the water. Several reports have been prepared which describe results of selected phases of these investigations (Schneider and Kolipinski, 1968; Higer and Kolipinski, 1967a and 1967b; Kolipinski and Higer, 1966a and 1966b; and Kolipinski, 1965). A report by Hartwell, 1969, covers hydrologic aspects related to the historical and current water supplies in southern Florida.

The purpose of this report is to describe the hydrobiological findings of the investigations to date. These are found under the following sections:

A. Vegetative changes in Shark River Slough,

B. Population dynamics of aquatic animals in Shark River Slough,

C. Effects of drought on aquatic animals of the Everglades, and

D. Water-quality criteria for aquatic animals of Everglades National Park.

Some of the statements and conclusions that follow are tentative and subject to modification, because they are based on interpretations of short-term data that have been collected as part of long-term investigations.

HYDROBIOLOGICAL SETTING

The interior of southern peninsular Florida, from the Kissimmee and Lake Okeechobee regions southward to Florida Bay, is characterized by extensive marshes and swamps. The major physiographic units are the Everglades, Big Cypress Swamp, and the mangrove and coastal glades (fig. 1). The location of the Everglades National Park in relation to these units is shown in figure 1.

Within Everglades National Park are two major sloughs, the larger, Shark River Slough and, the smaller, Taylor Slough are shown in figure 2. Sloughs in south Florida are slowly

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Figures 1 and 2. Belong near here. Captions on next page.

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moving rivers whose flows are generally imperceptible to the eye. The Shark River Slough, capable of holding a considerable volume of water and a variety of aquatic organisms within its 125,000 acres, is the course through which fresh water flows to the principal estuaries of the park (fig. 2). Because of the size and importance of the Shark River Slough most of the hydrobiological investigations are conducted there. The habitats selected for study in and near the slough are: tree islands, fresh-water glades, alligator holes, and streams and rivers in the brackish and marine environments.

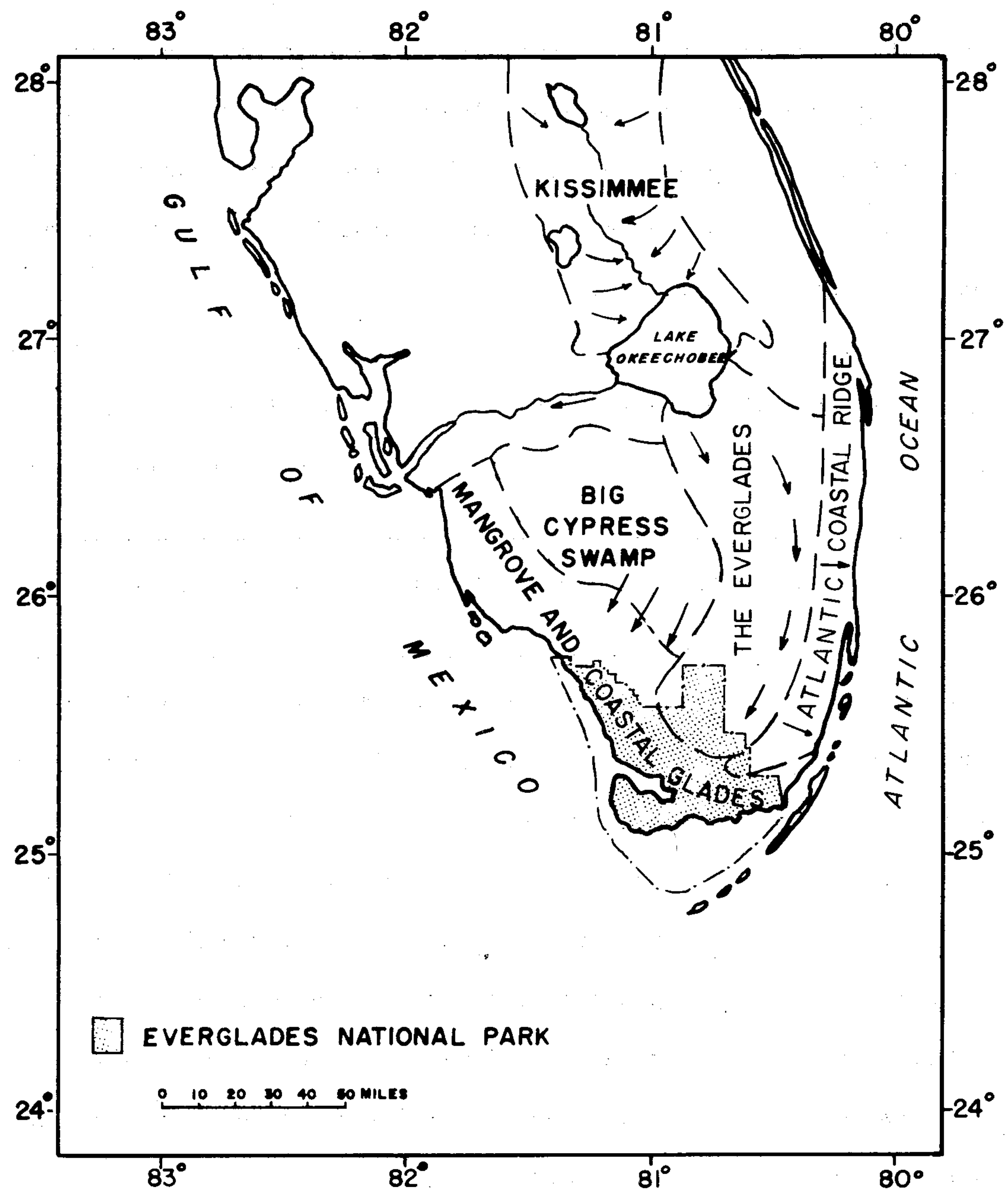

Figure 1.--Map of central and southern Florida showing physiographic divisions. Arrows indicate the general direction of natural surface-water flows that occurred before their modification by man.

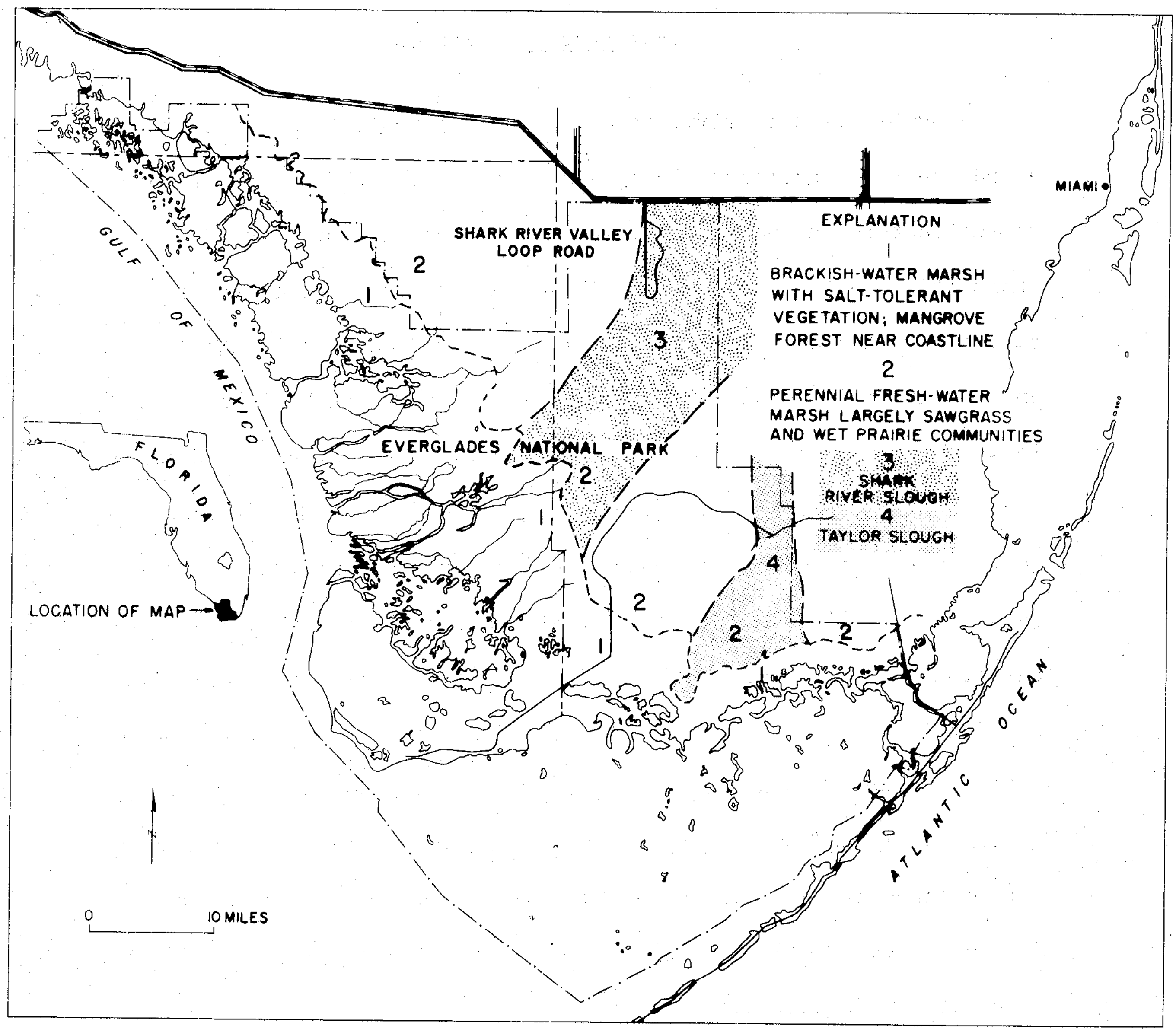

Figure 2.--Map of Everglades National Park indicating the location of Shark River Slough, Taylor Slough, and the approximate position of the interface between fresh water and brackish water along the coast.

SECTION A

VEGETATIVE CHANGES IN SHARK RIVER SLOUGH

Background and Methods

A number of scientific reports and statements by naturalists allude to the significant changes that have occurred since the turn of the century in the distribution and composition of plant communities in the Everglades. These reports and statements are valuable historically, but they fail to show specifically the location and extent of the changes. An exception is a report by Johnson (1958), in which aerial photographs were used to illustrate the spread of bushy vegetation in Everglades National Park. The ground locations represented in the illustrations were generally given as near the Tamiami Trail (U.S. Highway 41) immediately west of the Shark River Slough and in the slough itself. His illustrations indicated that an increase in the density of bushy growth had occurred during the 11-to-14-year period commencing in 1940. He stated, "The widespread growth of myrtle, willow, holly and bay throughout the Everglades flood plain has not only changed its appearance but has influenced the flow of water. The insiduous spread of this unwanted alien growth makes it difficult to recall the change that has occurred."

A quantitative and more detailed study was designed by the authors to document the gross vegetative changes that have occurred in the slough, and to determine why these changes occurred. Schneider (1966) touched briefly on the preliminary findings of this investigation, based on aerial photographs taken in 1940 and 1952 by the U.S. Department of Agriculture and by the U.S. Geological Survey in 1964.

The approach used in this study was to classify all the vegetation observed on the photographs within three categories of plant groupings. The three community types are: (1) communities with trees and shrubs, i.e., heads, hammocks, and river-bank forests, (2) the sawgrass community, and (3) the wet prairie community (fig. 3). Each community is a complex

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Figure 3. Belongs near here. Caption on next page.

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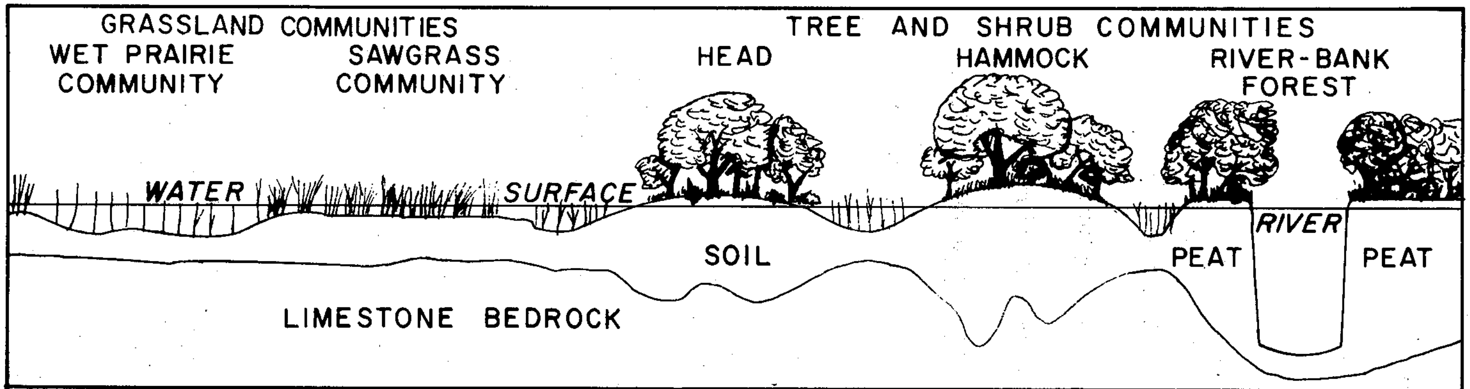
of species sharing a common habitat involving a particular ground elevation and mean period of water inundation. Under stereoscopic examination of panchromatic aerial photographs, taken at an altitude of 5,000 feet or higher, community types in the Everglades are distinguishable, but generally the genera composing a community cannot be identified taxonomically. The characteristics of the communities will be considered here briefly.



Wet prairie community	Sawgrass community	Head	Hammock	River-bank forest
Common plants	Common plants	Common plants	Common plants	Common plants
Algal mat Spikerush Bladderwort Arrowhead Beak-rush	Sawgrass Arrowhead Spikerush Bladderwort Beak-rush	Willow Cocoplum Redbay Wax myrtle Dahoon holly Cypress	Strangler fig Oak Mahogany Gumbo limbo Wild tamarind Poisonwood	Red mangrove Buttonwood Pond-apple Willow Cocoplum
Characteristics	Characteristics	Characteristics	Characteristics	Characteristics
Sparsely vegetated, with periphyton covering the marly bottom. The marl over the limestone is generally only 1 foot thick.	Medium to dense vegetation. Peaty soils generally 1-3 feet thick cover the limestone. Slightly higher ground elevation than the surrounding wet prairie communities.	Islands of trees and shrubs where the ground is a few inches higher than it is in the surrounding marshes.	Islands containing hardwood forests of a variety of broad-leaved trees. Land elevation higher than it is in heads.	Woody growth along the banks of rivers. Colonized by trees and shrubs that tolerate the seasonally brackish conditions.

Figure 3.--Annotated diagram of the major plant communities in Shark River Slough. Note relation of communities to the position of the water surface and thickness of the soil.

Tree and shrub communities occur as "islands" in areas where the ground is at least a few inches higher than it is in the surrounding marshes. The majority of the tree islands in Shark River Slough contain relatively few species and are called heads. The most abundant trees are willow (Salix amphibia Small) and cocoplum (Chrysobalanus icaco L.). Redbay (Persea borbonia (L.) Spreng., wax myrtle (Myrica cerifera L.), and dahoon holly (Ilex cassine L.) are less abundant but common to many of the heads in this region of the Everglades. Some tree islands are several hundred feet long, and contain hammocks in their broader northern reaches where the ground is elevated 1 or 2 feet above the peaty surface of the remainder of the tree island and the adjacent marsh. Hammocks are hardwood forests containing a variety of broad-leaved evergreen trees. For the purposes of this study the data from (a) the upper part and from (b) the lower (or southwestern) end of the Shark River Slough were considered separately, because the botanical character of the tree islands changes in the lower part of the slough, where it merges with the coastal marshes. Woody growth in the lower slough occurs not only in the tree islands but also along the banks of the rivers that begin there. This community along the banks of the headwater streams and the rivers is called a river-bank forest. Some of the trees in the river-bank forests are absent from the tree islands in the glades. These include red mangrove (Rhizophora mangle L.) and buttonwood (Conocarpus erectus L.). Other common plants in the forests along the headwater streams are willow, cocoplum, pond-apple (Annona glabra L.), and the large leather fern (Acrostichum spp.). In the dry season, brackish to moderately saline water moves up the headwater streams and into the surrounding glades. Thus, the plants that colonize the lower slough must tolerate the seasonally brackish conditions occasionally reaching a chloride content of 5,000 mg/l. About 10 percent of the area in the upper slough is currently occupied by trees and shrubs, compared to 23 percent of the area in the lower slough (based on measurements from rectified models of airphotos covering 5 percent of Shark River Slough taken in 1964).

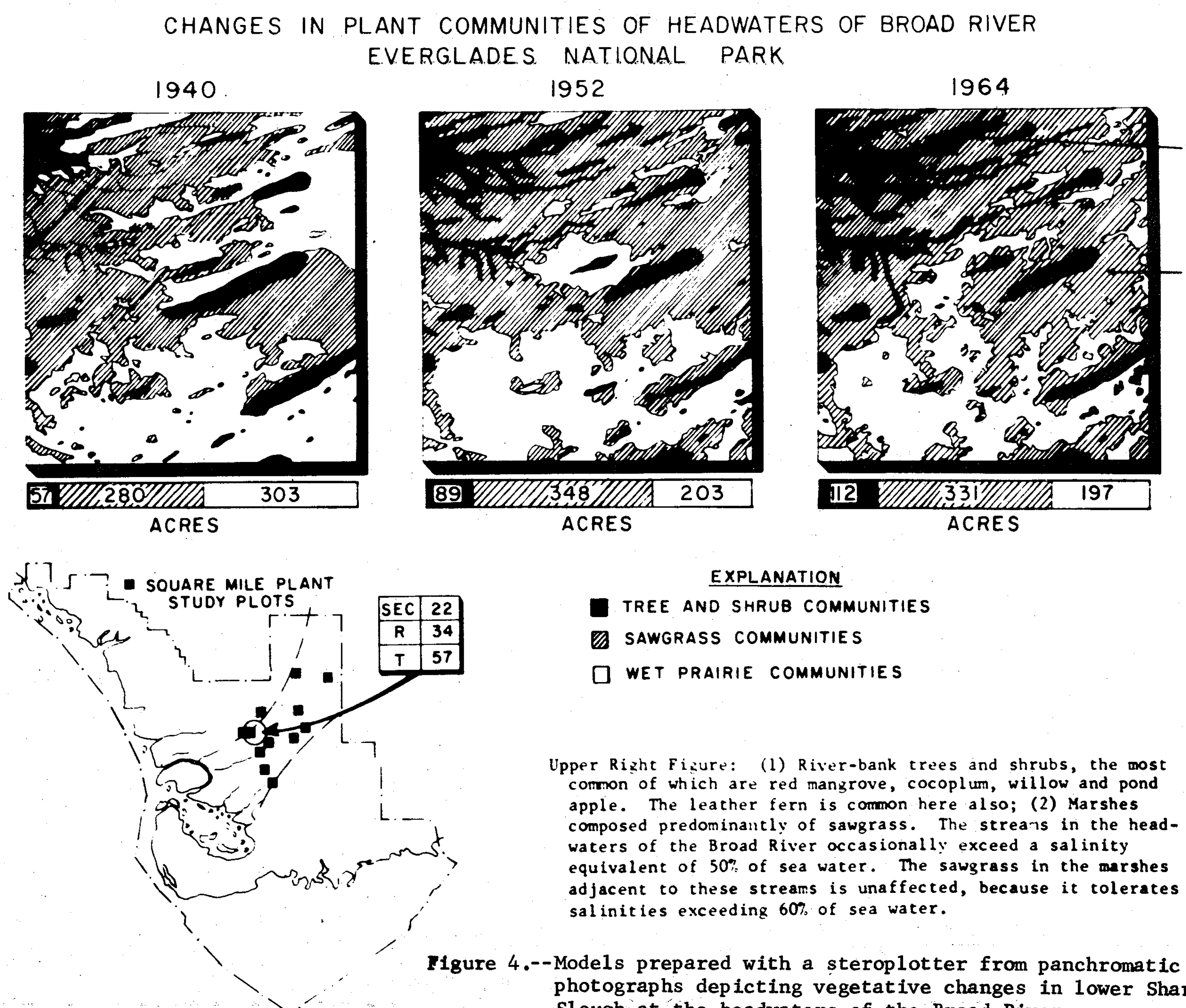
The *sawgrass* community predominates in the slough, constituting about 72 percent in the central portion and about 67 percent in the lower end. This marsh community was described by Loveless (1959), as comprising 65 to 70 percent of the total vegetative cover of the Everglades. He states that the sawgrass community is often mixed with an association of semi-aquatic species that warrant sub-community designation according to depth and duration of flooding.

The *wet prairie* is an aquatic community that is irregularly dispersed among the sawgrass marshes. Inhabiting the wet prairies are sparse-to-dense stands of aquatic sedges and grasses. Abundant in this community is a thick felt-like mat on the water-covered ground and around plant stems called *periphyton*, composed basically of interlaced filaments and cells of algae, other miscroscopic plants, minute animals, and calcite. Loveless (*ibid*.) described the wet prairie community as having three principal genera forming the plant cover -- *Rhynchospora*, *Panicum*, and *Eleocharis*. The wet prairies in Shark River Slough have sometimes been referred to by the descriptive phrase, shallow intermittent ponds.

In the lower end of the Shark River Slough only 10 percent of the area is now occupied by wet prairies, compared to 18 percent in the upper portion.

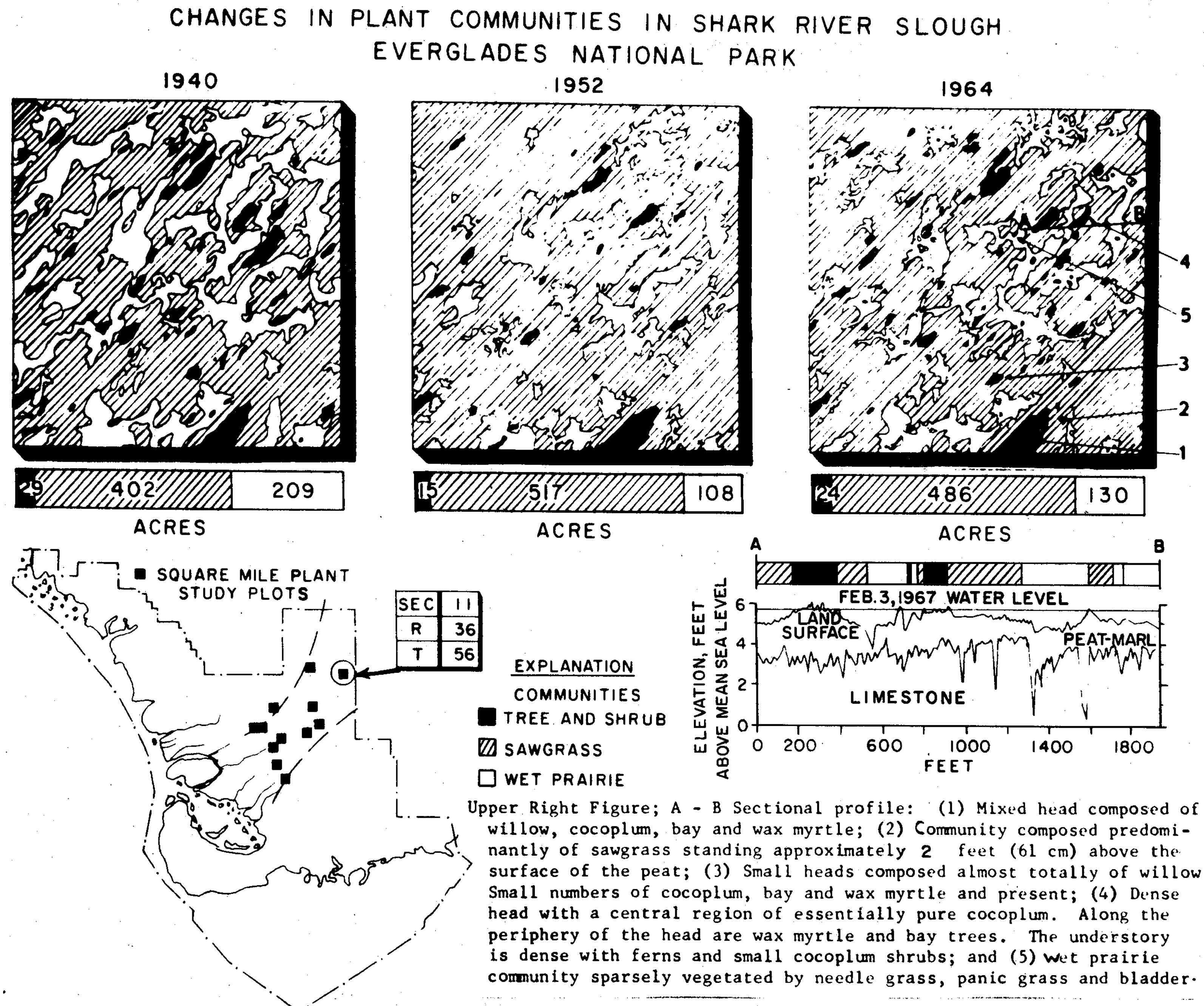
The communities were accurately outlined onto rectified models from the panchromatic aerial photographs with the aid of a mechanical stereoplotter. The illustrative models for this report were prepared by Antonio Jurado, U.S. Geological Survey, Miami, Fla. The percentage of the model areas occupied by each of the plant communities was determined by weighing each model on an analytical balance, then cutting out and weighing each community. Maximum variation of results was 0.2 percent. Models were compiled from ten randomly chosen plots in the slough of 640 acres (1 square mile) each. The 6,400 acres examined cover about 5 percent of the whole slough. Illustrated models from two of the 10 plots are shown in figures 4 and 5.

Figures 4 and 5. Belong near here. Captions on next page.



Upper Right Figure: (1) River-bank trees and shrubs, the most common of which are red mangrove, cocoplum, willow and pond apple. The leather fern is common here also; (2) Marshes composed predominantly of sawgrass. The streams in the headwaters of the Broad River occasionally exceed a salinity equivalent of 50% of sea water. The sawgrass in the marshes adjacent to these streams is unaffected, because it tolerates salinities exceeding 60% of sea water.

Figure 4.--Models prepared with a steroplotter from panchromatic aerial photographs depicting vegetative changes in lower Shark River Slough at the headwaters of the Broad River.



Upper Right Figure; A - B Sectional profile: (1) Mixed head composed of willow, cocoplum, bay and wax myrtle; (2) Community composed predominantly of sawgrass standing approximately 2 feet (61 cm) above the surface of the peat; (3) Small heads composed almost totally of willow. Small numbers of cocoplum, bay and wax myrtle and present; (4) Dense head with a central region of essentially pure cocoplum. Along the periphery of the head are wax myrtle and bay trees. The understory is dense with ferns and small cocoplum shrubs; and (5) wet prairie community sparsely vegetated by needle grass, panic grass and bladder·

Figure 5.--Models prepared with a stereoplotter from panchromatic aerial photographs depicting vegetative changes in upper Shark River Slough. Note sectional profile through 1,950 feet of plant communities in the study area.

Results

The most notable change in both the upper and lower parts of the slough from 1940 to 1964 is the decrease in acreage of the wet prairie communities ~~(fig. 6)~~. The decrease in acreage was greatest in the upper

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slough. The loss was balanced by an increase in the area of the sawgrass communities with no appreciable change in the tree and shrub communities. In 1940 wet prairies occupied one third of the upper slough, but by 1964 they occupied less than one fifth of this region. The decrease was accompanied by an increase in area of sawgrass marshes from 59 to 72 percent ~~(fig. 6)~~.

In the lower slough the change in area of wet prairies was less dramatic, decreasing from 14 to 10 percent in 24 years, and areas of sawgrass marsh decreased slightly from 69 to 67 percent. Here the increase was in woody species which went from 17 to 23 percent of the area.

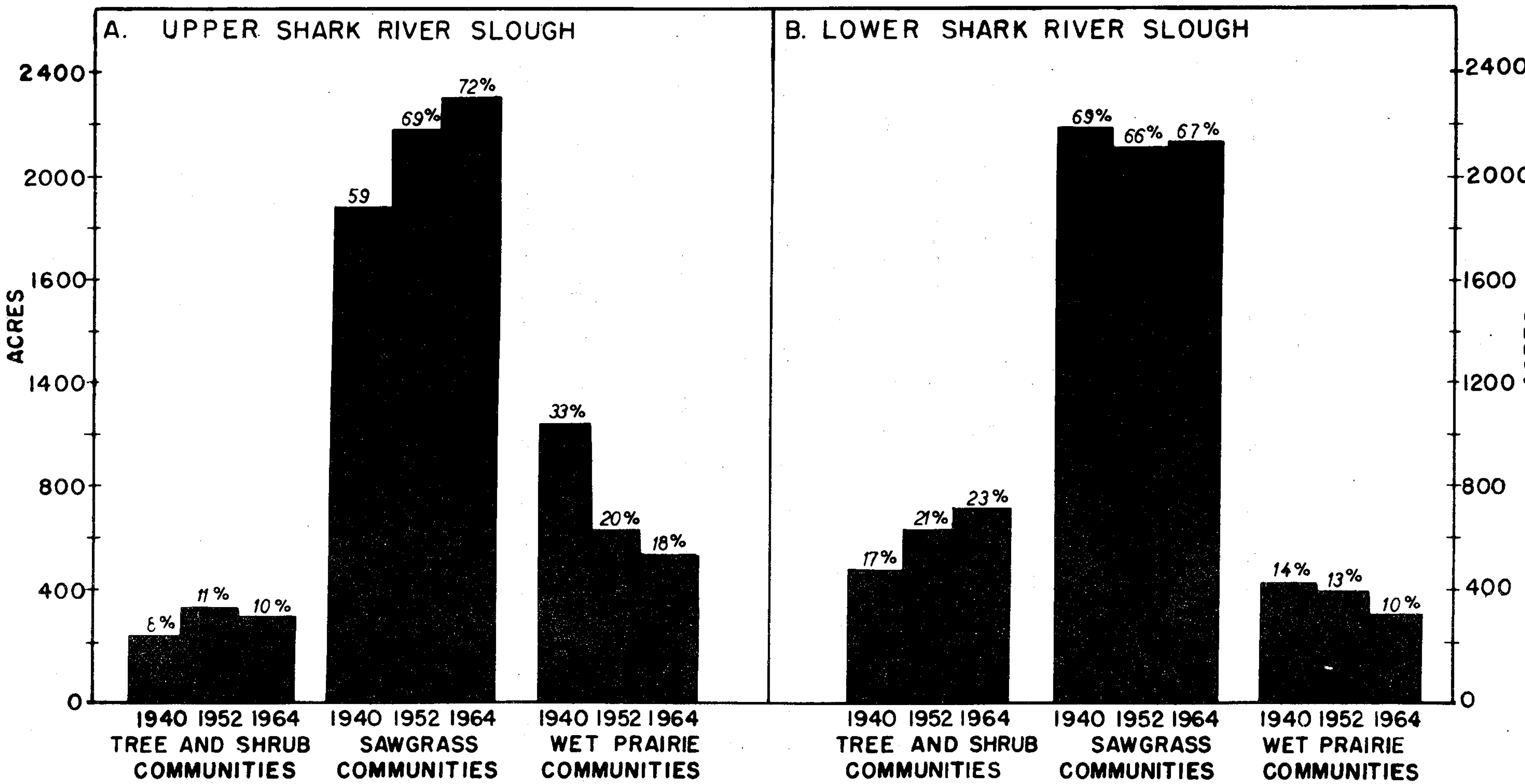

Figure 6.--Change in percentage of areas occupied by plant communities in the upper (A) and lower (B) reaches of Shark River Slough that occurred between 1940 and 1964. The percentage above each bar is that portion of 3,200 acres occupied by the community in the year below the bar.

The overall trend in the slough has been toward a loss of aquatic associations and an increase in semi-aquatic and tree and shrub associations. Frank Craighead, Sr. (oral commun., 1968) has stated that most of the woody growth in the park is less than 50 years old. Possible causes for the change in area of these plant communities are:

1. Shorter periods of inundation: The decrease in wet prairie habitats and corresponding increase in the other communities was greatest from 1940 to 1951 and somewhat less from 1952 to 1963. Parallelling this, the wet prairies were covered with less water and for shorter periods of time from 1940 to 1951 than they were from 1952 to 1963. The greater severity of droughts in the first 12 years is demonstrated in figure 7. A

Figure 7. Belongs near here. Caption on next page.

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drought, as defined here, is the period of time that the water level falls below the ground surface of the wet prairies. As indicated in Table 1,

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the wet prairies near the P-33 hydrologic station were flooded only 87 percent of the time (125 months) in the first twelve years but were flooded 92 percent of the time (132 months) in the second twelve years. The 5 percent difference, representing 7 months less of inundation from 1940 through 1952, seems critical because the greater loss of aquatic plant communities occurred in this first twelve-year period.

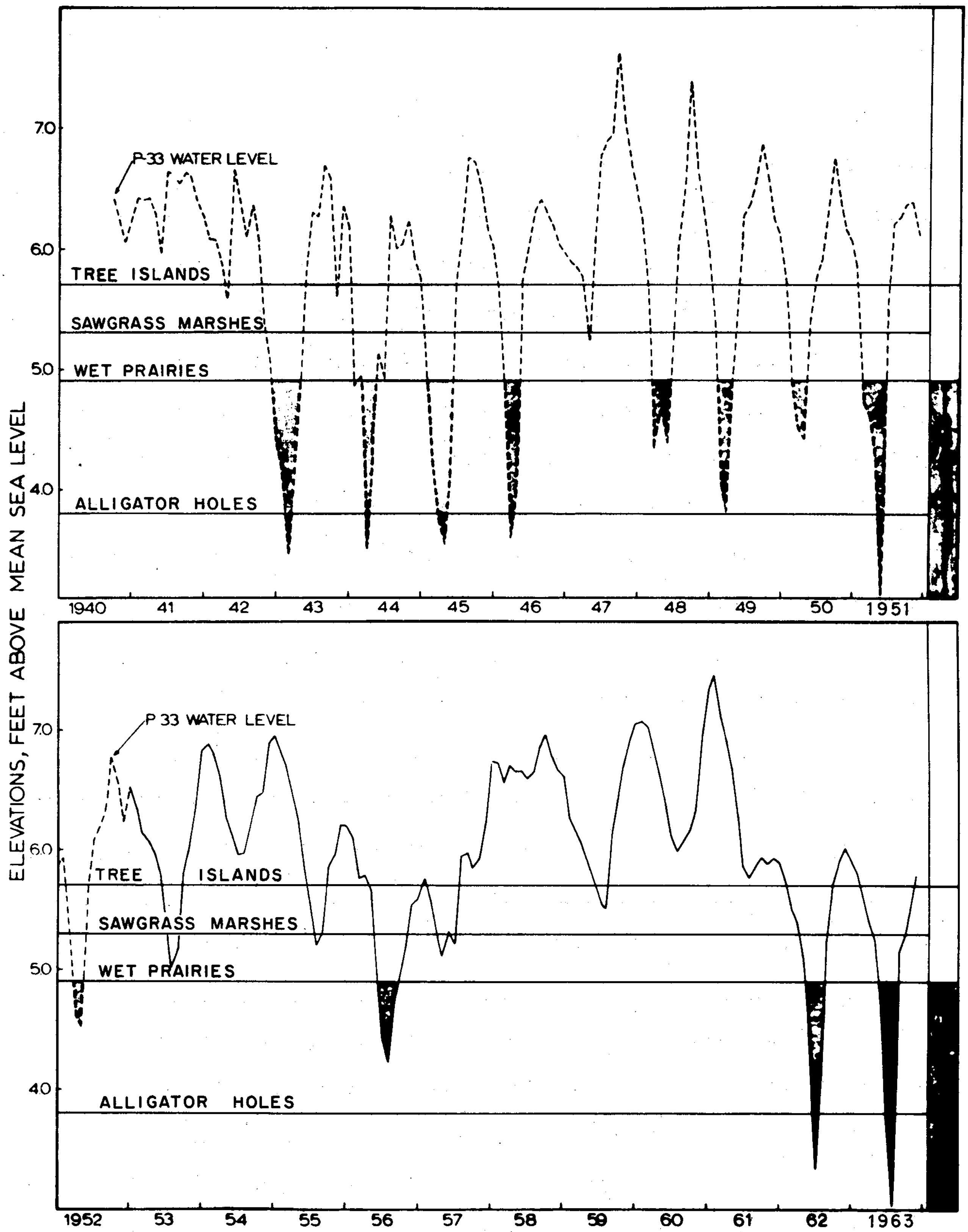

Figure 7.--Water levels at P-33 (hydrologic field station) in relation to mean land elevations in four types of biological communities. The mean elevations (horizontal lines in the figure) were determined from measurements made every 10 feet in a transect of 1,950 feet (A-B in fig. 5). The transect originates at P-33. Dotted line indicates values that were estimated from a correlation between data from the P-33 station and an upstream station at Forty-Mile Bend. The latter provided a continuous record of water levels for 24 years.

Table 1.--A comparison of the percentage of time water covers four major biogeomorphic features in a part of the Shark River Slough in two 12-year periods: 1940-1951 and 1952-1963. Mean levels are based on limited measurements from a transect (AB in fig. 5) in the slough.

Biogeomorphic features	Percentage of time water is above feature	
	1940-1951	1952-1963
Ground level in tree islands	66	68
Ground level in sawgrass marshes	74	82
Ground level in wet prairies	87	92
Ground level in alligator holes*	96	99

* Based on profiles of 14 alligator holes in the upper slough.

The P-33 water-level data for the first 12-year period, 1940-1952, are based on a correlation with water levels at Tamiami Canal at 40-mile bend (fig. 7). The elevations at the transect site (fig. 5) are not necessarily representative for the upper Shark River Slough Area. This is important to keep in mind as these data could be read to minimize the severity of past droughts in the entire slough.

2. Soil losses and fires: Oxidation and compaction of soil in the Everglades, especially in the farming regions around Lake Okeechobee, have been widely documented (Davis, 1946; Stephens, 1955 and 1960). Rapid oxidation together with other losses of peat deposits occur when the water level falls below the ground surface for extended periods. In upper Shark River Slough the soils, composed of interlayerings of peat and marl and having a thickness of only 1-2 feet have been deposited on the limestone base. In the willow and mixed heads the soil is largely peat as thick as 4 or 5 feet. In the lower slough, around the headwaters of streams draining the slough the peats are even thicker. Little is known about the rate and extent of soil compaction in the park, but scientists (Robertson and Craighead, oral commun., 1968) who have worked in the area and who have searched the records state that the sediments were generally deeper before construction of the extensive flood and water-control projects that began around the turn of the century.

also
Oxidation of soils/has taken place in the Everglades as a result of fire. Historically most fires originated from lightning strikes (Robertson, 1953), but in recent decades man has taken a more active role in starting fires. Soils in the slough were considerably deeper only a few decades ago, when fires were less devastating. Robertson (written commun., 1968) notes that the fires most destructive to peat in the Shark River Slough occurred from the mid-1930's through 1945. More recent fires in years of drought have burned less peat simply because less peat remained to be burned.

3. Soil formation: In opposition to the oxidation and compaction processes, soils are continually building up from plant remains, algal mats and precipitation of chemical constituents from the water. Calcareous materials are the most notable of these chemical depositions and they occur in the marls that form in the wet prairies. Peats are laid down in the sawgrass marshes and tree islands. The tendency of the sedimentation processes over the years is to fill in the water basins. The soils in the wet prairies and sawgrass marshes throughout the slough average only 1 or 2 feet deep, although depths are greater near and in the tree islands.

Conclusions

Two terms used in plant ecology as related to the succession of plants need to be introduced here. A climax, in the traditional sense, is a relatively stable, self-perpetuating, terminal, biotic community of a sequence of communities or seres (Chew, 1966). The tropical hammocks represent a climax community. Communities which persist in equilibrium with a continual disturbance are called disclimaxes (contraction of the words disturbed and climax). The heads, wet prairies, and sawgrass marshes of Shark River Slough, as well as the pine forests outside the slough, are dynamic communities; they are fire disclimax types.

A principal common to all national parks is that they be preserved and protected in their natural state. Thus, where fires are occurring either more or less frequently than they were historically, consideration must be given to the maintainence of the fire-disclimax communities. Robertson (1953) noted the effects that altered hydrologic conditions have on fire frequency and resulting changes in the plant communities of the park. Briefly, his principle conclusions on the effects of fire in the park were:

1. Elimination of fire would result in the eventual disappearance of the "fire-maintained cover types" (= fire disclimax types).

2. "The severe and frequent fires occurring under present altered conditions are rapidly eliminating the hardwood forest types, and seem capable, also, of causing degenerative changes in the fire types. It thus seems imperative that an attempt be made to control all fires in the area

with special efforts to protect the tropical hammock and bayhead vegetation."

3. "Restoration of former water levels on the glades would change the necessities of fire control, and should bring about a situation in which only areas of special use or interest need be guarded from fire."

4. Careful long-term attention should be given to the study of fire effects on vegetation of the park with emphasis on stand density and composition of the sub-climax fire types.

A complete understanding of fire effects on the communities thus is a prerequisite to wise management practices that will preserve the biological integrity of the park. Also, there is the long-range need of having the annual period of inundation approximate that which occurred under natural conditions.

The comparatively short periods of inundation, such as from 1940 through 1951, appear to be the chief factor in the replacement of aquatic plant communities by semi-aquatic and semi-terrestrial communities (heads). Longer average periods of inundation are likely to result only through the release of adequate volumes of water from the areas north of the park. The National Park Service has requested an annual release of 315,000 acre-feet into the park for the Taylor and Shark River Sloughs on a monthly schedule based on available information on the historical seasonal pattern of flows (U.S. Corps of Engineers, 1968).

The use of biological criteria, as they become established, may provide the means for a more precise determination of the water requirements of the park. "Continuing research may permit refinement of the (water) requirement based on ecology" (U.S. Corps of Engineers, 1968).

Recommendations

The 10 vegetative study plots have been established as vigil stations for continuing studies. Despite the numerous botanical studies that have been conducted in the environs of Everglades National Park few have dealt with the description of the communities, and the few reports that describe communities fail to document the specific location of the areas studied. With future studies at the vigil stations it may be possible to predict what hydrologic and other environmental conditions will be necessary for the plant communities to develop naturally. The communities in the vigil plots should be re-examined every 5 or 6 years to determine what additional changes have occurred and why.

SECTION B

POPULATION DYNAMICS OF AQUATIC ANIMALS IN SHARK RIVER SLOUGH

Background and Methods

The small fishes and crustaceans are a particularly important segment of the wildlife in the park, for they are near the base of the food webs that provide nourishment for larger fishes, amphibians, alligators and other reptiles, the marsh and wading birds, and various mammals. Small fishes, as the sailfin molly, flagfish, and sheepshead minnow feed on components of the algal mats or periphyton, that include diatoms, desmids and filamentous algae, and to some extent on vascular plants and minute arthropods (tables 2 and 3). These fishes, in turn, serve as food for

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Tables 2, 3 and 4.--Pages 36-38 of ms. belong near here.

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birds, (table 4) such as the American Bittern (Botaurus lentiginosus (Rackett)), Green Heron (Butorides virescens), Great Blue Heron (Ardea herodias) and Wood Ibis (Mycteria americana Linnaeus). The large variety of aquatic organisms in the diets indicates that these predatory birds take what is easily available within a certain size range rather than feed on particular species. It is necessary therefore, to know what happens to aquatic animals in the park during the seasonal cycles of high and low water levels and, more importantly, what happens during several consecutive unusually wet or dry years.

Table 2.--Diets of four common Everglades fishes from Shark River Slough, based on analyses of stomach contents.

Species of fish	Number of stomachs examined	Size range (length, mm)	Date of sampling	Percentage of diet as:					
				Filamentous algae	Desmids	Diatoms	Vascular plants	Arthropods	Unidentifiable remains
Sailfin molly	13	16-50	11-30-65 08-23-66	42	32	14	6	Trace	6
Flagfish	3	19-28	11-30-65 03-21-66	21	29	11	3	34	2
Mosquitofish	30	22-48	03-22-67 03-23-67	Trace	--	--	Trace	Nearly 100	--
Sheepshead minnow	3	31-42	11-30-65 03-21-66	73	10	7	10	--	--

Data from Julie Multer, graduate student in the Department of Biology, University of Miami, Fla. (written commun., 1968).

Table 3.--Algae, diatoms, and desmids that are included in the diets of the fishes listed in table 2.

Green Algae

- Bulbochaete
- Chlorococcum
- Closterium
- Coelastrum
- Microspora
- Micrasterias
- Mougeotia
- Oedogonium
- Pleurotaenium
- Scenedesmus
- Spirogyra
- Spondylosium

Diatoms

- Coscinodiscus
- Other unidentified genera

Blue-green algae

- Aphanocapsa
- Lyngbya
- Oscillatoria
- Phormidium
- Schizothrix
- Spirulina

Desmids

- Cosmarium
- Dismidium
- Euastrum
- Staurastrum
- Triploceras

(From Julie Multer, written commun., 1968)

Table 4.--Examples of diets of four marsh and wading birds common to the Everglades, based on analyses of stomach contents.

Bird	Number of stomachs examined	Site of feeding	Percentage of diet as: Cray fish	In-sects	Misc. inver te-brates	Non food or game fishes	Food or game fishes	Amphibians and reptiles	Mice and shrews
American Bittern *Botaurus lentiginosus* (Rackett)	133	Throughout U.S. and Canada	19	23	2	20	--	26	10
Green Heron *Butorides virescens virescens*	255	Over a wide unspecified territory	--	24	31[a/]	39	6	--	--
Great Blue Heron *Ardea herodias herodias* and *A. h. wardi*	189	Throughout the U.S.	--	8[b/]	11[c/]	47	25	4	5
Wood Ibis *Mycteria americana* Linnaeus	4	Alligator Lake Fla.	--	--	--	Nearly 100[d/]	--	--	--

a/ Crustaceans

b/ Chiefly aquatic insects

c/ Largely crustaceans, but includes miscellaneous animal and vegetable matter

d/ Almost entirely small fishes: *Mollienisia latipinna*, *Cyprinodon variegatus*, *Gambusia affinis*, *Lepomis holbrooki*; and *Adinia multifasciata*.

Data summarized from various sources in Palmer, 1962.

William B. Robertson, Jr., (oral commun., 1968) believes that the Wood Ibis is a key avian species in that its failure or success in forming rookeries each year usually indicates the availability of food and the suitability of hydrologic conditions necessary for all grope-feeding birds. The quantity of food that these birds consume is considerable. Kahl (1962) estimated that, on the average, a young Wood Ibis consumes about 16,500 grams of food during its nestling period of approximately 60 to 65 days.

The aim of this investigation is: (1) to define the abundance and types of aquatic organisms present under different hydrologic conditions, and (2) to correlate the hydrological and biological parameters to acquire a measure of the water needed to maintain adequate biological populations. Quantitative information on the numbers of aquatic animals can serve as one index of the zoological well-being of the park.

A pull-up trap with 1/8-inch openings in the nylon mesh (fig. 8)

Figure 8. Belongs near here. Caption on next page.

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was devised to quantitatively sample the small, freely swimming animals in the shallow ponds and sawgrass marshes of the slough. Sampling which began on a monthly basis in April 1965, is expected to continue for several years to determine relationships existing among numbers of animals, periods of inundation, and physico-chemical characteristics of the water. This may make it possible to predict the number of aquatic organisms that will be produced seasonally under given hydrologic conditions. To date more than 50,000 small fishes, crustaceans, and insect larvae (fig. 9, table 5) have been collected, identified, counted and weighed.

Figure 9. Belongs near here. Caption on next page.

Table 5. Page 43 of ms. belongs near here. Caption on next page.

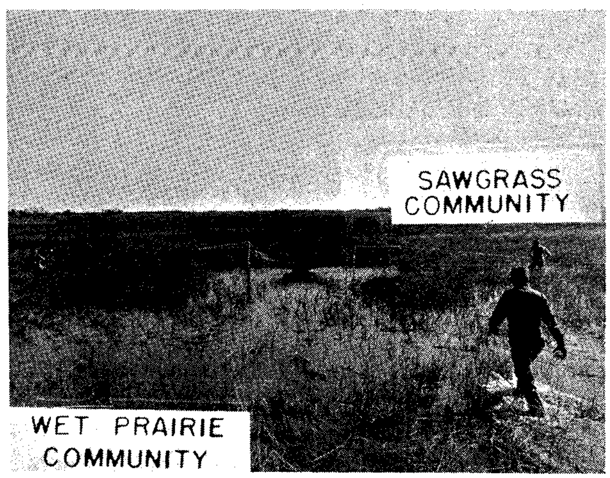
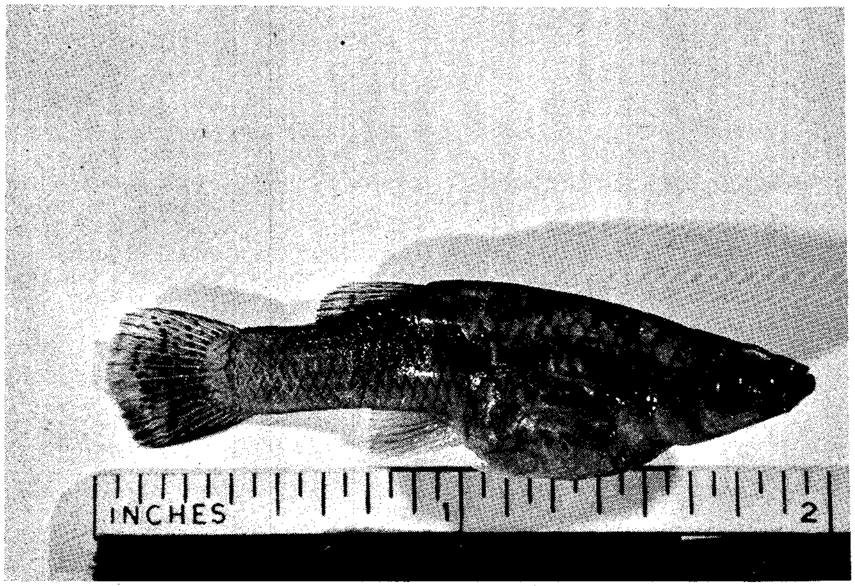


Figure 8. --Pull-up trap designed to quantitatively sample small aquatic animals in the wet prairie and sawgrass communities of the Shark River Slough. This trap and preliminary data have been described by Higer and Kolipinski (1968).

A.



B.

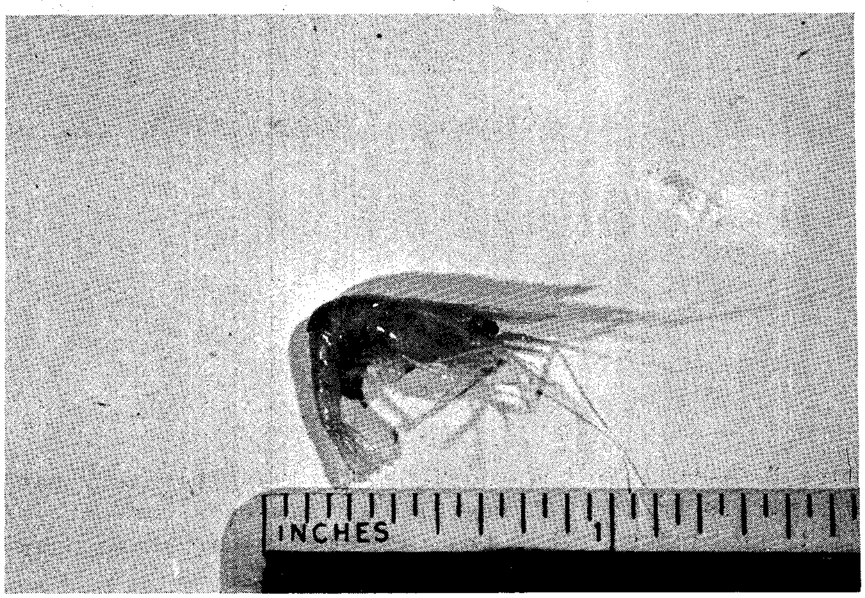


Figure 9.--Adult specimens of A, the mosquitofish, Gambusia affinis and B, the fresh-water shrimp, Palaemonetes paludosus. These are the most abundant of the many aquatic animals of similar size that live in Shark River Slough and occupy intermediate positions in a number of Everglades food webs.

Table 5.--Percentage of occurrence of aquatic animals captured by pull-up trap.

Scientific name	Common name	Percentage of number of individuals per trapping a/
Gambusia affinis (Baird and Girard --------------------	Mosquitofish	73.7
Mollienisia latipinna Sueur ---------------------	Sailfin molly	8.3
Cyprinodon variegatus Lacepede ------------------	Sheepshead minnow	6.1
Palaemonetes paludosus	Fresh-water shrimp	5.0
Fundulus confluentus Goode and Bean ------------	Marsh killifish	2.5
Jordanella floridae Goode and Bean ------------	Flagfish	1.7
	Insect larvae b/	0.6
	Tadpoles c/	0.6
Heterandria formosa Agassiz ------------------	Least killifish	0.3
	Other animals	1.2
		100.0

a/ Based on 40 night samples comprising 1,432 specimens collected from October 1965 to March 1966 in the Shark River Slough.

b/ Principally dragonfly nymphs, Corixidae, and Dytiscidae.

c/ Tadpoles unidentified.

d/ Other animals taken: Lepomis spp., Lucania goodei Jordan, Fundulus chrysotus (Gunther), Notemigonus crysoleucas (Mitchill), Labidesthes sicculus (Cope), Ictalurus punctatus (Rafinesque), Procambarus alleni (Faxon), Gastropoda, Mysidacea.

A data-storage-and-retrieval computer program is used to tabulate data and run statistical analyses on the trapping results. The program considers the numbers and weights of individual species in relation to water depth, antecedent water conditions, water temperature, time of reproduction, type of aquatic environment sampled, time of sampling, and phase of the moon.

Figure 10 depicts the changes in numbers of these species in relation

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Figure 10. Belongs near here. Caption on next page.

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to the mean monthly water depths and periods of inundation of the sawgrass and wet prairie communities for a 26-month period. Beginning in April 1965, the water level fell below the ground surface of the wet prairies in the slough. As the severe drought continued, the water level continued to decline until even the deepest of the alligator holes were dry. In July 1965 the water was above the ground surface again as a result of rainfall, but small and large fishes were essentially absent from the slough. However, the few remaining animals together with migrants into the slough began to reproduce, causing a gradual population increase. As water remained in the shallow ponds their numbers continued to increase until they reached a peak of more than 160 individuals of the six most common species (fig. 10) per trapping in January 1967.

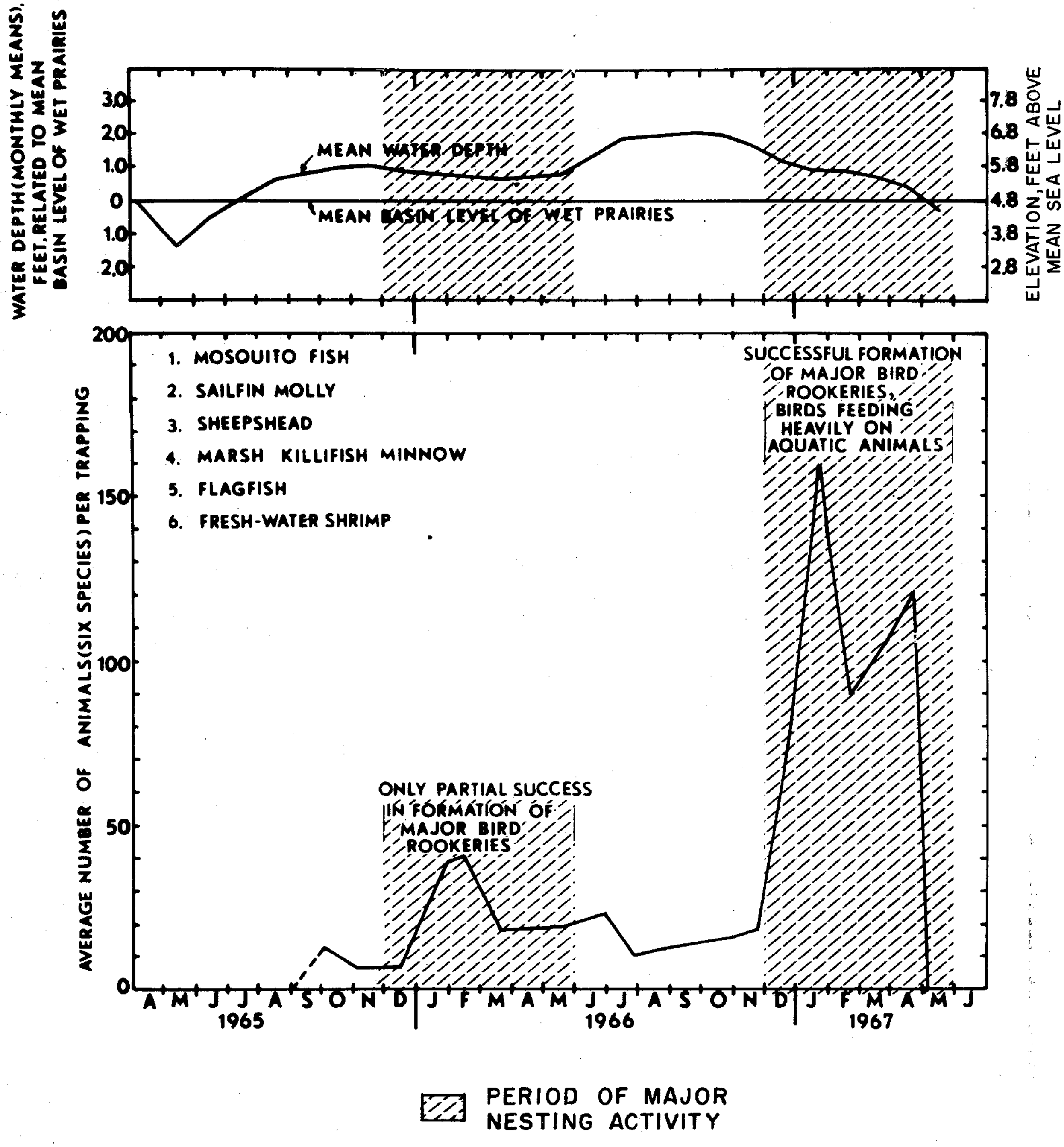

Figure 10.--Comparison of seasonal variations in populations of aquatic animals and wading birds with an index of water depths in upper Shark River Slough.

Conclusions and Recommendations

Several additional cycles of continuous sampling would be required before drawing definite conclusions, but it is noteworthy that the major bird rookeries formed only partially in the 1965-66 nesting season. They did form successfully in the 1966-1967 season (fig. 10), when aquatic food-organisms were abundant, after a longer period of inundation. The investigation may be expedited by increasing the number of sampling locations especially in the lower Shark River Slough where the bird rookeries form and the major feeding occurs.

When this investigation of the animal samplings is completed and considered in context with other data on populations of selected birds, the results could be correlated to permit refinement of the water-release plan essential for maintaining a natural balance in the Shark River Slough and the estuaries to the southwest. These findings may have transfer value to other areas of the park.

SECTION C

REPOPULATION OF SMALL AQUATIC ANIMALS AFTER DROUGHTS

Droughts in the Shark River Slough can result from either rainfall deficiency or lack of inflow. The rate and extent of recovery of aquatic populations after drought depends not only on the duration and extent to which the habitats dry out, but also on the individual survival methods and physiological adaptations of each species. Unfortunately, little has been reported in the literature on the methods and adaptations for survival of aquatic organisms in shallow-water environments that dry up occasionally.

After drought, the replenishment of the shallow-water communities of the Shark River Slough with animals probably occurs in the following ways:

1. Movement of aquatic animals into the slough via water releases through the control structures and canals along the northern boundary of the park (fig. 2). This is based on observations of a movement of fishes in July 1965, following a severe drought. As the water level rose above the ground with the onset of the rainy season, small numbers of fishes were observed in the extreme northern part of the slough, but considerable searching revealed none southward until several weeks later.

2. Movement into the slough from the south via the headwaters of the rivers that empty into the Gulf of Mexico and Whitewater Bay (fig. 2). Many of the headwater channels retain fresh or brackish water even at the height of a drought. Upon reflooding, aquatic animals can migrate back into the slough and coastal marshes.

3. Movement into the shallow waters of the sawgrass marshes and intermittent ponds from the hundreds of interspersed alligator holes, occasional deep ground cavities and the few water-filled quarries created by the excavation of limestone. These deeper bodies of water rarely dry completely, and in most years they harbor vestigial numbers of organisms that can move out and repopulate the glades during summer flooding.

4. <u>The eggs of some species temporarily survive in a damp or humid substrate</u>. To some extent the peats, marls and algal mats remain moist in the dry season by capillary attraction of the water below. Interestingly, Harrington (1959) demonstrated that eggs of the marsh killifish, *Fundulus confluentus*, stranded in the soil and exposed to the air, remain viable for months and hatch when the water rises above the ground. In another instance, Fred Lesser (oral commun., 1968) has watched numerous mummichogs, *Fundulus heteroclitus*, crawl out from shallow water, lay eggs on the exposed ground and then die. In addition to the fairly abundant marsh killifish, the golden topminnow, *Fundulus chrysotus*, is occasionally caught in the Shark River Slough traps (table 5). It will be interesting to learn whether *F. chrysotus* also has eggs that are resistant to the exposure of air. This survival adaptation may be common to the genus or perhaps it is a subgeneric characteristic.

5. <u>Animals carried by storms, birds, man and other incidental and accidental ways</u>. This is undoubtedly the means by which many fresh-water species of the West Indian faunal province have become common to the West Indies and southern Florida.

6. Replenishment from animal burrows. Crayfish, frogs, salamanders, turtles and other animals excavate burrows in the peat and marl soils. The burrows, frequently connecting with solution channels in the underlying porous limestone, provide an aquatic environment when the water falls below the ground. Small numbers of fishes and other non-burrowing animals survive droughts, for they find their way, probably fortuitiously, into burrows as water levels in the slough recede.

Tabb (1963) has made an intensive review of what little is known about the role played by burrowing animals in survival during droughts of various duration. The crayfish, Procambarus alleni, abundant throughout the park, is by itself responsible for creating millions of burrows utilized with other small animals during a drought. Creaser (1931) has shown the importance of these burrows to animal survival. He dug into burrows of the crayfish, Cambarus diogenes, in a dried slough adjacent to a river in the Missouri Ozark Mountains. After digging through about 3 feet of clay, he reached the water level and removed a quart of water. While only crustaceans were found, more than 6,000 specimens belonging to three species representing ostracods, copepods and amphipods were counted.

In Georgia, Neill (1951) noted the occurrence of numerous crayfish in dry shallow ponds, some overgrown entirely with dwarf cypress, Taxodium ascendens, and others with a mixture of trees and various emergent, marginal and aquatic plants. The burrows led down to the water table and sometimes opened into a complex network of horizontal passages. Casual excavation of the burrows by Neill during a dry spell revealed specimens of the amphibians, Amphiuma and Siren, and the rainwater killifish, Lucania parva, all common to the park. Also, several other types of fish were present in the burrows.

The appearance of various fishes in the slough after drought raised our interest to determine whether their source was from burrows or from other methods of repopulation. During the dry season of 1967, an impoundment, 65 by 65 feet, (fig. 11) was constructed in upper Shark

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Figures 11 and 12. Belong near here. Captions on next page.

River Slough. It was enclosed with heavy plastic sheeting supported on a wooden framework and to prevent inflow to the enclosure, the plastic was sealed to the ground surface with an earthen mound around the base. The dried bed within the enclosure had numerous crayfish burrows, frog burrows, and limestone solution holes (fig. 12). Baited vertical-slit traps were placed within the impoundment to catch any organisms that might emerge from the holes. At the beginning of the rainy season, water levels had risen both outside and inside the impoundment, by rainfall and subsequent raising of the ground-water level. Several adult mosquitofish, marsh killifish, flagfish and a few crayfish were captured in the traps.

Figure 11. --Impoundment constructed in Shark River Slough to study survival and recovery capabilities of aquatic animals following average and unusually long droughts.

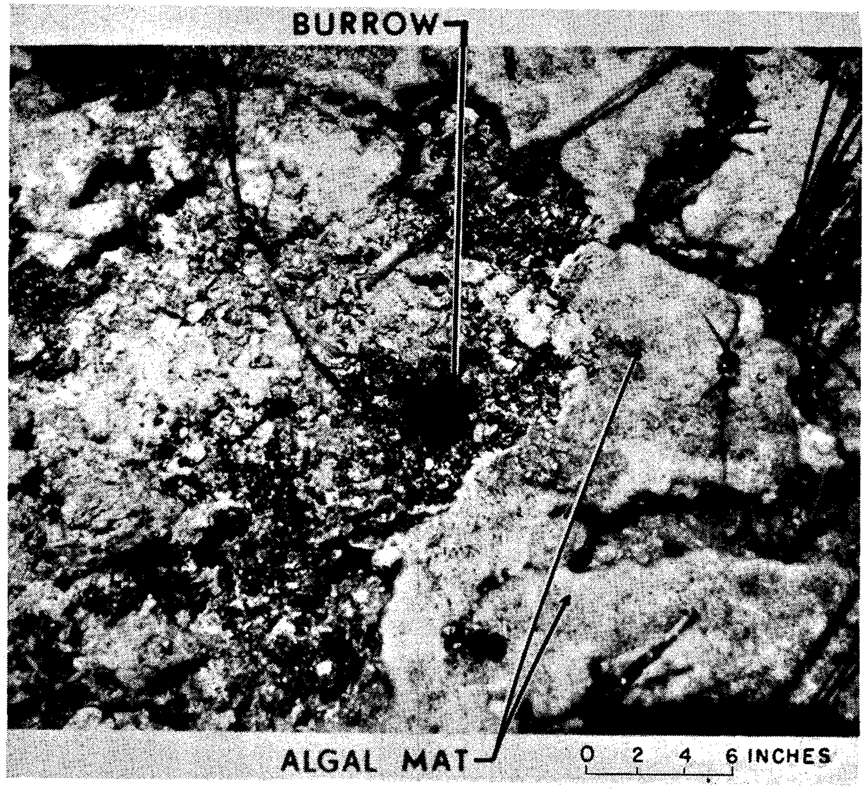

Figure 12. --Animal burrow and surrounding algal mats within the impoundment in Shark River Slough.

The results from this preliminary study have led to the planning for a more definitive examination in which tagged fish will be utilized. The authors have tentatively concluded that the crayfish burrow serves as a vital refuge for small aquatic animals when the water level falls below the ground surface. The two major factors affecting survival in burrows are: (1) the level to which the water recedes; and (2) the length of time that the water level remains below the ground surface. If the water level falls more than 1 or 2 feet below the ground surface as it did in 1965 (fig. 10), animals requiring an aqueous medium, such as fish, die from exposure to air. If the small aquatic animals are restricted to the burrow for long periods they undergo physiological stress and may eventually die. The stagnant water in the burrow builds up with their waste products, becomes depleted of dissolved oxygen, and increases in free carbon dioxide all creating a toxic environment. How long a period they can live in the restriction of the burrow is unknown.

SECTION D

WATER QUALITY CRITERIA IN EVERGLADES NATIONAL PARK

Background and Objectives

In 1959, analyses were begun by the U.S. Geological Survey for common chemical constituents in the waters within and to the north of the park. Starting in late 1966, the waters were also analyzed to determine the amounts of trace elements, heavy metals and pesticides in various aquatic communities, (fig. 13, table 6). A research station, called

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Table 6. Page 57 of ms. belongs near here. Caption on next page.

Cottonmouth Camp (fig. 14), was built in the Shark River Slough to serve

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Figures 13 and 14. Belong near here. Captions on next page.

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as a base of operations for the water quality and other hydrobiological investigations carried on in the Everglades communities.

The objectives of the water-quality investigations are to determine, on diurnal, seasonal and long-term bases, the following:

1. The effect of water quality on aquatic organisms,
2. Conversely, the effect of organisms on water quality, and
3. The occurrence, distribution and source of pollutants in the park.

Table 6. Water quality characteristics measured in the surface waters of Everglades National Park and vicinity.

Common chemical constituents	Trace elements and heavy metals
Ammonium (NH_4)	Arsenic (As)
Bicarbonate (HCO_3)	Copper (Cu)
Calcium carbonate ($CaCo_3$)	Bromide (Br)
Chloride (Cl)	Iodine (I)
Dissolved Oxygen	Lead (Pb)
Dissolved solids	Lithium (Li)
Floride (F)	Nickel (Ni)
Free Carbon dioxide (CO_2)	Zinc (Zn)
Iron (Fe)	**Pesticides (chlorinated hydrocarbons)**
Nitrate (NO_3)	Aldrin
Nitrite (NO_2)	DDT, DDD, and DDE
Phosphate (PO_4)	Dieldrin
Potassium (K)	Endrin
Silica (Si)	Heptachlor
Sodium (Na)	Heptachlor epoxide
Sulfate (SO_4)	Lindane
Physical characteristics	
Color	
pH	
Specific conductance	
Temperature	
Turbidity	

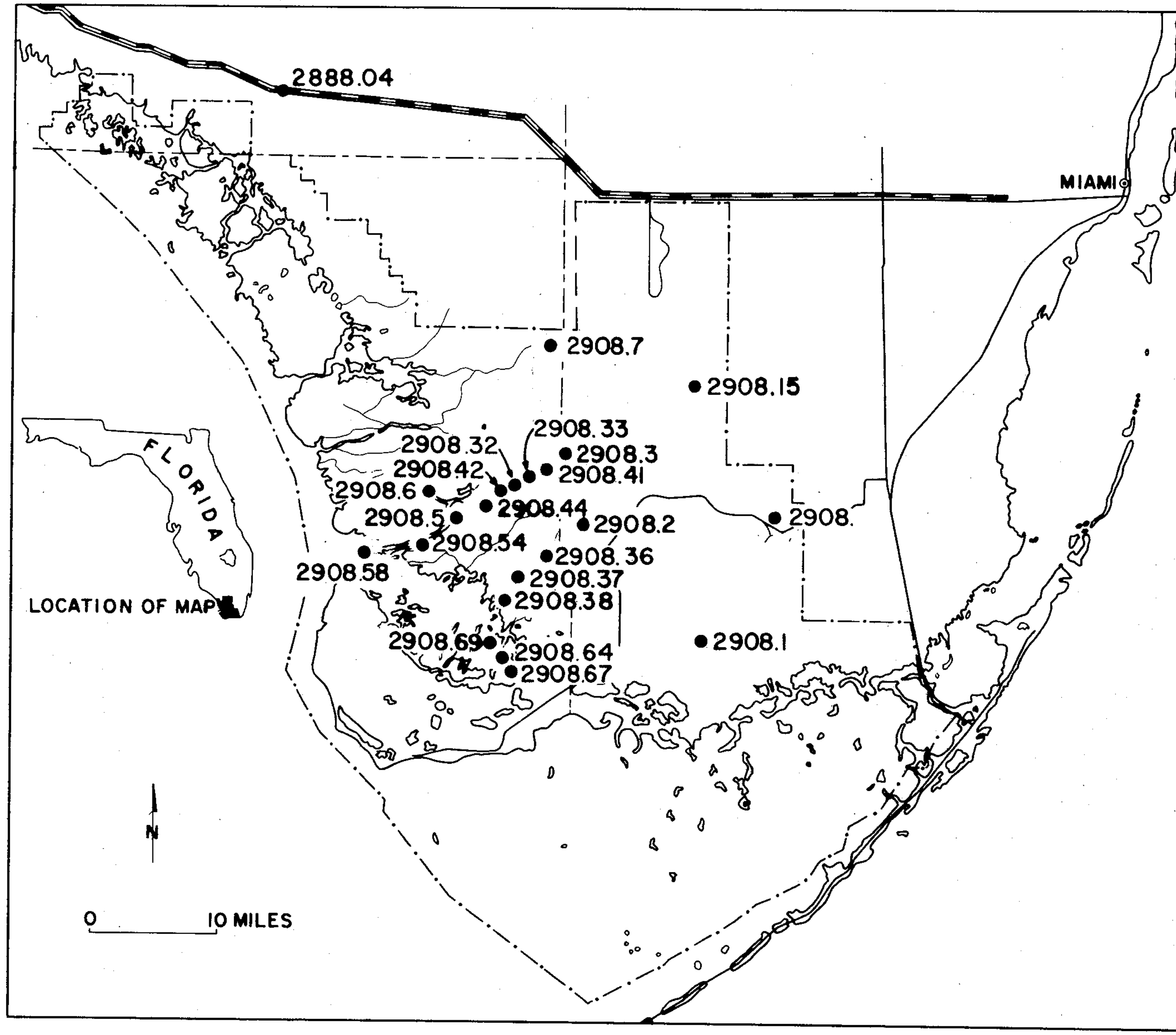

Figure 13.--Map showing location of water-quality sampling stations in and near Everglades National Park. The station names are listed with water quality data in table 8.

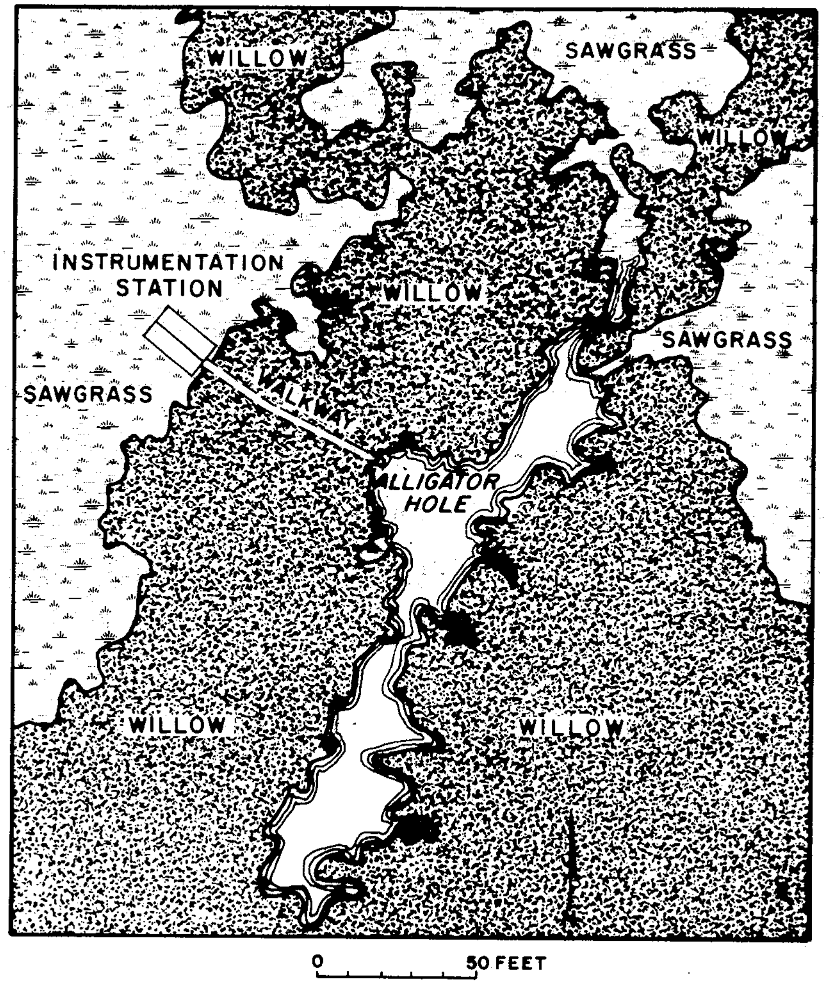

Figure 14.--Map of Cottonmouth Camp and vicinity in Shark River Slough. Biologically important water-quality characteristics are monitored in the alligator hole and surrounding glades in conjunction with quantitative sampling of aquatic animals. (Map traced from an aerial photograph).

The water-quality data that have been collected are still undergoing analysis. The findings, to date, are discussed in this section as they relate to Everglades National Park under the following headings:

1. General water-quality characteristics,
2. Diurnal and seasonal variations in dissolved oxygen, and
3. The potential threat of pesticides to biological communities.

General water-quality characteristics

The bulk of the water-quality information has been prepared for calculations by a digital computer. An appendix to this report contains computer tabulations of the data collected from 1958 through 1968. The listed values for pH were made in the laboratory and do not necessarily represent the true pH which would be found in the field. However, determinations of pH were made diurnally in the field periodically between 1965 and 1968. The pH ranged from 6.5 to 8.0.

As an indication of the general quality of the fresh waters of the park, the range and median values of nitrate, sulfate, calcium, dissolved solids, and iron were compared at three regions with values from various waters of the United States that support a mixed fish fauna (table 7).

Table 7. Page 72 of ms. belongs near here. Caption on next page.

These five dissolved chemical constituents become pollutants when their concentrations become excessive due to the activities of man. The concentrations of the five constituents at Tamiami Canal and Taylor and Shark River Sloughs have occasionally exceeded the values found by Hart (1945) in 95 percent of the waters in the country that harbored mixed fishes, including game fishes. However, the median values at the three sites in and near the park are lower, in every instance, than they were in 95 percent of the compared United States waters. Although a few decades old, Hart's data serve as a sound base for comparison by indicating the quality of the United States waters previous to the heavy pollution of recent years that has occurred in many of them. This comparison indicates, in a general way, that the fresh waters of the park are presently unpolluted in terms of the above five constituents.

Table 7.--A comparison of United States waters that support a mixed fish fauna to waters of Everglades National Park.

Potential Pollutants	United States Waters [1] (Percent of waters having this concentration, or less) 5% (mg/1)	50% (mg/1)	95% (mg/1)	Tamiami Canal [2] Range (mg/1)	Median (mg/1)	Shark River Slough [3] Range (mg/1)	Median (mg/1)	Taylor Slough [4] Range (mg/1)	Median (mg/1)
Nitrate	0.2	0.9	4.2	0-42	0.5	0-79	0.7	0-74	0.4
Sulfate	11	32	90	0-66	4.0	0-77	0.4	0-62	0.4
Calcium	15	28	52	23-133	62	40-173	54	38-101	58
Dissolved solids	72	169	400	85-410	240	24-1152	230	140-356	190
Iron	0.0	0.3	0.7	0-0.60	0.03	0-0.87	0.20	0-0.50	0.01

1/ Hart, 1945.

2/ Tamiami Canal: Bridge 45 to Bridge 86, October 20, 1955 to September 30, 1967 (113 water samples).

3/ Shark River Slough: P-33, P-34, P-38, and Cottonmouth Camp, December 24, 1959 to September 12, 1967 (65 water samples).

4/ Taylor Slough: at bridge State Highway 27, December 14, 1960 to September 14, 1967 (30 water samples).

Diurnal and Seasonal Variations in Dissolved Oxygen

Background:--As water levels drop and the sawgrass marshes dry, most of the fauna moves into canals, wet prairies, and alligator holes. The resulting concentration of aquatic organisms often depletes the available oxygen in these bodies of water. The situation becomes especially critical at night when the aquatic plants cease oxygen production while biological consumption and the oxidation of organic matter continue. The dissolved oxygen concentration is affected by various physical and chemical characteristics of the water, and by the organisms that live in and around these bodies of water. However, the recession of water levels in the Everglades environments is the dominant factor that initiates a series of physical, chemical and biological changes which collectively result in the depletion of dissolved oxygen.

Dissolved oxygen concentrations were determined under various hydrologic conditions and at different sites in the park. The findings at Cottonmouth Camp, Tamiami Canal near the Shark River Valley Loop Road, and Royal Palm Pond in Taylor Slough follow.

Results.--Cottonmouth Camp: This research station is located at the edge of a willow head that contains an alligator hole (fig. 14). It is surrounded by sawgrass marshes and wet prairies. At its deepest, the alligator hole has a water depth of about 5 feet during the wet seasons, but it, as well as virtually all the others in the slough, dries completely in times of extreme drought, as in April 1965. The alligator hole is about 60 x 40 feet; at high-water stages it contains approximately 7,000 cubic feet of water. In the wet season, the surrounding willow head is inundated and the water surface is continuous between the alligator hole and the surrounding glades.

Dissolved oxygen determinations were conducted hourly or bi-hourly for 24-hour periods about once a month beginning in April 1965 and terminating in June 1968.

During the high-water periods (fig. 15, A and B) dissolved oxygen

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concentrations were similar both in the sawgrass marshes and the alligator hole. Day and night concentrations were generally greater than 3 mg/1 with a peak of nearly 9 mg/1 occurring in mid or late afternoon.

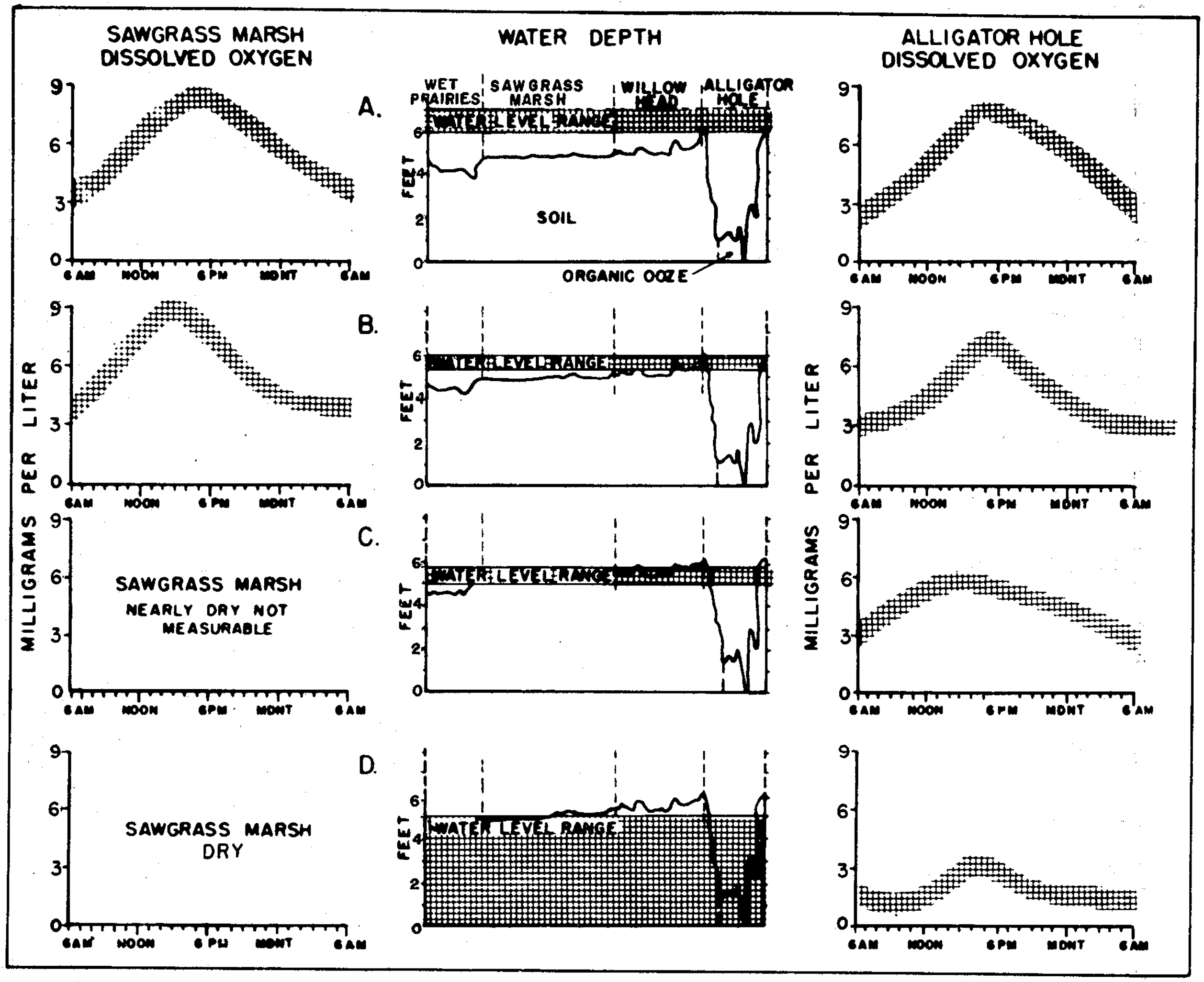

Figure 15.--The relationship between fluctuations in dissolved oxygen and water levels in an alligator hole and sawgrass marsh at Cottonmouth Camp in the Shark River Slough.

As the water level began to fall below the ground surface some organisms moved into burrows. The sawgrass marshes became isolated from the alligator hole (fig. 15, C). Other remaining animals, including large fishes such as gar and bream, by then, had moved into the alligator hole and its stagnating waters (fig. 15, D).

During such periods of low water the dissolved oxygen remained below 2 mg/l during most of each 24-hour period causing a mortality of susceptible aquatic animals. This was observed among the centrarchid fishes (bass, bream, etc.).

Tamiami Canal: A fish-kill occurred at the northern boundary of the park in the old Tamiami Canal between Control Structures 12B and 12D (fig. 16). The mortality began in the last week of November 1966.

Figure 16. Belongs near here. Caption on next page.

The control structures were closed on November 9 stopping water flow into the park. In the following 3 weeks the water level south of Structure 12C dropped nearly 2 feet from 9.2 to 7.3 feet above mean sea level. As the water level in the glades to the south dropped, large numbers of fish and other aquatic animals apparently moved into the old canal.

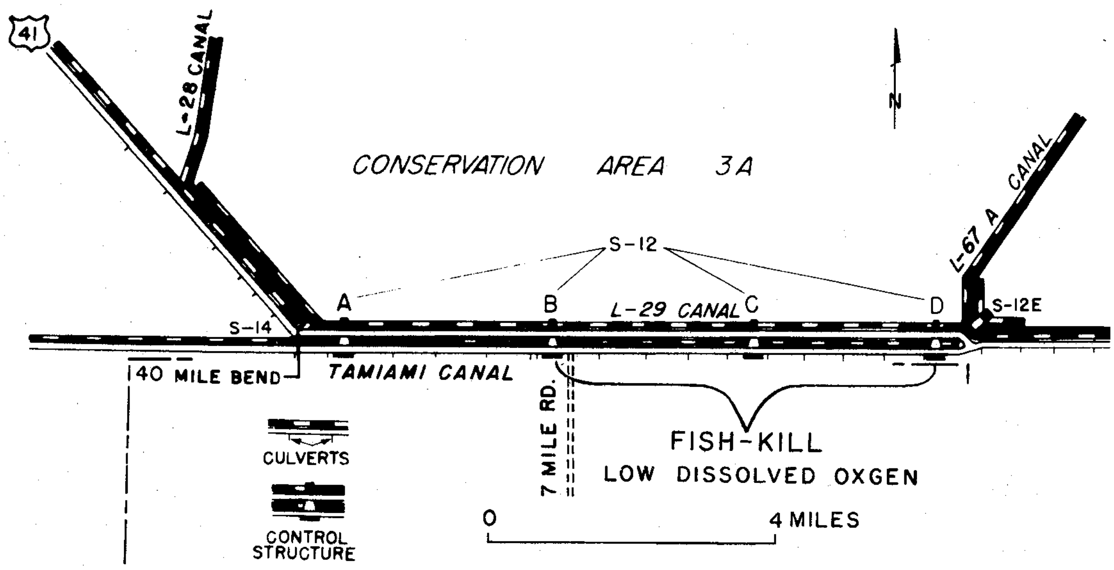

Figure 16.--Map showing location of fish kill that resulted from inadequate dissolved oxygen in November 1966 in Tamiami Canal.

During a reconnaissance on December 1, 1966, hundreds of dead catfish, bass, and bream were found in the canal. 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. Analyses late that morning showed that the dissolved oxygen of the water in the canal was less than 0.5 mg/1. Experience at Cottonmouth Camp alligator hole indicates that values were even lower at night when the aquatic plants ceased production of oxygen while consumption continued. The respiratory activity of many fishes and other aquatic animals begins to be severely affected as the dissolved oxygen falls below 3 mg/1 in subtropical waters; few fishes can exist for an extended period of time below 1 or 2 mg/1.

Royal Palm Pond: A mortality of more than 2,000 Florida spotted gar, Lepisosteus platyrhincus, resulted from an infestation by a branchiuran parasite, Argulus n. sp. at Royal Palm Pond located in Taylor Slough (fig. 2) in June 1965 (Kolipinski, 1965). Probable factors that influenced the population explosion of the parasite were the abundance of hosts (gar) and the lack of predators on Argulus. A concentration of gar in the pond immediately before the fish kill was related, in part, to an unusually prolonged drought. Coincidental with the mortality of gar was the lowest water level in the pond since the beginning of record in August 1960 (fig. 17). Laboratory

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Figure 17. Belongs near here. Caption on next page.

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tests (Leppert, written commun., 1965) showed that potential predators of Argulus n. sp. are flagfish (Jordanella floridae), golden topminnow (Fundulus chrysotus), several centrarchids, fresh-water shrimp (Palaemonetes paludosus), and water scorpion (Ranatra sp.). Species that would ordinarily feed on the larvae stages and adults of Argulus in Royal Palm Pond were either few in number or absent. The limited number of predators on Argulus probably resulted from feeding pressure by gar and other animals and the low dissolved oxygen during hours of dark.

Control of Argulus seems dependent upon high water levels which provide a favorable environment for predators of the hardy parasite.

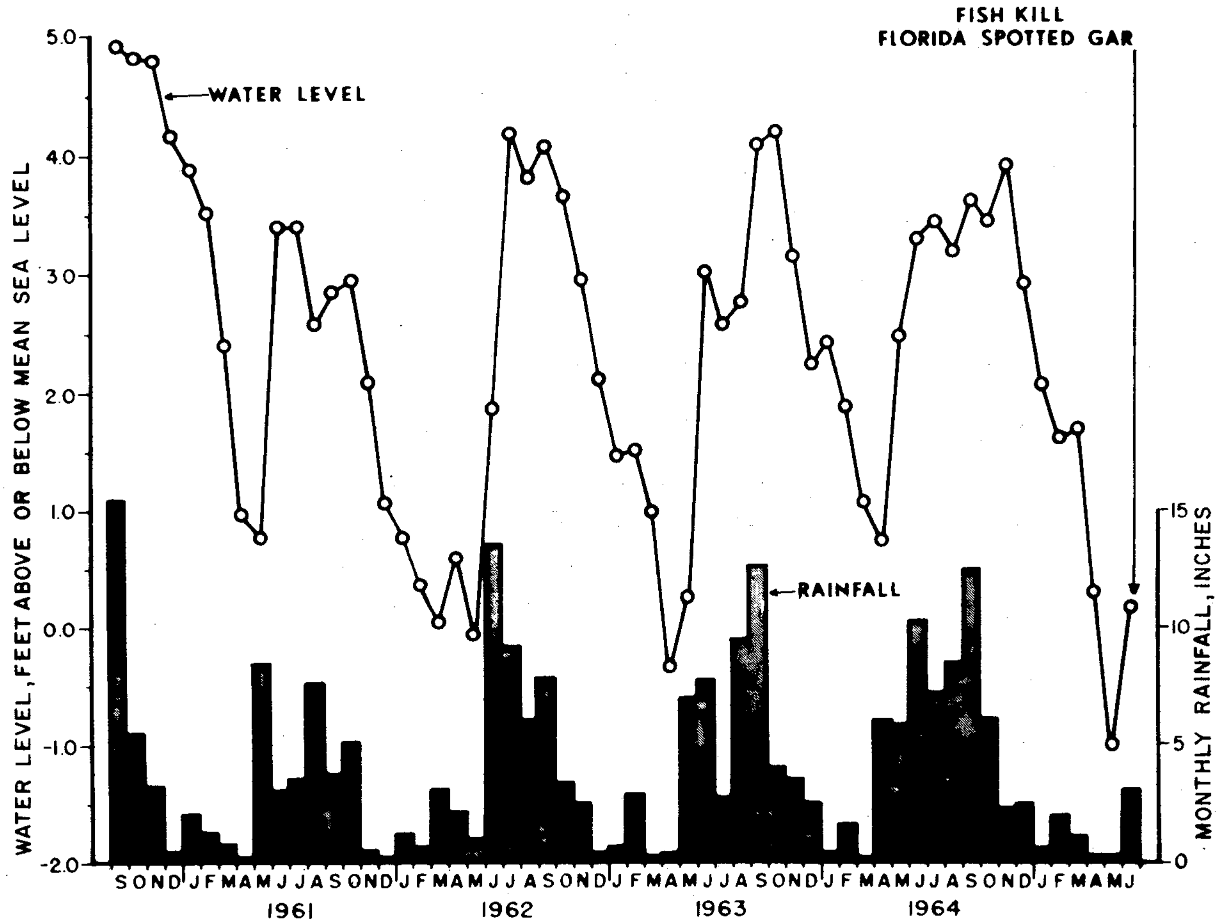

Figure 17.--Mean monthly water levels in Taylor Slough at Flamingo Road, and rainfall at nearby Royal Palm Pond from September 1960 to June 1965.

The Potential Threat of Pesticides to Biological Communities

The use of pesticides in Florida is increasing and is heaviest in the central citrus belt and the truck-farming regions in the central and southern parts of the state. In early 1967, the citrus industry encompassed 755,000 acres with 55 million trees (Jones, 1967). Eighteen months later (Jones, written commun., September 1968) the industry expanded to 931,000 acres with 74 million trees. There are also 420,000 acres (Mullin and Stiles, 1966) occupied by vegetable, melon, potato and strawberry crops (fig. 18). Sugar cane is grown on 200,000 acres

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(Orsinego, oral commun., January 1967) below Lake Okeechobee.

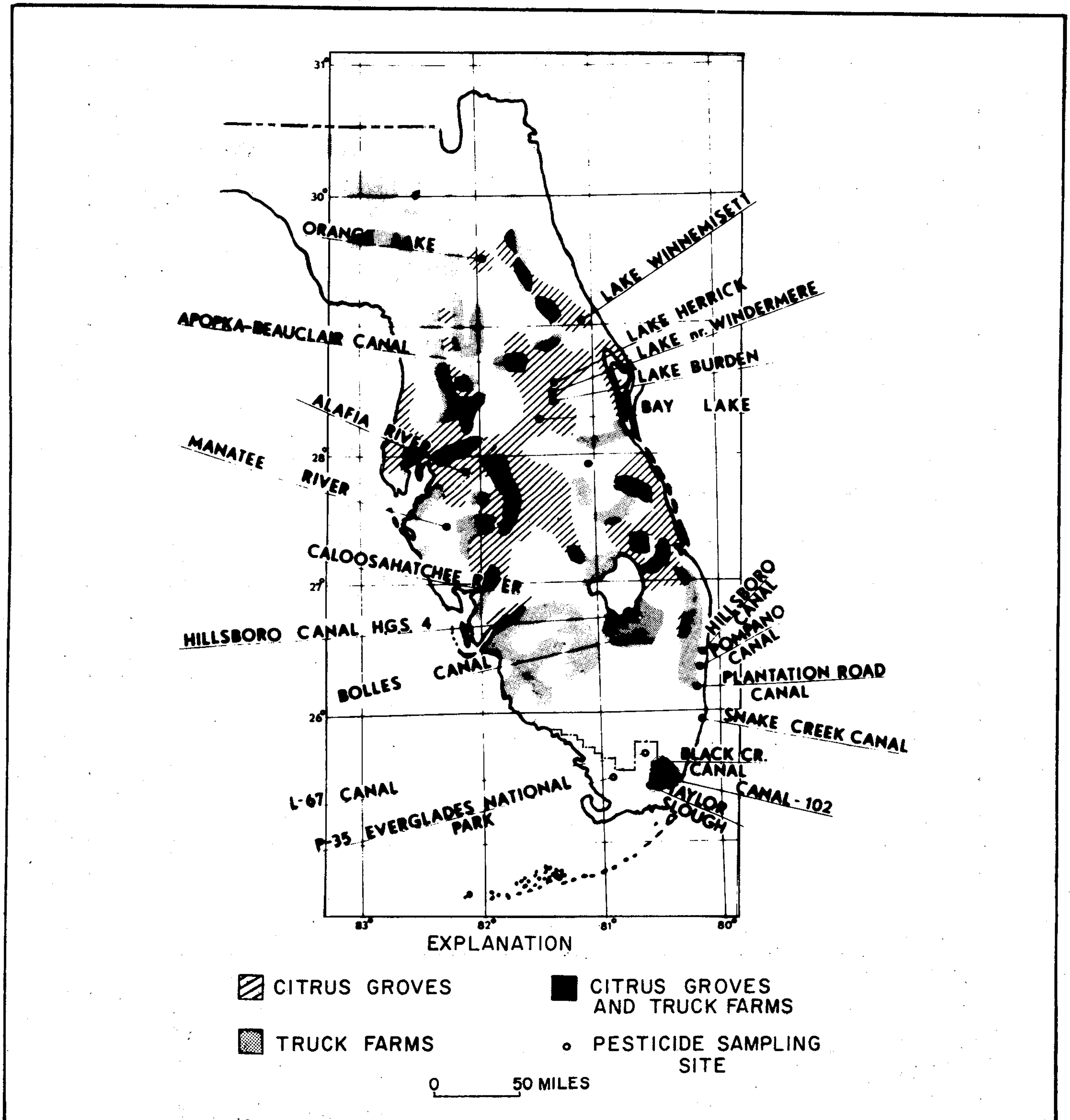

Figure 18.--Pesticide sampling locations in relation to major citrus and agricultural areas in southern and central Florida.

The organophosphate class of compounds (parathion, malathion, etc) is by far the most commonly used in Florida. However, considerable amounts of persistent chlorinated hydrocarbons (DDT, dieldrin, toxaphene, etc) are introduced into the environment, mainly by application to certain crops, and are found in most living organisms. Persistence leads to biological magnification, a phenomenon in which these toxins move through food chains with negligible loss and become highly concentrated in the terminal organism of each chain. Birds and other large predators have chlorinated hydrocarbons in their tissues at concentrations that often cause chronic diseases and hamper their ability to produce viable offspring. The biological concentration begins with algae and other microscopic organisms concentrating these pesticides from extremely dilute water solutions. The waters of Florida generally were found to contain concentrations of DDT, and its toxic metabolites DDD and DDE, in the range of 0-0.90 mg/l, and smaller amounts of other chlorinated hydrocarbons were detected (fig. 19).

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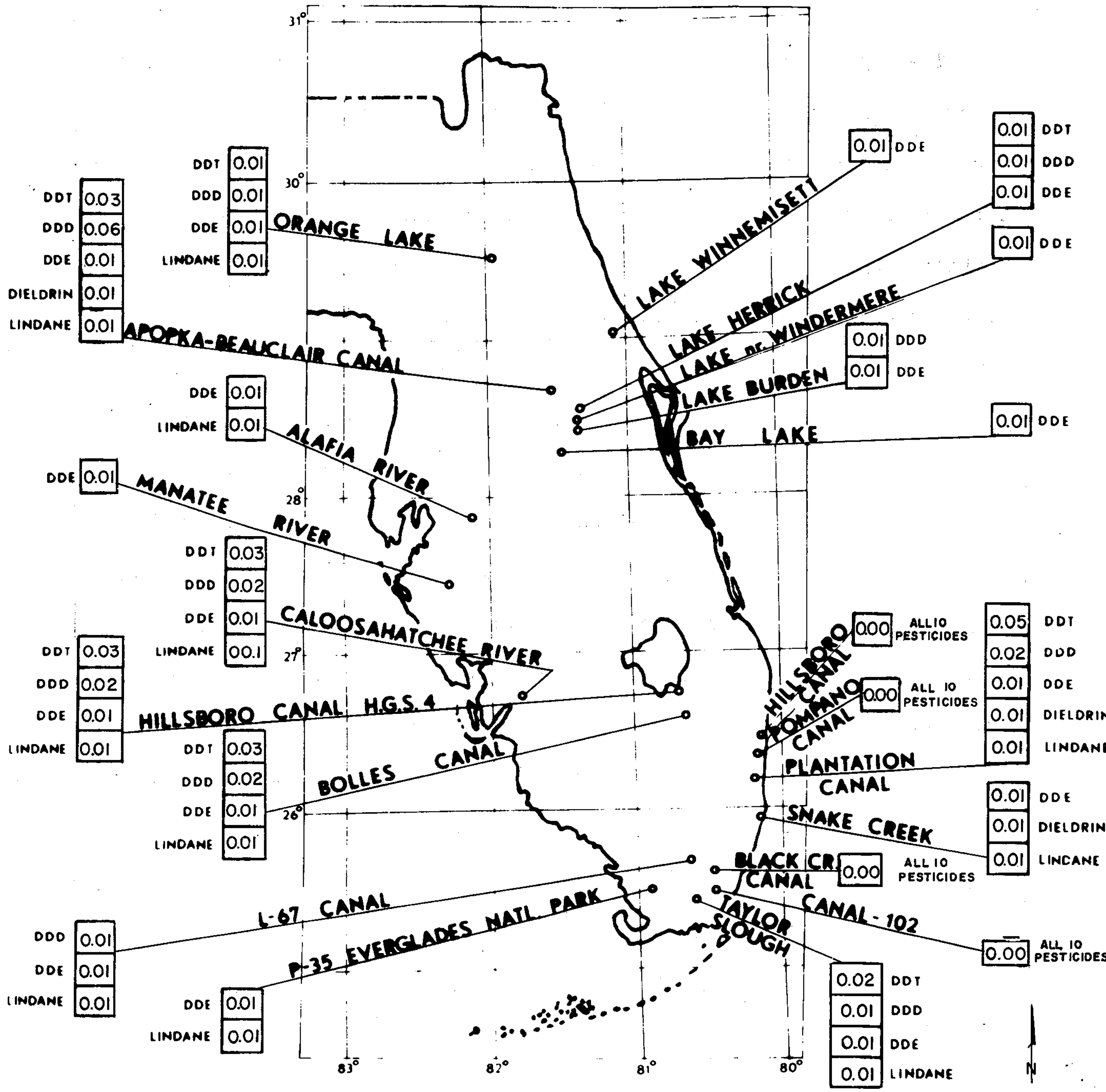

EXPLANATION

DDE 0.01 CONCENTRATION OF INDICATED PESTICIDE, MICROGRAMS PER LITER

∘ PESTICIDE SAMPLING SITE

0 — 50 MILES

*Analyses were made to detect the following 10 chlorinated hydrocarbons at each sampling station: ALDRIN, DDT, DDD, DDE, DIELDRIN, ENDRIN, HEPTACHLOR, HEPTACHLOR EPOXIDE, and LINDANE.

Figure 19.--Common chlorinated hydrocarbon pesticides detected in surface waters of Florida during December 1966 and January 1967.

Sediments in Shark River Slough and in the nearby L-67A canal were found to have concentrations of the DDT family in an order of magnitude of 1,000 times greater than in the overlying water above them (fig. 20).

Figures 20 and 21. Belong near here. Captions on next page.

From the low concentrations in water, algal mats and macroscopic plants also, are able to concentrate the DDT congeners in their tissues to micrograms per kilogram levels. Moquitofish, carnivores that are a few trophic levels higher, had average tissue levels of 700 μg/kg.

Raptorial birds, such as the Everglade kite, concentrate these toxins to even higher levels.

Work is continuing at nine sites in the Park and other locations in south Florida (fig. 21) to determine: (1) the sources and distribution of pesticides, (2) details on seasonal and long-term fluctuations in biological magnification of pesticides, and (3) the long-term chronic and mortality effects that pesticides have or will have on organisms in the park.

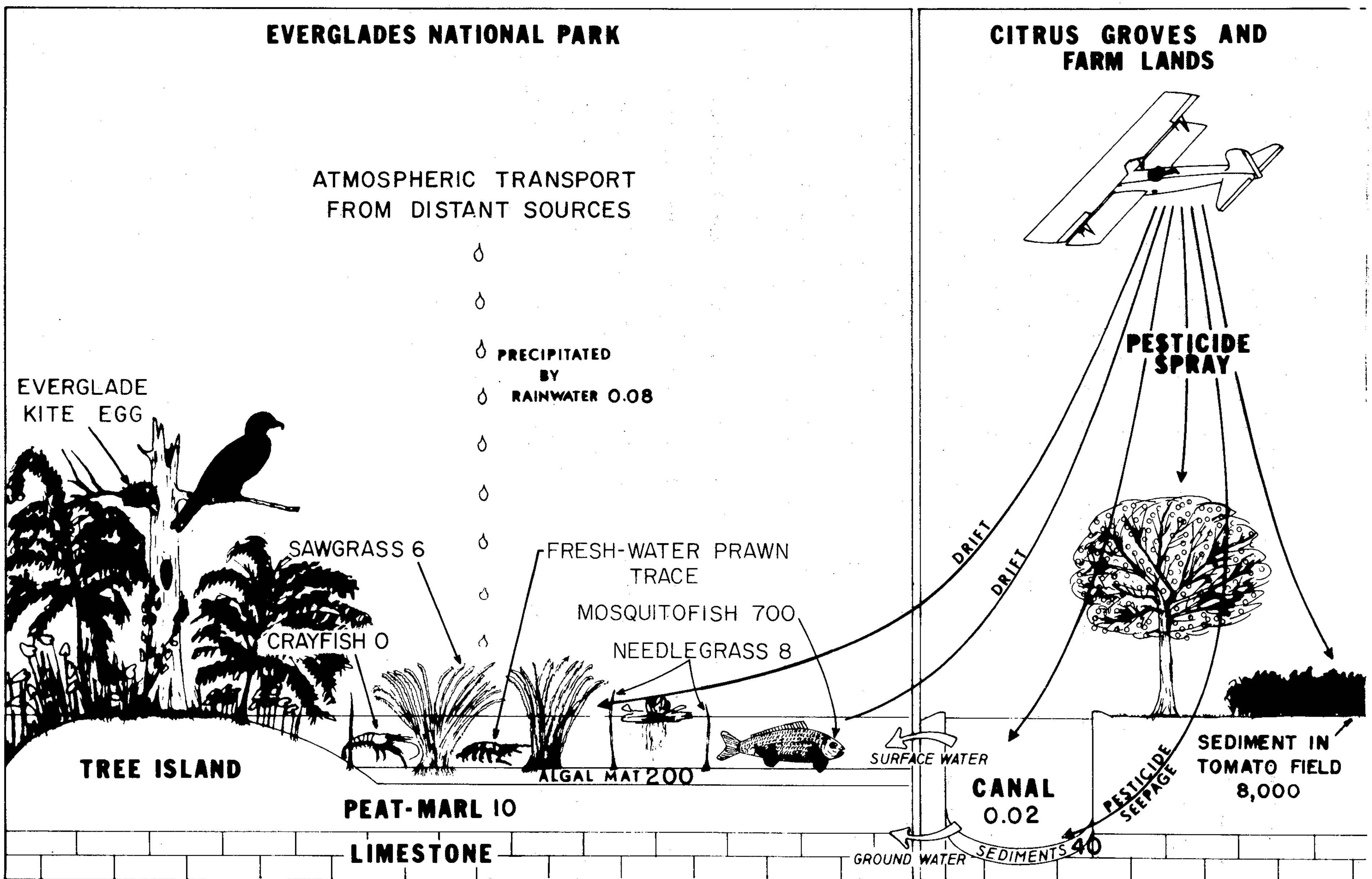

Figure 20 --Sources, occurrences and biological magnification of DDT+DDD+DDE residues in aquatic communities in and near Everglades National Park. The values obtained are from a few samples and are not necessarily average; residues in tissues and in sediments are expressed as micrograms per kilogram and those in water in micrograms per liter.

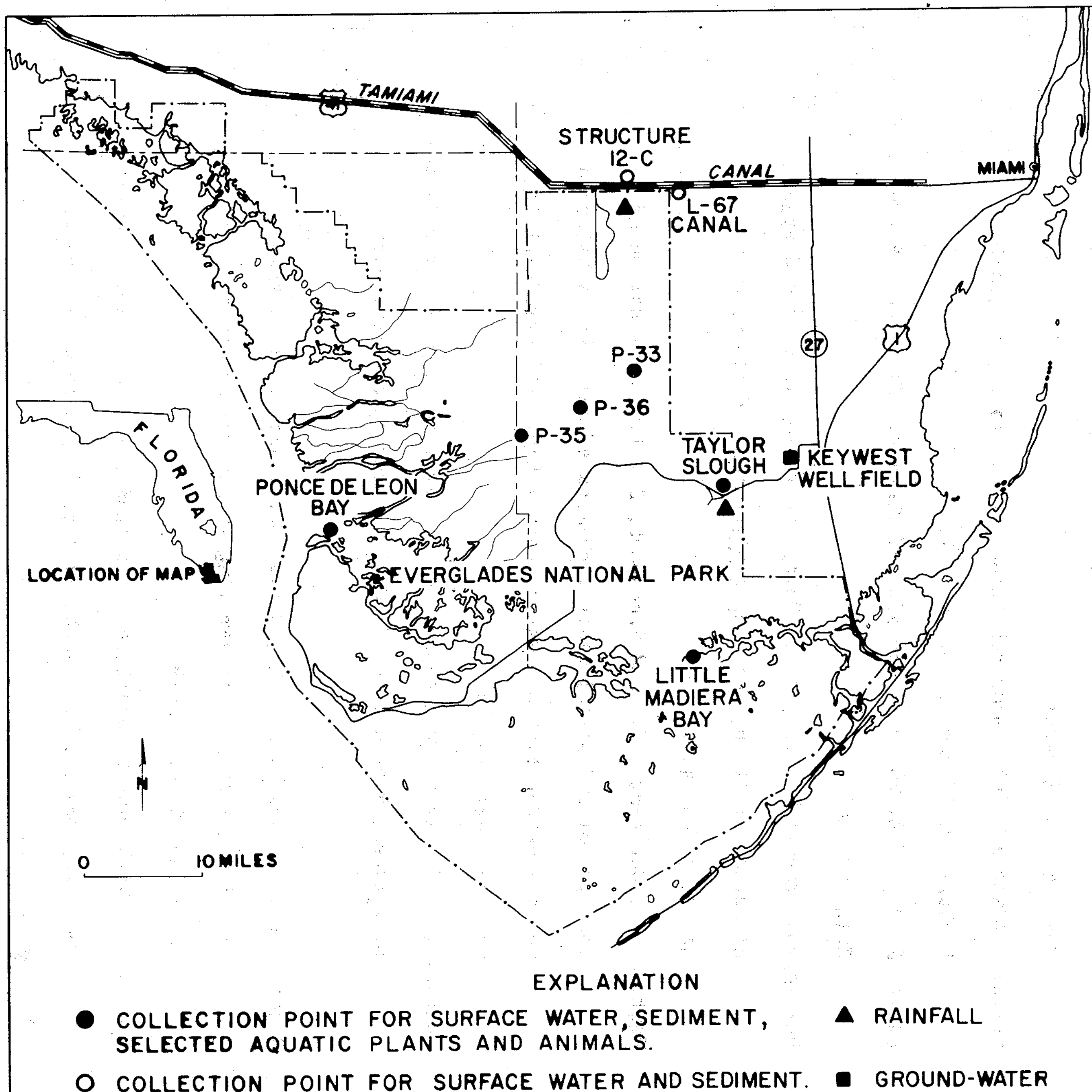

Figure 21.--Sampling sites for pesticide residues in aquatic communities of south Florida.

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APPENDIX

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA

Chemical analyses, in milligrams per liter

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2888. TAMIAMI CANAL OUTLETS MONROE TO CARNESTOWN, FLA. (BRIDGE 84)																					
May 16, 1966...	7.0	7.0		74	6.0	18	0.2	266	0.4	26	0.1	0.1	0.04		271	229	11	510	8.1	10	
May 15, 1967...		2.7	0.01	508	1555	12800	470	201	3110	23300	1.5	3.4	.02		41900	7650	7490	60200	7.3	30	
1-2888.02. TAMIAMI CANAL AT BRIDGE 77, NEAR CARNESTOWN, FLA.																					
May 15, 1967...		4.5	0.02	470	1390	11700	440	233	2890	21000	1.5	4.4	0.16		38000	6900	6710	56500	7.6	36	
2-2888.04. TAMIAMI CANAL (AT BRIDGE 86), NEAR OCHOPEE, FLA.																					
Aug. 30, 1961A.		3.8	0.05	46	2.7	4.2	0.3	145	3.2	8.0	0.0	0.3	0.00	154	140	126	7	247	7.5	30	
Sept. 14B......		3.2	.05	54	1.8	4.7	.2	165	2.4	9.0	.0	.5	.00	176	157	142	7	279	7.5	40	
Oct. 13........		4.2	.00	71	.7	6.0	.6	216	.0	10	.2	.3	.00	206	199	180	3	292	8.0	15	
Nov. 10........		2.8	.01	65	1.9	6.7	.5	202	.0	11	.2	.4	.01	186	189	170	4	343	7.8	15	
Dec. 15........		2.6	.04	59	2.7	7.0	.4	186	.4	12	.2	1.3	.02	178	178	158	6	324	8.1	15	
Jan. 12, 1962..		3.0	.01	74	1.3	15	1.3	217	.4	16	.1	11	.49	228	230	190	12	411	7.5	12	
Feb. 15........		.8	.00	58	2.3	7.8	.4	182	.0	12	.2	.8	.04	172	172	154	5	314	8.2	15	
Mar. 14........		1.9	.00	64	3.0	7.7	.3	204	.0	13	.3	.2	.13	192	191	172	5	349	8.0	7	
Apr. 18........		2.4	.02	38	1.7	7.7	.1	122	.0	12	.3	.1	.04	134	122	102	2	228	7.3	10	
May 15.........		15	.01	75	4.1	2.6	2.9	226	5.2	20	.3	.0	.02	272	236	204	19	445	7.3	20	
June 15........		3.9	.00	92	2.6	7.2	.8	267	8.8	12	.1	2.6	.32	276	262	240	21	462	7.4	15	
July 13........		2.2	.05	70	1.3	7.8	.8	216	2.4	14	.1	.1	.00	216	205	180	3	363	7.1	60	
Aug. 16........		2.2	.03	53	3.4	6.5	.6	168	.8	7.0	.0	.0	--	182	157	146	3	284	7.6	45	
Aug. 22........		--	--	--	--	77	2.1	226	--	--	--	--	--	--	--	240	55	796	7.5	70	
Sept. 14.......		2.2	.03	54	4.7	6.2	.3	168	.8	9.0	.0	.0	--	168	160	154	16	277	7.7	30	
Jan. 15, 1963..		.1	.00	54	13	7.2	.1	216	.0	12	.0	.3	--	206	193	186	9	351	8.1	20	
Feb. 14, 1966..		.0	.00	79	8.2	23	.9	270	12	34	.3	.1	--	--	291	230	9	510	8.0	20	
Mar. 30........		5.9	--	91	8.6	21	--	313	3.6	31	--	.1	--	--	--	--	--	80	8.1	10	
July 28........		5.3	.03	47	1.8	4.8	.2	148	.0	9.0	.2	.4	--	--	142	125	4	252	7.2	40	
Aug. 15........		3.5	.03	55	1.9	5.5	.2	172	.4	9.0	.2	.5	--	--	161	145	4	295	7.2	40	
Nov. 16........		1.1	.01	62	1.9	7.7	1.0	198	.0	14	.1	.3	--	194	186	162	0	342	7.8	20	
Mar. 15, 1967..		1.6	.01	41	1.6	6.4	.3	129	.0	11	.1	.4	--	141	126	109	4	242	7.3	10	
Aug. 15........		8.7	.03	54	2.0	5.6	.3	168	.0	9.0	.1	.8	--	174	164	142	5	286	7.2	50	
2-2889. TAMIAMI CANAL AT BRIDGE 105, NEAR MIAMI, FLA.																					
May 15, 1967...		22	0.03	110	6.2	20	13	344	0.4	28	0.2	42	4.1	419	415	300	18	740	7.3	50	

A Hydrogen sulfide (H_2S) 1.6.
B Hydrogen sulfide (H_2S) 2.1.

Analyses by U. S. Geological Survey

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligramsper liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2889.06. TAMIAMI CANAL AT 40-MILE BEND, NEAR MIAMI, FLA.																					
May 15, 1967...		3.4	0.01	58	4.1	19	0.7	196	0.4	32	0.3	1.0	0.04	250	216	162	2	405	7.2	10	
2-2890.3. TAMIAMI CANAL ABOVE S-12B, NEAR MIAMI, FLA.																					
Jan. 8, 1965...		3.5	0.01	46	1.7	13	0.8	142	0.8	22	0.0	0.5		158	--	122	6	310	7.7	20	
Apr. 30........		9.8	.00	63	14	48	1.5	210	12	84	.5	.2		336	--	216	44	623	7.8	40	
May 15, 1967...		4.1	.01	60	12	48	1.8	232	12	73	.4	.8	0.01	367	327	200	10	600	7.4	35	
Sept. 30.......		7.0	.01	38	2.6	9.6	.6	123	.4	16	.1	.6		160	136	106	4	243	7.2	25	
2-2890.6. TAMIAMI CANAL AT BRIDGE 45, NEAR MIAMI, FLA.																					
Oct. 20, 1955..	75.2	4.8	0.00	41	2.8	C4.1	--	126	1.0	13	--	0.1	--	--	129	114	11	236	7.8	60	
Nov. 16........	72.7	8.2	.06	51	2.6	C6.4	--	153	.5	18	0.2	.0	--	--	162	138	13	293	7.5	65	
Dec. 20........	69.9	1.9	.00	64	3.5	C6.4	--	192	1.0	21	--	.1	--	--	193	174	17	359	8.0	65	
Feb. 15, 1956..	65.3	51	.02	72	5.9	C8.8	--	220	5.0	26	--	1.2	--	--	278	204	24	425	7.5	50	
Mar. 29........	48.8	4.3	.01	120	6.9	C7.8	--	368	5.0	24	--	5.4	--	--	354	328	26	635	7.6	65	
May 15.........	50.6	19	.03	99	1.7	C22	--	320	5.0	23	--	1.6	--	--	329	254	0	545	8.1	60	
June 13........	42.6	.6	.02	82	7.2	C8.5	--	260	4.0	25	--	.7	--	--	256	234	21	473	7.9	55	
Aug. 15........	51.2	5.4	.03	87	3.6	C16	--	260	22	22	--	.1	--	--	284	232	19	463	8.3	90	
Oct. 31........	--	7.3	.60	49	2.3	C10	--	156	5.0	15	--	.4	--	--	167	132	4	283	7.5	200	
Dec. 18........	66.6	1.7	.02	65	2.9	C11	--	197	4.5	22	.3	.2	--	--	205	174	12	375	7.7	65	
Feb. 13, 1957..	56.4	4.9	.01	106	5.2	C15	--	336	5.0	26	.2	2.2	--	--	331	286	10	577	8.3	50	
Mar. 27........	57.6	16	.02	98	4.3	C19	--	305	14	27	.2	.0	--	--	329	262	12	533	7.9	28	
May 16.........	69.4	2.7	.04	47	3.0	C8.3	--	150	5.0	13	.2	1.0	--	--	154	130	7	281	7.6	55	
June 21........	66.0	2.4	.07	62	3.3	C9.9	--	194	7.5	16	--	.2	--	--	197	168	9	337	7.1	55	
July 18........	66.7	6.2	.02	54	2.3	C8.5	--	166	6.5	13	--	1.0	--	--	174	144	8	302	7.2	55	
Aug. 29........	70.9	7.2	.02	48	2.7	C8.0	--	154	5.0	12	.2	.1	--	--	159	131	5	274	7.5	50	
Oct. 9.........	82.2	5.9	.02	48	2.7	C5.5	--	148	1.0	14	.1	.4	--	--	151	131	10	277	7.6	50	
Nov. 14........	82.9	2.5	.01	40	3.4	C5.5	--	132	4.0	10	--	.1	--	--	131	114	6	244	7.7	65	
Jan. 15, 1958..	80.9	.8	.02	34	5.1	C7.4	--	122	5.0	12	--	.2	--	--	125	106	6	232	7.7	60	
Mar. 5.........	83.0	1.8	.01	36	2.4	C9.7	--	116	3.0	16	--	.6	--	--	127	100	5	222	7.6	50	
Apr. 30........	77.8	4.5	.02	43	3.0	C8.5	--	132	5.0	18	--	.0	--	--	147	120	12	263	7.4	45	
May 28.........	84.4	7.1	.01	34	.2	C9.0	--	102	4.5	12	--	.7	--	--	118	86	2	199	7.7	40	
July 17........	82.6	19	.02	32	1.2	C9.9	--	108	4.0	10	--	.1	--	--	129	85	0	195	7.9	40	
Oct. 31........	75.6	7.1	.02	44	1.5	9.4	0.2	137	10	14	--	.1	--	--	153	116	4	264	7.7	35	

C Calculated Na plus K, reported as Na.

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2890.6. TAMIAMI CANAL AT BRIDGE 45, NEAR MIAMI, FLA.--Continued																					
Nov. 26, 1958	73.8	4.5	0.02	48	2.4	10	0.6	152	5.6	18	--	0.0	--	--	164	130	6	294	7.9	28	
Dec. 31	--	4.3	.01	57	2.4	11	.4	178	7.6	18	--	.2	--	--	189	152	6	334	7.9	30	
Feb. 13, 1959	69.5	4.7	.02	60	3.5	14	.7	192	4.0	22	0.3	2.2	--	234	206	164	6	372	8.0	40	
Feb. 26	67.3	4.5	.01	70	2.8	14	1.0	210	5.6	25	.6	2.9	--	271	229	186	14	403	8.1	45	
Mar. 16	65.9	.7	.01	70	3.3	14	.6	222	3.2	24	.4	.0	--	274	225	188	6	412	8.0	35	
Mar. 30	68.5	2.4	.01	58	1.3	12	.6	178	4.0	21	.4	1.2	--	212	189	150	4	338	7.9	30	
Apr. 29	64.6	3.9	.07	7.1	2.2	14	.8	216	4.8	24	.0	.9	--	269	228	186	9	408	7.8	45	
May 29	67.7	5.1	.01	34	.7	5.7	.7	105	2.8	7.0	.1	.1	--	129	108	88	2	198	7.6	40	
June 16	66.0	8.1	.01	51	2.2	8.6	.4	162	3.2	11	.2	.1	--	170	165	136	3	289	7.9	50	
July 15	80.6	6.9	.07	38	1.7	5.0	.0	117	4.0	9.5	.0	.0	--	149	123	102	6	218	8.0	40	
July 30	84.0	6.3	.01	38	1.2	5.5	.4	120	2.4	6.0	.2	.0	--	146	119	100	2	211	7.7	45	
Sept. 1	86.6	7.0	.01	30	1.7	4.8	.6	100	2.8	6.0	.2	.0	--	130	102	82	0	181	7.5	45	
Sept. 30	88.7	3.9	.02	27	1.1	4.8	.4	86	2.4	6.0	.2	.0	--	115	88	72	2	162	7.7	45	
Oct. 29	91.6	2.0	.02	23	1.6	4.4	.0	74	1.6	8.5	.1	.0	--	96	77	64	4	147	7.7	30	
Nov. 12	90.2	3.3	.02	25	1.1	4.6	.3	76	2.4	6.0	.1	.1	--	105	80	67	4	148	7.4	45	
Dec. 30	87.8	7.6	.02	26	1.9	6.2	.3	86	2.8	8.0	.2	.5	--	119	96	73	2	169	7.7	40	
Jan. 12, 1960	85.5	.8	.02	27	2.6	6.6	.3	94	2.4	8.0	.1	.0	--	105	94	78	1	179	7.4	40	
Feb. 11	91.2	1.4	.01	34	1.7	7.6	.4	108	2.8	10	.2	.0	--	141	111	92	4	208	7.6	40	
Mar. 14	76.4	2.5	.02	40	2.9	8.4	.4	132	2.4	10	.2	.0	--	166	132	112	4	244	7.3	40	
Apr. 28	73.4	.6	.01	37	1.3	8.2	.6	116	.4	14	.1	.5	--	141	120	98	3	226	7.4	18	
June 16	70.6	5.6	.02	48	1.5	9.7	.4	147	.8	16	.2	.2	--	185	154	126	6	280	7.4	20	
June 29	72.8	4.8	.02	41	1.6	7.7	.4	121	3.2	12	.2	3.4	--	159	134	109	10	239	7.5	25	
July 15	73.2	9.8	.01	42	1.9	7.6	.4	128	2.4	13	.2	.1	--	161	140	113	8	242	7.3	22	
Aug. 17	73.8	7.2	.02	38	1.9	7.2	.3	118	1.2	13	.2	.1	--	147	127	103	6	225	7.3	25	
Sept. 19	86.0	4.9	.03	30	1.9	5.1	.3	97	2.0	9.0	.2	.1	--	111	102	83	4	182	6.8	22	
Oct. 31	95.0	2.5	.04	24	.5	8.2	.8	68	2.4	15	.2	.3	--	109	87	62	6	165	6.7	45	
Dec. 15	87.6	2.7	.04	26	1.7	7.8	.4	80	.8	13	.1	.0	--	119	92	72	6	164	7.3	25	
Jan. 16, 1961	84.0	.4	.03	28	1.2	7.5	.2	83	2.4	14	.1	.0	--	121	95	75	7	174	7.3	30	
Feb. 15	78.6	.7	.03	29	2.1	7.0	.6	93	.0	13	.1	.1	--	132	99	81	5	192	7.3	25	
Mar. 15	73.1	2.4	.04	39	2.6	15	.4	120	4.0	19	.1	1.0	--	166	143	108	10	247	7.8	30	
Apr. 14	67.2	3.7	.03	51	3.6	13	.8	154	4.8	22	.2	6.9	--	206	182	142	16	326	7.8	40	
May 17	60.4	5.0	.24	78	3.3	13	.7	234	6.8	24	.3	.3	--	270	246	208	16	433	8.2	40	
May 17	60.4	5.8	.02	95	4.6	14	1.3	288	4.8	20	.1	16	--	332	304	256	20	529	7.7	45	
June 15	66.6	5.4	.06	50	2.7	11	1.2	156	4.4	21	.1	.8	--	210	172	136	8	305	7.3	45	
July 17	64.8	10	.04	57	2.4	11	.6	174	4.0	18	.2	.9	--	236	190	152	10	331	7.5	45	
Aug. 15	65.2	7.8	.06	81	2.9	16	.4	242	8.0	21	.1	.3	--	282	257	214	16	431	7.2	45	

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2890.6. TAMIAMI CANAL AT BRIDGE 45, NEAR MIAMI, FLA.--Continued																					
Sept. 14, 1961.	67.2	5.8	0.05	64	3.0	10	0.1	196	3.6	18	0.2	1.5	--	234	203	172	12	357	7.7	55	
Oct. 13........	67.5	11	.02	62	4.3	13	.6	196	5.6	21	.2	.0	--	224	215	172	12	371	7.6	45	
Nov. 15........	63.2	5.7	.04	102	4.7	11	.5	300	5.6	20	--	3.2	--	--	301	274	28	524	7.7	55	
Dec. 15........	53.0	8.6	.03	94	12.	13	.6	340	4.4	20	.2	3.5	--	306	323	284	6	565	8.2	50	
Jan. 16, 1962..	45.8	6.7	.01	86	6.2	15	.8	270	5.6	22	.2	3.7	0.01	286	279	240	18	480	8.0	45	
Feb. 15........	36.7	6.5	.05	124	5.5	15	.5	388	3.6	22	.4	4.0	.08	400	373	332	14	636	8.0	45	
Mar. 14........	37.6	7.4	.00	101	6.8	3.2	.4	320	4.0	22	.5	2.0	.08	366	305	280	18	545	8.1	50	
Mar. 29........	38.2	6.6	.02	117	5.8	3.3	.3	368	4.4	22	.5	3.0	.00	410	344	316	14	617	7.9	45	
Apr. 16........	30.5	6.5	.02	112	7.4	18	.8	352	4.0	24	.2	5.9	--	358	352	310	22	605	8.0	45	
Apr. 16........	30.5	6.4	.01	114	6.7	3.3	.5	356	5.2	24	.5	4.2	.13	400	340	312	20	--	--	--	
May 15.........	37.6	6.6	.08	133	4.9	17	1.1	402	6.0	24	.5	11	.10	460	402	352	22	689	7.7	45	
June 15........	55.2	6.9	.01	102	8.6	15	.9	328	4.8	22	.2	7.2	--	334	330	290	21	569	7.7	40	
July 13........	62.4	5.1	.03	88	4.0	15	1.3	208	53	20	.3	1.2	.18	361	290	236	66	494	7.4	85	
July 13........	62.4	5.7	.06	92	6.0	15	1.6	206	66	22	.3	2.4	--	394	312	254	85	506	7.2	80	
Aug. 16........	65.1	4.8	.03	82	4.3	15	.8	240	11	20	.3	1.6	.09	314	258	222	26	456	7.6	75	
Sept. 14.......	64.6	4.5	.04	64	1.6	12	1.1	196	.4	19	.2	.8	--	236	201	166	6	343	7.6	50	
Oct. 15........	66.9	5.7	.05	98	6.2	12	.5	300	5.2	18	.2	3.1	--	340	297	270	24	488	7.5	60	
Dec. 14........	67.1	3.9	.12	94	1.8	13	.2	278	4.4	24	.3	.5	--	328	279	242	14	485	7.7	80	
Dec. 15........	67.6	4.0	.08	90	4.3	11	.2	270	5.2	20	.3	2.8	--	322	271	242	20	468	7.7	80	
Jan. 30, 1963..	66.2	2.8	.34	88	4.0	17	.2	264	5.2	23	.1	1.1	--	314	272	236	20	455	8.0	70	
Apr. 2.........	21.8	3.2	.02	94	2.3	16	.3	268	5.6	24	.3	2.3	--	348	280	244	24	502	8.0	60	
July 15........	57.0	4.8	.03	93	4.4	18	.1	277	17	28	.4	2.4	--	354	304	250	23	511	7.5	50	
Sept. 14.......	64.0	6.1	.02	82	4.3	3.5	.8	252	9.2	19	.3	2.1	--	298	251	222	16	442	7.5	80	
Jan. 8, 1965...	--	5.4	.03	78	3.3	9.4	.4	260	.0	24	.0	.0	--	--	249	208	0	431	7.7	45	
2-2908. TAYLOR SLOUGH (AT BRIDGE), NEAR HOMESTEAD, FLA.																					
Dec. 14, 1960..	--	2.9	0.00	51	0.7	9.2	0.4	156	0.0	15	0.2	0.3	0.02	162	157	130	2	300	7.6	5	
Jan. 13, 1961..	--	1.6	.00	47	2.1	9.1	.6	148	.4	14	.2	.2	.00	155	148	126	4	278	7.6	8	
Apr. 18........	--	.3	.02	75	1.2	18	11	149	15	31	.7	74	--	356	300	192	70	487	7.2	20	
June 23........	--	7.5	.00	55	.7	11	.4	166	1.2	16	.3	.2	--	180	174	140	4	315	8.0	10	
July 25........	--	5.6	.00	43	1.1	10	.2	131	.0	18	.2	.7	.03	142	144	112	4	270	7.7	5	
Aug. 28D.......	--	6.1	.02	69	.5	12	.9	209	7.6	17	.1	4.9	.00	230	221	174	2	387	7.6	10	

D Hydrogen sulfide (H_2S) 0.8.

Table 8. **MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued**

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908. TAYLOR SLOUGH (AT BRIDGE), NEAR HOMESTEAD, FLA.--Continued																					
Oct. 28, 1961	--	3.7	0.00	69	1.0	8.8	0.4	210	0.2	15	0.2	0.2	0.25	208	202	176	4	372	7.8	5	
Nov. 27	--	.0	.01	80	4.0	12	1.3	256	.0	18	.4	.3	.06	240	242	216	6	444	7.4	7	
Jan. 30, 1962	--	15	.00	78	5.0	19	5.3	246	1.2	29	.2	5.0	.02	274	279	215	14	480	8.1	15	
Feb. 21	--	38	.50	101	5.4	20	8.6	310	13	31	.4	2.7	.12	384	374	274	20	595	7.4	25	
Mar. 30	--	.2	.01	62	4.7	19	4.6	120	62	37	.4	.8	.04	284	250	174	76	431	7.6	45	
Apr. 18	--	.3	.06	76	6.0	22	4.1	194	38	47	.5	.7	.05	338	291	214	55	563	7.6	45	
May 8		2.7	.05	88	6.4	26	6.4	246	28	54	.6	1.3	.00	420	334	246	44	584	7.5	55	
June 22	156	8.8	.03	62	3.8	8.6	1.1	178	14	15	.2	.7	.01	224	202	170	24	350	7.6	50	
July 10	138	6.9	.02	54	3.3	9.5	.8	172	3.2	16	.2	.4	.00	184	179	148	7	316	7.4	35	
July 28	72	6.6	.03	38	2.7	7.1	.4	128	.4	10	.1	.2	.02	138	129	106	1	232	7.3	15	
Aug. 24	125	4.5	.02	44	2.4	8.5	.7	146	.4	12	.1	.0	.03	160	145	120	0	270	7.2	30	
Sept. 18	43	3.4	.01	42	3.6	7.9	.4	132	.0	12	.0	.0	--	140	134	120	12	235	7.6	5	
Jan. 4, 1963	--	.1	.01	42	15	8.8	.4	200	.0	16	.0	.8	--	188	182	166	2	337	8.1	15	
May 13, 1966	0	3.5	.03	74	3.1	8.8	.9	232	3.2	16	.2	.8	.01	--	225	198	8	400	7.8	25	
May 25	0	7.2	.02	67	3.1	8.6	.8	222	.2	14	.2	1.0	.00	--	151	180	0	394	7.8	20	
July 12	--	4.3	.02	44	1.8	5.5	.4	142	.0	9.0	.2	.3	--	--	136	118	1	252	7.3	50	
July 29	--	5.1	.02	47	1.9	5.5	.4	152	.0	9.0	.2	.3	--	--	144	126	1	268	7.0	40	
Sept. 12	--	2.3	.01	43	2.4	7.4	.3	146	.0	10	.1	.3	--	--	138	118	0	275	7.6	10	
Nov. 17	--	1.1	.01	58	3.0	9.0	.4	190	.0	15	.1	.7	.00	190	181	157	2	335	7.5	5	
Dec. 15	--	4.0	.01	66	2.8	7.9	.3	216	.0	14	.2	.1	--	207	201	176	0	370	7.7	5	
Jan. 17, 1967	--	3.8	.00	67	2.8	9.4	1.0	204	.8	17	.1	5.4	.20	225	208	179	12	382	7.0	10	
June 16	--	4.4	.01	54	2.0	5.9	.3	146	10	11	.2	13	--	201	173	142	23	308	7.7	10	
July 18	--	6.2	.02	44	2.6	11	.6	150	.0	16	.2	.3	--	171	155	120	0	285	7.6	20	
Sept. 14	--	4.1	.19	63	--	8.5	.4	208	.4	15	.1	.5	--	202	197	170	0	359	7.8	40	
2-2908.1. EVERGLADES STATION P-37 NEAR HOMESTEAD, FLA.																					
Jan. 8, 1960		2.6	0.00	53	3.4	25	1.2	166	0.4	44	0.1	0.2	--	229	212	146	10	405	7.6	5	
Mar. 24		3.5	.01	90	8.6	74	1.5	242	2.8	136	.2	10	--	506	446	260	62	822	7.5	10	
Aug. 10F		1.8	.05	28	2.9	18	1.1	92	.0	30	.3	.8	--	134	128	82	6	243	7.2	10	
Oct. 6G		1.7	.05	37	1.8	8.8	.4	114	.4	16	.2	.0	--	128	122	100	6	233	7.2	8	
Dec. 20H		2.4	.00	63	6.6	20	.7	200	.4	38	.2	.0	0.01	249	230	184	20	432	7.4	7	
Feb. 23, 1961H		3.9	.06	89	3.4	47	.8	262	3.2	90	.2	.0	.00	401	367	236	22	690	7.4	30	

E Hydrogen sulfide (H_2S) 0.4.
F Hydrogen sulfide (H_2S) 0.3.
G Hydrogen sulfide (H_2S) 0.6.

H Hydrogen sulfide (H_2S) 0.9.

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908.1. EVERGLADES STATION P-37 NEAR HOMESTEAD, FLA.--Continued																					
May 25, 1961		11	0.00	123	2.8	73	2.4	356	3.6	158	0.2	0.3	0.03	606	549	318	26	1000	7.9	10	
July 25I		4.0	.04	98	2.3	54	1.4	280	7.2	93	.1	11	.00	382	409	254	24	749	7.6	10	
Oct. 12J		2.5	.07	59	6.1	57	1.3	180	.0	103	.3	.3	.02	342	319	172	24	605	8.2	10	
Jan. 11, 1962		.9	.01	82	8.6	95	2.9	212	10	165	.2	9.6	.00	556	478	240	66	875	7.8	25	
Mar. 28		6.3	.06	122	3.8	52	.7	354	6.0	95	.3	5.0	.06	508	465	320	30	841	7.8	7	
June 18		3.7	.02	60	5.0	27	1.8	132	26.	42	.2	30	.00	332	261	170	62	453	7.2	85	
Mar. 4, 1964		2.0	.01	77	6.8	67	1.1	212	6.4	122	.2	3.7	--	--	390	220	46	746	7.5	10	
Sept. 17		3.7	.00	43	5.0	24	1.4	144	.0	38	.2	.0	.02	--	186	128	10	330	7.1	5	
Feb. 16, 1965		.0	.01	86	3.3	68	2.0	236	.0	124	.3	6.6	--	406	--	228	34	730	7.3	10	
Jan. 6, 1966		1.3	.01	71	4.6	45	1.0	216	6.0	81	.1	.4	.03	332	316	197	20	640	7.4	5	
May 25		3.4	.01	36	2.8	19	.6	118	9.6	29	.2	.8	.00	--	159	102	5	295	7.8	10	
July 12		2.4	.02	30	2.2	8.0	.3	97	0	16	.1	.1	--	--	107	84	4	215	7.6	5	
Aug. 22		3.2	.01	35	2.8	11	.6	112	.0	22	.1	.1	--	--	130	99	7	260	7.8	10	
Aug. 30, 1967		2.7	.27	4.8	4.5	33	.8	156	.8	61	.1	.2	.03	245	229	140	12	465	7.6	15	8.4
2-2908.12. ALLIGATOR HOLE AT COTTONMOUTH CAMP, NEAR HOMESTEAD, FLA.																					
Mar. 5, 1965		2.6	0.44	56	3.6	15	0.4	180	2.0	24	0.2	1.0	0.08	--	244	154	7	325	7.6	50	--
Dec. 22		1.4	.03	57	3.2	15	.6	184	.4	26	.2	.7	.00	262	196	156	4	392	7.3	50	--
June 16, 1966K		2.4	.78	44	4.0	28	.7	152	.4	43	.3	.7	.01	--	199	127	2	365	7.3	50	1.0
June 22		--	--	--	--	--	--	--	--	36	--	.9	.01	--	--		--	356	--	--	--
June 22		--	--	--	--	--	--	--	--	36	--	.9	.04	--	--	--	--	341	--	--	--
June 23		--	--	--	--	--	--	--	--	37	--	1.0	.00	--	--	--	--	345	--	--	--
July 21		--	--	--	--	--	--	--	--	21	--	1.2	.00	--	--	--	--	283	--	--	--
July 21		--	--	--	--	--	--	--	--	21	--	.1	.00	--	--	--	--	288	--	--	--
Oct. 20		--	--	--	--	--	--	--	--	31	--	.5	.04	--	--	--	--	325	--	--	--
Nov. 21		--	--	--	--	--	--	--	--	33	--	.4	.02	--	--	--	--	332	--	--	--
Dec. 27		--	--	--	--	--	--	--	--	61	--	.6	.30	--	--	--	--	469	--	--	--
Jan. 26, 1967		--	--	--	--	--	--	--	--	61	--	5.0	.06	--	--	--	--	470	--	--	--
Feb. 21		.2	.82	45	7.2	39	1.2	168	.4	63	.3	1.3	.04	293	241	142	5	462	7.3	40	--
Mar. 22		--	--	--	--	--	--	--	--	58	--	.6	35	--	--	--	--	460	--	--	--
Mar. 22		--	--	--	--	--	--	--	--	64	--	.7	23	--	--	--	--	480	--	--	--
May 26		--	--	--	--	--	--	--	--	118	--	1.3	.00	--	--	--	--	728	--	--	--
Sept. 12		8.0	.04	48	5.8	36	.6	174	.4	58	.3	.7	.01	260	244	144	2	442	7.2	50	6.0

I Hydrogen sulfide (H_2S) 1.0.
J Hydrogen sulfide (H_2S) 0.0.
K Nickel 0.00; Copper 0.00; Lead 0.01; Zinc 0.00; Arsenic 0.02; Bromide 1.2; Iodide 1.8; Ammonium 0.3

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908.13. OPEN EVERGLADES NEAR COTTONMOUTH CAMP, NEAR HOMESTEAD, FLA.																					
Dec. 22, 1965..		1.8	0.03	58	3.2	15	0.5	182	0.4	26	0.1	0.8	0.00	246	196	158	9	385	7.3	50	
June 22........		--	--	--	--	--	--	--	--	36	--	1.1	.01	--	--	--	--	345	--	--	
July 21........		--	--	--	--	--	--	--	--	21	--	1.6	.00	--	--	--	--	286	--	--	
July 21........		--	--	--	--	--	--	--	--	21	--	1.0	.00	--	--	--	--	286	--	--	
Oct. 20........		--	--	--	--	--	--	--	--	30	--	.5	.02	--	--	--	--	318	--	--	
Dec. 21........		--	--	--	--	--	--	--	--	33	--	.5	.16	--	--	--	--	330	--	--	
Dec. 27........		--	--	--	--	--	--	--	--	58	--	.7	.06	--	--	--	--	450	--	--	
Jan. 26, 1967..		--	--	--	--	--	--	--	--	61	--	1.1	.08	--	--	--	--	460	--	--	
Feb. 21........		.3	.87	47	7.5	39	1.2	166	.4	63	.3	1.3	.10	290	243	149	13	458	7.3	40	
Sept. 12.......		8.0	.04	51	5.9	35	.6	176	.8	57	.3	.9	.01	255	247	152	8	445	7.0	50	9.0
2-2908.15. EVERGLADES STATION P-33 NEAR HOMESTEAD, FLA.																					
Dec. 24, 1959..		1.3	0.05	44	1.1	0.6	0.0	137	0.4	9.5	0.1	0.4	0.00	149	129	114	2	243	7.6	20	
Apr. 7, 1960...		.4	.03	58	1.8	10	.0	176	.8	18	.3	.4	--	198	129	152	8	318	7.5	23	
July 28........		2.6	.02	53	.5	7.3	.0	160	.4	11	.2	.2	--	168	154	134	3	280	7.1	12	
Sept. 22.......		4.2	.05	47	.6	5.1	.1	142	.4	8.0	.2	.3	--	151	136	120	4	243	7.2	18	
Dec. 19J.......		1.9	.00	37	1.3	6.3	.2	116	.8	10	.2	.2	.00	134	113	98	3	218	7.5	20	
Feb. 24, 1961L.		1.8	.10	48	3.9	9.5	.2	150	3.2	17	.2	.0	.10	189	158	136	13	283	7.3	46	
May 26J........		4.9	.01	44	2.9	12	.6	137	.0	20	.1	.6	.00	176	152	122	10	275	7.8	20	
Aug. 7.........		3.2	.00	50	.7	6.8	.6	148	.0	13	.2	1.1	.00	164	149	128	6	278	8.2	10	
Oct. 10M.......		2.9	.00	54	.9	7.2	.7	164	.0	13	.2	1.9	.04	202	162	138	4	--	8.2	10	
Feb. 14, 1962..		45	.11	140	9.8	37	6.1	300	--	50	.6	--	.05	544	437	390	141	1160	8.0	45	
Mar. 27........		6.1	.06	130	5.7	14	.5	394	9.2	22	.4	17	.04	446	399	348	25	687	7.4	35	
May 15.........		1.6	.01	83	4.1	18	.2	96	77	36	.5	30	.05	442	297	224	146	538	7.3	50	
Nov. 6N........		.4	.01	54	3.3	9.3	.6	166	1.2	15	.1	.0	--	188	166	148	12	296	7.6	25	
Jan. 8, 1963O..		.0	.00	43	6.9	15	.4	148	.0	23	.0	.2	--	230	166	136	8	295	8.4	40	
Mar. 15........		4.2	.01	75	6.6	26	6.4	162	13	45	.3	79	--	--	336	214	81	563	7.9	80	
July 29P.......		13	.07	67	6.1	20	.6	192	.8	34	.1	1.3	.24	300	245	92	34	400	7.2	100	
Sept. 17O......		6.3	.23	58	3.8	9.6	.7	174	.4	15	.2	.1	.06	216	180	160	26	291	7.5	85	
Feb. 24, 1965..		3.4	.02	51	1.2	9.4	.8	149	4.8	16	.2	.7	--	161	--	132	10	280	7.2	30	
Aug. 23, 1966..		4.6	.04	46	5.9	39	.4	156	5.6	65	.3	.0	--	--	244	140	12	472	7.8	40	
Aug. 31, 1967..		7.7	.51	38	7.0	28	1.2	156	.8	42	.3	1.3	.03	242	204	124	0	402	7.5	50	5.6

J Hydrogen sulfide (H_2S) 0.0.
L Hydrogen sulfide (H_2S) 6.8.
M Hydrogen sulfide (H_2S) 0.1.
N Hydrogen sulfide (H_2S) 0.5.
O Hydrogen sulfide (H_2S) 0.2.
P Hydrogen sulfide (H_2S) 1.5.

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2908.2. EVERGLADES P-38 NEAR HOMESTEAD, FLA.																					
Jan. 29, 1960..		1.9	0.05	74	2.3	25	1.1	216	0.4	46	0.3	2.8	0.00	283	260	194	17	489	7.6	12	
Mar. 24R.......		2.0	.01	74	1.8	34	.2	198	.8	67	.2	2.6	--	328	281	192	30	521	7.6	8	
July 29S.......		1.6	.01	43	2.1	19	.2	130	.4	34	.2	1.2	--	180	166	116	10	311	7.2	10	
Oct. 6F........		1.9	.03	39	2.1	13	.2	116	.8	24	.2	.1	--	156	138	106	11	259	7.1	10	
Dec. 19J.......		2.2	.00	58	5.2	21	.5	182	.8	38	.2	.0	.10	246	216	166	17	407	7.5	10	
Feb. 23, 1961T.		3.4	.04	56	5.0	32	1.3	162	.4	68	.2	.0	.00	312	246	160	27	477	7.4	18	
May 25.........		10	.00	110	2.3	46	2.4	244	17	98	.2	21	.50	500	434	284	72	770	8.4	5	
July 25G.......		2.5	.01	64	.6	26	1.0	182	1.6	47	.1	4.9	.00	263	238	162	13	441	7.7	7	
Oct. 12........		.6	.01	62	6.7	58	1.2	128	.0	140	.2	1.0	.01	421	333	182	77	659	8.1	15	
Jan. 11, 1962..		8.1	.00	130	8.6	78	2.4	306	4.4	175	.1	15	.02	592	573	360	109	1050	7.9	7	
Mar. 28........		2.2	.04	124	14	166	3.1	128	45	400	.2	1.9	.02	1152	819	367	262	1550	7.4	15	
June 19F.......		4.6	.02	48	1.2	18	.6	122	11	31	.2	.6	.00	206	175	125	25	323	7.3	45	
Nov. 27, 1963..		1.5	.03	70	2.3	13	.4	204	4.4	21	.3	.3	--	--	213	184	17	370	7.5	45	
Feb. 26, 1964..		3.6	.02	80	4.5	17	.7	236	5.6	29	.3	2.8	--	--	260	218	24	463	7.4	45	
Mar. 4.........		4.1	.01	104	8.6	88	1.7	200	4.4	214	.3	5.0	--	--	529	295	131	1000	7.2	15	
July 28........		4.8	.05	46	1.7	8.3	.9	136	.4	10	.3	2.5	--	--	142	122	10	260	7.1	70	
Sept. 17.......		2.3	.00	40	2.9	20	.6	120	.0	38	.2	.0	.05	--	163	112	14	308	7.5	5	
Jan. 6, 1966...		.9	.01	74	6.5	58	1.1	178	.0	142	.1	.6	.00	506	371	212	66	775	7.2	10	
May 25.........		3.4	.05	78	7.1	66	.8	178	.6	163	.1	.3	--	--	407	224	78	788	7.8	20	
Aug. 22........		3.5	.01	35	2.5	13	.3	106	.4	27	.1	.2	--	--	134	98	11	262	7.8	10	
Oct. 4.........		3.2	.11	46	4.3	21	.5	138	.4	42	.1	3.2	--	--	189	132	20	380	7.9	10	
Aug. 30, 1967..		3.1	.09	46	4.9	23	.4	116	.8	60	.5	.1	.04	205	196	136	40	365	7.6	10	5.0
2-2908.22. TARPON CREEK NEAR FLAMINGO, FLA.																					
Dec. 1, 1966...										4780								14600			
Mar. 1, 1967...										7600								23000			
2-2908.24. BUTTONWOOD CANAL AT FLAMINGO, FLA.																					
Mar. 1, 1967...										17900								49000			

F Hydrogen sulfide (H_2S) 0.3.
G Hydrogen sulfide (H_2S) 0.6.
J Hydrogen sulfide (H_2S) 0.0.
R Hydrogen sulfide (H_2S) 2.7.
S Hydrogen sulfide (H_2S) 1.4.
T Hydrogen sulfide (H_2S) 6.0.

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908.3. EVERGLADES STATION P-35 NEAR HOMESTEAD, FLA.																					
Jan. 22, 1960O		2.3	0.22	54	1.8	8.6	0.7	166	0.7	16	0.1	2.5	0.10	199	169	142	6	317	7.4	25	--
July 29U		4.8	.02	43	1.1	11	.2	132	.4	17	.2	1.5	--	161	144	112	4	261	7.3	18	--
Sept. 21P		3.2	.06	46	3.2	8.0	.4	144	.4	13	.2	.3	--	158	146	128	10	265	7.5	18	--
July 5, 1961V		4.1	.03	43	1.1	9.4	.6	131	.0	15	.1	.8	.00	148	139	112	4	258	7.4	20	--
Mar. 30, 1962		2.1	.05	298	258	2450	83	297	560	4400	.6	5.3	1.1	9190	8200	1800	1560	13300	7.3	80	--
Mar. 30		5.9	.01	272	240	2220	77	306	535	4020	.6	1.5	.01	8330	7520	1670	1410	12400	7.4	45	--
June 21		6.7	.03	64	8.6	52	2.5	160	42	81	.3	6.1	.03	424	342	195	64	609	7.5	90	--
July 9, 1964		3.5	.07	82	96	75	34	168	180	1560	.3	.0	--	3100	2910	600	462	4780	7.7	80	--
Sept. 4		4.3	.04	43	3.0	15	.9	128	2.1	24	.2	.1	.06	--	156	120	15	272	6.8	30	--
Apr. 28, 1965		16	.02	292	115	1090	34	256	344	2150	.4	.5	--	--	4170	1200	2160	7200	7.2	50	--
Sept. 15		7.4	1.3	48	3.4	17	.8	148	3.0	30	.2	.9	.54	W216	--	134	12	338	7.8	80	--
Jan. 19, 1966		2.3	.03	74	13	92	3.4	204	15	180	.0	.8	.00	606	480	238	72	980	7.3	40	--
Apr. 13		--	--	--	--	--	--	--	--	650	--	.7	--	--	--	--	--	2500	--	--	--
May 9		--	--	--	--	--	--	--	--	3800	--	6.3	--	--	--	--	--	12000	--	--	--
June 15		--	--	--	--	--	--	--	--	22	--	.1	.20	--	--	--	--	305	--	--	--
June 16		--	--	--	--	--	--	--	--	24	--	1.4	.49	--	--	--	--	311	--	--	--
June 16X		4.0	.59	47	3.5	13	.5	148	.0	25	.3	1.0	.03		168	132	11	311	7.2	40	2.0
June 17		--	--	--	--	--	--	--	--	27	--	1.3	.92	--	--	--	--	310	--	--	--
July 13		--	--	--	--	--	--	--	--	32	--	1.0	.03	--	--	--	--	311	--	--	5.0
Aug. 17		--	--	42	--	--	--	--	--	40	--	1.4	.00	--	--	--	--	366	--	--	6.6
Sept. 13		--	--	45	--	--	--	--	--	45	--	5.6	.00	--	--	--	--	380	--	--	18
Oct. 7		--	--	37	--	--	--	--	--	44	--	.5	.06	--	--	--	--	324	--	--	4.0
Oct. 7		--	--	36	--	--	--	--	--	41	--	.6	.00	--	--	--	--	323	--	--	--
Nov. 1		--	--	47	--	--	--	--	--	54	--	.4	.07	--	--	--	--	410	--	--	2.0
Dec. 1		--	--	52	--	--	--	--	---	61	--	.6	.12	--	--	--	--	470	--	--	5.0
Dec. 7		--	--	53	--	--	--	--	--	72	--	.6	.12	--	--	--	--	500	--	--	2.0
Dec. 8		--	--	51	--	--	--	--	--	63	--	.6	.17	--	--	--	--	469	--	--	2.0
Jan. 5, 1967		--	--	118	--	--	--	--	--	69	--	.7	.03	--	--	--	--	550	--	--	14
Jan. 26		--	--	--	--	--	--	--	--	45	--	--	.05	--	--	--	--	371	--	--	--
Jan. 27		--	--	--	--	--	--	--	--	45	--	--	.04	--	--	--	--	391	--	--	--
Feb. 1		--	--	53	--	--	--	--	--	51	--	.4	.05	--	--	--	--	439	--	--	3.0
Mar. 1		--	--	60	--	--	--	--	--	79	--	.7	.04	--	--	--	--	600	--	--	9.0
Mar. 1		1.4	.55	62	7.1	41	1.2	200	.8	71	.2	1.5	.05	280	286	184	20	550	7.2	20	--
May 4		--	--	325	--	--	--	--	--	8120	--	1.4	6.3	--	--	--	--	24000	--	--	4.0
June 1		--	--	397	--	--	--	--	--	8600	--	23	.16	--	--	--	--	24200	--	--	7.0
July 3		6.7	.47	48	3.8	20	.6	152	1.2	37	.2	.7	.00	239	193	136	12	490	7.3	60	.5
Sept. 19		5.5	.05	48	4.2	27	.5	150	.4	49	.2	1.0	.02	254	210	138	15	390	7.2	90	8.0

O Hydrogen sulfide (H_2S) 0.2.
P Hydrogen sulfide (H_2S) 1.5.
U Hydrogen sulfide (H_2S) 1.2.
V Hydrogen sulfide (H_2S) 0.7.

W Calculated from determined constituents.
X Nickel 0.00; Copper 0.00; Lead 0.01; Zinc 0.00; Arsenic 0.02; Bromide 1.0; Iodide 1.8; Ammonium 0.3.

Table 8. **MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued**

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908.32. NORTH PRONG AT POINT 4 NEAR HOMESTEAD, FLA.																					
Mar. 21, 1962..		0.6	0.05	397	502	4290	156	294	1030	7830	0.8	18	0.01	16590	14400	3060	2810	22200	7.7	50	
2-2908.33. NORTH PRONG AT POINT 5 NEAR HOMESTEAD, FLA.																					
Mar. 21, 1962..		1.9	0.04	411	706	5980	219	269	1420	10800	1.0	3.0	0.00	22670	19700	3930	3710	29700	7.7	60	
2-2908.36. NORTH RIVER AT POINT 7 NEAR HOMESTEAD, FLA.																					
Feb. 4, 1963...		0.5	0.02	595	310	4420	121	268	953	7690	0.5	50		15500	14300	2760	2540	21000	7.9	50	
2-2908.37. NORTH RIVER AT POINT 3 NEAR HOMESTEAD, FLA.																					
Mar. 22, 1962..		0.2	0.05	485	1230	10200	380	256	1700	18500	1.4	0.9	0.00	37540	32600	6270	6060	50900	7.6	40	
June 25, 1965..		.0	.04	782	1170	10500	401	250	3870	18100	1.3	50		35000		6760	6560	46000	7.8	50	
2-2908.38. NORTH RIVER AT POINT 1 NEAR HOMESTEAD, FLA.																					
Sept. 12, 1963.										9590		5.0		20000				26500		45	
2-2908.41. ROOKERY BRANCH NEAR HOMESTEAD, FLA.																					
Jan. 18, 1962..		--	--	--	--	--	--	--	--	1500	--	--	--	--	--	--	--	5250	7.6	40	--
Aug. 8.........		4.0	0.05	52	9.8	81	3.1	152	8.4	142	0.2	0.2	0.01	476	376	170	46	706	7.4	65	--
July 8, 1964...		5.2	0.06	60	9.4	84	3.3	164	17	158	0.3	0.1	--	524	418	188	54	740	7.5	80	--
Mar. 30, 1965..		1.9	0.02	239	234	1990	69	303	479	3790	.5	6.3	--	6960	--	1560	1310	12000	7.2	50	--
June 24........		4.8	.04	269	323	2740	149	231	716	5120	.6	11	--	9450	--	2000	1810	16500	7.4	80	--
Apr. 13, 1966..		--	--	--	--	--	--	--	--	1740	--	.8	--	--	--	--	--	5000	--	--	--
May 9..........		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19100	--	--	--
May 9..........		--	--	--	--	--	--	--	--	7500	--	3.3	--	--	--	--	--	22000	--	--	--
June 15........		--	--	--	--	--	--	--	--	41	--	1.2	9.8	--	--	--	--	356	--	--	--
July 13........		--	--	50	--	--	--	--	--	39	--	1.4	.06	--	--	--	--	343	--	--	5.0
Aug. 17........		--	--	42	--	--	--	--	--	46	--	1.1	.00	--	--	--	--	372	--	--	3.4
Sept. 13.......		--	--	46	--	--	--	--	--	51	--	.5	.02	--	--	--	--	411	--	--	22
Oct. 7.........		--	--	40	--	--	--	--	--	54	--	.5	.02	--	--	--	--	471	--	--	4.0
Nov. 1.........		--	--	47	--	--	--	--	--	55	--	.5	.17	--	--	--	--	460	--	--	1.0
Dec. 1.........		--	--	50	--	--	--	--	--	62	--	.4	.10	--	--	--	--	515	--	--	4.0
Dec. 7.........		--	--	55	--	--	--	--	--	69	--	.6	.05	--	--	--	--	520	--	--	2.0
Jan. 5, 1967...		--	--	65	--	--	--	--	--	120	--	.8	.03	--	--	--	--	7300	--	--	14
Feb. 1.........		--	--	55	--	--	--	--	--	85	--	.3	.08	--	--	--	--	653	--	--	3.0

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908.41. ROOKERY BRANCH NEAR HOMESTEAD, FLA.--Continued																					
Mar. 1, 1967...		--	--	75	--	--	--	--	--	275	--	6.7	0.07	--	--	--	--	1460	--		15
Apr. 5.........		--	--	150	--	--	--	--	--	2050	--	2.1	.11	--	--	--	--	7500	--		13
May 3..........		--	--	314	--	--	--	--	--	8990	--	.2	14	--	--	--	--	27000	--		3.0
June 1.........		--	--	367	--	--	--	--	--	10500	--	11	.03	--	--	--	--	31000	--		5.0
July 3.........		--	--	44	--	--	--	--	--	84	--	.7	.08	--	--	--	--	490	--		10
Sept. 19.......		5.8	0.04	42	5.4	40	0.9	136	0.4	74	0.3	1.1	.02	259	237	128	16	452	7.0	50	4.0
2-2908.42. TARPON BAY AT TUSSOCK KEY NEAR HOMESTEAD, FLA.																					
Mar. 21, 1962..		1.6	0.07	411	764	6370	233	269	1430	11600	1.0	3.3	0.00	23850	20900	4170	3950	32300	7.7	60	--
Sept. 11, 1963.		7.0	.08	48	19	188	6.5	160	32	300	.7	.2	.05	710	681	200	149	1200	7.4	90	--
July 8, 1964...		6.0	.06	96	78	620	25	196	152	1190	.3	.0	--	--	2260	560	400	3900	7.6	110	--
Mar. 30, 1965..		4.2	.03	340	555	4650	168	297	1110	8510	.7	31	--	1550	--	3130	2890	25000	7.3	50	--
June 24........		3.4	.05	355	711	5550	197	282	1540	10400	.9	18	--	18900	--	3810	3580	31500	7.6	80	--
Apr. 13, 1966..		--	--	--	--	--	--	--	--	6800	--	3.9	--	--	--	--	--	20000	--	--	--
Apr. 13........		--	--	--	--	--	--	--	--	8600	--	3.3	--	--	--	--	--	25000	--	--	--
May 9..........		--	--	--	--	--	--	--	--	12000	--	3.6	--	--	--	--	--	33000	--	--	--
June 15........		--	--	--	--	--	--	--	--	--	--	1.7	.06	--	--	--	--	959	--	--	--
June 16........		--	--	--	--	--	--	--	--	514	--	2.3	.09	--	--	---	--	2070	--	--	--
June 17........		4.7	--	55	33	270	10	160	56	485	.4	.9	.01	--	994	273	142	1900	7.2	30	--
June 17Y.......		--	--	--	--	--	--	--	--	456	--	.1	.37	--	--	--	--	1820	--	--	2.0
July 13........		--	--	52	--	--	--	--	--	110	--	.5	.03	--	--	--	--	1890	--	--	1.0
Aug. 17........		--	--	42	--	--	--	--	--	78	--	.2	.00	--	--	--	--	487	--	--	3.2
Sept. 13.......		--	--	47	--	--	--	--	--	97	--	.3	.04	--	--	--	--	589	--	--	13
Oct. 7.........		--	--	44	--	--	--	--	--	91	--	.7	.02	--	--	--	--	546	--	--	14
Nov. 1.........		--	--	50	--	--	--	--	--	93	--	.3	.55	--	--	--	--	545	--	--	1.0
Dec. 1.........		--	--	52	--	--	--	--	--	148	--	.5	.06	--	--	--	--	780	--	--	5.0
Dec. 7.........		--	--	65	--	--	--	--	--	340	--	1.1	.13	--	--	--	--	1500	--	--	2.0
Jan. 5, 1967...		--	--	78	--	--	--	--	--	540	--	2.1	.04	--	--	--	--	2120	--	--	4.0
Feb. 1.........		--	--	65	--	--	--	--	--	386	--	1.3	.17	--	--	--	--	1570	--	--	3.0
Mar. 1.........		--	--	114	--	--	--	--	--	1350	--	5.2	.06	--	--	--	--	4920	--	--	9.0
Apr. 5.........		--	--	277	--	--	--	--	--	8120	--	5.0	.02	--	--	--	--	24900	--	--	4.0
May 3..........		--	--	360	--	--	--	--	--	13600	--	1.5	11	--	--	--	--	38000	--	--	.9
June 1.........		--	--	413	--	--	--	--	--	14400	--	39	.00	--	--	--	--	38000	--	--	5.0
July 3.........		--	--	50	--	--	--	--	--	272	--	2.3	.14	--	--	--	--	1100	--	--	.4
Sept. 19.......		6.1	.04	50	23	180	6.7	152	32	332	.3	.5	.03	760	706	220	96	1310	7.2	70	2.0

Y Copper 0.00; Arsenic 0.03; Bromide 1.2; Iodide 0.5; Ammonium 0.1.

Table 8. **MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued**

Chemical analyses, in milligramsper liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908.44. TARPON BAY AT MIDBAY PASS NEAR HOMESTEAD, FLA.																					
Mar. 21, 1962..		3.4	0.01	417	912	7430	293	272	1810	13800	1.2	0.4	0.00	28110	24800	4790	4570	35400	7.7	60	--
May 9, 1966....		--	--	--	--	--	--	--	--	14800	--	5.2	--		--	--	--	39500	--	--	--
June 15........		--	--	--	--	--	--	--	--	483	--	.9	.13		--	--	--	1750	--	--	--
July 13........		--	--	54	--	--	--	--	--	282	--	.2	.03		--	--	--	1200	--	--	2.0
Aug. 17........		--	--	45	--	--	--	--	--	94	--	1.1	.00		--	--	--	566	--	--	2.8
Sept. 13.......		--	--	50	--	--	--	--	--	186	--	.5	.02		--	--	--	900	--	--	12
Oct. 7.........		--	--	58	--	--	--	--	--	438	--	2.9	.02		--	--	--	1730	--	--	6.0
Nov. 1.........		--	--	51	--	--	--	--	--	153	--	.2	.13		--	--	--	740	--	--	1.0
Dec. 1.........		--	--	87	--	--	--	--	--	1480	--	.7	.15		--	--	--	5200	--	--	3.0
Dec. 7.........		--	--	81	--	--	--	--	--	1010	--	.4	.26		--	--	--	3900	--	--	2.0
Jan. 5, 1967...		--	--	96	--	--	--	--	--	1080	--	1.7	.07		--	--	--	3820	--	--	11
Feb. 1.........		--	--	73	--	--	--	--	--	806	--	.5	.01		--	--	--	2960	--	--	.0
Mar. 1.........		--	--	144	--	--	--	--	--	2580	--	8.2	.14		--	--	--	9100	--	--	9.0
Apr. 5.........		--	--	306	--	--	--	--	--	10600	--	11	.03		--	--	--	29900	--	--	4.0
May 3..........		--	--	396	--	--	--	--	--	15900	--	.0	12		--	--	--	43000	--	--	1.0
June 1.........		--	--	427	--	--	--	--	--	15900	--	8.8	.04		--	--	--	44000	--	--	5.0
July 3.........		--	--	57	--	--	--	--	--	580	--	2.0	.30		--	--	--	2240	--	--	.4
Sept. 19.......		5.0	.04	77	91	750	29	174	172	1380	.4	.2	.02		2590	568	425	4750	7.3	90	2.0
2-2908.5. SHARK RIVER NEAR HOMESTEAD, FLA.																					
July 9, 1964...		2.7	0.04	377	1020	8230	324	220	1670	15200	1.1	0.0	--		26900	5140	4960	39000	7.5	55	--
Mar. 30, 1965..		.0	.03	81	1260	8220	313	258	2110	16000	1.4	4.3	--		28100	5380	5170	44000	7.1	30	--
June 23........		2.2	.05	430	1080	8610	391	276	2150	15700	1.6	9.8	--		28500	5520	5290	44000	7.6	60	--
Apr. 13, 1966..		--	--	--	--	--	--	--	--	12600	--	3.0	--		--	--	--	35000	--	--	--
May 9Z.........		3.6	.21	361	1070	9380	352	203	2250	16700	1.3	5.8	0.00		30200	5310	5140	44880	7.3	40	--
May 9..........		--	--	--	--	--	--	--	--	16800	--	3.3	--		--	--	--	44000	--	--	--
June 15........		--	--	--	--	--	--	--	--	1170	--	.1	.01		--	--	--	4080	--	--	--
July 13........		--	--	58	--	--	--	--	--	501	--	1.3	.08		--	--	--	1950	--	--	2.0
Aug. 17........		--	--	54	--	--	--	--	--	462	--	1.3	.00		--	--	--	1750	--	--	2.7
Sept. 13.......		--	--	68	--	--	--	--	--	950	--	1.4	.02		--	--	--	3700	--	--	13
Oct. 7.........		--	--	116	--	--	--	--	--	1800	--	1.4	.07		--	--	--	5760	--	--	6.0
Nov. 1.........		--	--	60	--	--	--	--	--	560	--	.0	.08		--	--	--	2100	--	--	2.0
Dec. 1.........		--	--	117	--	--	--	--	--	2420	--	11	.17		--	--	--	8000	--	--	5.0
Dec. 7.........		--	--	156	--	--	--	--	--	4380	--	2.1	.22		--	--	--	14200	--	--	3.0
Dec. 8.........		--	--	233	--	--	--	--	--	7800	--	6.7	.14		--	--	--	24100	--	--	2.0
Jan. 5, 1967...		--	--	126	--	--	--	--	--	2080	--	1.0	.03		--	--	--	7000	--	--	4.0
Feb. 1.........		--	--	104	--	--	--	--	--	1740	--	1.5	.03		--	--	--	6020	--	--	3.0
Mar. 1.........		3.9	.12	256	599	4900	178	265	1170	8950	.7	1.9	.00		16200	3110	2890	26500	7.5	20	--

Z Nickel 0.00; Copper 0.00; Lead 0.01; Zinc 0.00; Arsenic 0.01; Bromide 4.3; Iodide 0.50.

Table 8. **MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued**

Chemical analyses, in milligrams per liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908.5. SHARK RIVER NEAR HOMESTEAD, FLA.--Continued																					
Mar. 1, 1967...		--	--	255	--	--	--	--	--	8500	--	6.5	0.04		--	--	--	25900	--	--	8.0
Apr. 5.........		--	--	120	--	--	--	--	--	850	--	4.4	.12		--	--	--	3500	--	--	13
Apr. 6.........		--	--	371	--	--	--	--	--	16000	--	14	.01		--	--	--	45000	--	--	3.0
May 5..........		--	--	422	--	--	--	--	--	18400	--	.0	9.3		--	--	--	52500	--	--	2.0
June 1.........		--	--	416	--	--	--	--	--	18400	--	7.8	.23		--	--	--	48000	--	--	4.0
July 3.........		5.7	0.33	32	66	58	--	150	124	1000	0.2	3.0	.07		1910	352	229	3800	8.1	120	.2
Sept. 19.......		5.3	.03	181	453	3970	157	206	952	7140	.8	.5	.05		13000	--	--	21200	7.0	90	4.0
2-2908.51. SHARK RIVER AT MARKER 68, NEAR HOMESTEAD, FLA.																					
Sept. 13, 1966.		--	--	354	--	--	--	--	--	15600	--	1.6	0.02		--	--	--	43700	--	--	12
Oct. 7.........		--	--	244	--	--	--	--	--	10400	--	7.2	.59		--	--	--	30000	--	--	5.0
Nov. 1.........		--	--	290	--	--	--	--	--	12600	--	1.6	.16		--	--	--	35000	--	--	1.0
Dec. 1.........		--	--	337	--	--	--	--	--	14300	--	4.1	.38		--	--	--	40000	--	--	5.0
Dec. 7.........		--	--	370	--	--	--	--	--	16900	--	3.9	.07		--	--	--	48200	--	--	2.0
Dec. 8.........		--	--	366	--	--	--	--	--	15900	--	3.0	.13		--	--	--	48000	--	--	2.0
Jan. 5, 1967...		--	--	305	--	--	--	--	--	13000	--	15	.04		--	--	--	36100	--	--	5.0
Feb. 1.........		--	--	309	--	--	--	--	--	13300	--	.0	.04		--	--	--	38800	--	--	.0
Mar. 1.........		--	--	404	--	--	--	--	--	18000	--	14	.08		--	--	--	48900	--	--	9.0
Apr. 5.........		--	--	409	--	--	--	--	--	18900	--	18	.08		--	--	--	48900	--	--	4.0
May 3..........		--	--	422	--	--	--	--	--	20000	--	.7	16		--	--	--	55000	--	--	.9
June 1.........		--	--	443	--	--	--	--	--	20400	--	12	.00		--	--	--	54200	--	--	4.0
July 3.........		3.7	0.03	332	1050	8420	308	182	1990	15200	1.1	1.8	.19		27400	5150	5000	44000	7.3	40	.3
Sept. 19.......		1.1	.01	383	1140	9840	390	170	2440	17500	1.5	.0	.05		31800	5650	5510	47500	7.5	25	8.0
2-2908.54. SHARK RIVER CUT-OFF NEAR HOMESTEAD, FLA.																					
May 9, 1966....				--						18900		4.7	--					49000			--
June 15........				--						13000		.0	0.00					36600			--
July 13........				133						5090		12	.01					16200			2.0
Aug. 17........				290						12900		9.0	.00					36000			3.0
Sept. 13.......				254						10100		1.1	.02					30000			14
Oct. 7.........				177						6450		4.8	.00					20000			8.0
Nov. 1.........				209						7520		.5	.13					24500			2.0
Dec. 1.........				57						11300		6.8	.08					32100			4.0
Dec. 7.........				273						10400		3.1	.08					33000			2.0
Jan. 5, 1967...				314						13200		26	.54					36200			4.0
Feb. 1.........				303						12900		14	.03					36100			3.0
Mar. 1.........				357						14600		13	.14					40500			9.0

Table 8. MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued

Chemical analyses, in milligramsper liter--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
2-2908.54. SHARK RIVER CUT OFF NEAR HOMESTEAD, FLA.--Continued																					
Apr. 5, 1967...				380						17100		9.4	0.02					49000			4.0
May 3..........				422						19200		.6	8.2					55000			1.0
June 1.........				442						20200		25	.01					53200			4.0
July 3.........				169						5650		3.3	.19					16900			.4
Sept. 19.......		2.8	0.03	343	963	8240	319	192	2040	14800	1.3	.0	.06		26800	4820	4660	40800	7.5	40	5.0
2-2908.58. SHARK RIVER (AT PONCE de LEON BAY) NEAR HOMESTEAD, FLA.																					
Sept. 12, 1963.		2.5	0.02	376	1120	10200	355	188	2230	16600	0.6	4.2	0.04	33200	31000	5640	5490	43000	7.4	40	
July 9, 1964...		1.0	.00	429	1350	10800	409	158	2570	20200	1.5	.0		--	35800	6630	6500	49000	7.5	10	
Mar. 31, 1965..		1.3	.01	1910	373	9810	389	192	2560	19400	1.6	20		34500	--	6300	6140	40000	7.3	10	
June 24........		1.1	.03	460	1480	12500	440	170	3290	21900	1.5	20		40200	--	7480	7340	61000	7.7	10	
2-2908.6. HARNEY RIVER NEAR HOMESTEAD, FLA.																					
July 8, 1964...		6.7	0.07	254	549	4560	171	262	1130	8130	0.7	0.0	--		14900	2890	2680	22100	7.5	60	--
Mar. 30, 1965..		7.2	.05	1570	181	7450	294	323	1750	13500	1.2	4.3	--		24900	4660	4400	36000	7.4	90	--
June 23........		1.6	.05	295	1200	6510	364	303	1790	12800	1.0	18	--		23100	5680	5430	36500	7.7	80	--
Apr. 13, 1966..		--	--	--	--	--	--	--	--	10600	--	14	--		--	--	--	30000	--	--	--
May 9..........		5.8	.11	374	998	8610	333	243	2040	15500	1.3	5.8	--		28000	5040	4800	42000	7.4	40	--
June 15........		--	--	--	--	--	--	--	--	998	--	.2	0.35		--	--	--	3580	--	--	--
July 13........		--	--	61	--	--	--	--	--	538	--	.8	.17		--	--	--	2100	--	--	--
Aug. 18........		--	--	--	--	--	--	--	--	242	--	1.6	.00		--	--	--	1030	--	--	--
Sept. 13.......		--	--	60	--	--	--	--	--	675	--	1.3	1.3		--	--	--	2710	--	--	--
Oct. 7.........		--	--	81	--	--	--	--	--	1020	--	1.3	.02		--	--	--	3780	--	--	22.0
Dec. 1.........		--	--	105	--	--	--	--	--	2140	--	13	.24		--	--	--	7000	--	--	5.0
Jan. 5, 1967...		--	--	120	--	--	--	--	--	1800	--	.9	.04		--	--	--	6200	--	--	5.0
Feb. 1.........		--	--	92	--	--	--	--	--	1370	--	.8	.03		--	--	--	4790	--	--	3.0
Mar.1..........		--	--	182	--	--	--	--	--	4500	--	3.4	.03		--	--	--	14500	--	--	14
Apr. 5.........		--	--	364	--	--	--	--	--	13600	--	14	.08		--	--	--	37000	--	--	4.0
May 3..........		--	--	448	--	--	--	--	--	17700	--	1.1	12		--	--	--	48500	--	--	2.0
June 1.........		--	--	441	--	--	--	--	--	17600	--	6.4	.02		--	--	--	47500	--	--	5.0
July 3.........		--	--	72	--	--	--	--	--	1000	--	1.6	.89		--	--	--	3520	--	--	11
Sept. 19.......		5.0	.04	114	214	1840	63	198	439	3340	.5	.2	.02		6120	1170	1000	10600	7.1	120	2.0

Table 8. **MISCELLANEOUS ANALYSES OF STREAMS IN THE EVERGLADES NATIONAL PARK, FLORIDA--Continued**

Date of collection	Discharge (cfs)	Chemical analyses, in milligrams per liter-- Continued												Dissolved solids		Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
		Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Residue at 180°C	Calculated	Calcium, magnesium	Noncarbonate				
2-2909.03. LOSTMANS CREEK NEAR EVERGLADES, FLA.																					
Nov. 1, 1966...				41						139		0.1	0.04					675			--
Dec. 1.........				57						348		1.2	.06					1440			--
Jan. 6, 1967...				108						1300		.5	.02					4550			--
Feb. 1.........				89						960		1.5	.10					3470			0.0
Mar. 1.........				158						3340		4.0	.15					10500			10
Apr. 12........				318						11300		14	.08					32700			10
May 16.........				456						18100		6.8	.00					48500			4.0
2-2909.05. BIG LOSTMANS BAY NEAR EVERGLADES, FLA.																					
Jan. 6, 1967...				136						3700		1.4	0.09					11700			3.0
Feb. 1.........				173						5320		2.2	.00					16400			3.0
Mar. 1.........				217						7620		7.8	.20					24300			10
Apr. 12........				369						14700		13	.07					40200			1.0
2-2909.1. LOSTMANS STATION AT POINT 11, NEAR EVERGLADES, FLA.																					
Nov. 1, 1966...				39						428		0.0	0.03					1590			1.0
Dec. 1.........				127						3990		6.9	.09					12500			3.0
Jan. 6, 1967...				125						3440		.0	.08					11000			5.0
Mar. 1.........				226						8120		6.2	.13					24500			30
Apr. 12........				364						15200		19	.09					42000			7.0
May 16.........				432						20900		14	.10					56200			9.0
2-2909.23. LOSTMANS RIVER AT FIRST BAY, NEAR EVERGLADES, FLA.																					
Nov. 1, 1966...				159						6650		0.0	0.07					20000			4.0
Dec. 1.........				276						11600		4.7	.19					33000			9.0
Jan. 6, 1967...				242						9730		.4	3.2					28600			3.0
Mar. 1.........		2.8	0.23	151	214	1800	60	230	439	3240	0.3	1.3	.01		6020	1260	1070	10500	7.4		--
Apr. 12........				414						20100		18	.06					54500			7.0
May 16.........				446						20900		13	.00					56200			4.0