

*SIXTH ANNUAL REPORT
OF THE CONTINUING SURFACE WATER
QUALITY MONITORING PROGRAM
FOR THE PALMER RANCH
JANUARY - DECEMBER 1990
SARASOTA COUNTY, FLORIDA*


June 19, 1991

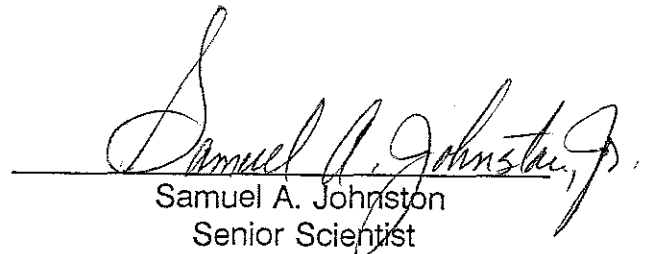
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**SIXTH ANNUAL REPORT OF THE
CONTINUING SURFACE WATER QUALITY MONITORING PROGRAM
THE PALMER RANCH
SARASOTA COUNTY, FLORIDA**

1.0 INTRODUCTION

A master development plan for the North Tract of the Palmer Ranch is being implemented pursuant to the terms and conditions of the Master Development Order (MDO) which was adopted on December 24, 1984, by the Board of County Commissioners of Sarasota County. The MDO calls for planning and developing the 5,119-acre North Tract of the Palmer Ranch in incremental developments. Construction of the first incremental development (Prestancia) was initiated in 1986 and involved the realignment of various streams flowing through the property. As shown in Figure 1.1, the North Tract of the Palmer Ranch is located in west-central Sarasota County.

Pursuant to the conditions of the MDO, a "Continuing Surface Water Quality Monitoring Program" is required to be performed prior to and during construction of the North Tract, except during the period in which a "Pollutant Loading Monitoring Program" is to be performed as specified in the Agreement of Understanding between Sarasota County and Palmer Venture established during August 1987.

Annual reports of the surface water quality monitoring program are required to be provided to the Sarasota County Planning Department, the Southwest Florida Regional Planning Council, the Florida Bureau of Land and Water Management, and all affected

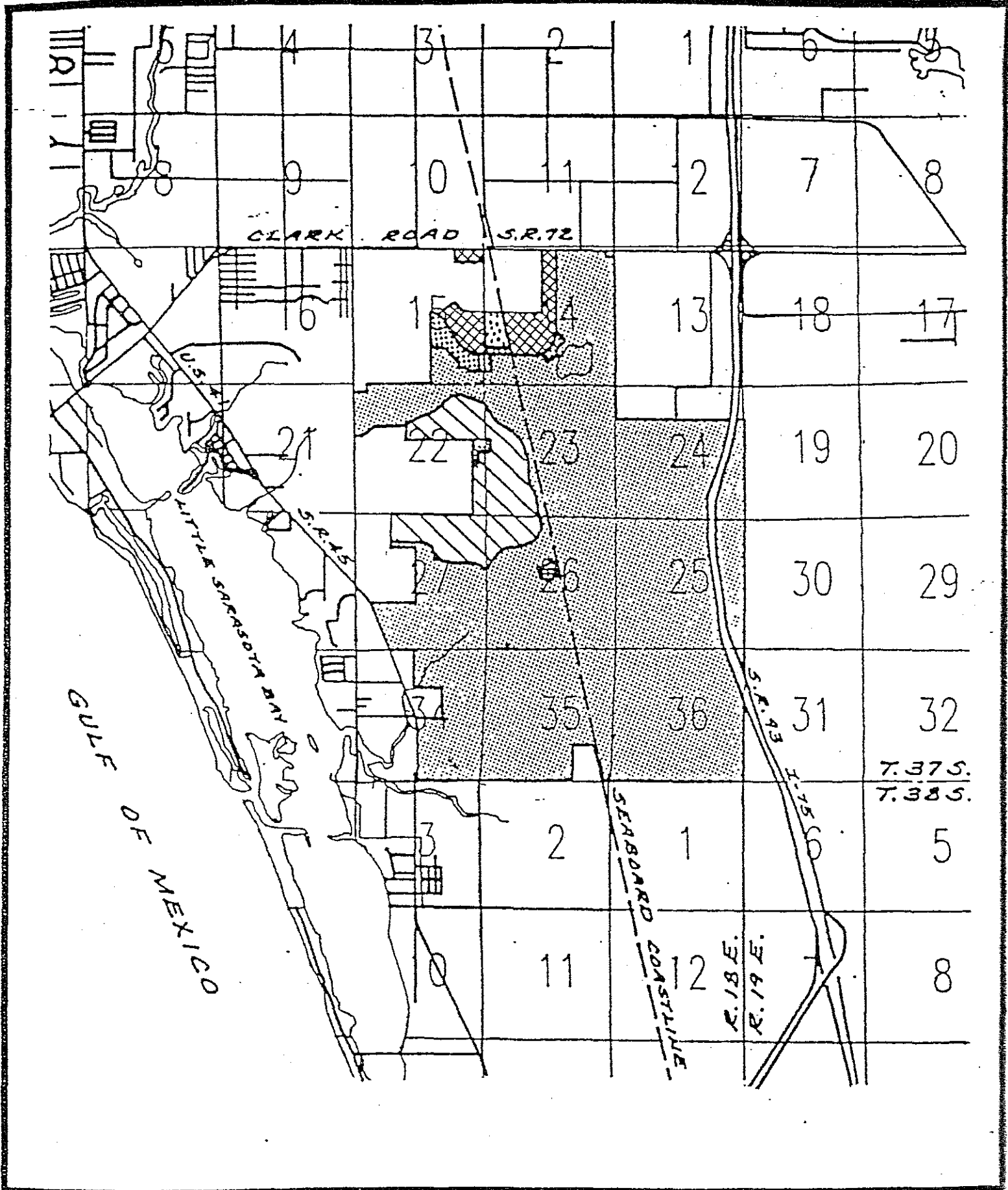


FIGURE 1.1
GENERAL SITE LOCATION



permitting agencies pursuant to the requirements of Chapter 380.06(14) and (16), Florida Statutes, Chapter 9B-16.25, Florida Administrative Code, and procedures established by the Southwest Florida Regional Planning Council.

The primary purpose of the required "Continuing Surface Water Quality Monitoring Program" is to provide a continual assessment of the surface water quality conditions prior to and during the construction activities on the North Tract of the Palmer Ranch.

The monitoring program which was initiated in May 1984 by GeoScience, Inc. employed a bimonthly sampling frequency as required for the first year of monitoring. Subsequently, the scope of the monitoring program for the following two-year period was revised during an agency review meeting in June 1985. The meeting involved the developer's representative, Mr. T. W. Goodell, and Mr. Russ Klier of Sarasota County Pollution Control Division (personal communication with Mr. T. W. Goodell). The revised workscope entailed a 13 station network with a quarterly sampling frequency for the parameters monitored during the first year with the exception of trace elements and organochlorine pesticides which would receive annual audits (refer to July 24, 1986 correspondence of Mr. T. W. Goodell to Mr. Russ Klier).

Palmer Venture contracted Conservation Consultants, Inc. (CCI) to implement the "Continuing Surface Water Quality Monitoring Program" during the second year of the monitoring program. CCI began monitoring on September 16, 1985, pursuant to the instructions provided by Palmer Venture. Except for an annual sampling event conducted in September 1988, the "Continuing Surface Water Quality Monitoring Program" was suspended in June 1988, due to the initiation of the "Pollutant Loading Monitoring

Program". Subsequent to an agreement between the Sarasota County Pollution Control Division and Palmer Venture, the "Continuing Surface Water Quality Monitoring Program" was resumed in December 1989 with a single annual sampling event conducted during the fifth monitoring year. The water quality conditions observed during the period from January through December 1990 are reported herein. This report includes a discussion of the results with respect to applicable water quality criteria, observed spatial and temporal trends, and comparisons with results obtained during previous monitoring events.

2.0 GENERAL ENVIRONMENTAL SETTING

2.1 Climate

Prevailing climatic conditions in west-central Florida are sub-tropical, characterized by abundant rainfall and moderate temperatures. Average monthly temperatures derived from two separate 30-year periods of record are provided in Table 2.1

below :

Table 2.1 Average Monthly Air Temperatures (National Weather Service - Tampa, FL).

MONTH	AIR TEMPERATURE			
	1941-1970 ^a		1931-1960 ^b	
	°C	°F	°C	°F
January	16.4	61.6	16.9	62.4
February	17.2	62.9	17.7	63.8
March	19.4	66.9	19.4	67.0
April	22.3	72.1	22.1	71.8
May	24.8	76.7	24.9	76.8
June	26.8	80.3	26.9	80.4
July	27.6	81.6	27.6	81.6
August	27.7	81.9	27.8	82.0
September	26.9	80.5	27.0	80.6
October	23.9	75.0	23.9	75.1
November	19.8	67.7	19.9	67.9
December	17.1	62.8	17.4	63.4
Annual Average	22.5	72.5	22.6	72.7

^aThompson, 1976

^bBradley, 1974

Based on a 30-year period of record, rainfall in Bradenton, Florida (NOAA, 1977), averages 56 inches per year. The minimum annual rainfall recorded during the 30-year period was 29 inches while the maximum was 93 inches. Historical rainfall trends for this

area show that a wet season occurs during the period of June through September followed by a dry season during the period of October through December. On the average 62 percent (35 inches) of the annual rainfall occurs during the summer with only 13 percent (7 inches) during the fall. The dry season is followed by a short wet period during February and March and subsequently a short dry period during April and May.

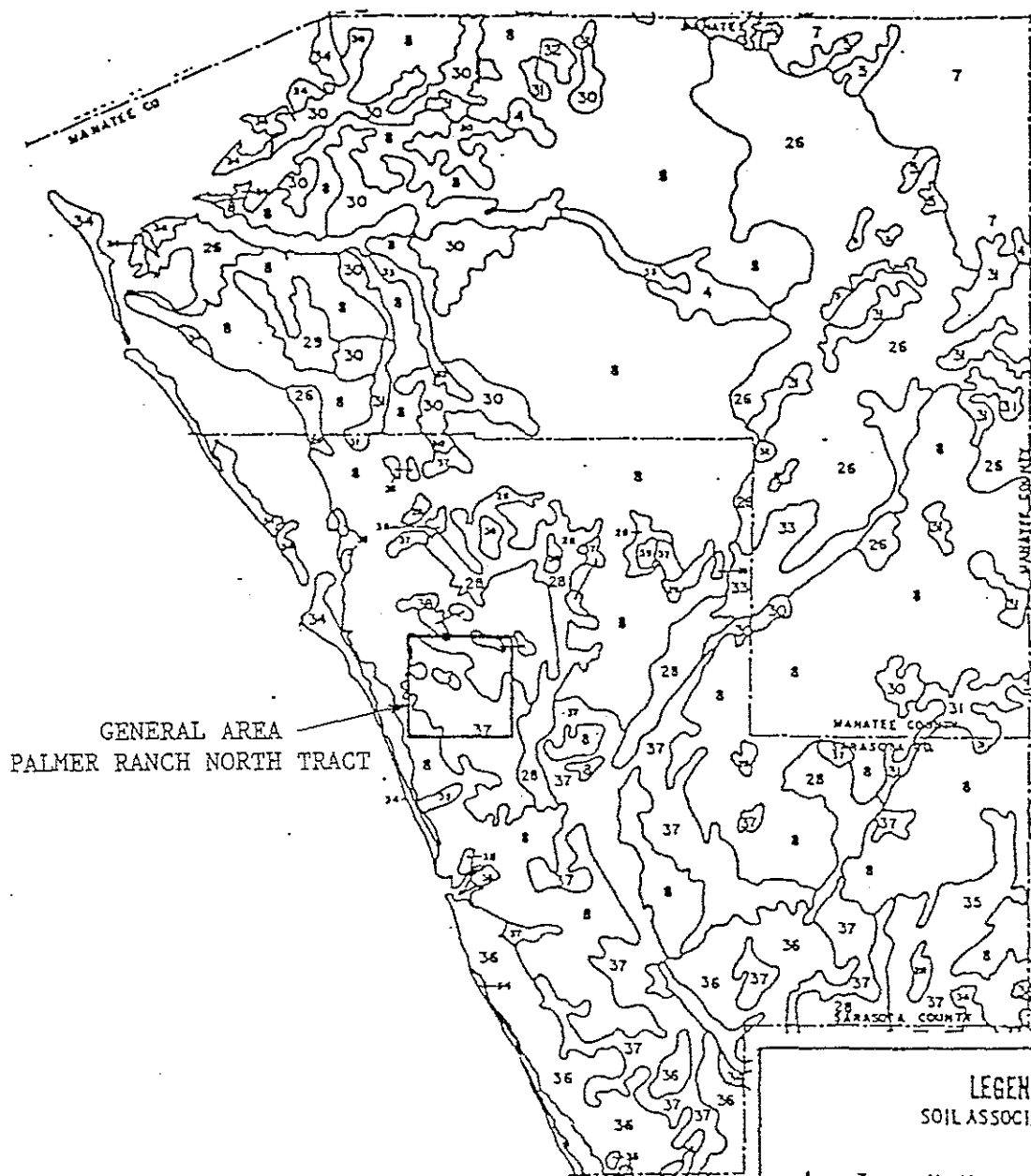
2.2 Soils

Soils in the area of the Palmer Ranch are generally sandy except in areas of low relief and poor drainage where peaty mucks are common. Upland soils found throughout the Palmer Ranch are predominately of the Myakka-Immokalee-Basinger Association. This soil association is defined as being nearly level with poorly drained sandy soils.

Along the well-incised banks of several drainage ditches traversing the Palmer Ranch (e.g. lower reach of Catfish Creek), it is evident that a natural marine deposit exists a few feet below the ground surface. This marine deposit contains a thin layer of shells and shell fragments. Figure 2.1 and Table 2.2 provide the locations and descriptions of the soil associations that occur in the area of the Palmer Ranch.

2.3 Land Use and Vegetation

Historically, the primary land use within the Palmer Ranch has been cattle ranching. However, recent changes in land uses on the Palmer Ranch have included the following: channelization and maintenance of natural drainage systems; construction of roads, golf courses, homes, and wastewater treatment facilities and associated domestic wastewater spray effluent fields; and, land disposal of sludge. During the second monitoring year (April 1985 - March 1986), the land application of sludge wastes on the Palmer Ranch



GENERAL AREA
PALMER RANCH NORTH TRACT

LEGEND
SOIL ASSOCIATIONS

- 4 Tavares-Myakka
- 5 Pomello-St. Lucie
- 7 Myakka-Pomello-Basinger
- 8 Myakka-Immokalee-Basinger
- 26 Immokalee-Pomello
- 28 Pompano-Charlotte-Delray
- 30 Wabasso-Bradenton-Myakka
- 31 Plack-Basinger
- 32 Delray-Manatee-Pompano
- 33 Fresh Water Swamp & Marsh
- 34 Tidal Marsh & Swamp-Coastal Beach Ridges
- 35 Pomello-Paola-St. Lucie
- 36 Immokalee-Myakka-Pompano
- 37 Adamsville-Pompano
- 38 Scranton, var. -Ona-Plack
- 39 Terra Cala

Source: The Florida General Soils Atlas,
Florida Division of State Planning
(1975)

FIGURE 2.1
SOIL ASSOCIATIONS IN REGION



Table 2.2 Descriptions of Soil Associations.

Area Definition	Map Unit No.	Soil Association Description
Areas dominated by moderately well to poorly drained soils not subject to flooding	4	Tavares-Myakka association: Nearly level to gently sloping, moderately well-drained soils sandy throughout and poorly drained sandy soils with weakly cemented sub-soils.
	5	Pomello-St. Lucie association: Nearly level to sloping, moderately well drained, sandy soils with weakly cemented sandy subsoil and excessively drained soils sandy throughout.
	7	Myakka-Pomello-Basinger association: Nearly level, poorly and moderately well drained, sandy soils with weakly cemented sandy subsoil and poorly drained sandy soils throughout.
	8	Myakka-Immokalee-Basinger association: Nearly level, poorly drained, sandy soils with weakly cemented sandy subsoil and poorly drained sandy soils throughout.
	26	Imokalee-Pomello association: Nearly level to gently sloping, poorly and moderately well drained, sandy soils with weakly cemented sandy subsoil.
	30	Wabasso-Bradenton-Myakka association: Nearly level, poorly drained, sandy soils with a weakly cemented sandy subsoil layer underlain by loamy subsoil; poorly drained soils with thin, sandy layers over loamy subsoil and poorly drained soils with weakly cemented sand subsoil.

Table 2.2 (continued) Descriptions of Soil Associations.

Area Definition	Map Unit No.	Soil Association Description
Areas dominated by moderately well to poorly drained soils not subject to flooding (continued)	35	Pomello-Paola-St. Lucie association: Nearly level to sloping, moderately well drained sandy soils with weakly cemented sandy subsoil and excessively drained soils, sandy throughout.
	36	Imokalee-Myakka-Pompano association: Nearly level, poorly drained, sandy soils with weakly cemented sandy subsoil and poorly drained soils, sandy throughout.
	37	Adamsville-Pompano association: Nearly level, somewhat poorly and poorly drained, soils, sandy throughout.
	38	Scranton, var.-Ona-Placid association: Nearly level, somewhat poorly drained, dark surface soils, sandy throughout; poorly drained soils with thin, sandy layers over weakly cemented sandy subsoil and very poorly drained soils, sandy throughout.
Areas dominated by poorly and very poorly drained soils subject to flooding.	28	Pompano-Charlotte-Delray association: Nearly level, poorly drained soils, sandy throughout, and very poorly drained soils with thick sandy layers over loamy sub-soil.
	31	Placid-Bassinger association: Nearly level, very poorly and poorly drained soils, sandy throughout.

Table 2.2 (continued) Descriptions of Soil Associations.

Area Definition	Map Unit No.	Soil Association Description
Areas dominated by poorly and very poorly drained soils subject to flooding (continued)	32	Delray-Manatee-Pompano association: Nearly level, very poorly drained soils with thick, sandy layers over loamy subsoil; very poorly drained sandy soils, with loamy subsoil and poorly drained soils, sandy throughout.
	33	Fresh Water Swamp and Marsh association: Nearly level, very poorly drained soils subject to prolonged flooding.
	34	Tidal Marsh and Swamp-Coastal Beach Ridges/Dune association: Nearly level, very poorly drained soils subject to frequent tidal flooding, high-lying coastal dune-like ridges and deep, draughty sands.
	39	Terra Ceia association: Nearly level, very poorly drained, well-decomposed, organic soils 40-91 cm (16-36 inches) thick over loamy material.

was discontinued and construction of the Central County Utilities Regional Treatment Plant and an adjacent golf course was completed. Subsequently, construction of a residential development was initiated during the third monitoring year.

Land uses adjacent to the ranch which are located upstream in several drainage basins covering portions of the ranch include golf courses, roads and highways, residential developments, a mobile home park, commercial businesses, a dairy farm which was changed to a sod farm (effective August 1, 1987), light industry, and a metal salvage operation.

The primary vegetation associations found on the ranch include pine flatwoods, improved and semi-improved pastures, wet prairies, marshes and sloughs, swamps, and wetland fringing hammocks.

2.4 Drainage

The North Tract of the Palmer Ranch is divided into six primary drainage basins which ultimately discharge into Little Sarasota Bay. Two basins, the Catfish Creek-Trunk Ditch Basin and the South Creek Basin, drain the majority of the North Tract. As shown in Figure 2.2, approximately 2,590 acres of the Catfish Creek-Trunk Ditch Basin which has a total drainage area of 3,700 acres and approximately 1,770 acres of the South Creek Basin which has a total drainage area of approximately 12,000 acres are located on the North Tract. Four minor basins also drain portions of the property. These include Metheny Creek Basin (40 acres), Elligraw Bayou Basin (180 acres), North Creek Basin (460 acres), and Clower Creek Basin (80 acres). The major streams of these basins are generally described in the following sections.

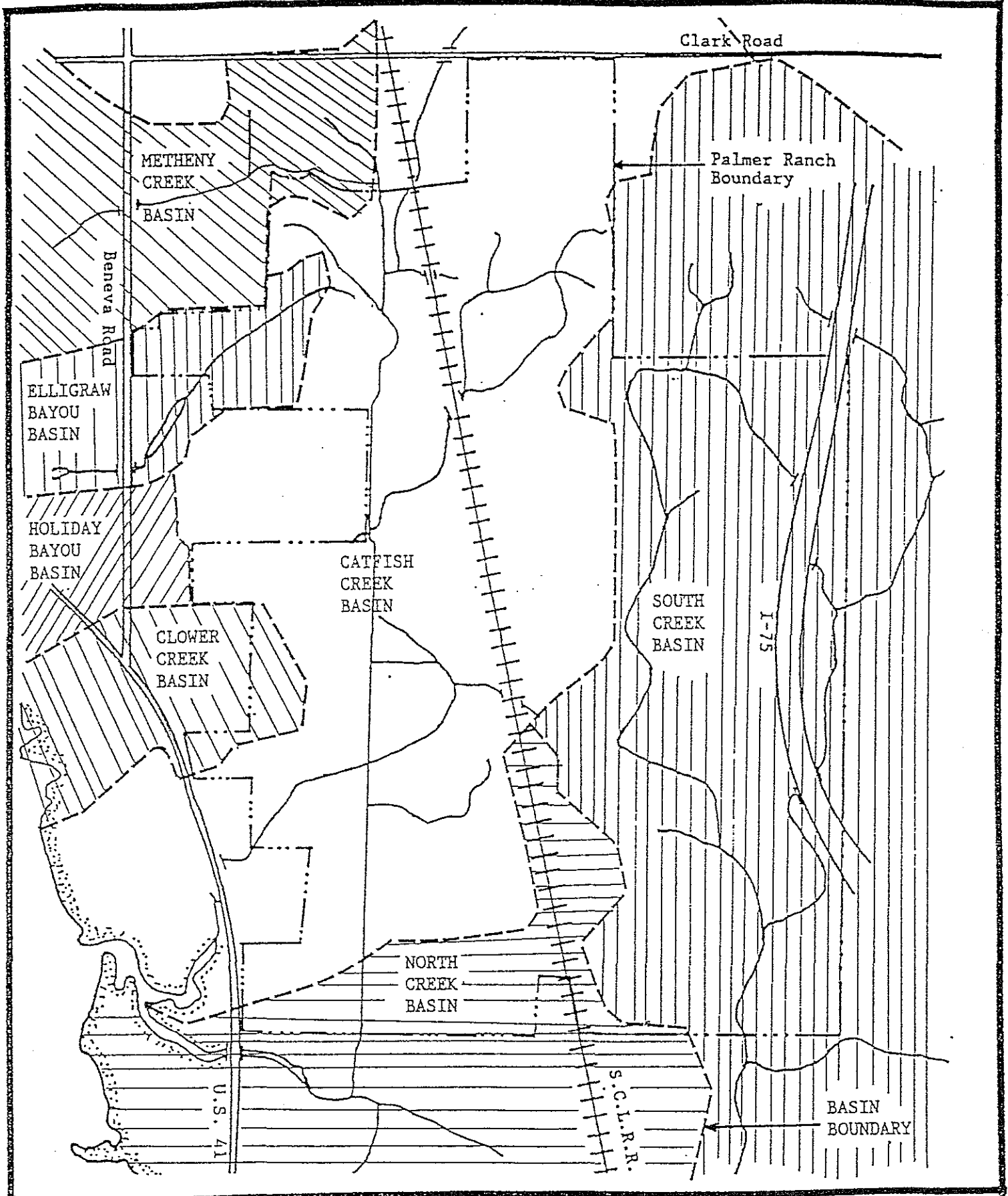


FIGURE 2.2
PALMER RANCH DRAINAGE BASINS



2.4.1 Catfish Creek

Catfish Creek is a meandering stream which is channelized and flows southwest to the southern boundary of the property, intersecting Trunk Ditch, a straight man-made canal, at five locations. The upper reach of Catfish Creek receives off-site drainage from commercial and industrial areas near Clark Road. Many of these commercial and industrial areas lack stormwater management systems.

On the Palmer Ranch, Catfish Creek receives drainage from a domestic wastewater effluent disposal spray field of Palmer Utilities and a spray field and golf course irrigation system operated by the Central County Regional Utilities (CCU) Wastewater Treatment Plant, and drainage from the Prestancia stormwater management system. The remainder of drainage into Catfish Creek originates in wetlands, pine flatwoods and improved pasture. At the end of the third monitoring year, *i.e.*, February 1987, an upper segment of Catfish Creek underwent realignment. Mid-way through the fourth monitoring year, in September 1987, Sarasota County cleared the segment of Catfish Creek downstream of its last confluence with Trunk Ditch of vegetation and snags to facilitate drainage.

Downstream of the Palmer Ranch, Catfish Creek receives drainage from residential areas and runoff from U.S. Highway 41. Further downstream, Catfish Creek is subject to the tidal influences of Little Sarasota Bay.

2.4.2 Trunk Ditch

Trunk Ditch is a straight canal that was constructed by Sarasota County to improve drainage. Trunk Ditch originates near the northern end of the property and flows south where it becomes contiguous with a dredged tributary to North Creek. As previously

mentioned, Trunk Ditch intersects Catfish Creek at five locations. During early 1986, Trunk Ditch was realigned in association with the Prestancia golf course construction. In the realigned segment, Trunk Ditch exhibits an enlarged channel and two weirs which result in lentic conditions during the dry season. Upstream and downstream, however, Trunk Ditch exhibits steep banks showing evidence of erosion. Vegetation in Trunk Ditch is dominated by Hydrilla, Elodea, cattail, and other aquatic weeds. During September 1987, Sarasota County cleared its channel of vegetation and snags downstream of the southern boundary of Prestancia.

Runoff entering the upper reaches of Trunk Ditch originates along Clark Road, including the adjacent commercial and industrial areas. Downstream, runoff enters Trunk Ditch from Prestancia's golf course and residential development, the Country Club of Sarasota and associated residential area, as well as pine flatwoods, improved pastures, and wetlands of the Palmer Ranch.

In addition to two weirs in the realigned segment of Trunk Ditch, a sill (elevated streambed) exists between the last confluence with Catfish Creek and its juncture with the North Creek Basin. During dry periods when water levels are low, Trunk Ditch only flows into Catfish Creek, possibly resulting in stagnation in its southernmost segment at its juncture with the North Creek Basin. However, during periods of high water Trunk Ditch flows over the aforementioned shallow sill into the North Creek Basin via the man-made canal to North Creek, as well as flowing into Catfish Creek.

2.4.3 North Creek

North Creek is connected to Trunk Ditch by a dredged tributary located near the southern boundary of the North Tract. The banks of this tributary are vegetated with grasses and trees resulting in a partially overhanging canopy. Most of the drainage into this dredged tributary originates in improved pasture, idle agricultural land, a marsh/slough system, and an off-site metal salvage operation. Downstream of the North Tract, Trunk Ditch enters the main channel of North Creek, which subsequently flows into Little Sarasota Bay. Residential areas, U. S. Highway 41, and pine flatwoods drain into the downstream reach of North Creek.

2.4.4 South Creek

South Creek is a meandering stream that has been partially channelized. The banks of South Creek are vegetated with grasses and occasional pines, while its channel is generally void of aquatic vegetation. Upstream of the Palmer Ranch, South Creek receives drainage in its western tributary from a golf course and a mobile home park. Also, it receives drainage in its eastern tributary from I-75 and a dairy which was gradually converted into a sod farm during the third and fourth monitoring years. This land use change was completed August 1, 1987.

Within the Palmer Ranch, South Creek primarily receives drainage from improved pastures and pine flatwoods, but to a lesser extent from a portion of the CCU spray field. Downstream of the ranch, South Creek flows through the Oscar Scherer State Recreational Area and subsequently into the tidal waters of Little Sarasota Bay.

2.4.5 Elligraw Bayou

Elligraw Bayou is a channelized stream that flows southwesterly to Little Sarasota Bay. The banks of Elligraw Bayou are sloped and vegetated with grasses and trees. On the ranch, Elligraw Bayou receives drainage from marshes, sloughs, open areas, and Prestancia. Downstream of the Palmer Ranch, Elligraw Bayou flows through Ballantrae and several other residential areas before entering Little Sarasota Bay.

2.4.6 Matheny Creek

Matheny Creek is a channelized stream that originates in the marshes and sloughs northwest of the Palmer Ranch. It flows southwest and eventually discharges into Little Sarasota Bay. The banks of Matheny Creek are steep and vegetated with grasses and some trees. Drainage enters Matheny Creek from residential developments, commercial and industrial areas, and golf courses.

2.4.7 Clower Creek

Clower Creek forms the south border of the 70-acre Sarasota Square Mall. A 1.6 acre wet prairie located east of the mall on the Palmer Ranch most likely represents the headwaters of Clower Creek during the wet season. Drainage conveyed by Clower Creek flows westerly for 1,350 feet, and subsequently, through an underground pipeline along the north and west borders of a trailer park adjacent to the Sarasota Square Mall. After flowing underground for about 650 feet, drainage enters the mall's stormwater management system. Subsequently, discharge from the mall's stormwater management system drains through swales into culverts and underneath U.S. 41 to Little Sarasota Bay.

2.5 Water Quality Classification

The segments of the streams traversing the North Tract of the Palmer Ranch are non-tidal freshwater systems which have been designated by the State as Class III waters pursuant to Section 17-302.400(1), Florida Administrative Code (F.A.C.). Downstream, these streams flow into a predominantly marine estuarine system (Little Sarasota Bay) which is classified as an Outstanding Florida Water (OFW). In addition, the segment of South Creek which flows through the Oscar Scherer State Recreational Area is classified as an OFW. State and Sarasota County water quality standards applicable to the "Continuing Water Quality Monitoring Program" (*i.e.*, those applicable to Class III, predominantly fresh surface waters) are listed in Table 2.3.

TABLE 2.3 APPLICABLE STATE AND COUNTY WATER QUALITY CRITERIA FOR CLASS III, PREDOMINATELY FRESH WATERS.

Parameter	State of Florida FAC 17-302	Sarasota County Ord. No. 72-37
Arsenic	Not > 0.05 mg/l	Not > 0.01 mg/l
BOD-5	Not to be increased in a manner that would depress Dissolved Oxygen levels below criteria.	Same as FAC 17-3
Cadmium	Not > 0.0008 mg/l in predominantly fresh waters with a hardness of less than 150 mg/l of CaCO ₃ . Not to exceed 0.0012 mg/l in harder waters.	Not > 0.01 mg/l
Chromium	Not > 0.05 mg/l in predominantly fresh waters	Not > 0.02 mg/l
Coliform, Fecal	Not > 800/100 ml	----
Coliform, Total	Not > 2,400/100 ml	Not > 2,400/100 ml
Conductivity	Shall not be increased more than 50% above background or to 1275 umhos/cm, whichever is greater, in predominantly fresh waters.	+100% above background, or to max. of 500 umhos/cm in fresh water streams.
Copper	Not > 0.03 mg/l	Not > 0.01 mg/l
Dissolved Oxygen	Not < 5 mg/l	Not < 4 mg/l
Lead	Not > 0.03 mg/l	Not > 0.01 mg/l
Mercury	Not > 0.0002 mg/l	Not > 0.01 mg/l
Nickel	Not > 0.1 mg/l	Not > 0.1 mg/l

TABLE 2.3 APPLICABLE STATE AND COUNTY WATER QUALITY CRITERIA FOR CLASS III, PREDOMINATELY FRESH WATERS (continued).

Parameter	State of Florida FAC 17-302	Sarasota County Ord. No. 72-37
Nutrients	Concentrations in a body of Water shall not be altered in such a manner as to cause an imbalance in natural populations of aquatic flora or fauna.	-----
Nitrogen, Ammonia (ionic plus non-ionic)	See Nutrients	Only applies to non-ionic Ammonia
Nitrogen, Nitrite	See Nutrients	-----
Nitrogen, Nitrate	See Nutrients	-----
Nitrogen, Total	See Nutrients	-----
Nitrogen, Organic	See Nutrients	-----
Oil and Greases	Not > 5 mg/l	Not > 15 mg/l
Phosphate, Ortho	See Nutrients	-----
Phosphate, Total	See Nutrients	-----
pH	6 - 8.5	6 - 8.5
Solids, Total Suspended	-----	-----
Turbidity	Not > 29 NTU above background	Not > 25 JTU above background
Zinc, as Zn	Not > 0.03 mg/l	Not > 0.01 mg/l

TABLE 2.3 APPLICABLE STATE AND COUNTY WATER QUALITY CRITERIA FOR CLASS III, PREDOMINATELY FRESH WATERS (continued).

Parameter	State of Florida FAC 17-302	Sarasota County Ord. No. 72-37
Aldrin plus Dieldrin	Not > 0.003 ug/l	----
alpha - BHC	----	----
beta - BHC	----	----
delta - BHC	----	----
gamma - BHC (Lindane)	Not > 0.01 ug/l	----
Chlordane	Not > 0.01 ug/l	----
4,4' DDD	----	----
4,4'-DDE	----	----
4,4'-DDT	Not > 0.001 ug/l	----
Endosulfan	Not > 0.003 ug/l	----
Endrin	Not > 0.004 ug/l	----
Heptachlor	Not > 0.001 ug/l	----
Toxaphene	Not > 0.005 ug/l	----
Polychlorinated Biphenyls	Not > 0.001 ug/l	----

3.0 FIELD AND LABORATORY PROCEDURES

3.1 Station Locations and General Descriptions

The "Continuing Surface Water Quality Monitoring Program" employs a network of 13 sampling stations located at various sites along South Creek, Catfish Creek, Elligraw Bayou, and Trunk Ditch (Figure 3.1). A general description of the characteristics of the 13 sampling stations is provided in Table 3.1.

South Creek was monitored at five locations. These included two points of inflow (SC-3 and SC-7) as well as one point of outflow (SC-2) from the North Tract. One point of inflow, Station SC-7, is located downstream of the aforementioned dairy/sod farm and I-75. The other point of inflow, Station SC-3, is located downstream of a mobile home park and golf course. South Creek was also monitored in the interior of the North Tract at Stations SC-4 and SC-1, and downstream of the North Tract at Station SC-8.

In Catfish Creek, inflow into the North Tract was monitored at Station CC-1 while outflow was monitored at Station CC-5. Station CC-1 receives drainage from Clark Road, McIntosh Road, and various commercial/industrial developments. Two tributaries of Catfish Creek were also monitored near their confluences with Trunk Ditch (Stations CC-2 and CC-3). These two stations represent stream segments which receive drainage from Prestancia and backwater effects of Trunk Ditch.

Trunk Ditch was monitored within its realigned segment within the Catfish Creek-Trunk Ditch Drainage Basin at Station CC-4. This site lies adjacent to and receives drainage from both the Country Club of Sarasota and Prestancia and sources farther upstream, as well as pine flatwoods, improved pastures, and wetlands of the Palmer Ranch. Farther

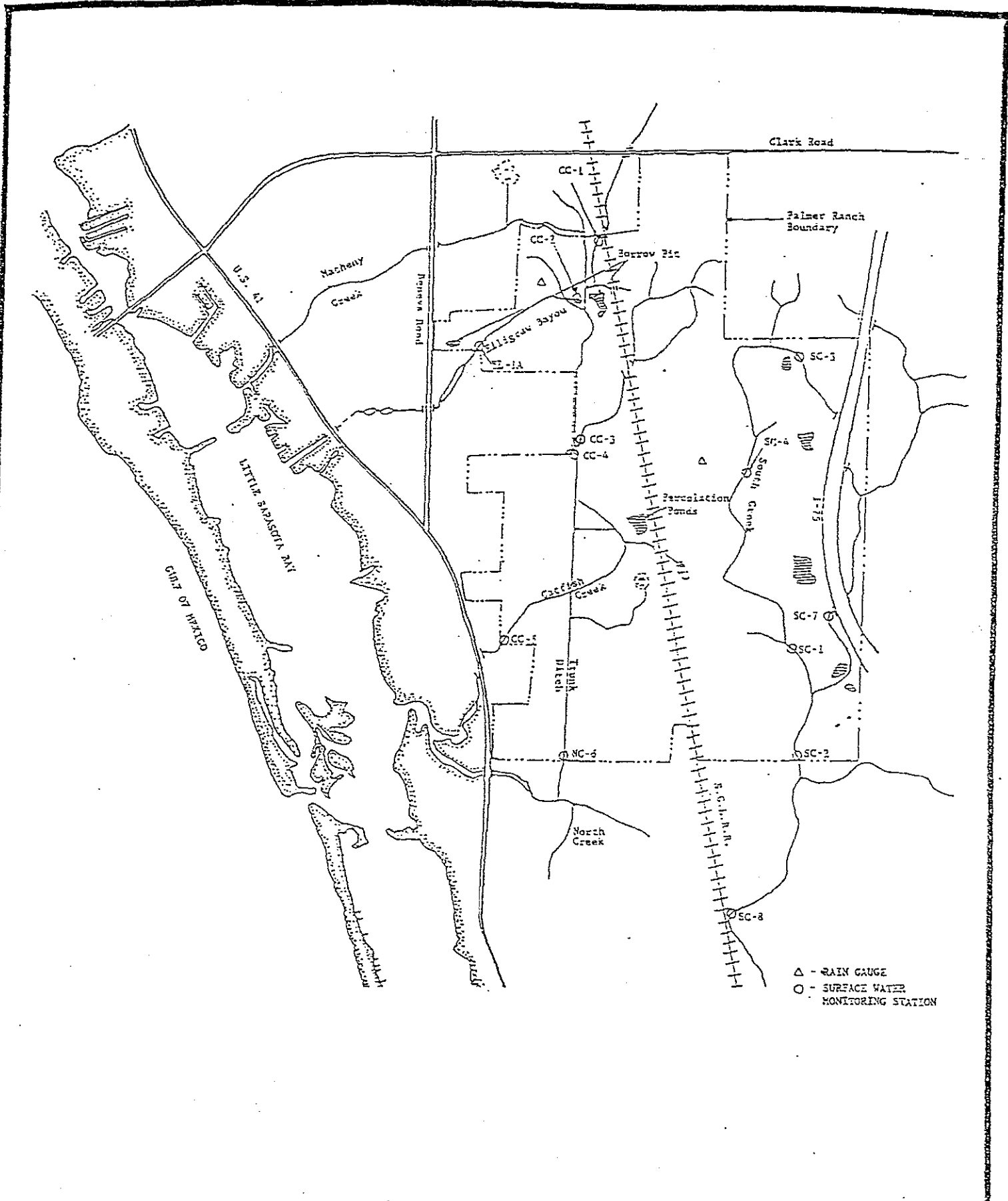


FIGURE 3.1
 LOCATIONS OF MONITORING STATIONS AND RAIN GAUGES



TABLE 3.1 GENERAL DESCRIPTIVE CHARACTERISTICS OF SURFACE WATER QUALITY SAMPLING STATIONS.

Station	General Location	Water Depth (ft) ^a	Channel Width (ft)	Habitat
CC-1	Catfish Creek Site Entry	1.0-1.6	10	75-100% Canopy of <i>Salix</i> , Rooted Emergents, Incised Banks.
CC-2	Catfish Creek Upstream of Trunk Ditch	0.0-0.45	12	Aquatic Vegetation, Shallow Sloped Banks.
CC-3	Catfish Creek Upstream of Trunk Ditch	0.3-0.6	6	Aquatic Vegetation, Incised Banks.
CC-4 ^b	Trunk Ditch Downstream of Catfish Creek Confluence	0.6-2.2	50	Sodded Banks, Rooted Emergents.
CC-5	Catfish Creek Outfall from Site	0.3-0.8	50	Shading in by Oaks, Willows, and Wax Myrtle, Sodded Banks.
NC-6	Trunk Ditch Downstream of Catfish Creek	1.7-2.7	12	Aquatic Vegetation.
EI-1	Elligraw Bayou near Site Exit	0.4-0.6	6	Aquatic Vegetation.
SC-1	South Creek Mid-property	0.6-0.7	12	Sand covered with Organic Matter.
SC-2	South Creek at Site Exit	0.5-1.2	17	Rooted Emergents, Floating Aquatics, Palm Trees Shade Channel in A.M.
SC-3	South Creek Outfall from Large Wetland	0.0-0.7	10	Shallow banks, Aquatic Vegetation.
SC-4	South Creek near Honore Avenue	0.7-1.2	8	Rooted Emergents Cover 33% of Channel, Canopy of Pine.
SC-7	South Creek near I-75 Downstream of Dairy	0.4-0.6	9	50% Cover of Rooted Emergents, 75% Upstream Coverage by Floating Aquatics, Willow and Pepper Trees Line Banks.
SC-8	South Creek Upstream of Oscar-Scherer Recreational Area	0.8-1.7	10	Aquatic Vegetation, Incised Banks.

^aRange in Depth recorded during monitoring period of April, 1987 - March, 1988.

^bDepths reported are depths at sampling location - total depth at site averages 8.0 feet.

to the South, Trunk Ditch was monitored at a location within the North Creek Basin, *i.e.*, Station NC-6.

Elligraw Bayou was monitored near its point of outflow from the North Tract at Station EL-1A. Elligraw Bayou receives drainage primarily from marshes, sloughs, and open areas on the Palmer Ranch and from the Prestancia Development.

3.2 Parameters and Sampling Frequency

Quarterly sampling was performed during March, June, September, and December 1990. In addition, samples were collected for analysis of the annual parameters during the September 1990 monitoring event. During the monitoring event performed in September, three stations, CC-2, SC-2, and SC-7, exhibited dry conditions, therefore, no *in situ* measurements or water samples were collected at these stations for this event. In addition, dry conditions precluded successful sampling at Station SC-3 during the June and December monitoring events. Otherwise, all attempts to collect samples during the 1990 monitoring year were successful. The dates and times of all sample collections are provided in Table 3.2.

Surface water quality monitoring during the period from January through December 1990 was performed by: (1) the use of field instrumentation and *in situ* measurements; and (2) the collection of grab samples for subsequent laboratory analyses. A digital readout Hydrolab Series 4000 was used for *in situ* measurements of dissolved oxygen, pH, specific conductance, and water temperature. Prior to deployment in the field, the Hydrolab was calibrated according to the manufacturer's recommended procedures. All *in situ* measurements were taken at approximate mid-depth at each station except Station

Table 3.2 Date and Time of Sampling for Sixth Annual Monitoring Period of January - December, 1990.

Quarter No.	Date of Sampling	EL-1A	CC-1	CC-2	CC-3	CC-4	CC-5	NC-6	SC-1	SC-2	SC-3	SC-4	SC-7	SC-8
1	03/12/90	1037	1012	1026	1050	1108	1150	1212						
	03/13/90								1120	1100	1225	1201	1138	1021
2	06/11/90	1308	1232	1315	1335	1347	1410	1435						
	06/12/90								1252	1237	1345	1330	1308	1212
3	09/17/90	1123	1102	1132	1145	1208	1233	1308						
	09/18/90								1114	1101	1205	1145	1127	1028
4	12/10/90	1310	1030	1135	1210	1335	1420	1500						
	12/11/90								1105	1050	1345	1200	1125	0955

CC-4, which was monitored at a depth of approximately 1 foot. Grab samples were collected at each station during the four quarterly events, preserved, and analyzed in the laboratory within the recommended hold times for the parameters listed in Table 3.3. Sampling was performed in accordance with CCI's Comprehensive Quality Assurance Plan on file with the Florida Department of Environmental Regulation.

All laboratory analyses were performed in accordance with the procedures described in the seventeenth edition of Standard Methods (APHA, 1989) or the Methods for Chemical Analysis of Water and Wastes (USEPA, 1983). Laboratory analyses, except for oils and greases, trace elements, and organochlorine pesticides, were performed by the CCI's laboratory which is certified by Florida Department of Health and Rehabilitative Services for the analyses of environmental and drinking water analyses. The analyses for oils and greases, trace elements, and organochlorine pesticides were performed by a state-certified subcontract laboratory. Copies of the laboratory reports are provided in Appendix B.

Two additional parameters, stream flow and stream depth, were monitored at each sampling point concurrently with water quality monitoring as an aid in evaluating the water quality data although not part of the "Continuing Surface Water Quality Monitoring Program." Stream flow was determined using a Marsh McBirney model 201D flow meter. Stream depth was measured at each point of water quality sampling by the use of a weighted fiberglass tape.

TABLE 3.3 COLLECTION AND ANALYTICAL METHODS USED DURING THE CONTINUING SURFACE WATER QUALITY MONITORING PROGRAM.

Parameter	Sample Type	Field Handling	Hold Time	Laboratory Handling	Analytical Method	Method Reference
Arsenic, Total	Grab	HNO ₃ to pH <2, Stored on Ice	6 Months	Stored at Room Temperature	Digestion, Atomic Absorption - Furnace Technique	EPA 206.2
Bacteria, Fecal Collform	Grab	Stored on Ice	30 Hours	Immediate Analysis	Multiple Tube Fermentation	APHA 9221 C
Bacteria, Total Coliform	Grab	Stored on Ice	30 Hours	Immediate Analysis	Multiple Tube Fermentation	APHA 9221 B
Biochemical Oxygen Demand (BOD-5 Day)	Grab	Stored on Ice	48 Hours	Immediate Analysis	Membrane Electrode	APHA 5210 B
Cadmium, Total	Grab	HNO ₃ to pH <2, Stored on Ice	6 Months	Stored at Room Temperature	Digestion/PDCA Extraction, Atomic Absorption	EPA 213.1
Chromium, Total	Grab	HNO ₃ to pH <2, Stored on Ice	6 Months	Stored at Room Temperature	Digestion/PDCA Extraction Atomic Absorption	EPA 218.1
Conductivity	In situ	---	---	---	Hydrolab - Wheatstone Bridge	APHA 2510 B
Copper, Total	Grab	HNO ₃ to pH <2, Stored on Ice	6 Months	Stored at Room Temperature	Digestion, Atomic Absorption	EPA 220.1
Lead, Total	Grab	HNO ₃ to pH <2, Stored on Ice	6 Months	Stored at Room Temperature	Digestion/PDCA Extraction, Atomic Absorption	EPA 239.1
Mercury, Total	Grab	HNO ₃ to pH <2, Stored on Ice	28 Days	Stored at 4 °C Temperature	Digestion, Atomic Absorption Cold Vapor Method	EPA 245.1
Nickel, Total	Grab	HNO ₃ to pH <2, Stored on Ice	6 Months	Stored at Room Temperature	Digestion, Atomic Absorption	EPA 249.1
Nitrogen, Ammonia	Grab	H ₂ SO ₄ to pH <2, Stored on Ice	28 Days	Stored at 4 °C	Automated Phenate	APHA-NH ₃ H
Nitrogen, Nitrate + Nitrite	Grab	H ₂ SO ₄ to pH <2, Stored on Ice	28 Days	Stored at 4 °C	Automated Cadmium Reduction	EPA 353.2
Nitrogen, Nitrite	Grab	Stored on Ice	48 Hours	Stored at 4 °C	Automated Autoanalyzer	EPA 353.2
Nitrogen, Nitrate	Grab	---	---	---	Calculation	EPA 353.2

TABLE 3.3 COLLECTION AND ANALYTICAL METHODS USED DURING THE CONTINUING SURFACE WATER QUALITY MONITORING PROGRAM
(continued).

Parameter	Sample Type	Field Handling	Hold Time	Laboratory Handling	Analytical Method	Method Reference
Nitrogen, Total Kjeldahl	Grab	H ₂ SO ₄ to pH <2, Stored on Ice	28 Days	Stored at 4 °C	Automated Block Digestion, Autoanalyzer	EPA 351.2
Nitrogen, Total	Grab	---	---	---	Calculation	APHA 4500-N
Oil and Grease	Grab	H ₂ SO ₄ to pH <2, Stored on Ice	28 Days	Stored at 4 °C	Gravimetric	EPA 413.1
Oxygen, Dissolved	In situ	---	---	---	Hydrolab - Membrane Electrode	APHA 4500-O G
pH	In situ	---	---	---	Hydrolab - Electrometric	APHA 4500-H
Phosphate, Total Reactive	Grab	Stored on Ice	48 Hours	Immediate Analysis	Automated, Ascorbic Acid	EPA 365.1
Phosphorus, Total	Grab	H ₂ SO ₄ to pH <2, Stored on Ice	28 Days	Stored at 4 °C	Automated Block Digestion, Autoanalyzer	EPA 365.4
Solids, Total Suspended (TSS)	Grab	Stored on Ice	7 Days	Stored at 4 °C	Glass Fiber Filtration, Dried at 105 °C	APHA 2540 D
Temperature	In situ	---	---	---	Hydrolab - Thermistor	APHA 2550B
Turbidity (NTU)	Grab	Stored on Ice	48 Hours	Stored at 4 °C	Nephelometric	APHA 2130B
Zinc, Total	Grab	HNO ₃ to pH <2, Stored on Ice	6 Months	Stored at Room Temperature	Digestion, Atomic Absorption	EPA 289.1
Pesticides, Organochlorine	Grab	Stored on Ice	7 Days	Stored at 4 °C	Gas Chromatograph	EPA 608
Flow/Direction	In situ	---	---	---	Marsh-McBirney Flow Meter - Electromagnetic Sensor	Manufacturer's Specifications

APHA - American Public Health Association, American Water Works Association and Water Pollution Control Federation, 1989. Standard Methods for the Examination of Water and Wastewater, 17th Edition. American Public Health Association.

EPA - U.S. Environmental Protection Agency, 1983. Methods for Chemical Analysis of Water and Wastes, EPA - 600/4-79-020, National Environmental Research Center, Cincinnati, Ohio.

4.0 RESULTS AND DISCUSSION

During the sixth year of the "Continuing Surface Water Quality Monitoring Program" (*i.e.*, January - December 1990) quarterly surface water quality monitoring was conducted by CCI in compliance with the conditions of the Master Development Order for the North Tract of the Palmer Ranch. Monitoring events were performed on March 12-13, June 11-12, September 17-18, and December 10-11, 1990. Individual results for the four events performed during the 1990 monitoring year of the "Continuing Surface Water Quality Monitoring Program" are tabulated by parameter in Appendix A. In addition, the data acquired during the January - December 1990 monitoring year are summarized in Appendix A by parameter according to sampling location and sampling event. For each parameter statistics (*i.e.*, mean, range, standard deviation, and number of observations) are calculated across sampling events and sampling locations. Also, applicable water quality criteria are footnoted below each table.

Copies of the laboratory reports of analytical results for the samples collected during the 1990 monitoring year are provided in Appendix B. Comparison of the data with previous results and general conclusions are included with the discussion for each parameter or group of related parameters.

4.1 Rainfall and Hydrology

4.1.1 Rainfall

Less than the normal amount of rainfall occurred on the Palmer Ranch during the sixth year of monitoring for the "Continuing Surface Water Quality Monitoring Program" During the 1990 monitoring year only 38.5 inches were recorded in comparison to 51 to 52

inches recorded during the third and fourth monitoring years (CCI, 1988 and 1988b). The rainfall amount recorded during 1990 is more than 17 inches less than the average annual rainfall of approximately 56 inches per year based on a 30-year period of record (NOAA, 1982).

Figure 4.1 provides a comparison of the monthly distribution of rainfall measured on the Palmer Ranch during the 1990 monitoring year with the monthly distribution of historical rainfall for the 30-year period of record (NOAA, 1982). As observed during the previous monitoring years, the distribution of rainfall generally follows the expected temporal trends for this region of Florida. During the 1990 monitoring year, below-normal rainfall occurred during nine months, whereas above-normal rainfall occurred only during February, May, and October. The highest monthly rainfall during 1990 was recorded for July when 8.15 inches were recorded compared to the historical average of 8.8 inches for July. An abnormally high amount of precipitation also occurred during October 1990 when 6.10 inches of rainfall were recorded compared to the 3.2 inch historical average. The high October rainfall was primarily due to a tropical storm which passed through the area in mid-October.

As provided in Table 4.1, the seasonal amounts of rainfall recorded on-site during the spring and summer quarters were 8.43 and 17.08 inches, respectively. During the winter and fall quarters, 5.50 and 7.45 inches were recorded, respectively. During the four-month period in which the wet season normally occurs, June - September, 21.08 inches (or 55 percent of the annual rainfall) was recorded on the Palmer Ranch, while only 7.50 inches (or 19 percent of the annual rainfall) was recorded during the four-month period in which

PALMER RANCH

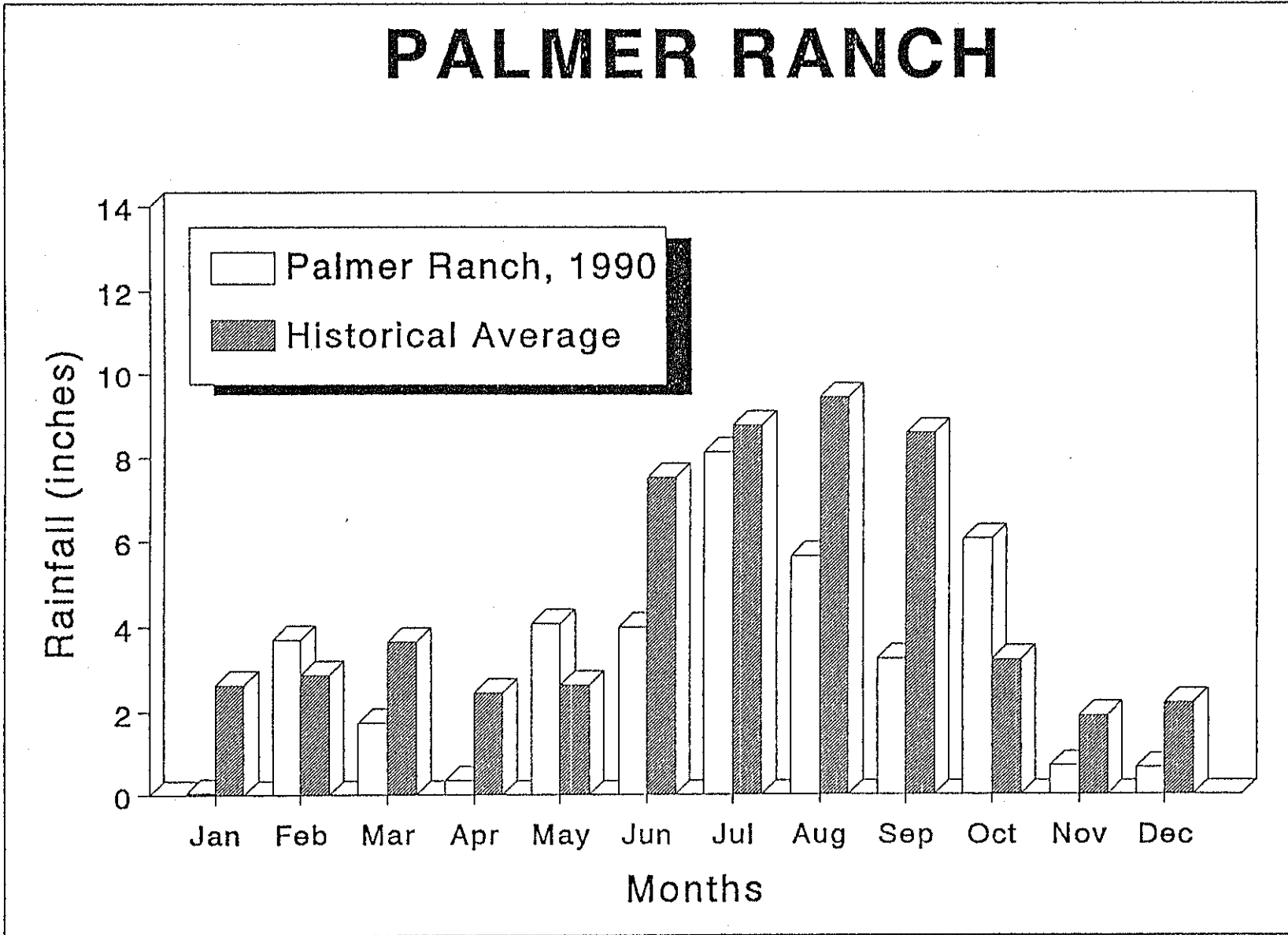


Figure 4.1 Historical vs. Actual Rainfall Recorded on the Palmer Ranch During January - December, 1990.

Table 4.1 Rainfall Recorded on the Palmer Ranch during the Period of January, 1990 through December, 1990.

Date	Rainfall (inches)				
	Monthly	Seasonal ^a	Pre-event Rainfall		
			2 Mo.	2 Week	2 Day
January, 1990	0.05				
February, 1990	3.70				
March, 1990	1.75		3.95	0.20	0.00
Winter		5.50			
April, 1990	0.35				
May, 1990	4.08				
June, 1990	4.00		6.68	4.60	0.00
Spring		8.43			
July, 1990	8.15				
August, 1990	5.68				
September, 1990	3.25		9.03	0.70	0.15
Summer (wet season)		17.08			
October, 1990	6.10				
November, 1990	0.70				
December, 1990	0.65		7.10	1.15	0.00
Fall (dry season)		7.45			
Yearly Total		38.46			

^aPrimary Wet Season (June - September) - 21.08
 Primary Dry Season (October - January) - 7.50
 Secondary Wet Season (February - March) - 5.45
 Secondary Dry Season (April - May) - 4.43

the dry season normally occurs (*i.e.*, October-January). The percentage of the total annual rainfall recorded during the 1990 dry season was above that reported during previous years due to the abnormally high amount of rainfall which occurred in October and the low rainfall amounts observed during much of the wet season.

Antecedent rainfall accumulations during a 2-week period prior to each quarterly event, as well as 2-month and 2-day antecedent accumulations, are given in Table 4.1. As evident in the table, rainfall was recorded during the 2-day antecedent period only for the September 1990 monitoring event. However, rainfall events did occur during the 2-week antecedent periods for all events performed during the 1990 monitoring year. Prior to the March and September quarterly events, minimal rainfall accumulations of 0.2 and 0.7 inches, respectively, were recorded during the 2-week antecedent periods. In contrast, 4.6 and 1.2 inches of rainfall were recorded during the 2-week period prior to the June and December quarterly events, respectively.

4.1.2 Stream Stage

Water depths measured at each station during the four quarterly sampling events performed during 1990 are tabulated in Appendix Table A-1. As expected, due to the droughty conditions experienced during much of the year, the stream stages determined during 1990 are generally lower than those measured during the third and fourth monitoring years. Overall, stream stage averaged 0.6 feet with a range of 0.0 to 2.3 feet compared to an average of 0.8 feet recorded during the fourth monitoring year.

In general, the Trunk Ditch exhibits the deepest waters of the streams traversing the North Tract of the Palmer Ranch with a depth approximately 8 feet near the center of its

realigned segment. This segment of Trunk Ditch runs adjacent to the Country Club of Sarasota and Prestancia. Although Station CC-4 is located on the realigned segment of Trunk Ditch, it exhibited an average depth of 0.9 feet since the measurements are taken in the littoral zone of the ditch. Even so, the stream stage at Station CC-4 was slightly higher than observed at most other stations. Similarly, Station NC-6 exhibited an average depth of approximately 1.0 feet, which was the second highest recorded during the sixth monitoring year. However, Station NC-6 is located in the southern end of Trunk Ditch in a pool-type community. The uppermost station in Catfish Creek (Station CC-1) exhibited the highest average depth of 1.4 feet during 1990.

The shallowest stations were located in Catfish Creek and South Creek, at Station CC-5 which averaged 0.3 feet and Station SC-3 which averaged 0.2 feet. Shallow conditions were also observed in Catfish Creek at Station CC-2 and in South Creek at Station SC-7 as stream depths averaged 0.4 and 0.3 feet, respectively. During the quarterly events in June and December, one station exhibited dry conditions (Station SC-3). During the September monitoring event, three stations (*i.e.*, CC-2, SC-2, and SC-7) were dry. However, all 13 stations were inundated during the quarterly event performed in March.

4.1.3 Stream Flow

As evident in Appendix Table A-2, positive flows were recorded for 31 of 52 measurements (60 percent) taken during the sixth year of monitoring. As expected due to the dry conditions, the percentage of positive flows measured during 1990 is slightly lower than the 65 and 67 percent positive flow measurements observed during the third and fourth monitoring years, respectively (CCI, 1988 and 1988b). However, the 60

percent positive flow measurements recorded in 1990 was well above the 47 percent found during the second year of monitoring when the total annual rainfall was 33 inches (CCI, 1986).

The highest stream flows during 1990 occurred during the June monitoring event for which average flows for Catfish Creek and South Creek were determined to be 268 and 119 gpm, respectively. The high stream flows measured in June coincide with the highest 2 week antecedent rainfall amount (Table 4.1) which resulted in elevated groundwater tables and a higher percentage of runoff, and therefore, increased stream flow.

As noted during the past three years of monitoring, it is apparent that low flow conditions have prevailed in various stream segments. During the sixth monitoring year, low flow conditions were most frequently observed in the Catfish Creek-Trunk Ditch Basin at Stations CC-1 and CC-2, and in the South Creek Basin at Stations SC-1 and SC-3, and at Station EL-1A . No flow conditions were found at Stations CC-2, EL-1A, and SC-1 during all four monitoring events performed in 1990. With the exception of Station EL-1A, similar results were obtained during the fourth year of monitoring in which Stations CC-2 and SC-1 exhibited no flow conditions during all monitoring events.

During the sixth year of monitoring, stream flows in the Catfish Creek-Trunk Ditch Basin ranged 0 - 46 gpm in its upper reaches (CC-1 and CC-2) and 25 - 221 gpm in its mid-reach (CC-3 and CC-4). During this same period, South Creek exhibited a range of 0 - 97 gpm in its upper reaches and 0 - 288 gpm in its mid-reach. In comparison, less flow was recorded in Elligraw Bayou and in the southern end of Trunk Ditch, as flow ranged 0 - 55 gpm at Station NC-6 with no flow recorded at Station EL-1A.

4.2 Physical Water Quality Parameters

4.2.1 Water Temperature

Appendix Table A-3 presents the surface water temperature measurements acquired during the 1990 monitoring year. Results indicate that the water temperature of the streams of the North Tract of the Palmer Ranch ranged from 12.0 to 34.0°C during the four monitoring events. This range is similar to those recorded during previous years of monitoring (Palmer Venture, 1986 and CCI, 1986, 1988, and 1988b).

As expected, the lowest water temperatures were recorded in the streams of the North Tract during the December, 1990 quarterly event, and the highest water temperatures were recorded during the June and September monitoring events. During the June monitoring event, temperatures averaged 29.3°C, while during the December event a lower average of 14.8°C was observed. Average temperatures for Catfish Creek and South Creek for each event are very similar with differences of less than 1°C.

An evaluation of diurnal variations in water temperature in the Catfish Creek and South Creek Basins was performed during the dry season of 1985 and the wet season of 1986 (CCI, 1987). The results of the diurnal evaluation showed increases in water temperature to maximum levels by mid-afternoon followed by declines during the evening to minimal levels by early morning. An evaluation of the results of the diurnal study is provided in the report prepared by CCI.

4.2.2 Specific Conductance

As evidenced in Appendix Table A-4, the streams of the North Tract exhibited a range in specific conductance of 587 - 1,625 micromhos per centimeter ($\mu\text{mhos/cm}$) as compared

with a slightly lower ranges of 422 - 1,406 and 620 - 1,430 $\mu\text{mhos/cm}$ during the third and fourth monitoring years, respectively (CCI, 1988 and 1988b) and a higher range of 413 - 1,809 $\mu\text{mhos/cm}$ during the second monitoring year (CCI, 1986). The slightly higher conductivities found during the sixth year probably resulted from the relatively low amount of rainfall which occurred during 1990. As discussed in the previous annual reports (CCI, 1988 and 1988b), during times of drought, such as occurred during the second monitoring year in which only 33 inches of annual rainfall was recorded as well as the 1990 monitoring year, the lack of precipitation resulted in minimal runoff of low conductivity stormwater thereby allowing the conductivity in the streams of the ranch to increase. In addition, a larger portion of the streams' surface waters probably originated from groundwater exfiltration. Since groundwater normally has a higher conductivity than rainwater and surface runoff, an increase in the the conductivity of the streams would be expected.

The lowest average conductivities were reported for the June and September, 1990 monitoring events, 862 and 858 $\mu\text{mhos/cm}$, respectively. As described above, these lower conductivities most likely resulted from the cumulative effects of increased surface runoff of low conductivity stormwater during the periods of highest rainfall (refer to Table 4.1).

In a comparison of streams within the Palmer Ranch, the overall annual mean for both South Creek and Catfish Creek was 956 $\mu\text{mhos/cm}$. However, South Creek exhibited higher conductivities than Catfish Creek during the March and June events, with the highest conductivities being found in Catfish Creek during the September and December

events. High conductivities were also consistently found at Station EL-1A. During past monitoring years, South Creek has exhibited higher conductivities than the other streams of the North Tract (Palmer Venture, 1986; CCI, 1986, 1988, and 1988b).

As observed during the previous years of monitoring (CCI, 1988 and 1988b), there were no apparent spatial trends observed in conductivity within the two major basins of the North Tract (Appendix Table A-4). In Catfish Creek and Trunk Ditch, conductivities in the upper reaches averaged 934 $\mu\text{mhos/cm}$, slightly lower than in the mid-reach which averaged 1049 $\mu\text{mhos/cm}$. In the South Creek Basin, upstream conductivities in the western branch averaged 1,076 $\mu\text{mhos/cm}$ as compared to lower mid-reach conductivities which averaged 877 $\mu\text{mhos/cm}$. Similarly, conductivities in the eastern branch averaged 873 $\mu\text{mhos/cm}$.

The State specific conductance criteria applicable to the streams of the Palmer Ranch allows an increase of not more than 50 percent above background levels or to a level of 1,275 $\mu\text{mhos/cm}$ which ever is greater. In the Catfish Creek-Trunk Ditch Basin, Station CC-2 and CC-3 exceeded the conductivity 1,275 $\mu\text{mhos/cm}$ threshold on one occasion (i.e. during the, December and September sampling events, respectively). Likewise, one station in the South Creek Basin (i.e., Station SC-4) was found to exceed this threshold, on two occasions (i.e., June and December). However, since the conductivity levels observed at these stations during the 1990 monitoring year are similar to those reported during previous years, the levels measured during 1990 are not considered to be more than 50 percent above background levels. Therefore, no violations of the State criteria for specific conductivity occurred during 1990.

The Sarasota County criteria for specific conductance (Ordinance No. 72-37) is similar to, but more stringent than, the State criteria. The Sarasota County standard allows up to a 100 percent increase above background but to a maximum level of 500 μ mhos/cm in freshwater streams. Therefore, the streams of the Palmer Ranch were out of compliance with the County criteria during the sixth year since they are considered to be freshwater. Ubiquitous non-compliance conductivities were also observed during the past years of monitoring (CCI, 1986, 1988, and 1988b).

4.2.3 Total Suspended Solids

During the sixth year of monitoring, the streams of the Palmer Ranch exhibited a range in total suspended solids (TSS) of <1 to 24 mg/l with a yearly average of approximately 6 mg/l (Appendix Table A-5). In general, the TSS levels observed during the sixth year of monitoring are lower than those recorded in second, third and fourth years of monitoring. The lower TSS levels are probably associated with the droughty conditions experienced during much of the year and the subsequent low mass transport rates.

The highest TSS levels during 1990 were recorded at the mid-reach of Catfish Creek (CC-4), in the upper and mid-reaches of South Creek (SC-1, SC-3, and SC-4), and in Elligraw Bayou (EL-1A). The lowest TSS levels were recorded in the upper reaches of Catfish Creek (CC-1, CC-2, and CC-3) and in the South Creek Basin at Stations SC-2, SC-7, and SC-8. As expected, the highest TSS levels were recorded for the September and June monitoring events, probably due to the higher amounts of rainfall and the resultant increase in the amount of suspended material occurring during the wet season. The lowest TSS levels were observed during the driest part of the year (*i.e.*, March event).

The TSS level ranged from 1 to 57 and from <1 to 86 mg/l during the third and fourth monitoring years, respectively, with a yearly average of approximately 15 mg/l during each of the two monitoring years (CCI, 1988 and 1988b). During the second year of monitoring (CCI, 1986), the streams of the Palmer Ranch exhibited a much wider range in TSS (1 - 207 mg/l) and a higher yearly average (24 mg/l). Moreover, high TSS levels were recorded in the vicinity of the Prestancia construction site in Catfish Creek (CC-3), Trunk Ditch (CC-4), and Elligraw Bayou (EL-1A). These elevated TSS levels observed near Prestancia were attributed to construction activities including the excavation of Trunk Ditch.

During the first year of monitoring, TSS was reported to be much lower than observed during the past four years of the monitoring program, perhaps as a result of low mass transport rates associated with drought conditions or differences in sampling and analytical procedures (Palmer Venture, 1986). Overall, the surface waters of the ranch showed a range of approximately 1 - 12 mg/l during the first year of monitoring.

4.2.4 Turbidity

Stream turbidities were found to be positively correlated with TSS during the 1990 monitoring year, as expected (*i.e.*, correlation coefficient (R) = 0.68). Also, turbidity exhibited the same seasonal trends observed for TSS with the highest mean turbidity level (*i.e.*, 9.6 NTU) occurring in September, 1990 while the lowest mean level (*i.e.*, 4.8 NTU) was determined for the March event (Appendix Table A-6). Intermediate averages of 6.0 and 6.1 NTU were observed for the June and December events, respectively.

Overall, the streams traversing the North Tract exhibited a range in turbidity of approximately 0.6 to 24 NTU with an average of 6.5 NTU during the sixth year of the monitoring program (Appendix Table A-6). In comparison, turbidity exhibited a comparable ranges of 1.2 to 36 NTU and 0.6 to 30 NTU during the third and fourth monitoring years, respectively, with strong positive correlations with TSS during both years (CCI, 1988, 1988).

During the second year of monitoring, CCI (1986) reported higher turbidities of 1 to 61 NTU, while during the first year of monitoring, Palmer Venture (1986) reported much lower turbidities, *i.e.*, < 6 NTU. Differences between the first and second year have been attributed to the drought combined with low pollutant loadings during the first year, and to the initiation of construction including the realignment of Trunk Ditch during the second year of monitoring.

The General Criteria for all surface waters (Chapter 17-302, F.A.C.) specifies that turbidity shall not exceed 29 NTU above natural background. Based on turbidity measurements taken during previous years of monitoring, natural background turbidity levels are expected to be less than 14 NTU (mean plus one standard deviation), although higher background turbidities might occur as a result of natural processes, *e.g.*, organic decay and import of particulate matter via stormwater runoff. Therefore, all turbidity measurements performed during the 1990 monitoring year were in compliance with the applicable state water quality criteria.

Sarasota County Ordinance (No. 72-37) allows a maximum increase of 25 Jackson units above background. Analysis of turbidity samples, however, were performed in

accordance with F.A.C. 17-302 criteria which is based on the Nephelometric procedure. Therefore, a comparison of the turbidity results to the County criteria can not be made.

4.3 Oxygen Demand and Related Parameters

4.3.1 Biochemical Oxygen Demand

As shown in Appendix Table A-7, the 5-day biochemical oxygen demand (BOD₅) recorded in the streams of the North Tract averaged approximately 1.9 mg/l and ranged from 0.4 to 7.8 mg/l during the sixth year of the monitoring program. Additionally, a positive correlation between BOD and TSS was noted (*i.e.*, correlation coefficient = 0.64), and is attributed to decaying vegetation and other organic matter in the water column. Generally, the highest BOD levels were recorded for the for the June and September events.

BODs in the two largest streams, South Creek and Catfish Creek, varied somewhat. South Creek exhibited an average level of approximately 1.9 mg/l with a range of 0.4 to 7.8 mg/l, whereas Catfish Creek exhibited a lower average level of approximately 1.8 mg/l with a narrower range of 0.6 - 4.5 mg/l. The highest mean BOD levels were determined for Stations SC-1, SC-3, EL-1A, and CC-1.

In general, slightly higher results were obtained during the third and fourth years of monitoring (CCI, 1988 and 1988b) when BODs in the streams of the Ranch averaged 3.1 and 3.2 mg/l, respectively. Moreover, South Creek and Catfish Creek exhibited low to moderate BODs with Elligraw Bayou and the southern end of Trunk Ditch exhibiting higher BODs during this period.

During the second year of monitoring, a higher average of 4 mg/l was found (CCI,1986). Similar to the third and fourth years, South Creek and Catfish Creek exhibited BOD levels of approximately 3.5 mg/l, whereas high BODs of approximately 8 mg/l were observed in Elligraw Bayou and in the southern end of Trunk Ditch (*i.e.*, Stations EL-1A and NC-6).

During the first year of monitoring, Palmer Venture (1986) reported an overall range in BOD₅ of 1.2 - 8.9 mg/l. Catfish Creek and Trunk Ditch exhibited a range of 1.2 - 6.5 mg/l, and South Creek exhibited a range of 1.4 - 8.9 mg/l. In Elligraw Bayou and at the Trunk Ditch-North Creek juncture, BOD was reported to range 2 - 6 mg/l.

According to Hynes (1966), a BOD of 3 mg/l is indicative of "fairly clean" water while a BOD of 5 mg/l is indicative of "doubtful" quality water. In addition, a BOD screening level of >3.3 has been established for Florida waters to indicate potential water quality problems (FDER, 1990). Therefore, South Creek and Catfish Creek generally exhibited fairly clean water with only five of the 47 measurements being in excess of the 3.3 mg/l screening level. The General Criteria for BOD in all surface waters as designated by the F.A.C. 17-302, "Rules and Regulations of the Department of Environmental Regulation," as well as Sarasota County Ordinance No. 72-37, specifies that BOD shall not be increased to levels that would result in violations of dissolved oxygen. BODs recorded in the streams traversing the North Tract only occasionally exceeded 3.3 mg/l, a screening level which the FDER (1990) considers to be indicative of potential water quality problems. During the sixth year of monitoring, only two of the 47 BOD measurements exceeded the 5 mg/l level which Hynes (1966) considered to be "doubtful" or between

"fairly clean" and "bad" water quality. These were recorded in South Creek (*i.e.*, Stations SC-1 and SC-3) during the September 1990 monitoring event.

4.3.2 Dissolved Oxygen

Appendix Table A-8 provides the results of dissolved oxygen measurements acquired during the sixth year of monitoring. Overall, dissolved oxygen was found to average 5.6 mg/l, with a range of 0.9 - 12.7 mg/l. The highest dissolved oxygen concentrations were recorded in the Catfish Creek-Trunk Ditch Basin where dissolved oxygen averaged 6.2 mg/l. The lowest dissolved oxygen levels were recorded in the southern end of Trunk Ditch (North Creek-Trunk Ditch Basin Station NC-6) where dissolved oxygen averaged 1.5 mg/l. Seasonally, the highest average BODs were observed for the December 1990 monitoring event with the lowest levels occurring for the September monitoring event in conjunction with the highest average BOD₅ levels. Similar seasonal trends have been observed during previous monitoring years (CCI, 1988 and 1988b).

The results obtained during the 1990 monitoring year are generally lower than those measured during the third and fourth monitoring years (CCI 1988 and 1988b) but higher than the concentrations determined during the first two years of the monitoring program (Palmer Venture, 1986 and CCI, 1986). During the third and fourth monitoring years (CCI, 1988 and 1988b), dissolved oxygen was found to average 6.1 and 7.2 mg/l, respectively. Highest seasonal levels were recorded during early spring (March 1987), as dissolved oxygen averaged 8.4 mg/l. Lowest seasonal levels were recorded during late summer (September 1986) as dissolved oxygen averaged 4.7 mg/l. Dissolved oxygen measurements acquired during the second year of monitoring were lower as evident in the ranch-

wide average of 4.0 mg/l and the overall range of 0.4 - 12.4 mg/l. The lowest dissolved oxygen levels were observed during the first year of monitoring (Palmer Venture, 1986), as 22 of the 38 measurements were less than 4 mg/l.

An evaluation of diurnal variations in dissolved oxygen in Catfish Creek and South Creek was performed during the dry season of 1985 and the wet season of 1986. The results of the diurnal evaluation showed typical increases in dissolved oxygen during the day to maximum levels by mid-afternoon and declines during the night to minimal levels by mid-morning, as well as diurnal trends characteristic of the stream community. A summary of the results of the diurnal study is provided in the report prepared by CCI (1987).

During the sixth monitoring year, dissolved oxygen concentrations in the streams of the North Tract frequently occurred at levels below the 5.0 mg/l criteria specified by F.A.C. 17-302 and the 4.0 mg/l standard specified by Sarasota County Ordinance 72-37 for predominantly freshwaters at several stations. Of the 47 dissolved oxygen measurements made during the 1990 monitoring year, 16 were below the 5.0 mg/l state criteria with 15 of the measurements being below the 4.0 mg/l County Criteria.

4.3.3 pH

Results of pH monitoring are given in Appendix Table A-9. During the 1990 monitoring year, the streams of the Palmer Ranch exhibited pH levels in a narrow range of 6.6 - 8.2. In comparison to other years of monitoring, the range of pH observed during the 1990 monitoring year was similar to that observed during the first, second, and fourth monitoring years, but much narrower than that observed during the third year of monitoring (Palmer Venture, 1986 and CCI, 1986, 1988, and 1988b).

During the third year of monitoring, the streams of the Palmer Ranch exhibited pH levels in the range of 6.7 - 9.8 (CCI, 1988). During the first and second years of monitoring, however, Palmer Venture (1986) and CCI (1986) reported ranges in pH of 6.3 - 8.4 and 6.0 - 8.1, respectively.

During the sixth year, the lowest pH levels were observed in Catfish Creek at Stations CC-3 whereas the highest pH levels were recorded at Station CC-5. These differences are attributed primarily to spatial variations in community metabolism. Differences or changes in pH are indicative of the effects of net community metabolism on the level of carbon dioxide and pH. During periods of net community respiration, carbon dioxide is produced faster than it is assimilated, thereby depressing pH as a result of its reaction with water to form carbonic acid. In contrast, carbon dioxide is consumed faster than it is produced during periods of net community primary production, thereby increasing pH. Therefore, pH typically exhibits a diel trend of increases during the day and decreases during the night. The amplitude of the cycle normally depends on the rate of production and consumption and to a lesser extent on the buffering capacity of the water (alkalinity) and atmospheric exchange of carbon dioxide.

In a diurnal evaluation of Catfish Creek and South Creek, which was conducted during the dry season of 1985 and the wet season of 1986, CCI (1987) reported changes in pH characteristic of the different biological communities. During the day, Catfish Creek and South Creek exhibited changes in pH ranging up to a 1 - 2 unit increase with maximum diurnal changes observed in the lower reach of Catfish Creek and the upper reach of South Creek where the greatest metabolic rates were encountered.

As specified in the General Criteria for all surface waters (F.A.C. 17-302) and in the Sarasota County Ordinance No. 72-37, the allowable variation in pH is 1.0 unit above or below the normal pH provided that the pH is not lowered or elevated outside the range of 6.0 to 8.5. Additionally, if natural background is less than 6.0, the pH shall not vary below the natural background or vary more than one unit above natural background. Similarly, if natural background is above 8.5, pH shall not vary above natural background or vary more than one unit below background. During the sixth year of monitoring, the observed range in pH (6.6 - 8.2) fell completely within the specified range of 6.0 - 8.5.

4.4 **Macronutrients**

4.4.1 Total Nitrogen

Appendix Table A-10 provides the results of total nitrogen measurements acquired during the sixth year of monitoring. Although generally lower, the spatial and compositional trends in total nitrogen were similar to the trends observed during the previous years of monitoring. During the sixth year, the upper reaches of South Creek and Elligraw Bayou exhibited higher total nitrogen levels than observed in the other streams or stream segments of the North Tract. In the upper segments of South Creek, total nitrogen levels averaged 1.83 and 1.74 mg/l for the east and west branches, respectively. At Station SC-3, the northern most station in South Creek, total nitrogen averaged 2.24 mg/l with an average concentration of 1.87 being observed for Station SC-4. In Elligraw Bayou at Station EL-1A, total nitrogen averaged 1.91 mg/l for the four monitoring events. Lower averages were observed in the mid reach of South Creek (1.30 mg/l) and in the Catfish Creek-Trunk Ditch Basin (1.16 mg/l).

Overall, total nitrogen levels averaged 1.4 mg/l during the 1990 monitoring year as compared with higher averages of 2.6, 1.9, and 1.6 mg/l second, third, and fourth years of monitoring (CCI, 1986, 1988, and 1988b). Of possible significance, the decline in total nitrogen during the past several years may be indicative of a general improvement in water quality in the streams of the North Tract of the Palmer Ranch.

The largest fraction of total nitrogen observed during the sixth year of monitoring occurred in the form of organic nitrogen. Organic nitrogen represented approximately 92 percent of the total and averaged 1.31 mg/l. The second most abundant form of nitrogen was ammoniacal nitrogen (ionized plus un-ionized ammonia) which represented approximately 5 percent of the total with an average level of 0.07 mg/l. Nitrate represented approximately 3 percent of the total with an average level of 0.04 mg/l. As expected, the smallest fraction of total nitrogen was found to be nitrite which represented < 1 percent of the total.

Similarly, CCI (1986, 1988, and 1988) reported comparable breakdowns of total nitrogen during the second, third, and fourth years of the monitoring program. The largest fraction of total nitrogen observed during the previous years of monitoring also occurred in the form of organic nitrogen. Organic nitrogen represented from 82 to 85 percent of the total and averaged from 1.3 to 2.2 mg/l during this period. Likewise, the second most abundant form of nitrogen was ammoniacal nitrogen which represented from 9 to 13 percent of the total with average levels of 0.14 to 0.30 mg/l over the same period. Nitrate represented approximately from 3 to 8 percent of the total with average levels ranging from 0.07 to 0.12 mg/l during the previous years of monitoring. As during the 1990

monitoring year, the smallest fraction of total nitrogen during the second, third, and fourth years was nitrite, which represented < 1 percent of the total during all years.

During the first year monitoring, however, Palmer Venture (1986) reported a significantly different breakdown and a substantially lower total nitrogen (0.8 mg/l) than during the following monitoring years. During the first year, total nitrogen averaged 69 percent organic nitrogen, 8 percent ammonia-nitrogen, 23 percent nitrate-nitrogen, and < 1 percent nitrite-nitrogen. The lower total nitrogen during the first year versus the latter years can not be explained based on the available information, but may be associated with the extremely droughty conditions experienced during the first monitoring year. Also, it is not completely understood why nitrate levels exceeded ammonia levels during the first year since nitrate is normally assimilated by denitrifying bacteria under conditions of depressed oxygen levels, a condition which prevailed throughout the first year.

As specified in F.A.C. 17-302, nutrients, including total nitrogen, shall not be elevated to levels causing an imbalance in the natural flora and fauna, a condition characteristic of eutrophic or nutrient-rich streams. In this respect, there were some implications in the data acquired during the second, third, and fourth monitoring years which linked the observed total nitrogen levels to eutrophic conditions even though there appeared to be a general trend of decreasing nitrogen levels as previously discussed (CCI, 1986, 1988, and 1988b). Results obtained during the 1990 monitoring year indicate that total nitrogen rarely exceeded the screening level of 2.0 mg/l considered by the FDER (1990) to be characteristic of eutrophic conditions. Only four of the 47 total nitrogen measurements made during 1990 exceeded the 2.0 mg/l screening level. The total nitrogen levels

exceeding the screening level were recorded during the September event in Elligraw Bayou and the upper reaches of South Creek.

4.4.2 Nitrite

Nitrite levels observed in the streams of the Palmer Ranch during the fourth year of monitoring are provided in Appendix Table A-11. As expected, nitrite concentrations throughout the streams traversing the North Tract were much lower than the other nitrogen constituents, and too low to be a significant nutrient source. Of the 47 samples collected during the 1990 monitoring year, 40 contained nitrite concentrations below the 0.01 mg/l analytical detection limit. Overall, nitrite observations averaged <0.01 mg/l with a range of <0.01 to 0.02 mg/l as compared with the fourth year in which nitrite averaged 0.01 mg/l and ranged from <0.01 to 0.04 mg/l.

During the second and third years of monitoring, elevated nitrite levels were primarily observed downstream of the dairy (deactivated by August 1987) in the eastern branch of South Creek. During the fourth year of monitoring, however, only traces of nitrite (0.01 mg/l) were recorded in South Creek.

As a nutrient, nitrite is considered to be covered by the general water quality standard (F.A.C. 17-302). Due to the observed low concentrations, however, nitrite was generally found to be of little importance as a nutrient in the streams of the Palmer Ranch. For all practical purposes, therefore, nitrite is considered to meet desired standards.

4.4.3 Nitrate

As shown in the results provided in Appendix Table A-12, nitrate levels observed in the streams traversing the North Tract exhibited a yearly average of 0.04 mg/l with a range of <0.01 to 0.33 mg/l. These results are much lower than those determined during the fourth monitoring year in which nitrate averaged 0.12 mg/l with a range of <0.01 to 1.30 mg/l. More comparable nitrate concentrations were reported for the second and third monitoring years when nitrate exhibited yearly averages of 0.07 and 0.06 mg/l and ranges of < 0.01 - 0.54 and < 0.01 - 0.42 mg/l, respectively.

Similar to the previous years, the highest nitrate levels, averaging 0.07 mg/l, were recorded during the December, 1990 monitoring event. This temporal trend is attributed to lower rates of nitrate assimilation and/or higher rates of nitrification during the fall and winter seasons as primary production declines to minimal rates. Additionally, nitrate loading rates might have increased during the fall and winter seasons in association with increased fertilization of the adjacent golf courses along Trunk Ditch along with decreased gross production.

Ranch-wide, the Catfish Creek-Trunk Ditch Basin exhibited the highest nitrate levels recorded during the sixth monitoring year, averaging 0.06 mg/l in its upper reach (Stations CC-1 and CC-2), 0.11 mg/l in its mid-reach (Stations CC-3 and CC-4), and 0.03 mg/l in its lower reach (Station CC-5). Similar to the fourth monitoring year, nitrate levels in the South Creek Basin were found to be comparatively low during 1990. In contrast, the South Creek Basin was found to have a major source of nitrate, the dairy, located in its eastern branch upstream of the Palmer Ranch during the first, second and third years

of monitoring (Palmer Venture, 1986, and CCI, 1986 and 1988). During the sixth monitoring year, however, the eastern branch (Stations SC-7 and SC-3) averaged only 0.06 mg/l. Even lower nitrate values were recorded in the western branch (Stations SC-1 and SC-4) as nitrate averaged <0.01 mg/l. Downstream in the mid-reach of South Creek the nitrate concentration also averaged of <0.01 mg/l. The highest nitrate level observed in South Creek during the sixth year occurred in the eastern branch at Station SC-7. Since Station SC-7 is located at the upstream boundary of the Palmer Ranch but downstream of the dairy/sod farm, the high nitrate observation which occurred December is attributed to dairy/sod farm runoff in association with the relatively high antecedent rainfall recorded during the two week period prior to the sampling event.

Very low nitrate levels were also recorded at the juncture of Trunk Ditch and the North Creek Basin and in Elligraw Bayou, as evidenced by the yearly average of <0.01 mg/l determined for both stations, respectively. Since both Trunk Ditch and Elligraw Bayou sites exhibited low-flow conditions, nitrate import was probably minimal. Furthermore, the Trunk Ditch site exhibited anaerobic conditions which are conducive to denitrification and minimal nitrate concentrations. Elligraw Bayou, on the other hand, exhibited relatively high dissolved oxygen levels during the sixth year suggesting that the low nitrate levels in the water might have resulted from nitrate assimilation during plant production.

As a nutrient, nitrate is designated as a parameter covered by the general water quality criteria (F.A.C. 17-302), and is an important limiting nutrient in the streams of the Palmer Ranch. Therefore, increases in nitrate availability from anthropogenic sources would accelerate production rates of aquatic plants resulting in an imbalance in the flora and

fauna which would be considered a violation of the nutrient standard. However, the nitrate concentrations determined during the 1990 monitoring year were the lowest recorded during the six year monitoring program on the Palmer Ranch and are not thought to represent an important source of nitrogen in the streams of the Palmer Ranch. Therefore, nitrate is considered to meet desired criteria.

4.4.4 Ammoniacal Nitrogen

Appendix Table A-13 provides the results of ammoniacal nitrogen measurements (ionized plus un-ionized ammonia) recorded during the sixth year of monitoring. As described previously, ammoniacal nitrogen represented 5 percent of the total nitrogen found during the sixth monitoring year. Overall, ammoniacal nitrogen exhibited an average of 0.07 mg/l with a range from <0.02 to 0.86 mg/l.

Although ammoniacal nitrogen is a potentially important nutrient to the primary producers in the streams of the Palmer Ranch, the results suggest that nitrate might be the preferred nitrogen source. This indication is based on two annual trends observed during the 1990 monitoring year as well as previous monitoring years as related to normal plant production and decay. First, nitrate declined to minimal levels during the late spring (June 1990), most likely in association with the peak of the growing season while ammoniacal nitrogen remained comparatively high, 0.02 versus 0.07 mg/l, respectively. Second, ammoniacal nitrogen declined to minimal levels during December (*i.e.*, 0.03 mg/l) at a time when nitrate levels peaked (*i.e.*, 0.07 mg/l). Since December is considered to be the beginning of the winter season when net (primary) production is minimal, assimilation of nutrients should also be minimal. Since nutrients should be more available

when they are assimilated at minimal rates, and vice versa, their concentrations should be elevated during December and depressed during June. Furthermore, nitrification (biological oxidation of organic nitrogen to nitrate) is expected to increase in association with the die-off and decay of plant material under aerobic conditions. Moreover, die-off and decay of plant material is expected to increase immediately following the period in which its standing crop peaks. This should occur in the streams of the Palmer Ranch from October to December. Since it was evident that the streams of the Palmer Ranch followed these trends of primary production, decay, nitrification, and minimal levels of nitrate during the growing season, it is concluded that nitrate is the preferred nitrogen source. Other freshwater studies (Wetzel, 1975) have also concluded that aquatic vegetation, including algae, prefer nitrate to ammonia.

During the first, second, third, and fourth years of monitoring (Palmer Venture, 1986 and CCI, 1986, 1988 and 1988), ammonia was higher than observed during the sixth year. During the fourth year, ammonia ranged 0.03 - 0.75 mg/l with a yearly average of 0.14 mg/l. Additionally, the eastern tributary of South Creek exhibited the highest ammoniacal nitrogen levels on the ranch during the first three years of monitoring. During the fourth year, however, the eastern tributary of South Creek exhibited generally low ammonia levels.

Until recently, the eastern tributary of South Creek received drainage from an active dairy farm. During a period of approximately one year, the dairy farm was gradually phased out and officially converted to a sod farm on August 1, 1987. While actively operated during most of the third year of monitoring, drainage from the dairy farm represented a

significant source of nitrogen. The effect of this nitrogen source was observed in the eastern tributary of South Creek to the downstream boundary of the North Tract. Additionally, its effects included elevated ammoniacal nitrogen levels (Palmer Venture, 1986 and CCI, 1986 and 1988)). However, during the fourth, fifth, and sixth years of monitoring the results showed no evidence of enrichment with ammoniacal nitrogen.

Although ammoniacal nitrogen is a nutrient and therefore has the potential to influence the growth of the primary producers (plants) and their balance with the consumers (bacteria and animals), F.A.C. 17-302 does not provide a quantitative nutrient standard for ammoniacal nitrogen. Although it might be less preferred than nitrate, increases in ammonia have the potential to accelerate plant production, and, in turn, influence the balance between the flora and fauna of the streams traversing the Palmer Ranch. Since the non-ionized fraction of ammoniacal nitrogen was not evaluated independently, comparisons to County and State criteria for non-ionized ammonia were not made.

4.4.5 Organic Nitrogen

Organic nitrogen (total Kjeldahl nitrogen less ammoniacal nitrogen) concentrations determined in the streams traversing the Palmer Ranch during the 1990 monitoring year are provided in Appendix Table A-14. Overall, the streams of the Palmer Ranch exhibited an average organic nitrogen concentration of 1.31 mg/l during the sixth year of monitoring with a range from 0.51 to 2.86 mg/l. This is very similar to the 1.30 mg/l average observed during the fourth monitoring year (CCI, 1988). However, during the second and third years of monitoring (CCI, 1986 and 1988), organic nitrogen exhibited higher averages of 2.21 and 1.56 mg/l, respectively. This can be interpreted as another

indication of a gradual improvement in water quality over the past six years. An important contributing factor to the trend of improving water quality is the deactivation of the dairy farm in the South Creek Basin. Also, channel maintenance in Trunk Ditch during the fourth monitoring year, as well as the aquatic community changes resulting from the "realignment" of a segment of the Catfish Creek-Trunk Ditch Basin during the second year, could have contributed to the declining trend in organic nitrogen.

The concentration of organic nitrogen followed a seasonal trend similar to that observed during previous monitoring years with the level of organic nitrogen increasing to maximal levels during the late summer (*i.e.*, September 1990) then declined during the fall and winter to a minimum in March. During the September 1990 monitoring event, ranch-wide organic nitrogen levels averaged 1.54 mg/l compared to the 1.20 mg/l observed during the March 1990 event.

The peak in organic nitrogen during September is apparently associated with peaks in the standing crop of aquatic vegetation and stormwater loadings, since September represents the end of the summer wet season. During the fall and winter, the standing crop of vegetation declined in association with low production rates and the decay of plant material. During this period, organic nitrogen exhibited a concomitant decline as the plant material was depleted by the microbial heterotrophs. Additionally, stormwater loading rates most likely declined in association with minimal runoff during the dry months of October - January.

4.4.6 Total Phosphorus

During the 1990 monitoring year, total phosphorus in the streams of the Palmer Ranch exhibited a yearly average of 0.20 mg/l and a range of <0.01 to 0.71 mg/l (Appendix Table A-15). The highest total phosphorus levels were recorded in the upper reaches of South Creek Basin with Station SC-7 averaging 0.50 mg/l for the four 1990 monitoring events. The lowest mean total phosphorus concentrations were observed in the mid and lower segments of Catfish Creek (*i.e.*, CC-3, CC-4, and CC-5).

During the third and fourth monitoring years considerably higher levels of total phosphorus were recorded with overall mean concentrations of 0.47 and 0.45 mg/l, respectively. During the third year of monitoring (CCI, 1988), total phosphorus exhibited a yearly average of 0.47 mg/l and a range of 0.07 - 2.86 mg/l, slightly higher than the average of 0.45 mg/l and range of 0.06 to 2.51 mg/l observed during the fourth year. Also, the highest total phosphorus levels during this period were recorded in the eastern tributary of the South Creek Basin, apparently originating from the active dairy farm as previously noted. Since inactivation of the dairy farm was initiated during the third monitoring year, a gradual decrease in phosphorus levels as well as a general improvement in water quality should be expected beginning in the fourth year following the inactivation of the dairy farm.

In addition, high total phosphorus levels were also observed in Elligraw Bayou during the second and third year of monitoring (CCI, 1986 and 1988),. The source of this phosphorus is attributed to cleared lands and construction activities associated with the development of Prestancia which is adjacent to Elligraw Bayou.

During the second year of the monitoring program (Palmer Venture, 1986), total phosphorus levels were higher than recorded during the latter years of monitoring. This was evidenced by the ranch-wide yearly average of 1.0 mg/l and by the wider range of 0.08 - 6.4 mg/l. As observed during the other years of monitoring, the highest total phosphorus levels were recorded in the eastern branch of South Creek, apparently originating from the dairy farm. Likewise, Palmer Venture (1986) reported high total phosphorus concentrations in the eastern tributary of South Creek during the first monitoring year and attributed them to the upstream dairy farm.

As a nutrient, phosphorus is required by algae and other plants for the primary production of organic matter and, therefore, as specified in F.A.C. 17-302, shall not be elevated to levels which will cause an imbalance in the natural flora and fauna. The results of the sixth year of monitoring indicate that the total phosphorus concentrations in the streams of the Palmer Ranch only occasionally exceeded the FDER screening level of 0.46 mg/l (FDER, 1990) which is considered to be indicative of water quality problems. The total phosphorus concentrations were more often above the 0.09 mg/l level determined to be the median concentration for Florida streams (FDER, 1990).

Similar concentrations are normally found in west-central Florida because of the widespread deposits of naturally occurring phosphate. Interestingly, well drillers' logs show that phosphates exist in shallow deposits on the Palmer Ranch (Patton and Associates, 1984). In addition, Palmer Venture (1986) noted that the phosphate levels in the streams of the Palmer Ranch were significantly influenced by groundwater during periods when stream flow was augmented by groundwater exfiltration (*i.e.*, low flow

conditions). Consequently, phosphates originating from these naturally occurring deposits within, or upstream of, the Palmer Ranch should not be considered violations even though they exhibit the potential for contributing to high rates of primary production and a concomitant imbalance in the flora and fauna.

4.4.7 Orthophosphate

Orthophosphate (total reactive phosphate) concentrations determined in the streams traversing the Palmer Ranch during the 1990 monitoring year are provided in Appendix Table A-16. Overall, the streams of the Palmer Ranch exhibited an average orthophosphate concentration of 0.14 mg/l during the sixth year of monitoring with a range from <0.01 to 0.57 mg/l. As with total phosphorus, the orthophosphate concentrations observed during the 1990 monitoring year are significantly below the levels recorded for previous monitoring years. During the fourth year orthophosphate was found to average 0.38 mg/l with a range of from 0.02 to 2.30 mg/l with an average of 0.44 mg/l and range of 0.10 to 2.86 mg/l during the third year. Even higher ranges of 0.10 to 4.3 and <0.02 to 5.5 mg/l were determined for the first and second monitoring years, respectively (Palmer Venture, 1986 and CCI, 1986).

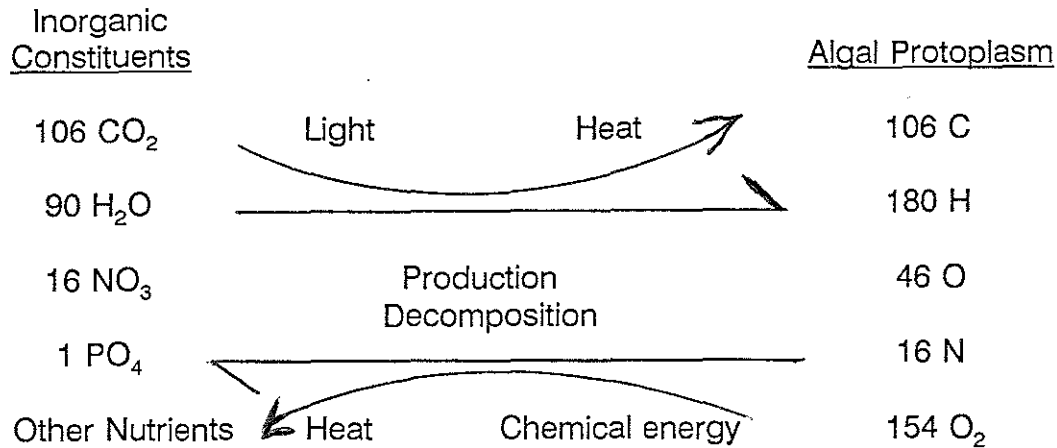
Even though the phosphorus concentrations have decreased considerably over the last four years, the percentage of total phosphorus consisting of orthophosphate has remained relatively constant. In general, orthophosphate represented approximately 70 percent of the total phosphorus during 1990 compared to 62 and 84 percent for the third and fourth years respectively.

During the sixth year of monitoring, an apparent spatial and temporal trend in orthophosphate showed that there continued to be a significant source of phosphate in the headwaters of the South Creek Basin the dairy farm which was inactivated in August, 1987 and converted into a sod farm. Due to this upstream nutrient source the highest mean orthophosphate level (*i.e.*, 0.36 mg/l) was found for the eastern tributary of South Creek with Station SC-7 exhibiting the highest mean concentration (*i.e.*, 0.44 mg/l). As expected, the orthophosphate concentration decreased downstream of the apparent source with the lowest levels in the South Creek Basin being observed for Station SC-8. Similar trends were observed during the third and fourth monitoring years for the South Creek Basin. These spatial and temporal declines are attributed to the following: (1) the inactivation of the dairy farm and subsequent residual effects; (2) downstream dilution of the dairy farm drainage; and, (3) phosphate uptake by biological and physicochemical processes.

As a nutrient, orthophosphate is designated by F.A.C. 17-302 as a general water quality parameter. This criteria specifies that the discharge of nutrients, such as orthophosphate, shall be limited to prevent an imbalance in the natural populations of aquatic flora and fauna. Although the observed levels are occasionally above the threshold considered to indicate eutrophic conditions as defined by FDER (1983), orthophosphate has been found to occur naturally on the North Tract. Consequently, other factors, such as nitrogen availability, are probably more growth limiting than orthophosphate. Therefore, the phosphate levels found during the 1990 monitoring year is not likely to have caused an imbalance in the aquatic flora and fauna.

4.4.8 Nutrient Ratios

Nitrate and phosphate are required by aquatic plants in proportions of approximately 16:1 (N:P) as illustrated (Odum, 1959) in the following equation:



In these proportions, they are assimilated by the primary producers (rooted aquatic plants and algae) and converted into protoplasm during the process of photosynthesis. Conversely, the (unresistant or digestible) organic forms of nitrogen and phosphate are oxidized back into their biogenic salts during the process of aerobic respiration, *e.g.*, organic decomposition, heterotrophic activity.

The primary forms of these biogenic salts are nitrate and orthophosphate. However, nitrate may be substituted by some plants for other forms of nitrogen, such as ammonia. Also of importance, orthophosphate may be accumulated and stored as polyphosphates by some algae, thereby alleviating a potential future phosphate limiting condition.

Importantly, other limiting factors such as low light and low dissolved oxygen could play as important, if not more important, roles in limiting the rate of primary production and decomposition in the streams of the Palmer Ranch, respectively. For example, if the availability of inorganic nitrogen is high and the $N_i:P_i$ ratio is low, *e.g.*, 2:1, it would indicate that some factor other than inorganic nitrogen is the real limiting factor. Even so, determinations and the use of nutrient ratios in light of other important and potentially limiting factors is helpful in evaluating the results of long-term monitoring programs when nutrient loading and its consequences are major concerns, such as for the "Continuing Surface Water Quality Monitoring Program."

Results of the sixth year of monitoring were used to determine the atomic ratios of nitrogen to phosphorus in the streams of the Palmer Ranch. Total nitrogen to total phosphorus ratios ($N_t:P_t$) are provided in Appendix Table A-17 with ratios of inorganic nitrogen (ammonia, nitrite, and nitrate) to orthophosphorus ($N_i:P_i$) being given in Appendix Table A-18.

The $N_i:P_i$ ratios are consistently low and found to average 9:1, indicative of conditions in which fixed inorganic nitrogen would limit plant growth before orthophosphate. In contrast, $N_t:P_t$ ratios were found to average 48:1 which indicates conditions in which phosphate would limit plant growth in an excess of nitrogen. The lower $N_i:P_i$ ratio is attributed to the naturally high levels of orthophosphate, as well as the high percentage of total phosphorus represented by orthophosphate (70 percent of total phosphorus).

The most meaningful ratio in assessing nutrient limiting conditions is based on the inorganic forms (biogenic salts as previously discussed) since these constituents are

immediately available to the primary producers whereas even the unresistant organic forms must be chemically transformed into the inorganic forms prior to photosynthesis. During the sixth year of monitoring, the $N_i:P_i$ ratios found were generally indicative of excess phosphorus with respect to nitrogen during the four quarterly events. In June, $N_i:P_i$ ratios averaged approximately 8:1 and declined to 5:1 during September. The $N_i:P_i$ ratio for the March and December events was 11. In a comparison of the different drainage basins, the Catfish Creek/Trunk Ditch Basin exhibited a yearly average of 20:1 whereas the South Creek Basin was much lower, averaging 1:1. Within the Catfish Creek-Trunk Ditch Basin, the realigned segment (*i.e.*, Stations CC-3 and CC-4) exhibited a higher ratio of 42:1. Perhaps these somewhat elevated ratios observed in the Catfish Creek/Trunk Ditch Basin resulted from the runoff of fertilizers originating from one or both of the adjacent golf course.

4.5 Oils and Greases

As provided in Appendix Table A-19, the streams of the Palmer Ranch were found to exhibit a narrow range in oils and greases during the sixth year of the monitoring program (*i.e.*, below the detection limit of 1 mg/l up to a maximum of 8.9 mg/l). Only one of the 47 measurements during the past year of monitoring (*i.e.*, Station CC-2 for the December event) exceeded the State standard of 5 mg/l specified in F.A.C. 17-302. None of the 47 measurements exceeded the Sarasota County standard of 15 mg/l.

Most of the oil and grease measurements above the 1.0 mg/l detection limit were observed during the June and December 1990 monitoring events with none of the measurements for the September 1990 monitoring event being above 1.0 mg/l. The

elevated oil and grease levels coincide with the highest two week antecedent rainfall amounts which occurred for the June and December events (refer to Table 4.1).

The elevated oils and greases concentrations are attributed to sources of oils and greases on and/or upstream of the Palmer Ranch and are probably associated with increased runoff during the June and December events. The greater rates of stormwater loadings during these periods might be expected due to accumulations of oils and greases in the watershed (e.g., on paved surfaces, such as the trailer park located in the upper parts of the South Creek Drainage Basin) during the extended dry periods followed by their removal by the storm water runoff which occurred in the two weeks preceding the monitoring events. Therefore, it is possible that runoff from parking lots, roads, the trailer park, as well as naturally occurring oils from the immediate surroundings contributed to these elevated observations.

The concentrations of oils and greases reported in the streams of the Palmer Ranch during the first, second, third, and fourth years of the monitoring program (Palmer Venture, 1986, and CCI, 1986, 1988, and 1988), ranged from less than 1 mg/l to 17 mg/l. Most of the observations (152 of 158) were found to be less than the maximum allowable State criteria of 5 mg/l and only one was found to be greater than the maximum allowable County criteria of 15 mg/l.

4.6 Bacteriological Parameters

4.6.1 Total Coliform

As indicated in Appendix Table A-20, the streams traversing the Palmer Ranch were found to exhibit frequent violations of the State and County standards for Total Coliform

during the sixth year of monitoring. Both the State and County standards, which allow up to 2,400 counts/100 ml, were exceeded in 19 of the 47 samples (40 percent) collected during the 1990 monitoring year. Highest counts were observed in the Cattfish Creek-Trunk Ditch Basin at Station CC-2 as compared to the fourth year in which the South Creek exhibited the highest counts.

During the third and fourth monitoring years (CCI, 1988 and 1988b), the streams traversing the Palmer Ranch were also found to commonly exceed the State and County standards with 43 and 57 percent of the results being higher than the 2,400 colonies/100 ml criteria, respectively. Even higher coliform densities and a higher frequency of violations were observed during the first two years of monitoring. During the first year of monitoring, Palmer Venture (1986) reported non-compliance bacteria levels for 71 percent of the measurements made. During the second year (CCI, 1986) 68 percent of the samples taken were determined to exceed the 2,400 colonies/100 ml standard.

As during previous years, the highest number of total coliform colonies were observed during the 1990 wet season with an mean level of 5,570 colonies/100 ml being observed for the September 1990 monitoring event. This trend is expected since the primary mode of transport of the coliform bacteria to the streams traversing the ranch is surface runoff, consequently resulting in seasonal trends associated with the amount of rainfall.

As noted in previous years (CCI, 1988 and 1988b), these data show that several sources of coliform bacteria exist on and upstream of the Palmer Ranch. A primary source is expected to be the naturally occurring coliform bacteria of the soils and vegetation on and upstream of the ranch. During periods of land clearing coupled with significant

runoff, this source is expected to be exacerbated. Such a condition probably occurred during the second and third monitoring years in the Catfish Creek-Trunk Ditch Basin as the construction of Prestancia was initiated. Another source of coliform bacteria is represented by the warm-blooded animals inhabiting the watershed, including cattle, birds, feral hogs, deer, and rodents.

4.6.2 Fecal Coliform

During the sixth year of monitoring, the streams of the Palmer Ranch exhibited fecal coliform densities which ranged from 4 to 16,000 colonies/100 ml (Appendix Table A-21) as compared to a range of 10 to 7,300 colonies/100 ml during the fourth year (CCI, 1988). Of the 47 samples which were collected during the sixth year, 13 (28 percent) exceeded the Class III State and County Standard of 800 colonies/100 ml. The same number of exceedences were recorded during the third and fourth monitoring years, however, fewer samples were collected during the fourth year than during the third and sixth years of monitoring.

The highest number of fecal coliform colonies and the greatest number of exceedences during the 1990 monitoring year generally occurred in the Catfish Creek-Trunk Ditch Basin probably due to a greater number of warm blooded animals in the stream communities associated with the undeveloped portion of the Palmer Ranch. The high fecal coliform bacteria levels were observed both upstream and internal to the Palmer Ranch, indicate important sources of fecal coliform bacteria originating both upstream and within the ranch, with birds, cattle, and other warm-blooded wild animals considered the primary sources.

4.7 Trace Elements

During the September 1990 monitoring event, samples were collected for the analyses of trace elements (*i.e.*, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc). The results of these analyses are provided in Appendix Table A-22 along with the applicable State and County Standards for each element. The concentrations of all metals, except copper, were below the analytical detection limits at all monitoring locations. Therefore, the concentrations of arsenic, cadmium, chromium, lead, mercury, nickel, and zinc found on the Palmer Ranch during the 1990 monitoring year are in compliance with all applicable State and County water quality criteria.

Copper concentrations ranging from <0.005 to 0.04 mg/l were found during 1990 with a yearly average of 0.011 mg/l. Of the ten measurements made during 1990, one exceeded the State Standard of 0.03 mg/l (*i.e.*, Station SC-4) while two were in excess of the more stringent 0.01 mg/l criteria of Sarasota County (*i.e.*, Stations CC-5 and SC-4). Possible sources of copper include the use of copper containing-fertilizers, fungicides, and algicides on and upstream of the North Tract of the Palmer Ranch.

4.8 Organochlorine Pesticides and PCBs

Analyses for organochlorine pesticides and polychlorinated biphenyls (PCBs) were performed on samples collected during the September 1990 monitoring event. The results of these analyses are provided in Appendix Table A-23 along with the applicable State and County Standards. The results indicate that the concentrations of all pesticides and PCBs were below their respective analytical detection limits. Therefore, no violations of the applicable water quality criteria were observed during the 1990 monitoring year.

5.0 SUMMARY

The sixth year of the "Continuing Surface Water Quality Monitoring Program" was performed at the 13 stations located in the streams of the Palmer Ranch during the period of January through December 1990. Quarterly monitoring events were performed during the March, June, September, and December 1990. Monitoring during the previous five years was performed at approximately the same 13 locations. Minor changes in the location of Stations CC-2, CC-4, and EI-1A (EL-1) were made during the second and third years. However, monitoring was performed bimonthly during the first year and subsequently changed to a quarterly frequency at the beginning of the second year of monitoring. The results of the first five years of monitoring may be reviewed in the annual reports prepared by Palmer Venture (1986) and CCI (1986, 1988, 1988b, and 1990).

Monitoring of the Palmer Ranch streams entailed measurements of conductivity, water temperature, suspended solids, turbidity, dissolved oxygen, pH, biochemical oxygen demand, macronutrients, oils and greases, and bacteriological quality during each sampling event. The results of the fourth year of monitoring are summarized in Table 5.1. A complete tabulation of the results is provided in Appendix A.

The sixth year of monitoring exhibited a less than normal amount of rainfall as only 39 inches of precipitation occurred on the Palmer Ranch. During the third and fourth years of monitoring 51 and 52 inches of rainfall were recorded, respectively. However, a drought was experienced during much of the second year during which only 33 inches of rainfall was recorded. The historical amount of rainfall for the region based on a

Table 5.1 Summary of Results for the Palmer Ranch Water Quality Monitoring Program for the period from January through December, 1990.

Parameter	CC-1	CC-2	CC-3	CC-4	CC-5	Catfish Creek Basin				Applicable Criteria
	Mean	Mean	Mean	Mean	Mean	Mean	N	Min.	Max.	
PHYSICAL										
Depth (ft.)	1.40	0.41	0.52	0.90	0.33	0.71	20	0.00	1.58	----
Flow (GPM)	22.83	0.00	46.72	99.60	396.2	113.1	20	0.0	1021.0	----
Temperature (°C)	21.35	21.83	23.10	25.87	29.90	24.5	19	12.8	34.0	----
Conductivity (µmho/cm)	756	1170	1253	845	809	956	19	587	1625	+ 50%, +100% ^a
Total Suspended Solids (mg/l)	3.1	4.2	3.5	7.7	5.2	4.8	19	<1	13.0	----
Turbidity (NTU)	3.75	2.93	12.70	8.45	6.07	6.99	19	1.7	24.0	+29, +25 ^b
OXYGEN DEMAND AND RELATED PARAMETERS										
BOD, 5-Day (mg/l)	2.52	2.03	0.87	2.17	1.60	1.83	19	0.60	4.50	----
Dissolved Oxygen (mg/l)	2.90	6.73	3.32	7.62	10.77	6.2	19	1.1	12.7	≥5, ≥4 ^c
pH	7.05	7.10	6.82	7.10	7.97	7.22	19	6.60	8.20	6.0 - 8.5
MACRONUTRIENTS										
Nitrite Nitrogen (mg/l)	0.01	<0.01	0.01	<0.01	<0.01	<0.01	19	<0.01	0.02	----
Nitrate Nitrogen (mg/l)	0.10	<0.01	0.20	0.02	0.03	0.08	19	<0.01	0.33	----
Ammonia Nitrogen (mg/l) ^d	0.13	0.04	0.07	0.06	0.04	0.07	19	<0.02	0.14	----- ^e
Organic Nitrogen (mg/l)	0.66	1.54	0.81	1.16	1.02	1.01	19	0.51	1.75	----
Total Nitrogen (mg/l)	0.89	1.58	1.09	1.24	1.08	1.15	19	0.69	1.75	----
Total Reactive Phosphate (mg/l)	0.24	0.08	0.02	0.01	0.02	0.07	19	<0.01	0.33	----
Total Phosphorus (mg/l)	0.28	0.10	0.04	0.07	0.05	0.11	19	<0.01	0.37	----
ORGANIC CONSTITUENTS										
Oils and Greases (mg/l)	0.8	4.0	0.8	1.4	1.4	1.6	19	<1.0	8.9	≤5, ≤15 ^c
BIOLOGICAL										
Total Coliform (#/100 ml)	5875	11200	4325	1232	5025	5233	19	230	16000	≤2400
Fecal Coliform (#/100 ml)	2307	1337	1425	235	960	1248	19	4	3000	≤800

Table 5.1 Summary of Results for the Palmer Ranch Water Quality Monitoring Program for the period from January through December, 1990.

Parameter	SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	South Creek Basin				Applicable Criteria
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	N	Min.	Max.	
PHYSICAL											
Depth (ft.)	0.59	0.43	0.19	0.42	0.34	0.57	0.42	24	0.00	0.90	----
Flow (GPM)	0.00	75.21	7.74	31.23	38.5	191.9	57.4	24	0.0	288.1	----
Temperature (°C)	23.97	21.37	28.70	24.05	19.73	21.97	23.0	20	12.0	31.6	----
Conductivity (µmho/cm)	933	965	825	1219	905	811	956	20	672	1363	+ 50%, +100% ^a
Total Suspended Solids (mg/l)	7.6	4.0	8.2	8.0	2.0	1.2	5.1	20	<1	16.0	----
Turbidity (NTU)	4.32	3.26	5.00	7.30	3.43	1.92	4.21	20	0.6	10.5	+29, +25 ^b
OXYGEN DEMAND AND RELATED PARAMETERS											
BOD, 5-Day (mg/l)	2.95	1.80	4.35	1.87	1.13	0.50	1.94	20	0.40	7.80	----
Dissolved Oxygen (mg/l)	6.40	7.00	3.55	6.80	3.70	6.22	5.8	20	1.7	9.4	≥5, ≥4 ^c
pH	7.27	7.47	7.35	7.10	6.97	7.02	7.18	20	6.60	8.10	6.0 - 8.5
MACRONUTRIENTS											
Nitrite Nitrogen (mg/l)	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	20	<0.01	0.02	----
Nitrate Nitrogen (mg/l)	<0.01	<0.01	0.02	0.01	0.08	<0.01	0.02	20	<0.01	0.21	----
Ammonia Nitrogen (mg/l) ^d	0.04	0.03	0.08	0.23	0.08	0.02	0.08	20	<0.02	0.86	---- ^e
Organic Nitrogen (mg/l)	1.57	1.66	2.14	1.63	1.40	1.00	1.51	20	0.84	2.86	----
Total Nitrogen (mg/l)	1.61	1.68	2.24	1.87	1.56	1.02	1.61	20	0.84	3.07	----
Total Reactive Phosphate (mg/l)	0.05	0.30	0.24	0.33	0.44	0.07	0.23	20	0.01	0.57	----
Total Phosphorus (mg/l)	0.10	0.37	0.45	0.43	0.50	0.08	0.30	20	0.03	0.71	----
ORGANIC CONSTITUENTS											
Oils and Greases (mg/l)	1.2	1.0	1.3	1.6	0.8	0.9	1.2	20	<1.0	3.2	≤5, ≤15 ^c
BIOLOGICAL											
Total Coliform (#/100 ml)	4675	1873	8150	6900	1733	1375	3946	20	220	16000	≤2400
Fecal Coliform (#/100 ml)	305	263	652	5025	190	192	1237	20	4	16000	≤800

Table 5.1 Summary of Results for the Palmer Ranch Water Quality Monitoring Program for the period from January through December, 1990.

Parameter	EL-1 Mean	NC-6 Mean	All Stations			Applicable Criteria
			Mean	N	Min. Max.	
PHYSICAL						
Depth (ft.)	0.80	0.98	0.61	52	0.00 2.30	----
Flow (GPM)	0.00	38.51	72.96	52	0.0 1021.0	----
Temperature (°C)	24.20	21.35	23.6	47	12.0 34.0	----
Conductivity (µmho/cm)	1025	694	940	47	587 1625	+ 50%, +100% ^a
Total Suspended Solids (mg/l)	15.7	4.5	5.8	47	<1 24.0	----
Turbidity (NTU)	14.42	7.47	6.48	47	0.6 24.0	+29, +25 ^b
OXYGEN DEMAND AND RELATED PARAMETERS						
BOD, 5-Day (mg/l)	2.57	1.17	1.89	47	0.40 7.80	----
Dissolved Oxygen (mg/l)	5.35	1.55	5.6	47	0.9 12.7	≥5, ≥4 ^c
pH	7.12	7.22	7.19	47	6.60 8.20	6.0 - 8.5
MACRONUTRIENTS						
Nitrite Nitrogen (mg/l)	<0.01	<0.01	<0.01	47	<0.01 0.02	----
Nitrate Nitrogen (mg/l)	<0.01	<0.01	0.04	47	<0.01 0.33	----
Ammonia Nitrogen (mg/l) ^d	0.04	0.07	0.07	47	<0.02 0.86	---- ^e
Organic Nitrogen (mg/l)	1.88	1.20	1.31	47	0.51 2.86	----
Total Nitrogen (mg/l)	1.91	1.27	1.42	47	0.69 3.07	----
Total Reactive Phosphate (mg/l)	0.08	0.09	0.14	47	<0.01 0.57	----
Total Phosphorus (mg/l)	0.23	0.14	0.20	47	<0.01 0.71	----
ORGANIC CONSTITUENTS						
Oils and Greases (mg/l)	1.6	0.8	1.3	47	<1.0 8.9	≤5, ≤15 ^c
BIOLOGICAL						
Total Coliform (#/100 ml)	2195	770	4047	47	80 16000	≤2400
Fecal Coliform (#/100 ml)	124	220	1060	47	4 16000	≤800

^aState Criteria allows 50% increase above background to 1275 µmhos/cm and County Ordinance 72-37 allows 100% increase above background to 500 µmhos/cm.

^bState Criteria allows a maximum increase of 29 NTU above background and County Ordinance 72-37 allows a maximum increase of 25 JTU above background.

^cState and County Criteria, respectively.

^dIonized plus non-ionized ammonia.

^eState Criteria allows a maximum of 0.02 mg/l unionized ammonia, County Criteria allows a maximum unionized ammonia concentration of 0.2 to 2.0 mg/l depending on pH.

30-year record is 56 inches per year (NOAA, 1982). Consequently, the streams of the Palmer Ranch exhibited below normal flows during the sixth year.

The streams of the North Tract exhibited a range in specific conductance of 587 - 1,625 micromhos per centimeter ($\mu\text{mhos/cm}$), as compared with slightly lower ranges of 422 - 1,406 and 620 - 14,300 $\mu\text{mhos/cm}$ observed during the third and fourth monitoring years, respectively. A higher range of 413 - 1,809 $\mu\text{mhos/cm}$ was determined during the second monitoring year. The higher conductivities found during the sixth year might have been associated to the droughty conditions and the subsequent lack of low conductivity rainfall and stormwater runoff entering the streams.

Seasonally lower conductivities were recorded during the quarterly surveys in June and September 1990. These lower conductivities most likely resulted from the cumulative effects of increased surface runoff of low conductivity stormwater during the early spring wet period.

During the previous years of monitoring, the streams of the Palmer Ranch have exhibited an annual cycle of suspended solids. Each annual cycle has consistently exhibited a peak during the wet season. During the sixth year of monitoring, the peak in suspended solids occurred during the September monitoring event with an average of 11 mg/l.

Apparently this annual cycle of suspended solids is related to a combination of the annual distribution of rainfall and seasonal changes in primary production. Additionally, an apparent ongoing trend in suspended solids during the previous years is also related to these factors. During the 1990 monitoring year, the streams of the ranch exhibited a

lower average TSS level than determined for the third and fourth monitoring years. The lower TSS levels observed during 1990 are probably associated to the lack of stormwater runoff and the associated reduction in mass transport. In addition, the general reduction in TSS levels during 1990 may also be indicative of a general improvement in water quality on the ranch. Turbidity also followed these same trends as evidenced by its positive correlation with total suspended solids (*i.e.*, $r = 0.68$).

Five-day biochemical oxygen demand (BOD_5) was found to average 1.9 mg/l in the streams of the ranch, considerably lower than the levels observed during the fourth year. During the previous monitoring years there has been a continuing reduction in the BOD levels observed on the ranch. This trend is also indicative of the general improvement in water quality which has been observed. As observed during the second, third, and fourth years, higher BOD_5 s indicative of decaying vegetation were recorded at Stations EL-1A, SC-1, SC-3, and CC-1

Dissolved oxygen averaged 5.6 and ranged from 0.9 to 12.7 mg/l. Higher yearly averages of 6.1 and 7.2 mg/l were reported for the third and fourth monitoring years, respectively. The lower dissolved oxygen levels observed for 1990 may be associated with the dry conditions experienced during much of the year and the subsequent lack of flow. During 1990, 16 of the 47 dissolved measurements made were below the 5.0 mg/l State Standard.

Although there has been a steady decline in nutrients during the previous years, nutrient concentrations during the 1990 monitoring year occasionally exceed the threshold levels characteristic of eutrophic conditions. During the sixth year, the streams of the Palmer

Ranch exhibited annual average total nitrogen and total phosphorus concentrations of 1.4 mg/l and 0.20 mg/l, respectively, as compared to even higher averages of 2.6 mg/l and 1.0 mg/l, respectively, during the second year, 1.9 mg/l and 0.47 mg/l, respectively, during the third year, and 1.6 mg/l and 0.45 mg/l, respectively, during the fourth year.

The inorganic fractions which are required by plants during the process of photosynthesis were also found to be readily available since orthophosphate represented 70 percent of total phosphorus and inorganic nitrogen represented 8 percent of total nitrogen. Although the availability of inorganic nitrogen was found to be substantial, its low molecular ratio to orthophosphate implies that nitrogen should become limiting to primary producers in the streams of the ranch before phosphate. Ratios of inorganic nitrogen to inorganic phosphorus were found to average 9:1, as compared to algal protoplasm which is 16:1 (Odum, 1959). These results were comparable to previous monitoring results as orthophosphate represented from 62 to 84 percent of total phosphorus, inorganic nitrogen represented from 12 to 17 percent of the total nitrogen, and the ratio of inorganic nitrogen to inorganic phosphorus averaged from 10:1 to 2:1, during the second, third, and fourth years of monitoring.

Potential sources of nutrients upstream of the Palmer Ranch include a dairy farm which was changed to a sod farm in August 1987, a golf course, and mobile home park located in the South Creek Basin. In the Catfish Creek-Trunk Ditch Basin, nutrients are subject to being transported onto the ranch by surface runoff originating in the commercial-industrial strip development along Clark Road and originating in the country club development located in the western part of the Catfish Creek-Trunk Ditch Basin. Within

the ranch, potential nutrient sources include Prestancia (new golf course and residential development), spray irrigation fields (Palmer Utilities and Central County Regional Utilities), and active pastures. Additionally, rainfall and surficial phosphate deposits represent two ubiquitous sources of phosphate and fixed nitrogen throughout the basins of the ranch.

During the sixth year of monitoring, oils and greases exceeded the State Standards of 5 mg/l only on one occasion (*i.e.*, at Station CC-2 during the December monitoring event). During 1990, oil and grease exhibited a range of < 1 - 8.9 mg/l. In fact most observations showed less than detectable levels. Sources of oils and greases in the South Creek Basin include runoff from the trailer park, golf course, roads, and natural vegetation associations into the western branch of South Creek. During the previous years of monitoring, oils and greases exhibited a range of < 1 - 17 mg/l while only seven of the 158 earlier samples (5 percent) were found to exceed the State standard, and only one exceeded the 15 mg/l County standard.

The bacteriological quality of the streams of the Palmer Ranch was found to be poor, as total coliform and fecal coliform counts were frequently out of compliance with applicable standards. Of the 47 total coliform counts taken during the sixth year, 19 exceeded the maximum allowable limit of 2,400 colonies/100 ml. Similarly, 13 of the 47 fecal coliform counts were found to exceed the maximum allowable limit of 800 colonies/100 ml. The primary sources of coliform bacteria within the Palmer Ranch are expected to include cattle and birds as well as the naturally occurring soil bacteria. During storm events which frequently occur during the early spring and late summer, it is likely that more of the non-fecal coliform bacteria are transported by surface runoff to the streams of the

Palmer Ranch than at other times of the year. However, during the drier periods of the year, it is likely that birds, cattle, and other warm blooded animals, which are the sources of fecal coliform bacteria, are attracted to the streams to water and feed, thereby resulting in an increase in fecal coliform counts.

During the September 1990 monitoring event, samples were collected for the analyses of trace elements (*i.e.*, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc) and organochlorine pesticides and PCBs. The concentrations of the trace metals, except copper, were determined to be below the analytical detection limits at all monitoring stations. Therefore, the concentrations of arsenic, cadmium, chromium, lead, mercury, nickel, and zinc found during the 1990 monitoring year are in compliance with all State and County water quality criteria.

Copper concentrations during 1990 averaged 0.11 mg/l with a range from <0.005 to 0.04 mg/l. Of the ten measurements made during 1990, one was determined to be in excess of the 0.03 mg/l State Standard with two measurements being in greater than the more stringent 0.01 mg/l County Criteria. Possible sources of copper include the use of copper-containing fertilizers, fungicides, and algicides on and upstream of the North Tract.

Analyses for organochlorine pesticides and polychlorinated biphenyls (PCBs) were performed on samples collected during the September monitoring event. The results of the analyses indicate that the concentrations of all pesticides and PCBs were below their respective analytical detection limits. Therefore, no violations of the applicable water quality criteria were observed during the 1990 monitoring year.

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APPENDIX A. WATER QUALITY DATA

Appendix Table A - 1
 Continuing Surface Water Quality Monitoring Program
 Stream Stage (ft.)^a
 March, 1990 - December, 1990

Sampling Date ^b	Cattfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	STD	Min	Max	N	
March 12-13, 1990	1.30	0.57	0.48	1.35	0.30	0.80	0.80	2.30	0.75	0.90	0.35	0.32	0.50	0.75	0.59	0.82	0.56	0.30	2.30	13
June 11-12, 1990	1.58	0.48	0.43	0.43	0.32	0.65	0.77	0.77	0.60	0.32	0.00	0.25	0.41	0.65	0.37	0.54	0.38	0.00	1.58	13
Sept. 17-18, 1990	1.41	0.00	0.65	0.43	0.39	0.58	0.60	0.53	0.52	0.00	0.40	0.43	0.00	0.47	0.30	0.45	0.37	0.00	1.41	13
Dec. 10-11, 1990	1.30	0.58	0.53	1.38	0.33	0.82	1.03	0.33	0.48	0.50	0.00	0.68	0.47	0.43	0.43	0.62	0.39	0.00	1.38	13
Mean	1.40	0.41	0.52	0.90	0.33		0.80	0.98	0.59	0.43	0.19	0.42	0.34	0.57						
Minimum	1.30	0.00	0.43	0.43	0.30		0.60	0.33	0.48	0.00	0.00	0.25	0.00	0.43						
Maximum	1.58	0.58	0.65	1.38	0.39		1.03	2.30	0.75	0.90	0.40	0.68	0.50	0.75						
Std. Deviation	0.13	0.27	0.09	0.54	0.04		0.18	0.90	0.12	0.37	0.22	0.19	0.23	0.15						
N	4	4	4	4	4		4	4	4	4	4	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	0.90	0.57	0.00	1.58	7
CC-3, CC-4 (mid reach)	0.71	0.41	0.43	1.38	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	0.71	0.47	0.00	1.58	20
SC-4, SC-1 (upper reach - west)	0.50	0.17	0.25	0.75	8
SC-3, SC-7 (upper reach - east)	0.27	0.22	0.00	0.50	8
SC-2, SC-8 (mid reach)	0.50	0.28	0.00	0.90	8
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	0.42	0.25	0.00	0.90	24
All 13 Stations	0.61	0.44	0.00	2.30	52

^a Stream Stage measured at sampling site for each station. 0.00 = Station dry.

^b Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 2
 Continuing Surface Water Quality Monitoring Program
 Stream Flow (GPM)
 March, 1990 - December, 1990

Sampling Date ^a	Cattfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	0.0	0.0	25.3	53.6	280.3	71.8	0.0	50.4	0.0	52.5	31.0	19.7	46.0	17.1	53.4	56.1	81.2	0.0	280.3	13
June 11-12, 1990	44.9	0.0	51.2	220.8	1021.0	267.6	0.0	48.5	0.0	238.7	0.0	96.9	91.6	288.1	119.2	161.7	276.3	0.0	1021.0	13
Sept. 17-18, 1990	0.0	0.0	34.1	83.6	6.3	24.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	139.1	23.2	20.2	43.0	0.0	139.1	13
Dec. 10-11, 1990	46.4	0.0	76.3	40.4	277.4	88.1	0.0	55.2	0.0	9.6	0.0	8.3	16.6	169.2	34.0	53.8	82.2	0.0	277.4	13
Mean	22.8	0.0	46.7	99.6	396.2		0.0	38.5	0.0	75.2	7.7	31.2	38.6	191.9						
Minimum	0.0	0.0	25.3	40.4	6.3		0.0	0.0	0.0	0.0	0.0	0.0	0.0	139.1						
Maximum	46.4	0.0	76.3	220.8	1021.0		0.0	55.2	0.0	238.7	31.0	96.9	91.6	288.1						
Std. Deviation	26.4	0.0	22.4	82.8	435.9		0.0	25.8	0.0	111.3	15.5	44.5	40.1	65.8						
N	4	4	4	4	4		4	4	4	4	4	4	4	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	11.4	21.1	0.0	46.4	7
CC-3, CC-4 (mid reach)	73.16	62.87	25.3	220.8	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	113.1	231.3	0.0	1021.0	20
SC-4, SC-1 (upper reach - west)	15.6	33.6	0.0	97.0	8
SC-3, SC-7 (upper reach - east)	23.1	32.6	0.0	91.6	8
SC-2, SC-8 (mid reach)	133.5	105.2	0.0	288.1	8
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	57.4	84.1	0.0	288.1	24
All 13 Stations	73.0	156.3	0.0	1021	52

^a Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.
 SD - standard deviation
 N - number of observations

Appendix Table A - 3
 Continuing Surface Water Quality Monitoring Program
 Water Temperature (°C)
 March, 1990 - December, 1990

Sampling Date ^a	Cattfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek							All Stations				
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	19.7	21.7	20.7	23.3	30.5	23.2	22.3	19.2	22.8	21.5	25.8	23.0	20.1	20.2	22.2	22.4	3.0	19.2	30.5	13
June 11-12, 1990	27.0	30.8	27.4	31.2	33.6	30.0	31.0	25.6	30.2	29.1	--	30.6	27.1	27.7	28.9	29.3	2.3	25.6	33.6	12
Sept. 17-18, 1990	25.9	--	26.9	30.4	34.0	29.3	29.2	27.4	29.4	--	31.6	27.8	--	27.1	29.0	29.0	2.5	25.9	34.0	10
Dec. 10-11, 1990	12.8	13.0	27.4	18.6	21.5	16.7	14.3	13.2	13.5	13.5	--	14.8	12.0	12.9	13.3	14.8	2.9	12.0	21.5	12
Mean	21.3	21.8	23.1	25.9	29.9		24.2	21.3	24.0	21.4	28.7	24.0	19.7	22.0						
Minimum	12.8	13.0	17.4	18.6	21.5		14.3	13.2	13.5	13.5	25.8	14.8	12.0	12.9						
Maximum	27.0	30.8	27.4	31.2	34.0		31.0	27.4	30.2	29.1	31.6	30.6	27.1	27.7						
Std. Deviation	6.5	8.9	4.9	6.0	5.8		7.6	6.5	7.7	7.8	4.1	6.9	7.6	6.9						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	21.6	6.9	12.8	30.8	7
CC-3, CC-4 (mid reach)	24.5	5.3	17.4	31.2	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	24.5	6.5	12.8	34.0	19
SC-4, SC-1 (upper reach - west)	24.0	6.8	13.5	30.6	8
SC-3, SC-7 (upper reach - east)	23.3	7.5	12.0	31.6	5
SC-2, SC-8 (mid reach)	21.7	6.7	12.9	29.1	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	23.0	6.5	12.0	31.6	20
All 13 Stations	23.6	6.5	12.0	34.0	47

^a Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.
 SD - standard deviation
 N - number of observations

Appendix Table A - 4
 Continuing Surface Water Quality Monitoring Program
 Specific Conductance ($\mu\text{mhos/cm}$)^a
 March, 1990 - December, 1990

Sampling Date ^b	Cattfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	712	1242	1266	894	782	979	1018	705	1079	1006	979	1175	887	896	1004	972	185	705	1266	13
June 11-12, 1990	738	643	1170	621	587	752	1046	697	776	940	---	1363	999	768	969	862	242	587	1363	12
Sept. 17-18, 1990	744	---	1304	892	803	936	921	726	821	---	672	1006	---	695	798	858	189	672	1304	10
Dec. 10-11, 1990	831	1625	1273	976	1063	1154	1115	650	1058	950	---	1332	830	886	1011	1049	263	650	1625	12
Mean	756	1170	1253	846	809		1025	694	933	965	825	1219	905	811						
Minimum	712	643	1170	621	587		921	650	776	940	672	1006	830	695						
Maximum	831	1625	1304	976	1063		1115	726	1079	1006	979	1363	999	896						
Std. Deviation	52	495	58	155	195		80	32	157	36	217	164	86	97						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	934	363	643	1625	7
CC-3, CC-4 (mid reach)	1049	243	621	1304	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	956	287	587	1625	19
SC-4, SC-1 (upper reach - west)	1076	213	776	1363	8
SC-3, SC-7 (upper reach - east)	873	132	672	999	5
SC-2, SC-8 (mid reach)	877	109	695	1006	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	956	185	672	1363	20
All 13 Stations	939	230	587	1625	47

^a Applicable surface water quality criteria: State - Maximum allowable increase of 50 percent above background or to 1275 $\mu\text{mhos/cm}$ which ever is greater;
 Sarasota County - Maximum allowable increase of 100 percent above background to a maximum of 500 $\mu\text{mhos/cm}$.

^b Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation; N - number of observations

Appendix Table A - 5
Continuing Surface Water Quality Monitoring Program
Total Suspended Solids (mg/l)
March, 1990 - December, 1990

Sampling Date ^a	Catfish Creek/Trunk Ditch						South Creek								All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean	EL-1A	NC-6	SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	<1	<1	2	8	1	2.4	14	<1	<1	1	<1	1	<1	<1	<1.0	2.3	4.0	<1	14	13
June 11-12, 1990	5	7	3	11	13	7.8	21	13	11	7	---	7	5	3	6.6	8.8	5.2	3	21	12
Sept. 17-18, 1990	4	---	7	4	6	5.2	24	4	16	---	16	11	---	1	11.0	9.3	7.3	1	24	10
Dec. 10-11, 1990	3	5	2	8	1	3.8	4	<1	3	7	---	13	<1	<1	4.2	3.7	3.7	<1	13	12
Mean	3.1	4.2	3.5	7.7	5.2		15.7	4.5	7.6	4.0	8.2	8.0	2.0	1.2						
Minimum	<1	<1	2	4	1		4	<1	<1	1	<1	<1	<1	<1						
Maximum	5	7	7	11	13		24	13	16	7	16	13	5	3						
Std. Deviation	1.9	3.3	2.4	2.9	5.7		8.9	5.9	7.2	3.0	10.9	5.3	2.6	1.2						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	3.6	2.4	<1	7	7
CC-3, CC-4 (mid reach)	5.6	3.3	2	11	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	4.8	3.5	<1	13	19
SC-4, SC-1 (upper reach - west)	7.8	5.8	<1	16	8
SC-3, SC-7 (upper reach - east)	4.5	6.7	<1	16	5
SC-2, SC-8 (mid reach)	2.4	2.4	<1	7	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	5.1	5.4	<1	16	20
All 13 Stations	5.8	5.8	<1	24	47

^a Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.
SD - standard deviation
N - number of observations

Appendix Table A - 6
 Continuing Surface Water Quality Monitoring Program
 Turbidity (NTU)^a
 March, 1990 - December, 1990

Sampling Date ^b	Cattfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	1.9	3.4	10.5	7.9	5.2	5.8	12.4	5.4	1.8	1.8	0.6	4.5	3.1	4.6	2.7	4.8	3.5	0.6	12.4	13
June 11-12, 1990	2.4	1.7	4.3	7.0	9.2	4.9	14.8	12.9	4.6	3.6	--	5.0	5.4	1.0	3.9	6.0	4.3	1.0	14.8	12
Sept. 17-18, 1990	3.7	--	24.0	6.0	5.7	9.8	22.0	7.1	8.7	--	9.4	9.2	--	0.7	7.0	9.6	7.5	0.7	24.0	10
Dec. 10-11, 1990	7.0	3.7	2.0	2.9	4.2	8.0	8.5	4.5	2.2	4.4	--	10.5	1.8	1.4	4.1	6.1	4.0	1.4	12.9	12
Mean	3.7	2.9	12.7	8.4	6.1		14.4	7.5	4.3	3.3	5.0	7.3	3.4	1.9						
Minimum	1.9	1.7	4.3	6.0	4.2		8.5	4.5	1.8	1.8	0.6	4.5	1.8	0.7						
Maximum	7.0	3.7	24.0	12.9	9.2		22.0	12.9	8.7	4.4	9.4	10.5	5.4	4.6						
Std. Deviation	2.3	1.1	8.2	3.1	2.2		5.7	3.8	3.2	1.3	6.2	3.0	1.8	1.8						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	3.4	1.8	1.7	7.0	7
CC-3, CC-4 (mid reach)	10.6	6.2	4.3	24.0	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	7.0	5.3	1.7	24.0	19
SC-4, SC-1 (upper reach - west)	5.8	3.3	1.8	10.5	8
SC-3, SC-7 (upper reach - east)	4.1	3.5	0.6	9.4	5
SC-2, SC-8 (mid reach)	2.5	1.6	0.7	4.6	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	4.2	3.1	0.6	10.5	20
All 13 Stations	6.5	5.1	0.6	24.0	47

^a Applicable surface water quality criteria: State - Allows a maximum increase of 29 NTU; Sarasota County - Allows a maximum increase of 25 NTU above background.

^b Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 7
 Continuing Surface Water Quality Monitoring Program
 5 - Day Biochemical Oxygen Demand (mg/l)
 March, 1990 - December, 1990

Sampling Date ^a	Catfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	1.9	2.5	0.6	2.0	1.1	1.6	2.0	0.7	1.4	1.0	0.9	0.8	0.8	0.6	0.9	1.2	0.6	0.6	2.5	13
June 11-12, 1990	4.5	1.8	0.6	2.9	2.2	2.4	4.3	1.5	3.1	2.7	---	1.3	1.6	0.6	1.9	2.3	1.3	0.6	4.5	12
Sept. 17-18, 1990	2.2	---	1.5	1.5	2.4	1.9	2.3	1.5	6.0	---	7.8	4.1	---	0.4	4.6	3.0	2.3	0.4	7.8	10
Dec. 10-11, 1990	1.5	1.8	0.8	2.3	0.7	1.4	1.7	1.0	1.3	1.7	---	1.3	1.0	0.4	1.1	1.3	0.5	0.4	2.3	13
Mean	2.5	2.0	0.9	2.2	1.6		2.6	1.2	2.9	1.8	4.3	1.9	1.1	0.5						
Minimum	1.5	1.8	0.6	1.5	0.7		1.7	0.7	0.6	1.0	0.9	0.8	0.8	0.4						
Maximum	4.5	2.5	1.5	2.9	2.4		4.3	1.5	1.3	2.7	7.8	4.1	1.6	0.6						
Std. Deviation	1.3	0.4	0.4	0.6	0.8		1.2	0.4	2.2	0.8	4.9	1.5	0.4	0.1						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	2.3	1.0	1.5	4.5	7
CC-3, CC-4 (mid reach)	1.5	0.8	0.6	2.9	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	1.8	0.9	0.6	4.5	19
SC-4, SC-1 (upper reach - west)	2.4	1.8	0.8	6.0	8
SC-3, SC-7 (upper reach - east)	2.4	3.0	0.8	7.8	5
SC-2, SC-8 (mid reach)	1.1	0.9	0.4	2.7	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	1.9	2.0	0.4	7.8	20
All 13 Stations	1.9	1.4	0.4	7.8	47

^a Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 8
 Continuing Surface Water Quality Monitoring Program
 Dissolved Oxygen (mg/l)^a
 March, 1990 - December, 1990

Sampling Date ^b	Cattfish Creek/Trunk Ditch					Mean	EL-1A	NC-6	South Creek					Mean	All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5				SC-1	SC-2	SC-3	SC-4	SC-7		SC-8	Mean	Mean	STD	Min	Max
March 12-13, 1990	2.3	7.1	1.2	7.5	12.7	6.2	6.3	1.2	5.9	7.0	4.3	9.4	3.1	6.2	6.0	5.7	3.3	1.2	12.7	13
June 11-12, 1990	1.8	5.7	5.7	8.4	9.5	6.2	6.5	1.1	6.6	5.3	---	7.3	1.7	7.0	5.6	5.6	2.7	1.1	9.5	12
Sept. 17-18, 1990	1.4	---	1.1	6.3	12.0	5.2	1.3	0.9	5.8	---	2.8	3.2	---	3.6	3.8	3.8	3.4	0.9	12.0	10
Dec. 10-11, 1990	6.1	7.4	5.3	8.3	8.9	7.2	7.3	3.0	7.3	8.7	---	7.3	6.3	8.1	7.5	7.0	1.6	3.0	8.9	12
Mean	2.9	6.7	3.3	7.6	10.8		5.3	1.5	6.4	7.0	3.5	6.8	3.7	6.2						
Minimum	1.4	5.7	1.1	6.3	8.9		1.3	0.9	5.8	5.3	2.8	3.2	1.7	3.6						
Maximum	6.1	7.4	5.7	8.4	12.7		7.3	3.0	7.3	8.7	4.3	9.4	6.3	8.1						
Std. Deviation	2.2	0.9	2.5	1.0	1.9		2.7	1.0	0.7	1.7	1.1	2.6	2.4	1.9						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	4.5	2.6	1.4	7.4	7
CC-3, CC-4 (mid reach)	5.5	2.9	1.1	8.4	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	6.2	3.5	1.1	12.7	19
SC-4, SC-1 (upper reach - west)	6.6	1.8	3.2	9.4	8
SC-3, SC-7 (upper reach - east)	3.6	1.7	1.7	6.3	5
SC-2, SC-8 (mid reach)	6.6	1.7	3.6	8.7	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	5.8	2.1	1.7	9.4	20
All 13 Stations	5.6	3.0	0.9	12.7	47

^a Applicable surface water quality criteria: State - Minimum allowable concentration of 5.0 mg/l; Sarasota County - Minimum allowable concentration of 4.0 mg/l.

^b Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 9
 Continuing Surface Water Quality Monitoring Program
 pH (-log[H⁺])^a
 March, 1990 - December, 1990

Sampling Date ^b	Calfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						Mean	All Stations				
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8		Mean	STD	Min	Max	N
March 12-13, 1990	6.8	7.0	6.7	7.0	8.0	7.1	7.1	7.4	7.2	7.7	6.6	7.2	6.9	7.1	7.1	7.1	0.4	6.6	8.0	13
June 11-12, 1990	8.2	7.2	6.9	7.1	8.2	7.5	7.4	7.0	7.1	6.9	--	7.3	6.9	6.7	7.0	7.2	0.5	6.7	8.2	12
Sept. 17-18, 1990	6.6	--	6.7	7.0	8.0	7.1	6.8	7.6	7.8	--	8.1	7.1	--	7.1	7.5	7.3	0.6	6.6	8.1	10
Dec. 10-11, 1990	6.6	7.1	7.0	7.3	7.7	7.1	7.2	6.9	7.0	7.8	--	6.8	7.1	7.2	7.2	7.1	0.3	6.6	7.8	12
Mean	7.0	7.1	6.8	7.1	8.0		7.1	7.2	7.3	7.5	7.3	7.1	7.0	7.0						
Minimum	6.6	7.0	6.7	7.0	7.7		6.8	6.9	7.0	6.9	6.6	6.8	6.9	6.7						
Maximum	8.2	7.2	7.0	7.3	8.2		7.4	7.6	7.8	7.8	8.1	7.3	7.1	7.2						
Std. Deviation	0.8	0.1	0.1	0.1	0.2		0.2	0.3	0.4	0.5	1.1	0.2	0.1	0.2						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	7.1	0.5	6.6	8.2	7
CC-3, CC-4 (mid reach)	7.0	0.2	6.7	7.3	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	7.2	0.5	6.6	8.2	19
SC-4, SC-1 (upper reach - west)	7.2	0.3	6.8	7.8	8
SC-3, SC-7 (upper reach - east)	7.1	0.6	6.6	8.1	5
SC-2, SC-8 (mid reach)	7.2	0.4	6.7	7.8	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	7.2	0.4	6.6	8.1	20
All 13 Stations	7.2	0.4	6.6	8.2	47

^a Applicable surface water quality criteria: State and Sarasota County - allowable range of 6.0 - 8.5.

^b Calfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 10
 Continuing Surface Water Quality Monitoring Program
 Total Nitrogen (mg/l)
 March, 1990 - December, 1990

Sampling Date ^a	Catfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	0.69	1.46	1.08	1.07	1.06	1.07	1.76	1.26	1.25	1.57	1.42	1.36	1.42	1.06	1.35	1.27	0.28	0.69	1.76	13
June 11-12, 1990	1.03	1.54	0.79	1.20	0.98	1.11	2.00	1.37	1.51	1.93	---	1.50	1.72	1.23	1.58	1.40	0.37	0.79	2.00	12
Sept. 17-18, 1990	0.98	---	1.37	1.13	1.24	1.18	2.10	1.39	2.34	---	3.07	2.97	---	0.94	2.33	1.75	0.81	0.94	3.07	10
Dec. 10-11, 1990	0.87	1.75	1.11	1.56	1.04	1.27	1.79	1.06	1.34	1.55	---	1.65	1.53	0.84	1.38	1.34	0.34	0.84	1.79	12
Mean	0.89	1.58	1.08	1.24	1.08		1.91	1.27	1.61	1.68	2.24	1.87	1.56	1.02						
Minimum	0.69	1.46	0.79	1.07	0.98		1.76	1.06	1.25	1.55	1.42	1.36	1.42	0.84						
Maximum	1.03	1.75	1.37	1.56	1.24		2.10	1.39	2.34	1.93	3.07	2.97	1.72	1.23						
Std. Deviation	0.15	0.15	0.24	0.22	0.11		0.16	0.15	0.50	0.21	1.17	0.74	0.15	0.17						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	1.19	0.39	0.69	1.75	7
CC-3, CC-4 (mid reach)	1.16	0.23	0.79	1.56	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	1.16	0.27	0.69	1.75	19
SC-4, SC-1 (upper reach - west)	1.74	0.60	1.25	2.97	8
SC-3, SC-7 (upper reach - east)	1.83	0.70	1.42	3.07	5
SC-2, SC-8 (mid reach)	1.30	0.40	0.84	1.93	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	1.61	0.58	0.84	3.07	20
All 13 Stations	1.42	0.49	0.69	3.07	47

^a Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 11
 Continuing Surface Water Quality Monitoring Program
 Nitrite (mg/l as N)
 March, 1990 - December, 1990

Sampling Date ^a	Catfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0	<0.01	<0.01	13	
June 11-12, 1990	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01	0	<0.01	<0.01	12	
Sept. 17-18, 1990	0.02	--	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	--	0.01	0.02	--	<0.01	0.01	0.01	0.007	<0.01	0.02	10
Dec. 10-11, 1990	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	0.02	<0.01	<0.01	<0.01	0.005	<0.01	0.02	12
Mean	0.01	<0.01	<0.02	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Minimum	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Maximum	0.02	<0.01	0.02	0.01	<0.01		<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.02	<0.01						
Std. Deviation	0.01	0.00	0.008	0.003	0.00		0.00	0.00	0.00	0.00	0.004	0.008	0.009	0.00						
N	4	3	4	4	4		4	4	4	3	2	3	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	<0.01	0.006	<0.01	0.02	7
CC-3, CC-4 (mid reach)	<0.01	0.005	<0.01	0.02	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	<0.01	0.005	<0.01	0.02	19
SC-4, SC-1 (upper reach - west)	<0.01	0.005	<0.01	0.02	8
SC-3, SC-7 (upper reach - east)	<0.01	0.007	<0.01	0.02	5
SC-2, SC-8 (mid reach)	<0.01	0.000	<0.01	<0.01	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	<0.01	0.005	<0.01	0.02	20
All 13 Stations	0.01	0.004	<0.01	0.02	47

^a Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.
 SD - standard deviation
 N - number of observations

Appendix Table A - 12
 Continuing Surface Water Quality Monitoring Program
 Nitrate (mg/l as N)
 March, 1990 - December, 1990

Sampling Date ^a	Cattfish Creek/Trunk Ditch						South Creek								All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean	EL-1A	NC-6	SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	0.05	<0.01	0.14	<0.01	0.05	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.02	0.04	<0.01	0.14	13
June 11-12, 1990	0.07	<0.01	0.07	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	---	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	0.07	12
Sept. 17-18, 1990	0.14	---	0.28	<0.01	<0.01	0.11	<0.01	<0.01	<0.01	---	0.04	0.03	---	<0.01	0.02	0.05	0.09	<0.01	0.28	10
Dec. 10-11, 1990	0.14	<0.01	0.33	0.07	0.06	0.12	<0.01	<0.01	<0.01	<0.01	---	<0.01	0.21	<0.01	0.05	0.07	0.10	<0.01	0.33	12
Mean	0.10	<0.01	0.20	0.02	0.03		<0.01	<0.01	<0.01	<0.01	0.02	0.01	0.08	<0.01						
Minimum	0.05	<0.01	0.07	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Maximum	0.14	<0.01	0.33	0.07	0.06		<0.01	<0.01	<0.01	<0.01	0.04	0.003	0.21	<0.01						
Std. Deviation	0.05	0.00	0.12	0.03	0.03		0.00	0.00	0.00	0.00	0.02	0.01	0.11	0.00						
N	4	3	4	4	4		4	4	4	0	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	0.06	0.06	<0.01	0.14	7
CC-3, CC-4 (mid reach)	0.11	0.13	<0.01	0.33	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	0.08	0.09	<0.01	0.33	19
SC-4, SC-1 (upper reach - west)	<0.01	0.009	<0.01	0.03	8
SC-3, SC-7 (upper reach - east)	0.06	0.09	<0.01	0.21	5
SC-2, SC-8 (mid reach)	<0.01	0.00	<0.01	<0.01	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	0.02	0.05	<0.01	0.21	20
All 13 Stations	0.04	0.07	<0.01	0.33	47

^a Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 13
 Continuing Surface Water Quality Monitoring Program
 Ammoniacal Nitrogen (mg/l)^a
 March, 1990 - December, 1990

Sampling Date ^b	Catfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	0.13	0.07	0.09	0.03	0.08	0.08	<0.02	0.08	0.05	0.02	<0.02	<0.02	0.06	<0.02	0.03	0.05	0.04	<0.02	0.13	13
June 11-12, 1990	0.14	0.05	0.04	0.05	0.04	0.06	0.06	0.13	0.05	0.05	---	0.05	0.13	0.04	0.06	0.07	0.04	0.04	0.14	12
Sept. 17-18, 1990	0.14	---	0.13	0.03	0.02	0.08	0.08	0.06	0.07	---	0.16	0.86	---	0.02	0.27	0.16	0.25	0.02	0.86	10
Dec. 10-11, 1990	0.11	<0.02	<0.02	0.12	<0.02	0.05	<0.02	<0.02	<0.02	<0.02	---	<0.02	0.04	<0.02	0.02	0.03	0.04	<0.02	0.12	12
Mean	0.13	0.04	0.07	0.06	0.04		0.04	0.07	0.04	0.03	0.08	0.23	0.08	0.02						
Minimum	0.11	<0.02	<0.02	0.03	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02						
Maximum	0.14	0.07	0.13	0.12	0.08		0.08	0.13	0.07	0.05	0.16	0.86	0.13	0.04						
Std. Deviation	0.01	0.03	0.05	0.04	0.03		0.04	0.05	0.02	0.02	0.11	0.42	0.05	0.01						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	0.09	0.05	<0.02	0.14	7
CC-3, CC-4 (mid reach)	0.06	0.04	<0.02	0.13	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	0.07	0.05	<0.02	0.14	19
SC-4, SC-1 (upper reach - west)	0.14	0.29	<0.02	0.86	8
SC-3, SC-7 (upper reach - east)	0.08	0.06	<0.02	0.16	5
SC-2, SC-8 (mid reach)	0.02	0.02	<0.02	0.05	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	0.08	0.19	<0.02	0.86	20
All 13 Stations	0.07	0.13	<0.02	0.86	47

^a Ionized plus un-ionized ammonia (State and County Surface Water Criteria applies only to un-ionized ammonia).

^b Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 14
 Continuing Surface Water Quality Monitoring Program
 Organic Nitrogen (mg/l)^a
 March, 1990 - December, 1990

Sampling Date ^b	Catfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	0.51	1.39	0.85	1.04	0.93	0.94	1.76	1.18	1.20	1.55	1.42	1.36	1.34	1.06	1.32	1.20	0.33	0.51	1.76	13
June 11-12, 1990	0.82	1.49	0.68	1.15	0.94	1.02	1.94	1.24	1.46	1.88	---	1.45	1.59	1.19	1.51	1.32	0.39	0.68	1.94	12
Sept. 17-18, 1990	0.68	---	0.94	1.10	1.22	0.98	2.02	1.33	2.27	---	2.86	2.06	---	0.92	2.03	1.54	0.71	0.68	2.86	10
Dec. 10-11, 1990	0.61	1.75	0.78	1.36	0.98	1.10	1.79	1.06	1.34	1.55	---	1.65	1.26	0.84	1.33	1.25	0.40	0.61	1.79	12
Mean	0.66	1.54	0.81	1.16	1.02		1.88	1.20	1.57	1.66	2.14	1.63	1.40	1.00						
Minimum	0.51	1.39	0.68	1.04	0.93		1.76	1.06	1.20	1.55	1.42	1.36	1.26	0.84						
Maximum	0.82	1.75	0.94	1.36	1.22		2.02	1.33	2.27	1.88	2.86	2.06	1.59	1.19						
Std. Deviation	0.13	0.19	0.11	0.14	0.14		0.12	0.11	0.48	0.19	1.02	0.31	0.17	0.15						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	1.04	0.50	0.51	1.75	7
CC-3, CC-4 (mid reach)	0.99	0.22	0.68	1.36	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	1.01	0.32	0.51	1.75	19
SC-4, SC-1 (upper reach - west)	1.60	0.38	1.20	2.27	8
SC-3, SC-7 (upper reach - east)	1.69	0.66	1.26	2.86	5
SC-2, SC-8 (mid reach)	1.28	0.38	0.84	1.88	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	1.51	0.47	0.84	2.86	20
All 13 Stations	1.31	0.47	0.51	2.86	47

^a Organic Nitrogen = Total Kjeldahl Nitrogen - Ammoniacal Nitrogen.

^b Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 15
 Continuing Surface Water Quality Monitoring Program
 Total Phosphate (mg/l as P)
 March, 1990 - December, 1990

Sampling Date ^a	Cattfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	0.22	0.08	<0.01	0.05	0.04	0.08	0.19	0.07	0.16	0.52	0.19	0.52	0.52	0.07	0.33	0.20	0.19	<0.01	0.52	13
June 11-12, 1990	0.37	0.18	<0.01	0.09	0.06	0.14	0.24	0.18	0.14	0.17	---	0.28	0.47	0.06	0.22	0.19	0.14	<0.01	0.47	12
Sept. 17-18, 1990	0.35	---	0.11	0.02	0.07	0.14	0.39	0.16	0.08	---	0.71	0.69	---	0.12	0.40	0.27	0.26	0.02	0.71	10
Dec. 10-11, 1990	0.20	0.05	0.02	0.12	0.02	0.08	0.11	0.15	0.03	0.43	---	0.22	0.50	0.06	0.25	0.16	0.16	0.02	0.50	12
Mean	0.28	0.10	0.03	0.07	0.05		0.23	0.14	0.10	0.37	0.45	0.43	0.50	0.08						
Minimum	0.20	0.05	<0.01	0.02	0.02		0.11	0.07	0.03	0.17	0.19	0.22	0.47	0.06						
Maximum	0.37	0.18	0.11	0.12	0.07		0.39	0.18	0.16	0.52	0.71	0.69	0.52	0.12						
Std. Deviation	0.09	0.07	0.05	0.04	0.02		0.12	0.05	0.06	0.18	0.37	0.22	0.02	0.03						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	0.21	0.12	<0.01	0.37	7
CC-3, CC-4 (mid reach)	0.05	0.05	<0.01	0.12	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	0.11	0.11	<0.01	0.37	19
SC-4, SC-1 (upper reach - west)	0.26	0.23	0.03	0.69	8
SC-3, SC-7 (upper reach - east)	0.48	0.19	0.19	0.71	5
SC-2, SC-8 (mid reach)	0.20	0.19	0.06	0.52	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	0.30	0.22	0.03	0.71	20
All 13 Stations	0.20	0.18	<0.01	0.71	47

^a Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 16
 Continuing Surface Water Quality Monitoring Program
 Orthophosphate (mg/l as P)
 March, 1990 - December, 1990

Sampling Date ^a	Catfish Creek/Trunk Ditch					Mean	EL-1A	NC-6	South Creek					Mean	All Stations				N	
	CC-1	CC-2	CC-3	CC-4	CC-5				SC-1	SC-2	SC-3	SC-4	SC-7		SC-8	Mean	STD	Min		Max
March 12-13, 1990	0.19	0.06	<0.01	<0.01	0.02	0.06	0.05	0.07	0.14	0.43	0.16	0.44	0.46	0.07	0.28	0.16	0.17	<0.01	0.46	13
June 11-12, 1990	0.33	0.15	<0.01	<0.01	0.01	0.10	0.05	0.11	0.03	0.08	---	0.25	0.38	0.05	0.16	0.12	0.13	<0.01	0.38	12
Sept. 17-18, 1990	0.31	---	0.04	0.01	0.02	0.09	0.21	0.11	0.02	---	0.33	0.57	---	0.11	0.26	0.17	0.18	0.01	0.57	10
Dec. 10-11, 1990	0.15	0.03	0.01	0.01	0.01	0.04	0.01	0.07	0.01	0.04	---	0.07	0.47	0.04	0.20	0.11	0.16	0.01	0.47	12
Mean	0.24	0.08	0.01	<0.01	0.01		0.08	0.09	0.05	0.30	0.24	0.33	0.44	0.07						
Minimum	0.15	0.03	<0.01	<0.01	0.01		0.01	0.07	0.01	0.08	0.16	0.07	0.38	0.04						
Maximum	0.33	0.15	0.04	0.01	0.02		0.21	0.11	0.14	0.43	0.33	0.57	0.47	0.11						
Std. Deviation	0.09	0.06	0.02	0.003	0.006		0.09	0.02	0.06	0.19	0.12	0.22	0.05	0.03						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	0.17	0.11	0.03	0.33	7
CC-3, CC-4 (mid reach)	0.01	0.01	<0.01	0.04	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	0.07	0.10	<0.01	0.33	19
SC-4, SC-1 (upper reach - west)	0.19	0.21	<0.01	0.57	8
SC-3, SC-7 (upper reach - east)	0.36	0.13	0.16	0.47	5
SC-2, SC-8 (mid reach)	0.17	0.17	0.04	0.43	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	0.23	0.19	0.01	0.57	20
All 13 Stations	0.14	0.16	<0.01	0.57	47

^a Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.
 SD - standard deviation
 N - number of observations

Appendix Table A - 17
 Continuing Surface Water Quality Monitoring Program
 Total N to Total P Ratios (N:P)^a
 March, 1990 - December, 1990

Sampling Date ^a	Cattfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	6.9	40	477	47	59	126	20	40	17	6.7	16	5.8	6.0	33	14	60	127	5.8	477	13
June 11-12, 1990	6.1	19	349	30	36	88	18	17	24	25	--	12	8.1	45	23	49	95	6.1	349	12
Sept. 17-18, 1990	6.2	--	27	125	39	49	12	19	65	--	9.6	9.5	--	17	25	33	37	6.2	125	10
Dec. 10-11, 1990	9.6	77	123	29	115	71	36	16	99	8.0	--	17	6.8	31	32	47	44	6.8	123	12
Mean	7.2	45	244	58	62		22	23	51	13	13	11	7.0	31						
Minimum	6.1	18	27	29	36		12	16	17	6.7	9.6	5.8	6.0	17						
Maximum	9.6	77	477	125	115		36	40	99	25	16	17	8.1	45						
Std. Deviation	1.6	30	206	46	36		10	11	38	10	4.9	4.5	1.0	11						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	24	27	6.1	77	7
CC-3, CC-4 (mid reach)	151	170	27	477	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	85	123	6.1	477	9
SC-4, SC-1 (upper reach - west)	31	33	5.7	99	8
SC-3, SC-7 (upper reach - east)	9.4	4.2	6.0	16	5
SC-2, SC-8 (mid reach)	24	14	6.7	43	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	23	23	5.8	99	20
All 13 Stations	48	85	5.8	477	47

^a Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.
 SD - standard deviation
 N - number of observations

Appendix Table A - 18
 Continuing Surface Water Quality Monitoring Program
 Inorganic N to Inorganic P Ratios (N_i:P_i)^a
 March, 1990 - December, 1990

Sampling Date ^a	Catfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	STD	Min	Max	N	
March 12-13, 1990	2.1	2.6	102	13	14	27	0.0	2.5	0.8	0.1	0.0	0.0	0.4	0.0	0.21	11	28	0	102	13
June 11-12, 1990	1.4	0.7	49	22	8.8	16	2.6	2.6	3.7	1.4	--	0.4	0.8	1.8	1.6	7.9	14	0.4	49	12
Sept. 17-18, 1990	2.1	--	24	6.6	2.2	8.7	0.8	1.2	7.7	--	1.4	3.5	--	0.4	3.3	5.0	7.0	0.4	24	10
Dec. 10-11, 1990	3.8	0.0	73	44	13	27	0.0	0.0	0.0	0.0	--	0.0	1.3	0.0	0.25	11	23	0	73	12
Mean	2.4	1.1	62	21	9.7		0.87	1.6	3.0	0.5	0.7	1.0	0.8	0.5						
Minimum	1.4	0.0	24	6.1	2.2		0	0	0	0	0	0	0.4	0						
Maximum	3.8	2.6	102	44	14		2.6	2.6	7.7	1.4	1.4	3.5	1.3	1.8						
Std. Deviation	1.0	1.3	33	16	5.5		1.2	1.2	3.5	0.8	1.0	1.7	0.4	0.8						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	1.8	1.2	0	3.8	
CC-3, CC-4 (mid reach)	42	32	6.6	102	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	20	28	0	102	19
SC-4, SC-1 (upper reach - west)	2.0	2.8	0	7.7	8
SC-3, SC-7 (upper reach - east)	0.8	0.8	0	1.4	5
SC-2, SC-8 (mid reach)	0.52	0.74	0	1.8	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	1.2	1.9	0	7.7	20
All 13 Stations	8.9	20	0.0	102	47

^a Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.
 SD - standard deviation
 N - number of observations

Appendix Table A - 19
 Continuing Surface Water Quality Monitoring Program
 Oils and Greases (mg/l)^a
 March, 1990 - December, 1990

Sampling Date ^b	Catfish Creek/Trunk Ditch						South Creek								All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean	EL-1A	NC-6	SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.1	3.2	<1.0	<1.0	1.2	0.8	0.8	<1.0	3.2	13
June 11-12, 1990	1.8	2.6	1.1	1.7	1.8	1.8	1.7	1.6	2.0	2.1	---	2.4	1.5	2.0	2.0	1.9	0.4	1.1	2.6	12
Sept. 17-18, 1990	<1.0	---	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	---	<1.0	<1.0	---	<1.0	<1.0	<1.0	0.0	<1.0	<1.0	10
Dec. 10-11, 1990	<1.0	8.9	1.1	2.9	3.0	3.3	3.7	<1.0	1.7	<1.0	---	<1.0	<1.0	<1.0	<1.0	2.0	2.5	<1.0	8.9	12
Mean	0.8	4.0	0.8	1.4	1.4		1.6	0.8	1.2	1.0	1.3	1.6	0.8	0.9						
Minimum	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0						
Maximum	1.8	8.9	1.1	2.9	3.0		3.7	1.6	2.0	2.1	2.1	3.2	1.5	2.0						
Std. Deviation	0.6	4.4	0.3	1.1	1.2		1.5	0.5	0.8	0.9	1.1	1.4	0.6	0.7						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	2.2	3.1	<1.0	8.9	7
CC-3, CC-4 (mid reach)	1.1	0.8	<1.0	2.9	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	1.6	2.0	<1.0	8.9	19
SC-4, SC-1 (upper reach - west)	1.4	1.1	<1.0	3.2	8
SC-3, SC-7 (upper reach - east)	1.0	0.7	<1.0	2.1	5
SC-2, SC-8 (mid reach)	0.9	0.8	<1.0	2.1	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	1.1	0.9	<1.0	3.2	20
All 13 Stations	1.3	1.4	<1.0	8.9	47

^a Applicable surface water quality criteria: State - Maximum allowable concentration of 5.0 mg/l; Sarasota County - Maximum allowable concentration of 15 mg/l.

^b Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 20
 Continuing Surface Water Quality Monitoring Program
 Total Coliform (count/100 ml)^a
 March, 1990 - December, 1990

Sampling Date ^b	Cattfish Creek/Trunk Ditch					Mean	EL-1A	NC-6	South Creek					Mean	All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5				SC-1	SC-2	SC-3	SC-4	SC-7		SC-8	Mean	STD	Min	Max	N
March 12-13, 1990	500	16000	2400	230	1300	4086	80	280	1700	220	300	1300	1400	800	953	2039	4253	80	16000	13
June 11-12, 1990	5000	16000	5000	700	9000	7140	5000	1100	3000	3000	---	1300	2200	800	2060	4342	4397	700	16000	12
Sept. 17-18, 1990	9000	---	9000	2400	800	5300	700	800	5000	---	16000	9000	---	3000	8250	5570	5058	700	16000	10
Dec. 10-11, 1990	9000	1600	900	1600	9000	4420	3000	900	9000	2400	---	16000	1600	900	5980	4658	4894	900	16000	12
Mean	5875	11200	4325	1232	5025		2195	770	4675	1873	8150	6900	1733	1375						
Minimum	500	1600	900	230	800		80	280	1700	220	300	2300	1400	800						
Maximum	9000	16000	9000	2400	9000		5000	1100	9000	3000	16000	16000	2200	3000						
Std. Deviation	4049	8314	3547	964	4594		2253	350	3187	1463	11102	7069	416	1084						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	8157	6272	500	16000	7
CC-3, CC-4 (mid reach)	2779	2919	230	9000	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	5233	5095	230	16000	19
SC-4, SC-1 (upper reach - west)	5787	5214	1300	16000	8
SC-3, SC-7 (upper reach - east)	4300	6576	300	16000	5
SC-2, SC-8 (mid reach)	1586	1171	220	3000	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	3946	4802	220	16000	20
All 13 Stations	4047	4673	80	16000	47

^a Applicable surface water criteria (State and County): Maximum of 2,400/100 ml.

^b Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 21
 Continuing Surface Water Quality Monitoring Program
 Fecal Coliform (count/100 ml)^a
 March, 1990 - December, 1990

Sampling Date ^b	Catfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations					
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N
March 12-13, 1990	230	2200	1300	7	110	769	40	220	500	50	4	300	50	170	179	399	642	4	2200	13
June 11-12, 1990	3000	1700	3000	30	3000	2146	17	130	500	500	---	800	21	50	374	1062	1261	17	3000	12
Sept. 17-18, 1990	3000	---	500	4	230	933	140	230	50	---	1300	3000	---	50	1100	850	1194	4	3000	10
Dec. 10-11, 1990	3000	110	900	900	500	1082	300	300	170	240	---	16000	500	500	3482	1952	4492	110	16000	12
Mean	2307	1336	1425	235	960		124	220	305	263	652	5025	190	192						
Minimum	230	110	500	4	110		17	130	50	50	4	300	21	50						
Maximum	3000	2200	3000	900	3000		300	300	500	500	1300	16000	500	500						
Std. Deviation	1385	1091	1100	443	1370		129	70	230	226	916	7410	269	213						
N	4	3	4	4	4		4	4	4	3	2	4	3	4						

Stations	Mean	SD	Min	Max	N
CC-1, CC-2 (upper reach)	1891	1275	110	3000	7
CC-3, CC-4 (mid reach)	836	1003	4	3000	8
CC-1, CC-2, CC-3, CC-4, CC-5 (entire basin)	1248	1226	4	3000	19
SC-4, SC-1 (upper reach - west)	2665	5470	50	16000	8
SC-3, SC-7 (upper reach - east)	375	557	4	1300	5
SC-2, SC-8 (mid reach)	223	203	50	500	7
SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (entire basin)	1238	5540	4	16000	20
All 13 Stations	1061	2436	4	16000	47

^a Applicable surface water criteria (State and County): Maximum of 800/100 ml.

^b Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

SD - standard deviation

N - number of observations

Appendix Table A - 22
 Continuing Surface Water Quality Monitoring Program
 Trace Elements^a
 September 17 - 18, 1990^b

Parameter	Catfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						All Stations						
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8	Mean	Mean	STD	Min	Max	N	
Arsenic	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10
Cadmium, µg/l	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	<0.5	<0.5	--	<0.5	<0.5	<0.5	0.0	<0.5	<0.5	10
Chromium	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
Copper	0.01	--	0.007	<0.005	0.02 ^d	0.01	0.007	0.01	<0.005	--	<0.005	0.04 ^{cd}	--	0.007	0.013	0.011	0.011	<0.005	0.04	10	
Lead	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10	
Mercury, µg/l	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	--	<0.1	<0.1	<0.1	0.0	<0.1	<0.1	10	
Nickel	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10	
Zinc	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10	

^a Units of measure are mg/l unless otherwise specified.

^b Catfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.

^c Out of Compliance with State Standards

^d Out of Compliance with Sarasota County Standards

Applicable surface water criteria (State/County): Arsenic (0.05/0.01 mg/l); Cadmium (0.8-1.2 µg/l/0.01 mg/l); Chromium (0.05/0.02 mg/l); Copper (0.03/0.01 mg/l); Lead (0.03/0.01 mg/l); Mercury (0.2 µg/l/0.01 mg/l); Nickel (0.1/0.1 mg/l); and Zinc (0.03/0.01 mg/l).

SD - standard deviation

N - number of observations

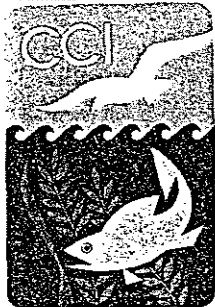
Appendix Table A - 23
 Continuing Surface Water Quality Monitoring Program
 Organochlorine Pesticides ($\mu\text{g/l}$)^a
 September 17 - 18, 1990^b

Parameter	Cattfish Creek/Trunk Ditch						EL-1A	NC-6	South Creek						Mean	All Stations			N	
	CC-1	CC-2	CC-3	CC-4	CC-5	Mean			SC-1	SC-2	SC-3	SC-4	SC-7	SC-8		Mean	STD	Min		Max
Aldrin	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10
alpha - BHC	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10
beta - BHC	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
delta - BHC	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
gamma - BHC (Lindane)	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
Chlordane	<0.10	--	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	--	<0.10	<0.10	--	<0.10	<0.10	<0.10	0.00	<0.10	<0.10	10
Dieldrin	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10
Endosulfan I	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
Endosulfan II	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
Endosulfan Sulfate	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
Endrin	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
Endrin Aldehyde	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	--	<0.05	<0.05	<0.05	0.00	<0.05	<0.05	10
Heptachlor	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10
Heptachlor Epoxide	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
Methoxychlor	<0.02	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	--	<0.02	<0.02	--	<0.02	<0.02	<0.02	0.00	<0.02	<0.02	10
Toxaphene	<0.005	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.005	<0.005	--	<0.005	<0.005	<0.005	0.00	<0.005	<0.005	10
4, 4'- DDD	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
4, 4'- DDE	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
4, 4'- DDT	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
PCB 1016	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
PCB 1221	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
PCB 1232	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--	<0.01	<0.01	<0.01	0.00	<0.01	<0.01	10
PCB 1242	<0.001	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	<0.001	<0.001	--	<0.001	<0.001	<0.001	0.00	<0.001	<0.001	10
PCB 1248	<0.001	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	<0.001	<0.001	--	<0.001	<0.001	<0.001	0.00	<0.001	<0.001	10
PCB 1254	<0.001	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	<0.001	<0.001	--	<0.001	<0.001	<0.001	0.00	<0.001	<0.001	10
PCB 1260	<0.001	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	--	<0.001	<0.001	--	<0.001	<0.001	<0.001	0.00	<0.001	<0.001	10

^a Applicable State surface water criteria ($\mu\text{g/l}$): Aldrin plus Dieldrin (0.003); Lindane (0.01); Chlordane (0.01); DDT (0.001); Endosulfan (0.003); Endrin (0.004); Heptachlor (0.001); Toxaphene (0.005); and PCB (0.001).

^b Cattfish Creek/Trunk Ditch, Elligraw Bayou and North Creek stations sampled on first day of event, South Creek stations on second day.
 SD - standard deviation; N - number of observations

APPENDIX B. LABORATORY REPORTS



LABORATORY REPORT

5010 U.S. HIGHWAY 19 NORTH
POST OFFICE BOX 35
PALMETTO, FLORIDA 34220

ENVIRONMENTAL BIOLOGISTS, CHEMISTS,
AND WATER RESOURCE SCIENTISTS

CONSERVATION CONSULTANTS, INC.

Palmetto (813) 722-6667 Bradenton (813) 747-0006
Tampa (813) 229-3516 FAX (813) 722-8384

REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 063/APR2790
Project Number: 0380-556
Sampling Date: 03-12-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 1 of 8

RESULTS OF ANALYSIS:	CC-1	CC-2	CC-3	Units
Laboratory Number	00276	00277	00278	
Sample Time	1012	1026	1050	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	1.9	2.5	0.6	mg/l
Bacteria, Fecal Coliform	230	2200*	1300*	colonies/100ml
Bacteria, Total Coliform	500	16000*	2400	colonies/100ml
Dissolved Oxygen (field)	2.3*	7.1	1.2*	mg/l
Nitrogen, Ammonia, as N	0.13	0.07	0.09	mg/l
Nitrogen, Nitrate, as N	0.05	<0.01	0.14	mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	0.64	1.46	0.94	mg/l
Nitrogen, Total, as N	0.69	1.46	1.08	mg/l
pH (field)	6.8	7.0	6.7	pH units
Phosphate, Total, as P	0.22	0.08	<0.01	mg/l
Phosphate, Total Reactive, as P	0.19	0.06	<0.01	mg/l
Solids, Total Suspended (TSS)	<1	<1	2	mg/l
Temperature (field)	19.7	21.7	20.7	°C
Turbidity (NTU)	1.9	3.4	10.5	NTU
Specific Conductivity (field)	712*	1242*	1266*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-3 and/or Sarasota County Ordinance
72-37, Class III surface waters.



LABORATORY REPORT

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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 063/APR2790
Project Number: 0380-556
Sampling Date: 03-12-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 2 of 8

RESULTS OF ANALYSIS:	CG-1	CG-2	CG-3	Units
Laboratory Number	00276	00277	00278	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	<1.0	<1.0	<1.0	mg/l
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^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



LABORATORY REPORT

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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 063/APR2790
Project Number: 0380-556
Sampling Date: 03-12-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 3 of 8

RESULTS OF ANALYSIS:	CC-4	CC-5	EL-1A	NC-6	Units
Laboratory Number	00279	00280	00281	00282	
Sample Time	1108	1150	1037	1212	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	2.0	1.1	2.0	0.7	mg/l
Bacteria, Fecal Coliform	7	110	40	220	colonies/100 ml
Bacteria, Total Coliform	230	1300	800	280	colonies/100 ml
Dissolved Oxygen (field)	7.5	12.7	6.3	1.2*	mg/l
Nitrogen, Ammonia, as N	0.03	0.08	<0.02	0.08	mg/l
Nitrogen, Nitrate, as N	<0.01	<0.01	<0.01	<0.01	mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	<0.01	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	1.07	1.01	1.76	1.26	mg/l
Nitrogen, Total, as N	1.07	1.01	1.76	1.26	mg/l
pH (field)	7.0	8.0	7.1	7.4	pH units
Phosphate, Total, as P	0.05	0.04	0.19	0.07	mg/l
Phosphate, Total Reactive, as P	<0.01	0.02	0.05	0.07	mg/l
Solids, Total Suspended (TSS)	8	1	14	<1	mg/l
Temperature (field)	23.3	30.5	22.3	19.2	°C
Turbidity (NTU)	7.9	5.2	12.4	5.4	NTU
Specific Conductivity (field)	894*	782*	1018*	705*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-3 and/or Sarasota County Ordinance
72-37, Class III surface waters.

LABORATORY REPORT



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 063/APR2790
Project Number: 0380-556
Sampling Date: 03-12-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 4 of 8

RESULTS OF ANALYSIS:	CC-4	CC-5	EL-1A	NC-6	Units
Laboratory Number	00279	00280	00281	00282	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	<1.0	<1.0	<1.0	<1.0	mg/l
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^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



LABORATORY REPORT

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Tampa (813) 229-3516 FAX (813) 722-8384

REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 063/APR2790
Project Number: 0380-556
Sampling Date: 03-13-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

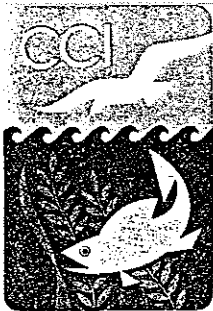
Page 5 of 8

RESULTS OF ANALYSIS:	SC-1	SC-2	SC-3	Units
Laboratory Number	00287	00288	00289	
Sample Time	1120	1100	1225	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	1.4	1.0	0.9	mg/l
Bacteria, Fecal Coliform	500	50	4	colonies/100 ml
Bacteria, Total Coliform	1700	220	300	colonies/100 ml
Dissolved Oxygen (field)	5.9	7.0	4.3*	mg/l
Nitrogen, Ammonia, as N	0.05	0.02	<0.02	mg/l
Nitrogen, Nitrate, as N	<0.01	<0.01	<0.01	mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	1.25	1.57	1.42	mg/l
Nitrogen, Total, as N	1.25	1.57	1.42	mg/l
pH (field)	7.2	7.7	6.6	pH units
Phosphate, Total, as P	0.16	0.52	0.19	mg/l
Phosphate, Total Reactive, as P	0.14	0.43	0.16	mg/l
Solids, Total Suspended (TSS)	<1	1	<1	mg/l
Temperature (field)	22.8	21.5	25.8	°C
Turbidity (NTU)	1.8	1.8	0.6	NTU
Specific Conductivity (field)	1079*	1006*	979*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-3 and/or Sarasota County Ordinance
72-37, Class III surface waters.



LABORATORY REPORT

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Tampa (813) 229-3516 FAX (813) 722-8384

REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 063/APR2790
Project Number: 0380-556
Sampling Date: 03-13-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

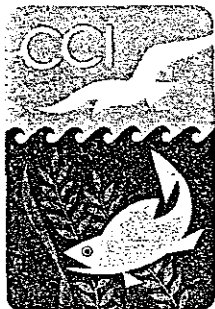
Page 6 of 8

RESULTS OF ANALYSIS:	SC-1	SC-2	SC-3	Units
Laboratory Number	00287	00288	00289	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	<1.0	<1.0	2.1	mg/l
----------------	------	------	-----	------

^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



LABORATORY REPORT

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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 063/APR2790
Project Number: 0380-556
Sampling Date: 03-13-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 7 of 8

RESULTS OF ANALYSIS:

	SC-4	SC-7	SC-8	Units
Laboratory Number	00290	00291	00292	
Sample Time	1201	1138	1021	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	0.8	0.8	0.6	mg/l
Bacteria, Fecal Coliform	300	50	170	colonies/100 ml
Bacteria, Total Coliform	1300	1400	800	colonies/100 ml
Dissolved Oxygen (field)	9.4	3.1*	6.2	mg/l
Nitrogen, Ammonia, as N	<0.02	0.06	<0.02	mg/l
Nitrogen, Nitrate, as N	<0.01	0.02	<0.01	mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	1.36	1.40	1.06	mg/l
Nitrogen, Total, as N	1.36	1.42	1.06	mg/l
pH (field)	7.2	6.9	7.1	pH units
Phosphate, Total, as P	0.52	0.52	0.07	mg/l
Phosphate, Total Reactive, as P	0.44	0.46	0.07	mg/l
Solids, Total Suspended (TSS)	1	<1	<1	mg/l
Temperature (field)	23.0	20.1	20.2	°C
Turbidity (NTU)	4.5	3.1	4.6	NTU
Specific Conductivity (field)	1175*	887*	896*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-3 and/or Sarasota County Ordinance
72-37, Class III surface waters.



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 063/APR2790
Project Number: 0380-556
Sampling Date: 03-13-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 8 of 8

RESULTS OF ANALYSIS:	SC-4	SC-7	SC-8	Units
Laboratory Number	00290	00291	00292	

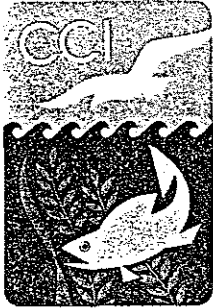
ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	3.2	<1.0	<1.0	mg/l
----------------	-----	------	------	------

*make sure copies
of lab reports are
signed - I just
signed all these.*

Lisa P. Knowles
Lisa P. Knowles/Laboratory Supervisor

Water Certification #83160
ntal Certification #E83079



LABORATORY REPORT

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Palmetto (813) 722-6667 Bradenton (813) 747-0006
Tampa (813) 229-3516 FAX (813) 722-8384

REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 161/JUL1690
Project Number: 0380-556
Sampling Date: 06-11-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

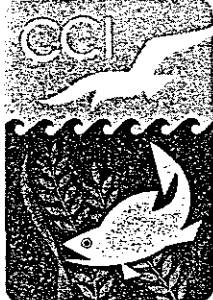
Page 1 of 8

RESULTS OF ANALYSIS:	CC-1	CC-2	CC-3	Units
Laboratory Number	00653	00654	00655	
Sample Time	1232	1315	1335	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	4.5	1.8	0.6	mg/l
Bacteria, Fecal Coliform	3000*	1700*	3000*	colonies/100ml
Bacteria, Total Coliform	5000*	>16000*	5000*	colonies/100ml
Dissolved Oxygen (field)	1.8*	5.7	5.7	mg/l
Nitrogen, Ammonia, as N	0.14	0.05	0.04	mg/l
Nitrogen, Nitrate, as N	0.07	<0.01	0.07	mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	0.96	1.54	0.72	mg/l
Nitrogen, Total, as N	1.03	1.54	0.79	mg/l
pH (field)	8.2	7.2	6.9	pH units
Phosphate, Total, as P	0.37	0.18	<0.01	mg/l
Phosphate, Total Reactive, as P	0.33	0.15	<0.01	mg/l
Solids, Total Suspended (TSS)	5	7	3	mg/l
Temperature (field)	27.0	30.8	27.4	°C
Turbidity (NTU)	2.4	1.7	4.3	NTU
Specific Conductivity (field)	738*	643*	1170*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 161/JUL1690
Project Number: 0380-556
Sampling Date: 06-11-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 2 of 8

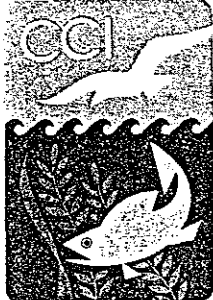
<u>RESULTS OF ANALYSIS:</u>	<u>CC-1</u>	<u>CC-2</u>	<u>CC-3</u>	<u>Units</u>
Laboratory Number	00653	00654	00655	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	1.8	2.6	1.1	mg/l
----------------	-----	-----	-----	------

^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079

LABORATORY REPORT



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 161/JUL1690
Project Number: 0380-556
Sampling Date: 06-11-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 3 of 8

RESULTS OF ANALYSIS:	CC-4	CC-5	EL-1A	NC-6	Units
Laboratory Number	00656	00657	00658	00659	
Sample Time	1347	1410	1308	1435	24 hours

ANALYSES PERFORMED BY CGI

Biochemical Oxygen Demand, BOD-5 day	2.9	2.2	4.3	1.5	mg/l
Bacteria, Fecal Coliform	30	3000*	17	130	colonies/100 ml
Bacteria, Total Coliform	700	9000*	5000*	1100	colonies/100 ml
Dissolved Oxygen (field)	8.4	9.5	6.5	1.1*	mg/l
Nitrogen, Ammonia, as N	0.05	0.04	0.06	0.13	mg/l
Nitrogen, Nitrate, as N	<0.01	<0.01	<0.01	<0.01	mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	<0.01	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	1.20	0.98	2.00	1.37	mg/l
Nitrogen, Total, as N	1.20	0.98	2.00	1.37	mg/l
pH (field)	7.1	8.2	7.4	7.0	pH units
Phosphate, Total, as P	0.09	0.06	0.24	0.18	mg/l
Phosphate, Total Reactive, as P	<0.01	0.01	0.05	0.11	mg/l
Solids, Total Suspended (TSS)	11	13	21	13	mg/l
Temperature (field)	31.2	33.6	31.0	25.6	°C
Turbidity (NTU)	7.0	9.2	14.8	12.9	NTU
Specific Conductivity (field)	621*	587*	1046*	697*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-3 and/or Sarasota County Ordinance
72-37, Class III surface waters.



LABORATORY REPORT

5010 U.S. HIGHWAY 19 NORTH
POST OFFICE BOX 35
PALMETTO, FLORIDA 34220

ENVIRONMENTAL BIOLOGISTS, CHEMISTS,
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CONSERVATION CONSULTANTS, INC.

Palmetto (813) 722-6667 Bradenton (813) 747-0006
Tampa (813) 229-3516 FAX (813) 722-8384

REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 161/JUL1690
Project Number: 0380-556
Sampling Date: 06-11-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 4 of 8

RESULTS OF ANALYSIS:	CC-4	CC-5	EL-1A	NC-6	Units
Laboratory Number	00656	00657	00658	00659	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY*

Oil and Grease	1.7	1.8	1.7	1.6	mg/l
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*FDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 161/JUL1690
Project Number: 0380-556
Sampling Date: 06-12-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

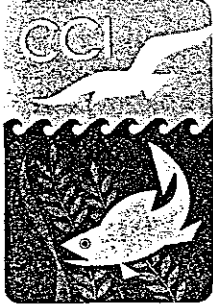
Page 5 of 8

RESULTS OF ANALYSIS:	SG-1	SG-2	SG-3	Units
Laboratory Number	00660	00661	-----	
Sample Time	1252	1237	1345	24 hours

ANALYSES PERFORMED BY GCI

Biochemical Oxygen Demand, BOD-5 day	3.1	2.7		mg/l
Bacteria, Fecal Coliform	500	500		colonies/100 ml
Bacteria, Total Coliform	3000*	3000*		colonies/100 ml
Dissolved Oxygen (field)	6.6	5.3		mg/l
Nitrogen, Ammonia, as N	0.05	0.05		mg/l
Nitrogen, Nitrate, as N	<0.01	<0.01		mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	D	mg/l
Nitrogen, Total Kjeldahl, as N	1.51	1.93	R	mg/l
Nitrogen, Total, as N	1.51	1.93	Y	mg/l
pH (field)	7.1	6.9		pH units
Phosphate, Total, as P	0.14	0.17		mg/l
Phosphate, Total Reactive, as P	0.03	0.08		mg/l
Solids, Total Suspended (TSS)	11	7		mg/l
Temperature (field)	30.2	29.1		°C
Turbidity (NTU)	4.6	3.6		NTU
Specific Conductivity (field)	776*	940*		umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-3 and/or Sarasota County Ordinance
72-37, Class III surface waters.



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 161/JUL1690
Project Number: 0380-556
Sampling Date: 06-12-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 6 of 8

RESULTS OF ANALYSIS:	SC-1	SC-2	SC-3	Units
Laboratory Number	00660	00661	-----	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY*

Oil and Grease	2.0	2.1	DRY	mg/l
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*FDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



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PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 161/JUL1690
Project Number: 0380-556
Sampling Date: 06-12-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

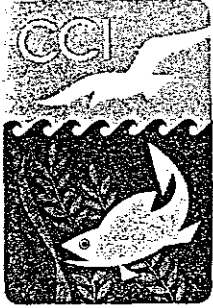
Page 7 of 8

RESULTS OF ANALYSIS:	SC-4	SC-7	SC-8	Units
Laboratory Number	00662	00663	00664	
Sample Time	1330	1308	1212	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	1.3	1.6	0.6	mg/l
Bacteria, Fecal Coliform	800	21	50	colonies/100 ml
Bacteria, Total Coliform	1300	2200	800	colonies/100 ml
Dissolved Oxygen (field)	7.3	1.7*	7.0	mg/l
Nitrogen, Ammonia, as N	0.05	0.13	0.04	mg/l
Nitrogen, Nitrate, as N	<0.01	<0.01	<0.01	mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	1.50	1.72	1.23	mg/l
Nitrogen, Total, as N	1.50	1.72	1.23	mg/l
pH (field)	7.3	6.9	6.7	pH units
Phosphate, Total, as P	0.28	0.47	0.06	mg/l
Phosphate, Total Reactive, as P	0.25	0.38	0.05	mg/l
Solids, Total Suspended (TSS)	7	5	3	mg/l
Temperature (field)	30.6	27.1	27.7	°C
Turbidity (NTU)	5.0	5.4	1.0	NTU
Specific Conductivity (field)	1363*	999*	768*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-3 and/or Sarasota County Ordinance
72-37, Class III surface waters.



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REPORT FOR: Mr. Jim Paulmann
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7184 Beneva Road
Sarasota, Florida 34238

Report Number: 161/JUL1690
Project Number: 0380-556
Sampling Date: 06-12-90
Sample Source: Surface Water
Sampled By: Odell, Shindehette

Page 8 of 8

RESULTS OF ANALYSIS:	SC-4	SC-7	SC-8	Units
Laboratory Number	00662	00663	00664	

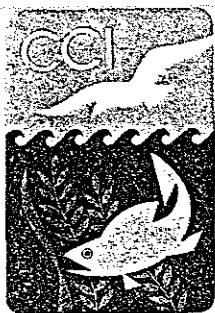
ANALYSES PERFORMED BY SUBCONTRACT LABORATORY*

Oil and Grease	2.4	1.5	2.0	mg/l
----------------	-----	-----	-----	------

*FDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079

Lisa P. Knowles
Lisa P. Knowles/Laboratory Supervisor

LABORATORY REPORT



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 303/OCT2390
Project Number: 0380-556
Sampling Date: 09-17-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

Page 1 of 12

RESULTS OF ANALYSIS:	CC-1	CC-2	CC-3	Units
Laboratory Number	01415	-----	01416	
Sample Time	1102	1132	1145	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	2.2		1.5	mg/l
Bacteria, Fecal Coliform	3000*		500	colonies/100 ml
Bacteria, Total Coliform	9000*		9000*	colonies/100 ml
Dissolved Oxygen (field)	1.4*		1.1*	mg/l
Nitrogen, Ammonia, as N	0.14		0.13	mg/l
Nitrogen, Nitrate, as N	0.14		0.28	mg/l
Nitrogen, Nitrite, as N	0.02	D	0.02	mg/l
Nitrogen, Total Kjeldahl, as N	0.82	R	1.07	mg/l
Nitrogen, Total, as N	0.98	Y	1.37	mg/l
pH (field)	6.6		6.7	pH units
Phosphate, Total, as P	0.35		0.11	mg/l
Phosphate, Total Reactive, as P	0.31		0.04	mg/l
Solids, Total Suspended (TSS)	4		7	mg/l
Temperature (field)	25.9		26.9	°C
Turbidity (NTU)	3.7		24	NTU
Specific Conductivity (field)	744*		1304*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-302 and/or Sarasota County
Ordinance 72-37, Class III surface waters.



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Report Number: 303/OCT2390
Project Number: 0380-556
Sampling Date: 09-17-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

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RESULTS OF ANALYSIS:

	CC-1	CC-2	CC-3	Units
Laboratory Number	01415	-----	01416	

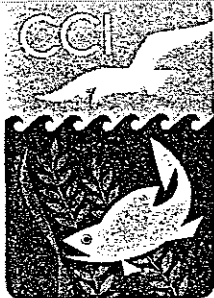
ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Arsenic, Total	<0.005		<0.005	mg/l
Cadmium, Total	<0.0005		<0.0005	mg/l
Chromium, Total	<0.01		<0.01	mg/l
Copper, Total	0.01		0.007	mg/l
Lead, Total	<0.005		<0.005	mg/l
Mercury, Total	<0.0001		<0.0001	mg/l
Nickel, Total	<0.005		<0.005	mg/l
Zinc, Total	<0.005		<0.005	mg/l
Oil and Grease	<1		<1	mg/l

Pesticides and Herbicides

PCB 1016	<0.01		<0.01	ug/l
PCB 1221	<0.01		<0.01	ug/l
PCB 1232	<0.01		<0.01	ug/l
PCB 1242	<0.001		<0.001	ug/l
PCB 1248	<0.001		<0.001	ug/l
PCB 1254	<0.001		<0.001	ug/l
PCB 1260	<0.001		<0.001	ug/l
4,4'-DDD	<0.001		<0.001	ug/l
4,4'-DDE	<0.001		<0.001	ug/l
4,4'-DDT	<0.001		<0.001	ug/l

^aFDHRS Drinking Water Certification #84271
FDHRS Environmental Certification #E84060



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PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 303/OCT2390
Project Number: 0380-556
Sampling Date: 09-17-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

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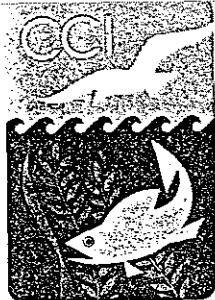
RESULTS OF ANALYSIS:	CC-1	CC-2	CC-3	Units
Laboratory Number	01415	-----	01416	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Aldrin	<0.005		<0.005	ug/l
a-BHC	<0.005		<0.005	ug/l
b-BHC	<0.01		<0.01	ug/l
D-BHC	<0.01		<0.01	ug/l
G-BHC	<0.005		<0.005	ug/l
Chlordane	<0.10		<0.10	ug/l
Dieldrin	<0.005		<0.005	ug/l
Endosulfan I	<0.01		<0.01	ug/l
Endosulfan II	<0.01		<0.01	ug/l
Endosulfan Sulfate	<0.01		<0.01	ug/l
Endrin	<0.01		<0.01	ug/l
Endrin Aldehyde	<0.05		<0.05	ug/l
Heptachlor	<0.005		<0.005	ug/l
Heptachlor Epoxide	<0.01		<0.01	ug/l
Methoxychlor	<0.02		<0.02	ug/l
Toxaphene	<0.005		<0.005	ug/l

^aFDHRS Drinking Water Certification #84271
FDHRS Environmental Certification #E84060

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Report Number: 303/OCT2390
Project Number: 0380-556
Sampling Date: 09-17-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

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RESULTS OF ANALYSIS:	CG-4	CG-5	EL-1A	NC-6	Units
Laboratory Number	01417	01418	01419	01420	
Sample Time	1208	1233	1123	1308	24 hours

ANALYSES PERFORMED BY CCI

	CG-4	CG-5	EL-1A	NC-6	Units
Biochemical Oxygen Demand, BOD-5 day	1.5	2.4	2.3	1.5	mg/l
Bacteria, Fecal Coliform	4	230	140	230	colonies/100 ml
Bacteria, Total Coliform	2400	800	700	800	colonies/100 ml
Dissolved Oxygen (field)	6.3	12.0	1.3*	0.9*	mg/l
Nitrogen, Ammonia, as N	0.03	0.02	0.08	0.06	mg/l
Nitrogen, Nitrate, as N	<0.01	<0.01	<0.01	<0.01	mg/l
Nitrogen, Nitrite, as N	<0.01	<0.01	<0.01	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	1.13	1.24	2.10	1.39	mg/l
Nitrogen, Total, as N	1.13	1.24	2.10	1.39	mg/l
pH (field)	7.0	8.0	6.8	7.6	pH units
Phosphate, Total, as P	0.02	0.07	0.39	0.16	mg/l
Phosphate, Total Reactive, as P	0.01	0.02	0.21	0.11	mg/l
Solids, Total Suspended (TSS)	4	6	24	4	mg/l
Temperature (field)	30.4	34.0	29.2	27.4	°C
Turbidity (NTU)	6.0	5.7	22	7.1	NTU
Specific Conductivity (field)	892*	803*	921*	726*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
Code 17-302 and/or Sarasota County
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Report Number: 303/OCT2390
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Sample Source: Surface Water
Sampled By: Odell, Schindehette

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RESULTS OF ANALYSIS:	CG-4	CG-5	EL-1A	NC-6	Units
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Laboratory Number	01417	01418	01419	01420	
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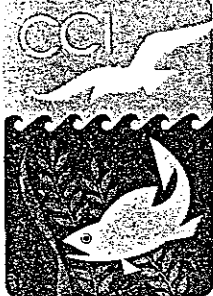
ANALYSES PERFORMED BY SUBCONTRACT LABORATORY*

Arsenic, Total	<0.005	<0.005	<0.005	<0.005	mg/l
Cadmium, Total	<0.0005	<0.0005	<0.0005	<0.0005	mg/l
Chromium, Total	<0.01	<0.01	<0.01	<0.01	mg/l
Copper, Total	<0.005	0.02	0.007	0.01	mg/l
Lead, Total	<0.005	<0.005	<0.005	<0.005	mg/l
Mercury, Total	<0.0001	<0.0001	<0.0001	<0.0001	mg/l
Nickel, Total	<0.005	<0.005	<0.005	<0.005	mg/l
Zinc, Total	<0.005	<0.005	<0.005	<0.005	mg/l
Oil and Grease	<1	<1	<1	<1	mg/l

Pesticides and Herbicides

PCB 1016	<0.01	<0.01	<0.01	<0.01	ug/l
PCB 1221	<0.01	<0.01	<0.01	<0.01	ug/l
PCB 1232	<0.01	<0.01	<0.01	<0.01	ug/l
PCB 1242	<0.001	<0.001	<0.001	<0.001	ug/l
PCB 1248	<0.001	<0.001	<0.001	<0.001	ug/l
PCB 1254	<0.001	<0.001	<0.001	<0.001	ug/l
PCB 1260	<0.001	<0.001	<0.001	<0.001	ug/l
4,4'-DDD	<0.01	<0.001	<0.01	<0.001	ug/l
4,4'-DDE	<0.01	<0.001	<0.01	<0.001	ug/l
4,4'-DDT	<0.01	<0.001	<0.01	<0.001	ug/l

*FDHRS Drinking Water Certification #84271
FDHRS Environmental Certification #E84060



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PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 303/OCT2390
Project Number: 0380-556
Sampling Date: 09-17-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

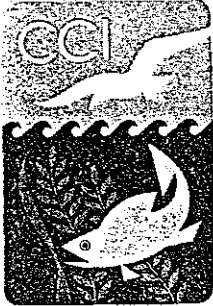
Page 6 of 12

RESULTS OF ANALYSIS:	CC-4	CC-5	EL-1A	NC-6	Units
Laboratory Number	01417	01418	01419	01420	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY*

Aldrin	<0.005	<0.005	<0.005	<0.005	ug/l
a-BHC	<0.005	<0.005	<0.005	<0.005	ug/l
b-BHC	<0.01	<0.01	<0.01	<0.01	ug/l
D-BHC	<0.01	<0.01	<0.01	<0.01	ug/l
G-BHC	<0.005	<0.005	<0.005	<0.005	ug/l
Chlordane	<0.10	<0.10	<0.10	<0.10	ug/l
Dieldrin	<0.005	<0.005	<0.005	<0.005	ug/l
Endosulfan I	<0.01	<0.01	<0.01	<0.01	ug/l
Endosulfan II	<0.01	<0.01	<0.01	<0.01	ug/l
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	ug/l
Endrin	<0.01	<0.01	<0.01	<0.01	ug/l
Endrin Aldehyde	<0.05	<0.05	<0.05	<0.05	ug/l
Heptachlor	<0.005	<0.005	<0.005	<0.005	ug/l
Heptachlor Epoxide	<0.01	<0.1	<0.1	<0.01	ug/l
Methoxychlor	<0.02	<0.02	<0.02	<0.02	ug/l
Toxaphene	<0.005	<0.005	<0.005	<0.005	ug/l

*FDHRS Drinking Water Certification #84271
FDHRS Environmental Certification #E84060



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REPORT FOR: Mr. Jim Paulmann
 PALMER VENTURE
 7184 Beneva Road
 Sarasota, Florida 34238

Report Number: 303/OCT2390
 Project Number: 0380-556
 Sampling Date: 09-18-90
 Sample Source: Surface Water
 Sampled By: Odell, Schindehette

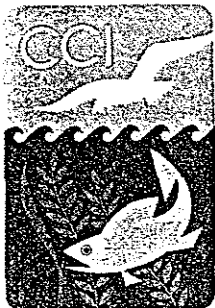
Page 7 of 12

RESULTS OF ANALYSIS:	SC-1	SC-2	SC-3	Units
Laboratory Number	01423	-----	01424	
Sample Time	1114	1101	1205	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	6.0		>7.8	mg/l
Bacteria, Fecal Coliform	50		1300*	colonies/100 ml
Bacteria, Total Coliform	5000*		16000*	colonies/100 ml
Dissolved Oxygen (field)	5.8		2.8*	mg/l
Nitrogen, Ammonia, as N	0.07		0.16	mg/l
Nitrogen, Nitrate, as N	<0.01		0.04	mg/l
Nitrogen, Nitrite, as N	<0.01		0.01	mg/l
Nitrogen, Total Kjeldahl, as N	2.34		3.02	mg/l
Nitrogen, Total, as N	2.34	D	3.07	mg/l
pH (field)	7.8	R	8.1	pH units
Phosphate, Total, as P	0.08	Y	0.71	mg/l
Phosphate, Total Reactive, as P	0.02		0.33	mg/l
Solids, Total Suspended (TSS)	16		16	mg/l
Temperature (field)	29.4		31.6	°C
Turbidity (NTU)	8.7		9.4	NTU
Specific Conductivity (field)	821*		672*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
 Code 17-302 and/or Sarasota County
 Ordinance 72-37, Class III surface waters.



LABORATORY REPORT

5010 U.S. HIGHWAY 19 NORTH
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Tampa (813) 229-3516 FAX (813) 722-8384

REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 303/OCT2390
Project Number: 0380-556
Sampling Date: 09-18-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

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RESULTS OF ANALYSIS:

	SC-1	SC-2	SC-3	Units
Laboratory Number	01423	-----	01424	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Arsenic, Total	<0.005		<0.005	mg/l
Cadmium, Total	<0.0005		<0.0005	mg/l
Chromium, Total	<0.01		<0.01	mg/l
Copper, Total	<0.005		<0.005	mg/l
Lead, Total	<0.005		<0.005	mg/l
Mercury, Total	<0.0001		<0.0001	mg/l
Nickel, Total	<0.005		<0.005	mg/l
Zinc, Total	<0.005		<0.005	mg/l
Oil and Grease	<1		<1	mg/l

Pesticides and Herbicides

PCB 1016	<0.01		<0.01	ug/l
PCB 1221	<0.01		<0.01	ug/l
PCB 1232	<0.01		<0.01	ug/l
PCB 1242	<0.001		<0.001	ug/l
PCB 1248	<0.001		<0.001	ug/l
PCB 1254	<0.001		<0.001	ug/l
PCB 1260	<0.001		<0.001	ug/l
4,4'-DDD	<0.001		<0.001	ug/l
4,4'-DDE	<0.001		<0.001	ug/l
4,4'-DDT	<0.001		<0.001	ug/l

^aFDHRS Drinking Water Certification #84271
FDHRS Environmental Certification #E84060



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7184 Beneva Road
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Report Number: 303/OCT2390
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Sampling Date: 09-18-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

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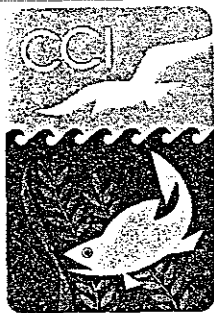
RESULTS OF ANALYSIS:	SG-1	SG-2	SG-3	Units
Laboratory Number	01423	-----	01424	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Aldrin	<0.005		<0.005	ug/l
a-BHC	<0.005		<0.005	ug/l
b-BHC	<0.01		<0.01	ug/l
D-BHC	<0.01		<0.01	ug/l
G-BHC	<0.005		<0.005	ug/l
Chlordane	<0.10		<0.10	ug/l
Dieldrin	<0.005		<0.005	ug/l
Endosulfan I	<0.01		<0.01	ug/l
Endosulfan II	<0.01		<0.01	ug/l
Endosulfan Sulfate	<0.01		<0.01	ug/l
Endrin	<0.01		<0.01	ug/l
Endrin Aldehyde	<0.05		<0.05	ug/l
Heptachlor	<0.005		<0.005	ug/l
Heptachlor Epoxide	<0.01		<0.01	ug/l
Methoxychlor	<0.02		<0.02	ug/l
Toxaphene	<0.005		<0.005	ug/l

^aFDHRS Drinking Water Certification #84271
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Report Number: 303/OCT2390
Project Number: 0380-556
Sampling Date: 09-18-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

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RESULTS OF ANALYSIS:	SC-4	SC-7	SC-8	Units
Laboratory Number	01425	-----	01426	
Sample Time	1145	1127	1028	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand, BOD-5 day	4.1		0.4	mg/l
Bacteria, Fecal Coliform	3000*		50	colonies/100 ml
Bacteria, Total Coliform	9000*		3000*	colonies/100 ml
Dissolved Oxygen (field)	3.2*		3.6*	mg/l
Nitrogen, Ammonia, as N	0.86		0.02	mg/l
Nitrogen, Nitrate, as N	0.03		<0.01	mg/l
Nitrogen, Nitrite, as N	0.02	D	<0.01	mg/l
Nitrogen, Total Kjeldahl, as N	2.92	R	0.94	mg/l
Nitrogen, Total, as N	2.97	Y	0.94	mg/l
pH (field)	7.1		7.1	pH units
Phosphate, Total, as P	0.69		0.12	mg/l
Phosphate, Total Reactive, as P	0.57		0.11	mg/l
Solids, Total Suspended (TSS)	11		1	mg/l
Temperature (field)	27.8		27.1	°C
Turbidity (NTU)	9.2		0.7	NTU
Specific Conductivity (field)	1006*		695*	umhos/cm, 25o C

*Noncompliance with Florida Administrative
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7184 Beneva Road
Sarasota, Florida 34238

Report Number: 303/OCT2390
Project Number: 0380-556
Sampling Date: 09-18-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

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RESULTS OF ANALYSIS:

	SC-4	SC-7	SC-8	Units
Laboratory Number	01425	-----	01426	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

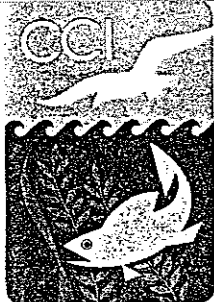
Arsenic, Total	<0.005		<0.005	mg/l
Cadmium, Total	<0.0005		<0.0005	mg/l
Chromium, Total	<0.01		<0.01	mg/l
Copper, Total	0.04*		0.007	mg/l
Lead, Total	<0.005		<0.005	mg/l
Mercury, Total	<0.0001		<0.0001	mg/l
Nickel, Total	<0.005		<0.005	mg/l
Zinc, Total	<0.005		<0.005	mg/l
Oil and Grease	<1		<1	mg/l

Pesticides and Herbicides

PCB 1016	<0.01		<0.01	ug/l
PCB 1221	<0.01		<0.01	ug/l
PCB 1232	<0.01		<0.01	ug/l
PCB 1242	<0.001		<0.001	ug/l
PCB 1248	<0.001		<0.001	ug/l
PCB 1254	<0.001		<0.001	ug/l
PCB 1260	<0.001		<0.001	ug/l
4,4'-DDD	<0.001		<0.001	ug/l
4,4'-DDE	<0.001		<0.001	ug/l
4,4'-DDT	<0.001		<0.001	ug/l

^aFDHRS Drinking Water Certification #84271
FDHRS Environmental Certification #E84060

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Report Number: 303/OCT2390
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Sampling Date: 09-18-90
Sample Source: Surface Water
Sampled By: Odell, Schindehette

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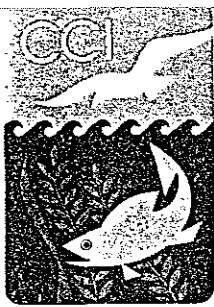
RESULTS OF ANALYSIS:	SC-4	SC-7	SC-8	Units
Laboratory Number	01425	-----	01426	

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Aldrin	<0.005		<0.005	ug/l
a-BHC	<0.005		<0.005	ug/l
b-BHC	<0.01		<0.01	ug/l
D-BHC	<0.01		<0.01	ug/l
G-BHC	<0.005		<0.005	ug/l
Chlordane	<0.10		<0.10	ug/l
Dieldrin	<0.005		<0.005	ug/l
Endosulfan I	<0.01		<0.01	ug/l
Endosulfan II	<0.01		<0.01	ug/l
Endosulfan Sulfate	<0.01		<0.01	ug/l
Endrin	<0.01		<0.01	ug/l
Endrin Aldehyde	<0.05		<0.05	ug/l
Heptachlor	<0.005		<0.005	ug/l
Heptachlor Epoxide	<0.01		<0.01	ug/l
Methoxychlor	<0.02		<0.02	ug/l
Toxaphene	<0.005		<0.005	ug/l

^aFDHRS Drinking Water Certification #84271
FDHRS Environmental Certification #E84060

Lisa P. Knowles
Lisa P. Knowles
Laboratory Supervisor



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 433/FEB2191
Project Number: 0380-556
Sampling Date: 12-10-90
Sample Source: Surface Water
Sampled By: Shindehette

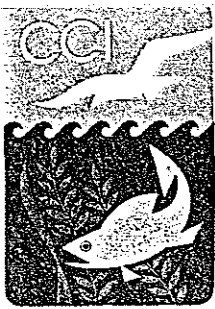
Page 1 of 10

RESULTS OF ANALYSIS:	CC-1	CC-2	CC-3	Units
Laboratory Number	02007	02008	02009	----
Sample Time	1030	1135	1310	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand	1.5	1.8	0.8	mg/l
Fecal Coliform Bacteria	3000*	110	900*	No./100ml
Total Coliform Bacteria	9000*	1600	900	No./100ml
Ammonia Nitrogen	0.11	<0.02	<0.02	mg/l
Nitrate Nitrogen	0.14	<0.02	0.33	mg/l
Nitrite Nitrogen	0.01	<0.02	<0.02	mg/l
Total Kjeldahl Nitrogen	0.72	1.75	0.78	mg/l
Total Nitrogen	0.87	1.75	1.11	mg/l
Total Phosphorus	0.20	0.05	0.02	mg/l
Total Reactive Phosphate	0.15	0.03	<0.02	mg/l
Total Suspended Solids	3	5	2	mg/l
Turbidity	7.0	3.7	12.0	NTU
Dissolved Oxygen (field)	6.1	7.4	5.3	mg/l
pH (field)	6.6	7.1	7.0	pH units
Specific Conductivity (field)	831*	1625*	1273*	µmhos/cm
Temperature (field)	12.8	13.0	17.4	°C

*Noncompliance with Florida Administrative Code
17-302 and/or Sarasota County Ordinance 72-37,
Class III surface waters.



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PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 433/FEB2191
Project Number: 0380-556
Sampling Date: 12-10-90
Sample Source: Surface Water
Sampled By: Shindehette

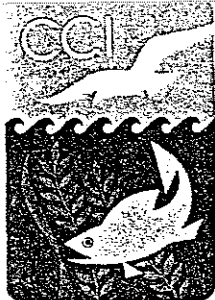
Page 2 of 10

RESULTS OF ANALYSIS:	CC-1	CC-2	CC-3	Units
Laboratory Number	02007	02008	02009	----

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	<1.0	8.9	1.1	mg/l
----------------	------	-----	-----	------

^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



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Sample Source: Surface Water
Sampled By: Shindehette

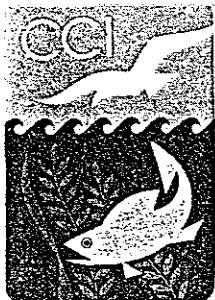
Page 3 of 10

RESULTS OF ANALYSIS:	CC-4	CC-5	EL1-A	Units
Laboratory Number	02010	02011	02012	----
Sample Time	1335	1420	1310	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand	2.3	0.7	1.7	mg/l
Fecal Coliform Bacteria	900*	500	300	No./100ml
Total Coliform Bacteria	1600	9000*	3000*	No./100ml
Ammonia Nitrogen	0.12	<0.02	<0.02	mg/l
Nitrate Nitrogen	0.07	0.06	<0.02	mg/l
Nitrite Nitrogen	0.01	<0.02	<0.02	mg/l
Total Kjeldahl Nitrogen	1.48	0.98	1.79	mg/l
Total Nitrogen	1.56	1.04	1.79	mg/l
Total Phosphorus	0.12	0.02	0.11	mg/l
Total Reactive Phosphate	<0.02	<0.02	<0.02	mg/l
Total Suspended Solids	8	1	4	mg/l
Turbidity	12.9	4.2	8.5	NTU
Dissolved Oxygen (field)	8.3	8.9	7.3	mg/l
pH (field)	7.3	7.7	7.2	pH units
Specific Conductivity (field)	976*	1063*	1115*	µmhos/cm
Temperature (field)	18.6	21.5	14.3	°C

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Project Number: 0380-556
Sampling Date: 12-10-90
Sample Source: Surface Water
Sampled By: Shindehette

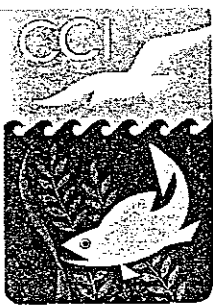
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RESULTS OF ANALYSIS:	CC-4	CC-5	EL1-A	Units
Laboratory Number	02010	02011	02012	-----

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	2.9	3.0	3.7	mg/l
----------------	-----	-----	-----	------

^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



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Project Number: 0380-556
Sampling Date: 12-11-90
Sample Source: Surface Water
Sampled By: Shindehette

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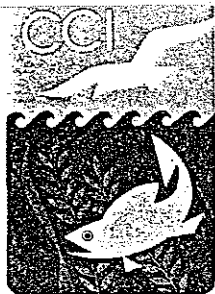
RESULTS OF ANALYSIS:	NC-6	SC-1	SC-2	Units
Laboratory Number	02013	02019	02020	----
Sample Time	1500	1105	1050	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand	1.0	1.3	1.7	mg/l
Fecal Coliform Bacteria	300	170	240	No./100ml
Total Coliform Bacteria	900	9000*	2400	No./100ml
Ammonia Nitrogen	<0.02	<0.02	<0.02	mg/l
Nitrate Nitrogen	<0.02	<0.02	<0.02	mg/l
Nitrite Nitrogen	<0.02	<0.02	<0.02	mg/l
Total Kjeldahl Nitrogen	1.06	1.34	1.55	mg/l
Total Nitrogen	1.06	1.34	1.55	mg/l
Total Phosphorus	0.15	0.03	0.43	mg/l
Total Reactive Phosphate	0.07	<0.02	0.40	mg/l
Total Suspended Solids	<1.0	3.0	4.0	mg/l
Turbidity	4.5	2.2	4.4	NTU
Dissolved Oxygen (field)	3.0*	7.3	8.7	mg/l
pH (field)	6.9	7.0	7.8	pH units
Specific Conductivity (field)	650*	1058*	950*	µmhos/cm
Temperature (field)	13.2	13.5	13.5	°C

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Report Number: 433/FEB2191
Project Number: 0380-556
Sampling Date: 12-11-90
Sample Source: Surface Water
Sampled By: Shindehette

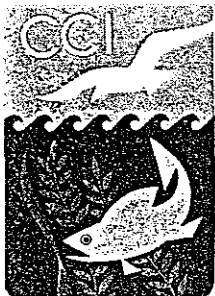
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RESULTS OF ANALYSIS:	NC-6	SC-1	SC-2	Units
Laboratory Number	02013	02019	02020	----

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	<1.0	1.7	<1.0	mg/l
----------------	------	-----	------	------

^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



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Sample Source: Surface Water
Sampled By: Shindehette

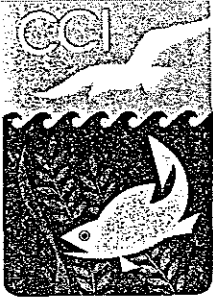
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RESULTS OF ANALYSIS:	SC-3	SC-4	SC-7	Units
Laboratory Number	----	02021	02022	-----
Sample Time	1345	1200	1125	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand	1.3	1.0	mg/l
Fecal Coliform Bacteria	16000*	500	No./100ml
Total Coliform Bacteria	16000*	1600	No./100ml
Ammonia Nitrogen	<0.02	0.04	mg/l
Nitrate Nitrogen	<0.02	0.21	mg/l
Nitrite Nitrogen	<0.02	0.02	mg/l
Total Kjeldahl Nitrogen	1.65	1.30	mg/l
Total Nitrogen	1.65	1.53	mg/l
Total Phosphorus	0.22	0.50	mg/l
Total Reactive Phosphate	0.07	0.47	mg/l
Total Suspended Solids	13.0	<1.0	mg/l
Turbidity	10.5	1.8	NTU
Dissolved Oxygen (field)	7.3	6.3	mg/l
pH (field)	6.8	7.1	pH units
Specific Conductivity (field)	1332*	830*	µmhos/cm
Temperature (field)	14.8	12.0	°C

*Noncompliance with Florida Administrative Code
17-302 and/or Sarasota County Ordinance 72-37,
Class III surface waters.



LABORATORY REPORT

5010 U.S. HIGHWAY 19 NORTH
POST OFFICE BOX 35
PALMETTO, FLORIDA 34220

ENVIRONMENTAL BIOLOGISTS, CHEMISTS,
AND WATER RESOURCE SCIENTISTS

Palmetto (813) 722-6667 Bradenton (813) 747-0006
Tampa (813) 229-3516 FAX (813) 722-8384

CONSERVATION CONSULTANTS, INC.

REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 433/FEB2191
Project Number: 0380-556
Sampling Date: 12-11-90
Sample Source: Surface Water
Sampled By: Shindehette

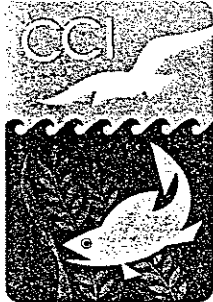
Page 8 of 10

RESULTS OF ANALYSIS:	SC-3	SC-4	SC-7	Units
Laboratory Number	----	02021	02022	-----

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease	DRY	<1.0	<1.0	mg/l
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^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 433/FEB2191
Project Number: 0380-556
Sampling Date: 12-11-90
Sample Source: Surface Water
Sampled By: Shindehette

Page 9 of 10

RESULTS OF ANALYSIS:	SC-8	Units
Laboratory Number	02023	----
Sample Time	0955	24 hours

ANALYSES PERFORMED BY CCI

Biochemical Oxygen Demand	0.4	mg/l
Fecal Coliform Bacteria	500	No./100ml
Total Coliform Bacteria	900	No./100ml
Ammonia Nitrogen	<0.02	mg/l
Nitrate Nitrogen	<0.02	mg/l
Nitrite Nitrogen	<0.02	mg/l
Total Kjeldahl Nitrogen	0.84	mg/l
Total Nitrogen	0.84	mg/l
Total Phosphorus	0.06	mg/l
Total Reactive Phosphate	0.04	mg/l
Total Suspended Solids	<1.0	mg/l
Turbidity	1.4	NTU
Dissolved Oxygen (field)	8.1	mg/l
pH (field)	7.2	pH units
Specific Conductivity (field)	886*	µmhos/cm
Temperature (field)	12.9	°C

*Noncompliance with Florida Administrative Code
17-302 and/or Sarasota County Ordinance 72-37,
Class III surface waters.



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REPORT FOR: Mr. Jim Paulmann
PALMER VENTURE
7184 Beneva Road
Sarasota, Florida 34238

Report Number: 433/FEB2191
Project Number: 0380-556
Sampling Date: 12-11-90
Sample Source: Surface Water
Sampled By: Shindehette

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RESULTS OF ANALYSIS: SC-8 Units

Laboratory Number 02023 ----

ANALYSES PERFORMED BY SUBCONTRACT LABORATORY^a

Oil and Grease <1.0 mg/l

^aFDHRS Drinking Water Certification #83160
FDHRS Environmental Certification #E83079

Lisa P. Knowles

Lisa P. Knowles
Laboratory Supervisor

FDHRS Drinking Water Certification # 84243
FDHRS Environmental Certification # E84017

Analysis performed in accordance with E.P.A. Standard Methods or other FDHRS approved methodology.

APPENDIX C. MONITORING TEAM

Fields of Competence

Stormwater Quality and Point and Non-point Source Assessment, Environmental Permitting and Monitoring, Pollutant Loading Evaluations, NPDES Permitting, Eutrophication Studies, Oceanography.

Experience Summary

Mr. Johnston has eighteen years of diverse technical and project management experience in the fields of environmental science and permitting. Much of his work has involved development and implementation of surface and groundwater monitoring programs, data interpretation and statistical analyses, and eutrophication studies employing water quality, macrophyte and biological resource data. He has significant project management experience involving environmental impact assessments and permitting. His experience record includes eight years as an environmental specialist with the Florida Department of Environmental Regulation, and over ten years consulting experience in the academic and private industry sectors. While with FDER, his responsibilities included development and review of surface and ground water monitoring programs, dredge and fill permit applications, and assessment of hazardous waste disposal sites. Additionally, he has served as an expert witness relative to numerous water quality and dredge and fill issues for both freshwater and estuarine systems.

At CCI, Mr. Johnston serves as Director of the Water Resource Management Division and oversees professional staff involved with water quality monitoring, data management and laboratory services. He is directly involved with planning, monitoring and permitting studies for industries, utilities, municipalities, land developers and water management authorities. Many of these projects involve stormwater impact assessment and management, expansion and protection of potable water supplies, NPDES permitting, development of nutrient and hydrologic budgets, and diagnostic studies of freshwater and estuarine water bodies.

Education

<u>Year</u>	<u>School</u>
1986	Florida State University M.S. - Oceanography - EPA Fellowship
1973	University of Miami B.S. - Biology/Chemistry

Employment History

1990 - Present	Conservation Consultants, Inc. Senior Scientist
1985 - 1990	Environmental Services and Permitting, Inc. Senior Scientist
1977 - 1985	Florida Dept. of Environmental Regulation Environmental Specialist
1973 - 1977	General Development Corp. Environmental Biologist
1973	University of Miami Field Biologist

Key Projects

Suwannee River Water Management District: Project Manager for a two-year ambient surface water quality monitoring program involving monthly water quality and biological monitoring of 72 lake, stream and estuarine stations, data synthesis, reports and presentations.

Florida Dept. of Transportation: Project Manager for sampling, analyses and assessment of runoff from a maintenance yard with emphasis upon base neutral/acid extractable organics. Work was conducted while serving as project manager under the FDOT's statewide miscellaneous environmental response contract. Lake County, Florida.

Florida Dept. of Transportation: State testing and maintenance yard groundwater contamination assessment and development of contamination assessment plan for FDER review and approval, including water quality data synthesis (priority pollutants). Gainesville, Florida.

Vero West: Project Manager for stormwater runoff impact assessment for a proposed development. Vero Beach, Florida.

Palm Coast Utility Corporation: Project Manager for the design and permitting of a 2,500 acre reclaimed wastewater-to-wetlands project involving ambient monitoring and projected nutrient and hydrologic loading impacts. Work included NPDES permitting and impact assessment of discharge into the Intracoastal Waterway. Flagler County, Florida.

Key Projects (Continued)

Florida Citrus Packers: Project Manager for development of an industry-wide groundwater monitoring plan.

Florida Sugar Cane League: Project Manager for Lake Okeechobee eutrophication studies and involvement with assessments of nutrient-enrichment studies in the Water Conservation Areas and Everglades National Park.

Cabot/Koppers Superfund Site: Project Manager for groundwater and surface water assessments. Gainesville, Florida.

Florida Rock Industries, Inc.: Project Manager for MSSW, CUP and IW permitting. Marion and Indian River Counties, Florida.

Florida Department of Environmental Regulation: Superfund Coordinator responsible for on-site assessment and ranking of uncontrolled hazardous waste disposal sites in Florida.

Florida Department of Environmental Regulation and Consulting: Responsible for development of both generic and project-specific Quality Assurance Plans (QAP's) for ground and surface water quality monitoring programs.

Camp Dresser & McKee and the University of Florida: Served in quality assurance/quality control QA/QC management position for a large reclaimed water-to-wetlands comprehensive monitoring project. Orange County.

King Engineering Associates: Lake Tarpon SWIM Study. Subproject manager for stormwater quality sediment and hydrologic studies in Lake Tarpon. Pinellas County, Florida.

Smally, Wellford and Nalven, Inc.: Project Manager for a Water Quality Based Effluent Limitation (WQBEL) study involving stormwater runoff and discharge entering Sarasota Bay for the City of Sarasota's water treatment plant. Sarasota, Florida.

DuPont De Nemours, E.I.: Project manager for long-term wetland resource, stormwater and NPDES permitting involving 4,000 acre titanium mine in North Florida.

Fields of Competence

Chemical Analysis and Quality Control of Water, Sediment, Microbial and Solid Waste Samples, Stormwater Quality and Drainage Impact Assessments, Pollutant Loading Evaluations, Environmental Permitting and Monitoring, Soil Chemistry.

Experience Summary

Dr. G. Garry Payne has seven years of applied and environmental chemistry experience. Applied research has included effects of common land use practices on water quality and environmental quality in general. He has supervised an analytical laboratory conducting analyses of plant, soil and water samples. Experience includes teaching applied chemistry procedures at the college level, and supervision of lab and field personnel.

Before joining CCI, Dr. Payne worked with research teams from 1981 to 1989, where he investigated nutrient chemistry from field research sites and was responsible for quality control and maintenance of modern analytical equipment. He has investigated the effects of metal-rich wastes on soil chemistry. He has considerable experience in the experimental design of field, greenhouse and lab studies, including effects of acidity and nutrients on plants. After obtaining his doctorate in agronomy with an emphasis in soil chemistry, Dr. Payne's work has centered on applied chemical research and methods of minimizing detrimental environmental impacts resulting from nutrient losses, in Florida.

At CCI, Dr. Payne serves as Group Leader of the Water Resource Management Division. In this position, he is responsible for the supervision, coordination and scheduling of all field sampling activities and subsequent chemical analyses. Much of his work involves statistical analysis and interpretation of water resource assessments. He has significant experience with projects involving surface and groundwater monitoring programs, pollutant loading evaluations and NPDES permitting in both freshwater and estuarine systems.

Education

<u>Year</u>	<u>School</u>
1986	Virginia Polytechnic Inst. & State Univ. Ph.D. - Agronomy (Soil Chemistry)
1983	Univ. of Georgia M.S. - Agronomy (Soil Fertility)
1981	Christopher Newport College B.S. - Biology

Employment History

1990 - Present	Conservation Consultants, Inc. Water Resources Monitoring & Analysis Group Leader
1989 - 1990	Conservation Consultants, Inc. Chemistry Supervisor
1987 - 1989	Univ. of Fla. Agricultural Research Center Postdoctoral Fellow
1983 - 1987	Virginia Polytechnic Institute & State University Research & Teaching Assistant
1981 - 1983	University of Georgia Research Assistant

Key Projects

Hatchett Creek Development, Ltd.: Project Manager for the implementation of agency approved worksopes for various water resource assessments specified by the DRI Development Order prior to construction of the Hatchett Creek Development. Venice, Florida.

Gulfstream Development Corporation: Project Manager for the implementation of agency approved worksopes for various water resource assessments and construction monitoring programs required by the DRI Development Orders prior to initiating construction of Woodmere Community Center and Woodmere Village. Venice, Florida.

Palmer Venture: Principal Investigator for an Assessment of Post-Development Pollutant Loading Rates including predictions of stormwater loadings from planned residential, transportation, and other land uses and predictions of pollutant removal rates for planned grassed swales, extended detention basins with long-term residence times and biological filters. Palmer Ranch. Increment VI and East Side. Sarasota County, Florida.

Power Corporation: Project Manager for the implementation of agency approved worksopes for various water resource assessments specified by the DRI Development Order during construction of the Tara Development. Bradenton, Florida.

Lake Tarpon Swim Study: Task manager for the assessment of the impacts of groundwater inputs on the quality of Lake Tarpon and the analyses and mapping of sediments to determine their impact on lake quality. Pinellas County, Florida.

Selected Publications

- Payne, G.G. and J.E. Rechcigl. 1989. Influence of various drying techniques on the extractability of plant nutrients from selected soils. *Soils Science*.
- Payne, G.G. and M.E. Sumner. 1986. Yield and composition of soybeans as influenced by soil pH, phosphorus, zinc and copper. *Communications in Soil Science and Plant Analysis* 17:257-273.
- Payne, G.G. and D.C. Martens. 1988. Form and availability of Cu and Zn following long-term CuSO_4 and ZnSO_4 applications to a Rhodic Paleudult. *Journal of Environmental Quality* 17:707-711.
- Rechcigl, J.E., P. Mislevy and G.G. Payne. In press. Fertilization of stargrass. In *Proceedings of the Internat. Conference on Livestock in the Tropics*. Univ. of Florida, Gainesville.
- Payne, G.G. and D.C. Martens. 1986. Lead in soils. p. 78-89. In *Soils*. Brooklyn Botanic Garden, Inc., Brooklyn, NY.
- Martens, D.C., G.G. Payne, C. Winarko, E.T. Kornegay and M.D. Lindemann. 1985. Crop response to high levels of copper application. *Internat. Copper Research Association, Research Report 292(F)*. 38 p.
- Payne, G.G., J.E. Rechcigl and A.B. Bottcher. 1988. Development of fertilization practices for beef cattle pastures to minimize nutrient loss in runoff. *Annual Report*. South Florida Water Management District. 125 p.
- Payne, G.G., J.E. Rechcigl and R.J. Stephenson. In press. Development of DRIS norms for bahiagrass. *Agronomy Journal*.
- Payne, G.G. and J.E. Rechcigl. 1989. Influence of phosphorus fertilization on bahiagrass and water quality. p. 43-46. In *Proceedings of the XVI International Grassland Congress, Nice, France*.

Fields of Competence

Automated and Manual Chemical Analysis and Quality Control of Water/Wastewater and Microbial Samples in accordance with EPA approved procedures, Laboratory Supervision/Management.

Experience Summary

Ms. Knowles has four years of environmental chemistry experience. This experience includes bench chemical analysis, autoanalyzer set-up, maintenance, operation and analysis, and data management trouble-shooting.

Ms. Knowles received a Bachelor of Science degree in Public Health, specializing in environmental biology with additional emphasis in water quality, statistics, and computer science. Upon joining CCI as a Staff Chemist, Ms. Knowles' responsibilities included sample analysis, statistical interpretation, quality control, and maintaining the laboratory's certification. She conducted the lab's upgrade to automated instrumentation and used automated equipment for both nutrient and mineral analysis. Currently, as Chemistry Supervisor, Ms. Knowles' responsibilities include supervising the chemistry laboratory, maintaining high standards of quality control, and keeping the lab up to date regarding new and improved analytical procedures, including the implementation of a computerized laboratory information management system. She assists in the coordination of chemical data acquisition and interpretation for water resources assessments, and continues to perform both automated and manual chemistries as well as microbiological analyses.

Education

<u>Year</u>	<u>School</u>
1987	University of North Carolina - Chapel Hill B.S., Public Health (Environmental Science)

Employment History

1989 - Present	Conservation Consultants, Inc. Chemistry Supervisor
1987 - 1989	Environmental Quality Laboratory, Environmental Chemist
1987	Smithsonian Environmental Research Center Physical Science Technician

Key Projects

Royster Phosphates, Inc.: Field team co-leader for two intensive surveys, fluorometry team co-leader for dye-dispersion study; responsible for all nutrient analyses (automated) and assisted chemistry report preparation. Manatee County, Florida.

Glance and Radcliffe: Assisted in the collection of water quality samples and in situ data for the City of Palmetto's WWTP WQBEL Study. Responsible for all microbiological and nutrient analyses (automated). Manatee County, Florida.

Well Monitoring: Project Manager for several well monitoring projects reviewed monthly, quarterly, and annually by SWFWMD for compliance with local, state, and federal regulations. Responsible for sample analysis and report preparation.

Industrial Monitoring: Responsible for project management, report preparation, and sample analysis of industrial wastes from several clients for compliance with regulations governing industrial effluents on a monthly and quarterly basis.

City of Palmetto WWTP Monitoring: Responsible for project management, report preparation and analysis of both sludge and wastewater effluent samples for compliance with regulatory standards on a quarterly basis. Manatee County, Florida.

Fields of Competence

Water Quality Sample Collection and Analyses, Surface Water Hydrologic Monitoring, Installation and Maintenance of Field and Laboratory Instruments, Bacteriological Analysis.

Experience Summary

Mr. Schindehette has recently begun working in the field of environmental technical services. He has knowledge of various aspects of surface water investigations including *in-situ* measurements, flow determination and grab and composite sampling. He has monitored groundwater via water level measurements and grab samples. He assists in the day-to-day operations of CCI's chemical laboratory including the routine chemical analyses of ground and surface waters. Prior to joining CCI, he worked for the Florida Department of Natural Resources where he was involved with all aspects of fish mariculture, including water quality sampling and analyses.

Education

<u>Year</u>	<u>School</u>
1987	University of North Carolina at Wilmington B.S. - Marine Biology
1985	Elgin Community College, Illinois Associate of Science - Biology

Employment History

1990 - Present	Conservation Consultants, Inc. Associate Scientist
1989 - 1990	Florida Department of Natural Resources Science Technician III

Key Projects

Coastal Communities & Resorts: Project Scientist for the sampling and analysis of tidally influenced waters. Manatee County, Florida.

King Engineering Associates, Inc.: Project Scientist for Lake Tarpon SWIM studies. Activities include mobilization, implementation and routine maintenance of water quality instrumentation, stratigraphic and bathymetric profiles of water and sediment parameters. Principal diver for retrieving sediment cores for Nutrient Exchange Rates/Sediment Oxygen Demand (NER/SOD) determination as well as deployment and retrieval of sedimentation traps. Pinellas County, Florida.

Smally Wellford & Nalven, Inc.: Project Scientist for Water Quality Based Effluent Limitation (WQBEL) study involving discharge entering Sarasota Bay from the City of Sarasota's Water Treatment Plan. Duties included collection of water samples and hydrographic measurements. Sarasota County, Florida.

Tierra Verde Yacht & Tennis Club: Project Scientist in environmental monitoring and permitting. Activities included mobilization and construction of hydrographic instrumentation, water quality and sediment sampling, and a basin flushing analysis using dye marker study. Pinellas County, Florida.