EVALUATION OF DIURNAL VARIATIONS IN DISSOLVED OXYGEN THE PALMER RANCH SARASOTA COUNTY, FLORIDA

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SARASOTA COUNTY, FLORIDA

1.0 INTRODUCTION

A master development plan for the North Tract of the Palmer Ranch is being implemented in accordance with the terms and conditions of the Master Development Order (MDO), adopted by the Board of County Commissioners of Sarasota County on December 24, 1984. These conditions include the performance of various environmental management studies and monitoring programs prior to and during the construction of the North Tract.

Pursuant to Condition A-15 of the MDO (refer to page B-6 of MDO Exhibit B), diurnal variations of dissolved oxygen shall be evaluated at selected locations within the various basins on the Palmer Ranch. To satisfy this condition, Palmer Venture retained Conservation Consultants, Inc. (CCI) to perform the evaluation.

In October 1985, CCI initiated a diurnal monitoring program to evaluate dissolved oxygen and related parameters within the two major basins of the Palmer Ranch. The monitoring program was conducted during the dry season of 1985 and the wet season of 1986. Based on the monitoring program results, an evaluation of the diurnal variations in dissolved oxygen has been performed at the request of Mr. Gary Serviss, Sarasota County Department of Natural Resources Management. The results of the evaluation are presented herein and follow the report outline approved by Mr. Donald A. Ellis of Pollution Control and Mr. Serviss on May 22, 1987. A copy of the approved outline is provided in Appendix A.

2.0 METHODS

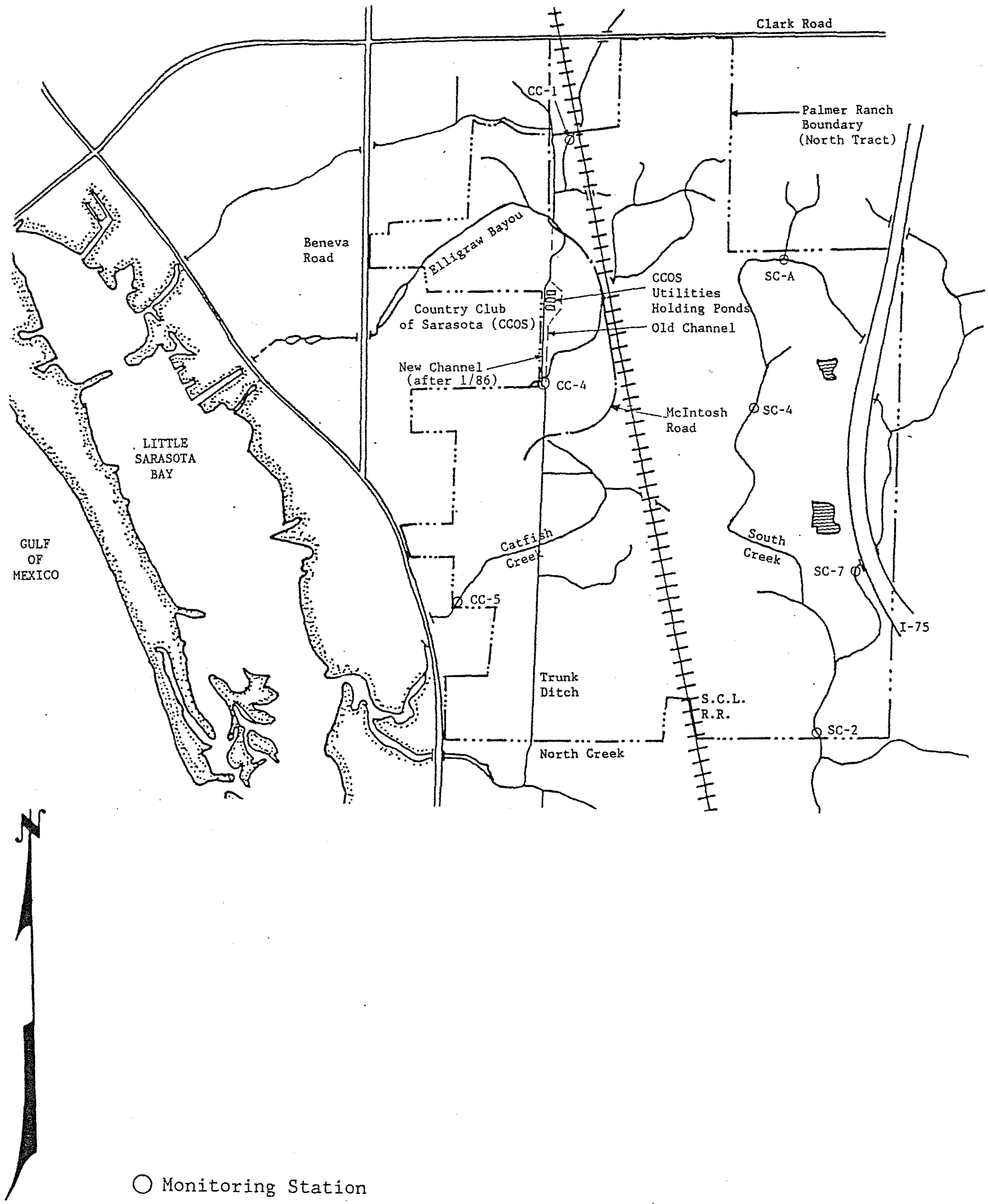
2.1 Station Locations

The diurnal monitoring program employed a network of sampling stations located at various sites in Catfish Creek and South Creek during the wet and dry season surveys. As shown in Figure 2.1, four stations were located on South Creek. These included points of inflow (SC-A) and outflow (SC-2) from the North Tract as well as two intermediate points on its eastern (SC-7) and western branches (SC-4).

Three stations were located on Catfish Creek as shown in Figure 2.1, including points of inflow (CC-1) and outflow (CC-5) from the North Tract, as well as one intermediate station (CC-4). Due to channel construction and realignment, the intermediate station represented an enlarged segment of Catfish Creek (Trunk Ditch) during the second half of the monitoring program, i.e. wet season (refer to community description in Section 3.3.1.2).

2.2 Parameters and Sampling Frequency

Diurnal surveys of Catfish Creek and South Creek were performed at least once during the 1985 dry season and once during the 1986 wet season. Monitoring included measurements of dissolved oxygen, pH, specific conductance, and water temperature at 15-minute intervals for one complete diel cycle. Water depth and qualitative observations of stream flow were recorded during each survey.



Scale: 1" ≈ 4600'

Figure 2.1 Locations of Diurnal Sampling Stations.

2.3 Sampling

Using Hydrolab 4000 automatic monitors, diurnal monitoring was performed in situ during one continuous diel cycle (photoperiod/dark period). Prior to deployment, each instrument was calibrated in accordance with the manufacturer's recommended procedures and data storage units were programmed. Hydrolab sender units were positioned at mid-depth and mid-stream at each station except at Station CC-4 during the wet season survey, when the sender unit was positioned approximately in the middle of the photic zone at a depth of 2.0 ft.

A total of 15 diurnal sampling events were performed. Nine events were conducted within a one-month period (10/8/85 to 11/13/85) during the 1985 dry season while six events were conducted within a one-week period (9/15/86 to 9/23/86) during the 1986 dry season. A concerted effort was made to monitor each basin simultaneously, though not always possible due to equipment failures. A tabulation of the sampling dates is provided in Table 2.1.

2.4 Data Analysis and Evaluation

The evaluation of the diurnal variations in dissolved oxygen in the two major basins on the Palmer Ranch is based on the approach described in the approved report outline given in Appendix A. Diel trends in water temperature, conductivity, pH, and dissolved oxygen have been plotted at hourly intervals beginning at 0600 hours (dawn) on the first complete day of sampling and ending at

Table 2.1. Sampling Dates, Stations Monitored, Photoperiod, and Cloud Cover Dry Season of 1985 and Wet Season of 1986.

SEASON/ STATION	DATE	PHOTOPERIOD (hours)[a]	CLOUD COVER (%)[a]
DRY SEASON 1985			
CC-1	10/8/85[b]	1141	20
CC-1	10/15/85	1128	60
CC-4	10/8/85[b]	1141	30
CC-4	10/15/85	1128	60
CC-5	10/24/85	1115	50
SC-4	10/17/85	1124	40
SC-A	11/12/85	1044	40
SC-7	10/17/85	1124	40
SC-2	10/30/85[c]	1104	80
WET SEASON 1986			
CC-1	9/22/86	1209	30
CC-4	9/15/86	1222	60
CC-5	9/15/86	1222	60
SC-A	9/22/86	1209	30
SC-7	9/18/86	1216	50
SC-2	9/18/86	1216	50

[a] NOAA, 1985-1986.

[b] Data not reported in "Diurnal Monitoring Program - Fall 1985" (CCI, 1985).

[c] Date reflects correction of that cited in "Diurnal Monitoring Program - Fall 1985" (CCI, 1985).

0600 hours (dawn) on the following day. Each diel plot graphically presents the diurnal variations recorded during the photoperiod followed by the dark period using common scales along each axis.

3.0 RESULTS AND DISCUSSION

3.1 Photoperiod

The photoperiod, defined herein as the period of time from sunrise to sunset, averages approximately 11 hours during the normal dry season of October through January (Table 3.1) and approximately 13 hours during the normal wet season of June through September (Table 3.2). As listed in Table 2.1, the photoperiod during the six wet season sampling events averaged 12 hours, approximately one-half hour longer than during the one-month period in which the dry season events were performed.

Since plants photosynthesize and produce oxygen during the photoperiod, more oxygen might be produced during the longer photoperiods of the wet season than during the dry season. With similar photoperiods encountered during the wet and dry season sampling events,i.e. approximately 12 hours versus 11.5 hours, however, this potential seasonal difference was minimal.

Although the length of the photoperiod (and dark period) is an important factor governing diurnal variations in dissolved oxygen, there are other important considerations such as those related to light intensity including conditions which attenuate incident radiation above and below the water surface. Examples of attenuating conditions above the surface of the stream include clouds, tree canopies, and steep and/or high stream banks while examples at or below the water surface include floating, emergent, and submerged plants, turbidity, and stream depth. These,

Table 3.1 Times of Sunrise, Sunset and Length of Photoperiod during the Dry Season of 1985.[a]

Date	Sunrise	Sunset	Photoperiod (hours)	Dark Period (hours)
October 1985				
10/03	0653[b]	1845[b]	1152	1208
10/08	0655[b]	1840[b]	1145	1215
10/13	0657[b]	1835[b]	1138	1222
10/18	0700[b]	1831[b]	1131	1229
10/23	0702[b]	1826[b]	1124	1236
10/28	0605	1722	1117	1243
November 1985				
11/02	0608	1719	1111	1249
11/07	0611	1716	1105	1255
11/12	0614	1714	1100	1300
11/17	0618	1712	1054	1306
11/22	0621	1711	1049	1311
11/27	0625	1710	1045	1315
December 1985				
12/02	0629	1710	1040	1320
12/07	0632	1711	1039	1321
12/12	0635	1712	1037	1323
12/17	0638	1714	1036	1324
12/22	0640	1716	1036	1324
12/27	0643	1719	1036	1324
January 1986				
01/01	0645	1722	1037	1323
01/06	0646	1726	1040	1320
01/11	0647	1729	1042	1318
01/16	0647	1733	1046	1314
01/21	0646	1737	1051	1309
01/26	0645	1741	1055	1305
01/31	0643	1744	1101	1259

[a]Taken from Tide Tables East Coast of North and South America, Table 4 - Sunrise and Sunset, National Oceanic and Atmospheric Administration, 1985, 1986.

[b]Eastern Daylight Time.

Table 3.2 Times of Sunrise, Sunset and Length of Photoperiod during the Wet Season of 1986.[a]

Date	Sunrise[b]	Sunset[b]	Photoperiod (hours)	Dark Period (hours)
June 1986				
06/05	0510	1847	1337	1023
06/10	0510	1849	1339	1021
06/15	0510	1851	1340	1020
06/20	0511	1852	1340	1020
06/25	0512	1853	1340	1020
06/30	0513	1854	1340	1020
July 1986				
07/05	0515	1854	1339	1021
07/10	0517	1853	1336	1024
07/15	0519	1852	1333	1027
07/20	0522	1851	1328	1032
07/25	0524	1849	1325	1035
07/30	0526	1846	1319	1041
August 1986				
08/04	0529	1843	1313	1047
08/09	0531	1840	1309	1051
08/14	0533	1836	1303	1057
08/19	0535	1831	1255	1105
08/24	0538	1827	1249	1111
08/29	0540	1822	1242	1118
September 1986				
09/03	0542	1817	1234	1126
09/08	0543	1812	1228	1132
09/13	0545	1807	1222	1138
09/18	0547	1801	1213	1147
09/23	0549	1756	1207	1153
09/28	0551	1750	1158	1202

[a]Taken from Tide Tables East Coast of North and South America, Table 4 - Sunrise and Sunset, National Oceanic and Atmospheric Administration, 1985, 1986.

[b]All times Eastern Daylight Time.

as well as other important factors encountered in the streams of the Palmer Ranch, are discussed in the following sections.

3.2 Weather

Diurnal variations in dissolved oxygen can be affected by cloud cover and rainfall. Clouds absorb solar radiation, thereby reducing incident radiation at the water surface. Because the rate of photosynthesis and subsequently oxygen production is dependent upon the availability of light, changes in that availability will affect diurnal variations in dissolved oxygen.

The effects of rainfall on diurnal variations in dissolved oxygen are more complicated since rainfall influences stream flow as well as water quality. Potential water quality effects include the import of nutrients, organic matter, and turbid water via runoff from the surrounding watershed. Turbid water and increased stream depths reduce light transmissivity thereby depressing photosynthetic rates and, in turn, oxygen production. Microbial heterotrophs, which decompose the organic matter typically imported during storm events, consume oxygen during the organic decomposition process. Growth-limiting nutrients, which might be imported during storm events, on the other hand, increase photosynthetic rates under conditions in which other factors such as light are not limiting. Still, runoff of rainwater saturated with oxygen might contribute dissolved oxygen to its receiving waters.

3.2.1 Dry Season

3.2.1.1 Rainfall

Based on a 30-year period of record at Bradenton, Florida, only 18 percent (or 10 in.) of the average annual rainfall occurs during the dry period of October - January (NOAA, 1977). This four month period, therefore, is referred to as the "dry season".

During the dry season of 1985, only 5 in. of rainfall was recorded on the Palmer Ranch, about one-half of the seasonal rainfall expected during this four month dry period. To illustrate this drought condition, Figure 3.1 provides a comparison of the monthly amounts of rainfall recorded on the Palmer Ranch to the historical averages for the region.

Additionally, Table 3.3 provides a daily record of rainfall recorded on the Palmer Ranch during and prior to the dry season surveys in 1985. As previously noted, nine diurnal surveys were performed during the period of October 8 - November 12, 1985. During this one-month period, several storm events (0.1 - 0.6 in./day) and trace quantities of rainfall (less than 0.1 in./day) were recorded. These occurred during the period of October 27 - November 4. However, rainfall occurred only during the diurnal sampling event performed at Station SC-2 on October 30-31. As evident in Table 3.3, a trace amount of rain (0.05 in.) was recorded on October 30 and approximately 0.5 inches of rainfall was recorded on October 31. In addition, two minor storm events (0.1 and 0.6 in.) were recorded within a three-day period prior to the survey of October 30-31. No rainfall was recorded during

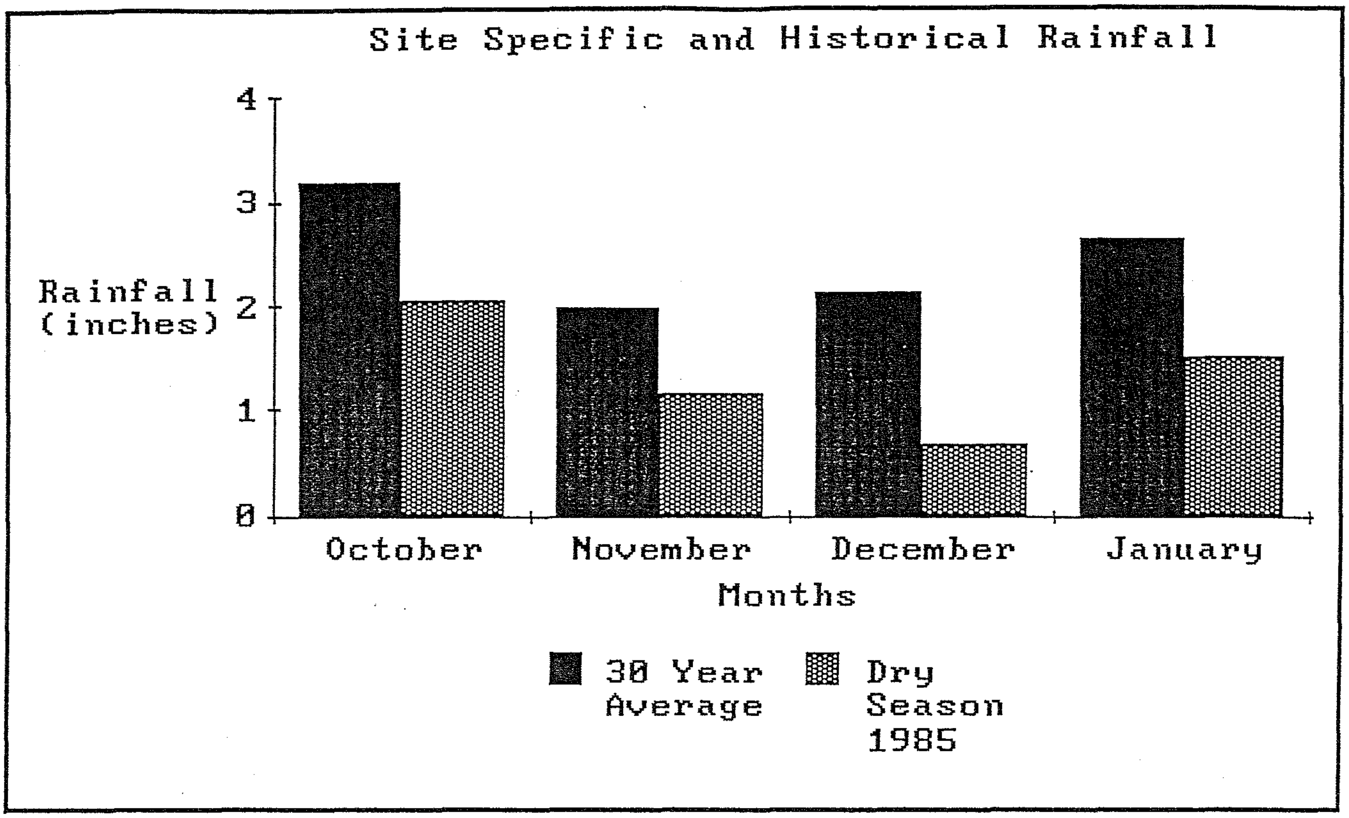


Figure 3.1 Rainfall during the Dry Season.

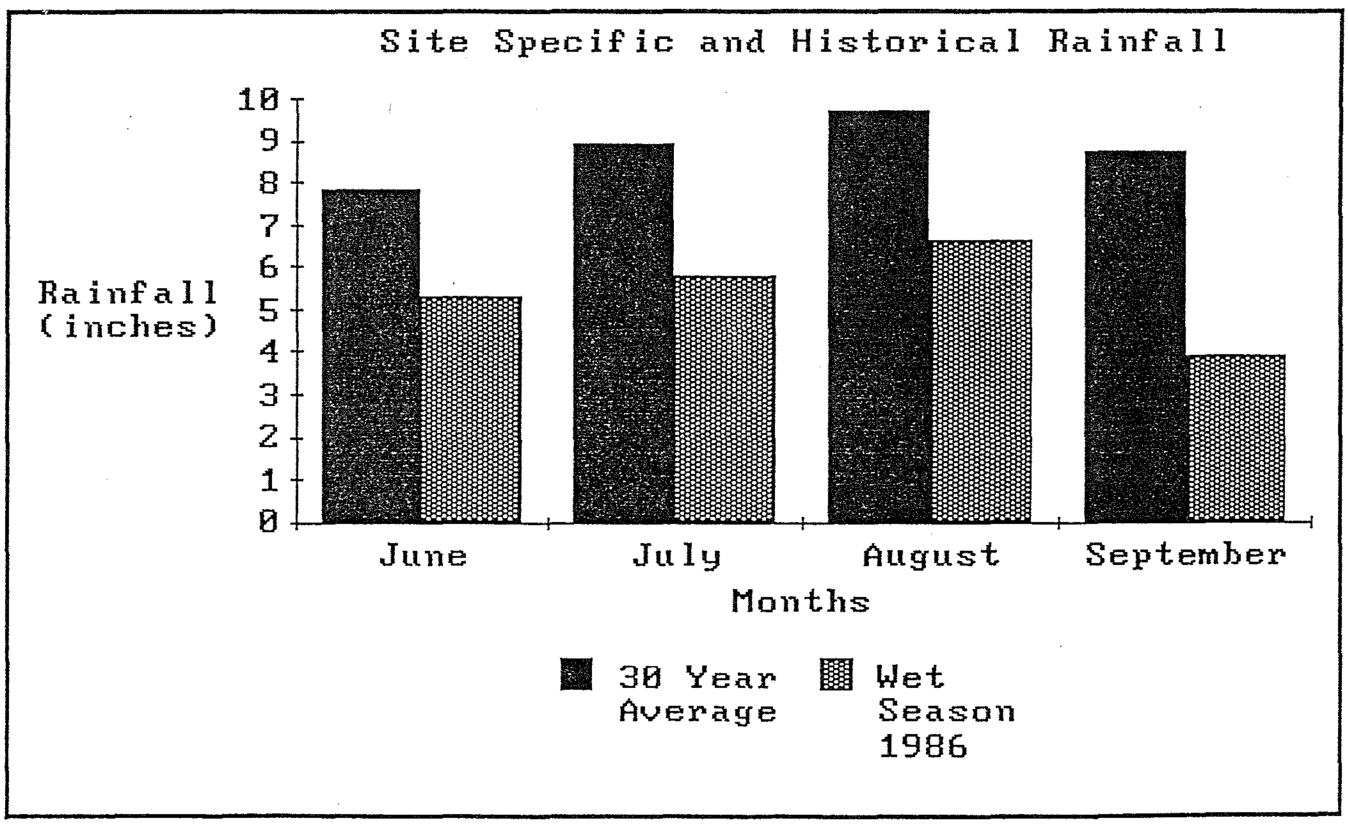


Figure 3.2 Rainfall during the Wet Season.

Table 3.3 Daily Rainfall Amounts Recorded on the Palmer Ranch during the Dry Season of 1985

October 1985	Rainfall (inches)	November 1985	Rainfall (inches)	December 1985	Rainfall (inches)	January 1986	Rainfall (inches)
1	0.43	1	0.30	1	0.03	1	0
2	0.03	2	0	2	0	2	0
3	0	3	0.03	3	0	3	0
4	0	4	0.03	4	0	4	0
5	0.38	5	0	5	0	5	0.20
6	0.03	6	0	6	0	6	0
7	0	7	0	7	0	7	0
8	0	8	0	8	0	8	0
9	0	9	0	9	0	9	0.45
10	0	10	0	10	0	10	0.55
11	0	11	0	11	0	11	0
12	0	12	0	12	0	12	0
13	0	13	0	13	0	13	0
14	0	14	0	14	0.53	14	0
15	0	15	0	15	0.03	15	0
16	0	16	0	16	0	16	0
17	0	17	0	17	0	17	0
18	0	18	0	18	0	18	0
19	0	19	0.40	19	0	19	0
20	0	20	0.38	20	0	20	0
21	0	21	0	21	0	21	0
22	0	22	0	22	0	22	0
23	0	23	0	23	0	23	0
24	0	24	0	24	0.08	24	0
25	0	25	0	25	0	25	0.13
26	0	26	0	26	0	26	0.13
27	0.53	27	0	27	0	27	0.03
28	0.10	28	0	28	0	28	0
29	0	29	0	29	0	29	0
30	0.03	30	0	30	0	30	0
31	0.52	--	--	31	0	31	0
TOTALS:	2.05		1.14		0.67		1.49

the four sampling events of Catfish Creek (CC-1, CC-4, and CC-5) or during the other three sampling events of South Creek (SC-A, SC-4, and SC-7).

During a two-week period immediately prior to the dry season surveys, storm events were recorded on October 1 (0.4 in.), October 2 (0.03 in.), October 5 (0.18 in.) and October 6 (0.03 in.).

3.2.1.2 Cloud Cover

Cloud cover, acquired from local climatological data (NOAA 1985), was reported to range 20 - 80 percent during the photoperiods of the dry season sampling events. Table 2.1 gives the percent cloud cover during the photoperiod of each sampling event.

3.2.2 Wet Season

3.2.2.1 Rainfall

Based on a 30-year period of record at Bradenton, Florida, 63 percent (or 35 in.) of the average annual rainfall occurs during the wet period of June - September (NOAA, 1977). This four-month period, therefore, is referred to as the "wet season".

During the wet season of 1986, however, only 22 in. of rainfall was recorded on the Palmer Ranch, i.e., about two-thirds of the rainfall expected during this four-month wet period. As shown in Figure 3.2, rainfall recorded on the Palmer Ranch is compared to the historical averages for this four-month period of normally high rainfall.

Table 3.4 provides a daily record of rainfall recorded on the Palmer Ranch during and prior to the wet season surveys in 1986. As previously noted, six diurnal surveys were performed during the period of September 15 - 22, 1986. During this one-week period, only one storm event was recorded, occurring on September 15 when 0.65 in. of rainfall was recorded during two concurrent sampling events at Stations CC-4 and CC-5.

During a two-week period immediately prior to the wet season surveys, storm events were recorded on September 6 (0.2 in.), September 9 (1.6 in.), and September 14 (0.35 in.).

3.2.2.2 Cloud Cover

Cloud cover data, acquired from the local climatological records (NOAA 1986), indicated a range of 30 - 60 percent coverage during the photoperiods of the wet season sampling events. Table 2.1 gives the percent cloud cover during the photoperiod of each sampling event.

3.3 Catfish Creek

3.3.1 Community Description

Table 3.5 provides a general comparison of the habitats at the upper, middle, and lower sampling stations on Catfish Creek including aquatic and bank vegetation, channel width, and average water depth during the wet and dry seasons. Schematic cross-sections of Catfish Creek at the upper, middle, and lower stations are illustrated in Figure 3.3. Figure 3.4 provides a cross-section of the middle station following realignment and widening of the middle segment (Trunk Ditch) during January 1986.

Table 3.4 Daily Rainfall Amounts Recorded on the Palmer Ranch during the Wet Season of 1986.

June 1986	Rainfall (inches)	July 1986	Rainfall (inches)	August 1986	Rainfall (inches)	September 1986	Rainfall (inches)
1	0	1	0	1	0.03	1	0.08
2	0.20	2	0	2	0	2	0.03
3	0.15	3	0	3	0	3	0
4	0	4	0.25	4	0	4	0
5	0	5	0.08	5	0.05	5	0
6	0	6	0.13	6	0	6	0.33
7	0	7	0.30	7	0.18	7	0
8	0.25	8	0	8	0.55	8	0
9	0.35	9	0	9	1.30	9	2.43
10	0.10	10	0	10	0	10	0
11	0	11	0	11	0.73	11	0
12	0	12	0.13	12	0.03	12	0
13	0.50	13	0	13	0.03	13	0
14	0	14	0	14	0	14	0.30
15	0.43	15	0	15	0	15	0.73
16	0.13	16	0	16	0	16	0
17	0	17	0	17	0.40	17	0
18	0.10	18	0.38	18	0.03	18	0
19	0	19	0	19	0.15	19	0
20	0	20	0	20	1.48	20	0.03
21	0	21	0	21	0	21	0
22	0.18	22	0	22	0.23	22	0
23	0.43	23	0.65	23	0	23	0
24	0	24	0	24	0.95	24	0
25	1.00	25	0.38	25	0	25	0
26	0.23	26	0.55	26	0	26	0
27	0	27	0.55	27	0.03	27	0
28	1.25	28	1.45	28	0.33	28	0
29	0	29	0.88	29	0.03	29	0
30	0	30	0	30	0	30	0
31	--	31	0.10	31	0.10	--	--
TOTALS:	5.30		5.84		6.63		3.93

Table 3.5. General Description of the Sampling Sites in Catfish Creek and South Creek

Station	General Location	Water Depth (Ft.)[a]	Channel Width (Ft.)	Habitat
CC-1	Catfish Creek Site Entry	1.0-1.2	10	75-100% canopy of Willow, _Salix_, rooted emergents
CC-4 (Dry Season)	Trunk Ditch Mid Basin	1.0	15	90% cover by rooted emergents, floating aquatics, cattails
CC-4[b] (Wet Season)	Trunk Ditch Mid Basin	8.0	50	Sod, rooted emergents
CC-5	Catfish Creek Outfall from Site	0.5-0.8	11	Shading in a.m. & p.m. by willow, wax myrtle, filamentous green algae, rooted emergents
SC-A	South Creek Site Entry	0.6-0.8	13	Rooted emergents - no canopy
SC-4	South Creek near Honore Avenue	0.3	8	Rooted emergents cover 33% of channel, canopy of pine
SC-7	South Creek near I-75, Downstream of Dairy	0.4-0.8	9	50% cover of rooted emergents, 75% upstream coverage by floating aquatics. Willow and pepper trees line banks
SC-2	South Creek Exit from North Tract	0.3-1.0	17	Rooted emergents, floating aquatics, palm trees shade channel in morning

[a] Dry season - wet season.

[b] Trunk ditch after widening.

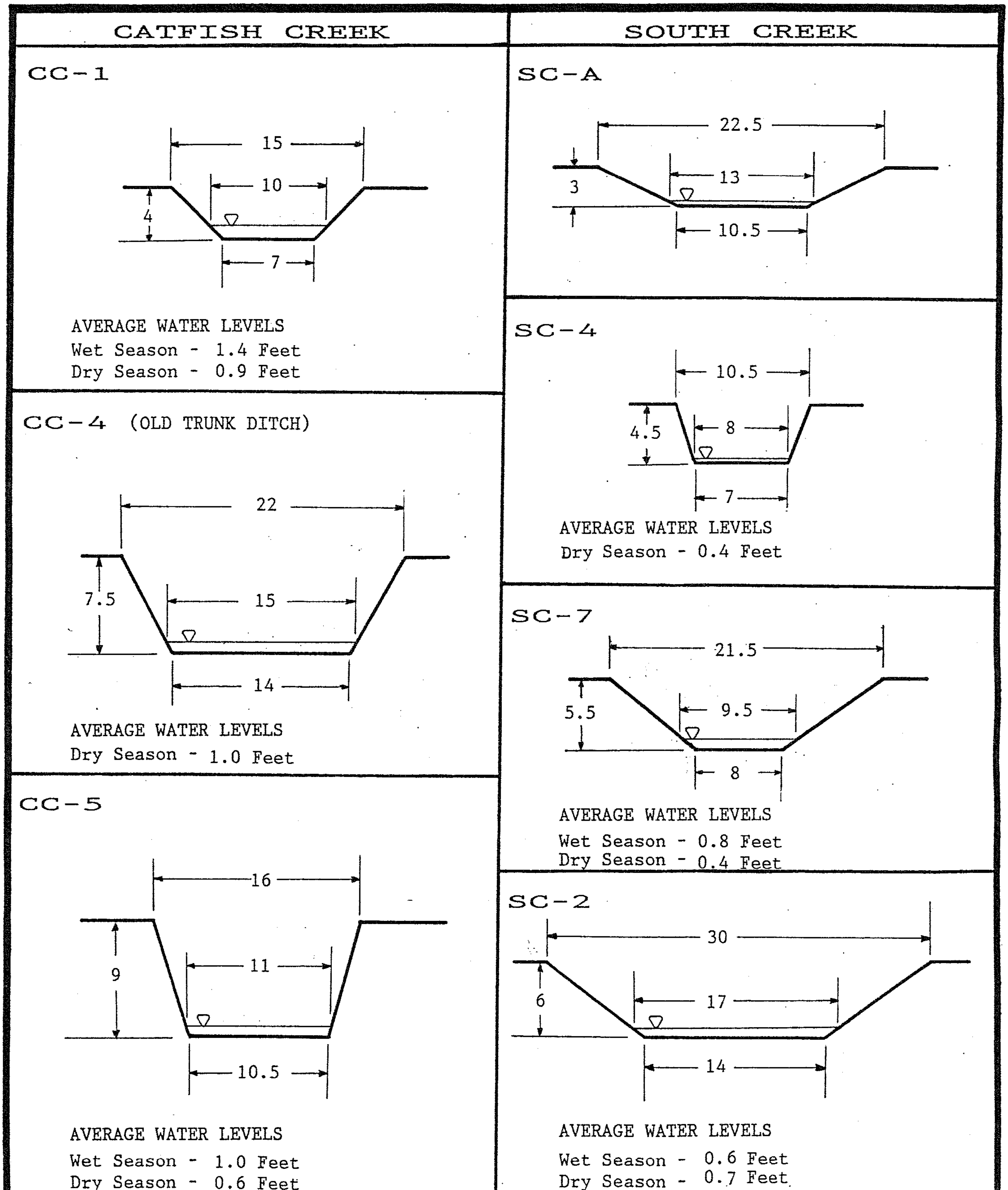


Figure 3.3 Channel Configuration at Sampling Stations In Catfish Creek and South Creek

Scale 1"=10'
All Dimensions are in Feet

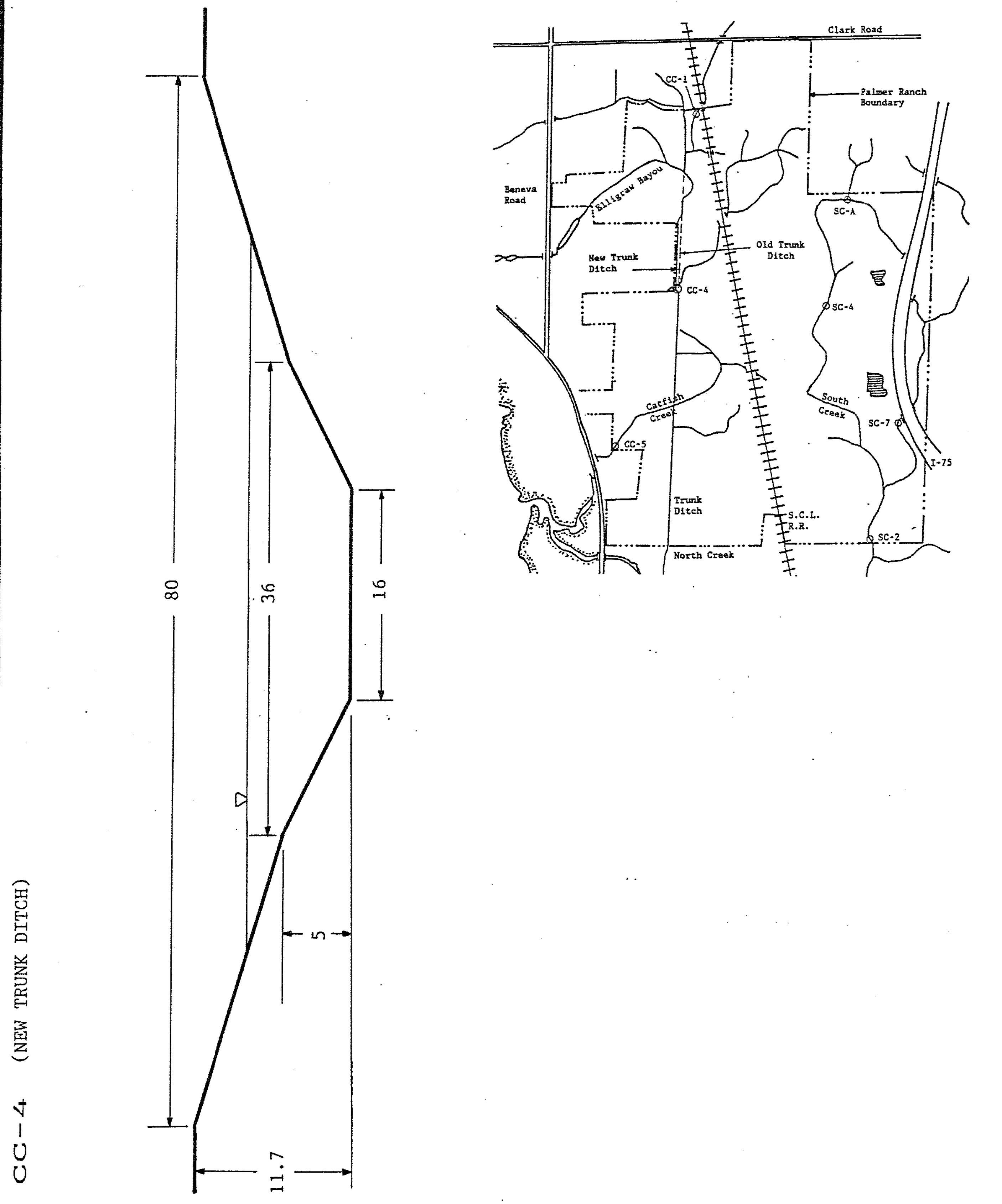


Figure 3.4 Channel Configuration at Station CC-4 after Realignment.

Scale 1"=10'
All Dimensions are in Feet

To facilitate comparisons, one common scale (1 in. = 10 ft.) has been used to delineate the channel cross-sections. In addition, Tables 3.6 and 3.7 compare measurements of stream depths and flows during the diurnal monitoring program with seasonal averages based on measurements taken by CCI (1986 and 1987) during the period of September 1985 through June 1987. An additional three-year summary of turbidity and BOD-5 measurements taken in Catfish Creek are provided in Tables 3.8 and 3.9.

3.3.1.1 Upper Station (CC-1)

Catfish Creek exhibits steep banks at its upper station (CC-1) and follows a north-south drainage pattern (Figure 3.3). At Station CC-1, its banks rise 4 ft. to a 15 ft. wide channel at the top of the bank (TOB). As a result, the steep banks shade the surface of the stream during the early morning and late afternoon hours. Consequently, photosynthetic oxygen production within the stream could be affected by shading.

Past studies (CCI, 1986 and 1987) have shown water levels at Station CC-1 to average 0.9 ft. during the dry season and 1.4 ft. during the wet season. At the beginning of each diurnal sampling event, water levels at Station CC-1 were determined to be 1.0 ft. on October 14, 1985, and 1.2 feet on September 21, 1986.

During the past two years, weak flows have generally prevailed at the upper station in Catfish Creek as observations averaged less than 100 gpm. During the dry and wet season sampling events (October 14, 1985, and September 21, 1986), weak flows were also observed (Table 3.7). Generally, transport of atmospheric oxygen

Table 3.6 Water Levels Recorded in Catfish Creek and South Creek during Diurnal Sampling Events with Comparisons to Historical Averages.

	DRY SEASON		WET SEASON	
Station	Actual[a] Depth (ft.)	Historical[b] Average (ft.)	Actual[a] Depth (ft.)	Historical[b] Average (ft.)
CC-1	1.0[c]	0.9	1.2	1.4
CC-4	1.0[c]	1.0	8.0	---
CC-5	0.5	0.6	0.8	1.0
SC-A	0.6	---	0.8	---
SC-7	0.4	0.4	0.8	0.8
SC-2	0.3	0.7	1.0	0.6
SC-4	0.3	0.4	---	---

[a]Depths recorded during diurnal sampling events performed on dates listed in Table 2.1.

[b]Seasonal average depths based on data collected by Conservation Consultants during the period of September 1985 through June 1987.

[c]Recorded depths on 10/14/85.

Table 3.7. Comparison of Recorded Flow Rates in Catfish Creek and South Creek during Diurnal Events to Historical Averages.

Station	DRY SEASON		WET SEASON	
	Actual[a] Flow	Historical[b] Average	Actual[a] Flow	Historical[b] Average
CC-1	Weak[c]	Weak	Weak	Weak
CC-4	Weak	Weak	Weak	---
CC-5	Weak	Moderate[e]	Strong[f]	Moderate
SC-A	None[d]	---	Weak	---
SC-4	Weak	Weak	---	Weak
SC-7	Moderate[e]	Weak	Strong	Weak
SC-2	Moderate	Moderate	Strong	Moderate

[a]Flow rates recorded during diurnal sampling events performed on dates listed in Table 2.1.

[b]Seasonal average flow rates based on data collected by Conservation Consultants during the period September 1985 through June 1987 (CCI, 1986 and 1987).

[c]Weak flow (<100 gpm)

[d]No flow (0 gpm)

[e]Moderate flow (100-300 gpm)

[f]Strong flow (300-600 gpm)

[g]Station SC-4 is located approximately 3,200 feet downstream of Station SC-A.

(reaeration) into the stream during below-saturation conditions is reduced by weak flow and limited mixing. Such conditions might be important factors influencing diurnal trends.

Vegetation at Station CC-1 consists primarily of rooted emergents. In addition, its banks are lined with Salix, providing a 75 - 100 percent canopy. Immediately upstream, Catfish Creek is conveyed through a culvert beneath a railroad bed. A ponded area of Catfish Creek is located immediately upstream of the culvert. Primrose willow covers the ponded area except for the banks, which are covered with Salix. Because of this dense vegetation, the surface waters in the vicinity of Station CC-1 are either partially or totally shaded resulting in a potentially depressing effect on photosynthetic oxygen production and, in turn, the level of dissolved oxygen. Of added significance, organic detritus, most likely originating from the dense stands of vegetation, accumulate in the bottom sediments and exert a depressing effect on dissolved oxygen while decaying. As expected, leaf litter and organic detritus had accumulated in the bottom sediments particularly upstream of Station CC-1.

As previously discussed, turbidity and BOD-5 are two important factors affecting dissolved oxygen in Catfish Creek. Turbidities reported at Station CC-1 during the past several years have averaged 4.1 NTU during the dry season and 2.9 NTU during the wet season, while BOD-5 levels averaged 1.7 mg/l during the dry season and 2.1 mg/l during the wet season (Patton & Associates, 1984; GeoScience, 1985; and CCI, 1986 and 1987). These levels, however, are considered to be normal and are not expected to have an acute effect on light transmissivity, microbial heterotrophic activity, and the level of dissolved oxygen. Although not measured, benthic oxygen demand could be a significant factor, however, in influencing the dissolved oxygen regime in the upper reaches of Catfish Creek.

3.3.1.2 **Middle Station (CC-4)**

The mid-segment of Catfish Creek, in which Station CC-4 is located, was rerouted and widened after the dry season surveys were completed. Diurnal variations in dissolved oxygen might have changed as a result of the alteration in habitat.

During the 1985 dry season, this segment of Catfish Creek exhibited steep banks (75^{o} slope) rising 7.5 ft. above the bottom to a 22 ft. wide channel (TOB) as shown in Figure 3.3. During the 1986 wet season, the channel was widened to 80 ft. (TOB) and the banks were sloped to 45^{o} (Figure 3.4). Consequently, the banks previously shading the surface waters during the early morning and late afternoon did not exhibit this effect during the wet season survey, resulting in an increase in incident radiation.

Prior to realignment, depths averaged 1.0 ft. during the dry season (CCI 1986 and 1987) while after realignment, depths averaged 8.0 ft. based on stream design criteria. Such conditions were observed at the start of the dry season event on October 14, 1985, and at the start of the wet season event on September 14, 1986.

During the past two years, weak flows (less than 100 gpm) have prevailed at Station CC-4 (Table 3.7). At the start of the dry and wet season sampling events (October 14, 1985, and September 14, 1986), weak flows were also observed. As might be expected following the widening, deepening, and placement of two upstream weirs (check dams 50 ft. and 3500 ft. upstream of CC-4), the mid-segment of Catfish Creek (Trunk Ditch) changed to a more lentic or lake-type community. Such a change typically results in an initial increase in phytoplankton primary production and a concomitant decrease in macrophyte production.

Prior to the widening of the mid-segment, vegetation at Station CC-4 consisted primarily of Hydrilla (a rooted mass-forming submergent) and some floating and rooted emergent vegetation. In contrast to the uppermost station (CC-1), there was no canopy shading the surface waters at Station CC-4.

After widening of the mid-segment, vegetation at Station CC-4 consisted primarily of sparse patches of rooted emergents and submergents and probably an active standing crop of microscopic algae. The banks were sodded with grass down to the normal water line. As might be expected in a recently excavated canal, the bottom consisted primarily of sand with a thin layer of silt.

During the dry season survey, the upstream segment of Catfish Creek from Station CC-4 to Station CC-1 was characterized by significant bank erosion as a result of its steep banks which were sparsely populated with weedy bank vegetation. A thick canopy of oaks and palms provided shade through most of the day in the upper reach from Station CC-1 to McIntosh Road. Near Station CC-4, shade was provided primarily in the morning by palms located well back from the stream channel. Vegetation in the channel included floating and rooted emergents, and rooted submergents with cover approaching 100 percent. Bottom sediments consisted primarily of sand with a thin covering of organic detritus.

Reconstruction altered that portion of Catfish Creek (Trunk Ditch) between McIntosh Road and Station CC-4. As previously discussed, this segment became ponded as a result of enlarging the channel and the construction of two check dams. Also, trees were cleared along the new channel and only those distant from the channel remained, resulting in a reduction in the amount of shading. On the other hand, the banks were sodded, thereby reducing erosion and associated increases in turbidity and sedimentation during storm events.

Turbidities reported at Station CC-4 during the past several years averaged 7.2 NTU during the dry season and 7.4 NTU during the wet season, while BOD-5 levels averaged 4.2 mg/l during the dry season and 5.7 mg/l during the wet season (Patton & Associates, 1984; GeoScience, 1985; and CCI, 1986 and 1987). These levels are considered to be excessive and could result in a depressing effect on dissolved oxygen. A combination of sources including bank erosion, point and non-point discharges from the adjacent sources including the Country Club of Sarasota and a wastewater treatment facility may have contributed to these elevated concentrations. During canal reconstruction, however, the wastewater treatment facility was decommissioned.

3.3.1.3 Lower Station (CC-5)

As shown in Figure 3.3, Catfish Creek's banks at Station CC-5 rise approximately 9.0 ft. at an 85^{o} angle to its 16 ft. wide channel (TOB). Although this lower segment of Catfish Creek is oriented in a southwesterly direction, its banks are sufficiently high and steep enough to shade its surface waters during the early morning and late afternoon.

Past studies (CCI, 1986 and 1987) have shown water levels at Station CC-5 to average 0.6 ft. during the dry season and 1.0 ft. during the wet season. At the beginning of each diurnal sampling event, water levels were determined to be 0.5 ft. on October 24, 1985 and 0.8 ft. on September 14, 1986.

In the lower reach of Catfish Creek, moderate flows ranging 100 - 300 gpm have prevailed during the past two wet and dry seasons (CCI, 1986 and 1987). During the dry and wet season sampling events, however, a weak flow was observed at the onset of the dry season survey on October 24, 1985, while a strong flow was observed at the onset of the wet season survey on September 14, 1986 (Table 3.7).

Station CC-5 is sparsely vegetated with rooted emergents, submergents, and filamentous algae attached to its sand-shell bottom. Its northwest bank contains willow and wax myrtle, offering some shade during the late afternoon. However, its southeast bank contains only low-lying grasses and shrubs that offer little or no shade. Catfish Creek exhibits a uniform habitat from Station CC-5 upstream (for several hundred feet) to the Trunk Ditch confluence.

Turbidities (Table 3.8) reported at Station CC-5 during the past several years averaged 3.7 NTU during the dry season and 3.5 NTU during the wet season, while BOD-5 levels (Table 3.9) averaged 2.4 mg/l during the dry season and 1.5 mg/l during the wet season (Patton & Associates, 1984; GeoScience, 1985; and CCI, 1986 and 1987). These levels are considered normal and are not expected to cause any significant depressing effects on dissolved oxygen.

3.3.2 <u>Water Temperature</u>

3.3.2.1 Dry Season Diels

Diel temperature curves at the uppermost station (CC-1), receiving the most shade, exhibited the lowest amplitudes of the three stations on Catfish Creek. For comparison, paired sampling events were performed at Stations CC-1 and CC-4 beginning October 8 and October 15 (Figures 3.5 and 3.6). During each pair of events, water temperature increased during the afternoon to peak levels of approximately 25 and 27°C at Station CC-1 and 28 and 29°C at Station CC-4, then declined to minimal levels of approximately 22 and 24°C at both Stations CC-1 and CC-4 after sunset.

Although the sampling event at Station CC-5 was performed a week later (Figure 3.5), its diel temperature curve exhibited the greatest amplitude as a minimal temperature of approximately 23°C

Table 3.8. Measurements of Turbidity (NTU) Recorded in Catfish Creek and South Creek during the Wet and Dry Seasons of 1984, 1985, and 1986.[a]

	TURBIDITY (NTU)							
	DRY SEASON				WET SEASON			
STATION	N	MIN.	MAX.	MEAN	N	MIN.	MAX.	MEAN
Catfish[c]	15	0.7	40	9.7	18	1.3	36	7.2
CC-1	3	0.8	8.3	4.1	5	1.3	4.0	2.9
CC-4	4	2.3	14.0	7.2	5	1.7	22.0	7.4
CC-5	4	0.7	7.7	3.7	5	1.6	5.0	3.5
South[c]	13	0.5	26	6.1	23	0.5	18	4.4
SC-4[b]	2	4.1	6.4	5.3	3	3.9	16.0	8.1
SC-7	2	2.1	7.6	4.8	4	1.5	5.5	4.0
SC-2	2	1.4	11.0	6.2	4	0.5	3.1	1.8

[a]Site specific data collected by Patton and Associates (1984), GeoScience (1985), and Conservation Consultants, Inc. (1986 and 1987).

[b]Station SC-4 is located approximately 3,200 ft. downstream of Station SC-A.

[c]Values for N include historical data from stations not included in Diurnal Monitoring Program.

Table 3.9. Measurements of BOD-5 (mg/l) Recorded in Catfish Creek and South Creek during Wet and Dry Seasons of 1984, 1985 and 1986.[a]

	BOD-5 (mg/l)							
	DRY SEASON				WET SEASON			
STATION	N	MIN.	MAX.	MEAN	N	MIN.	MAX.	MEAN
Catfish[c]	15	1.2	10.5	3.3	23	0.8	9.3	2.7
CC-1	3	1.2	2.2	1.7	5	1.2	3.3	2.1
CC-4	4	2.3	6.0	4.2	5	2.5	9.3	5.7
CC-5	4	1.8	2.9	2.4	5	0.9	2.5	1.5
South[c]	13	0.4	12.5	3.2	23	0.8	8.8	3.5
SC-4[b]	2	1.4	3.9	2.7	3	1.0	5.4	2.9
SC-7	2	2.7	12.5	7.6	4	1.9	8.8	4.4
SC-2	2	1.0	4.3	2.7	4	2.2	3.5	2.8

[a]Site specific data collected by Patton and Associates (1984), GeoScience (1985), and Conservation Consultants Inc. (1986 and 1987).

[b]Station SC-4 is located approximately 3,200 ft. downstream of Station SC-A.

[c]Values for N include historical data from stations not included in Diurnal Monitoring Program.

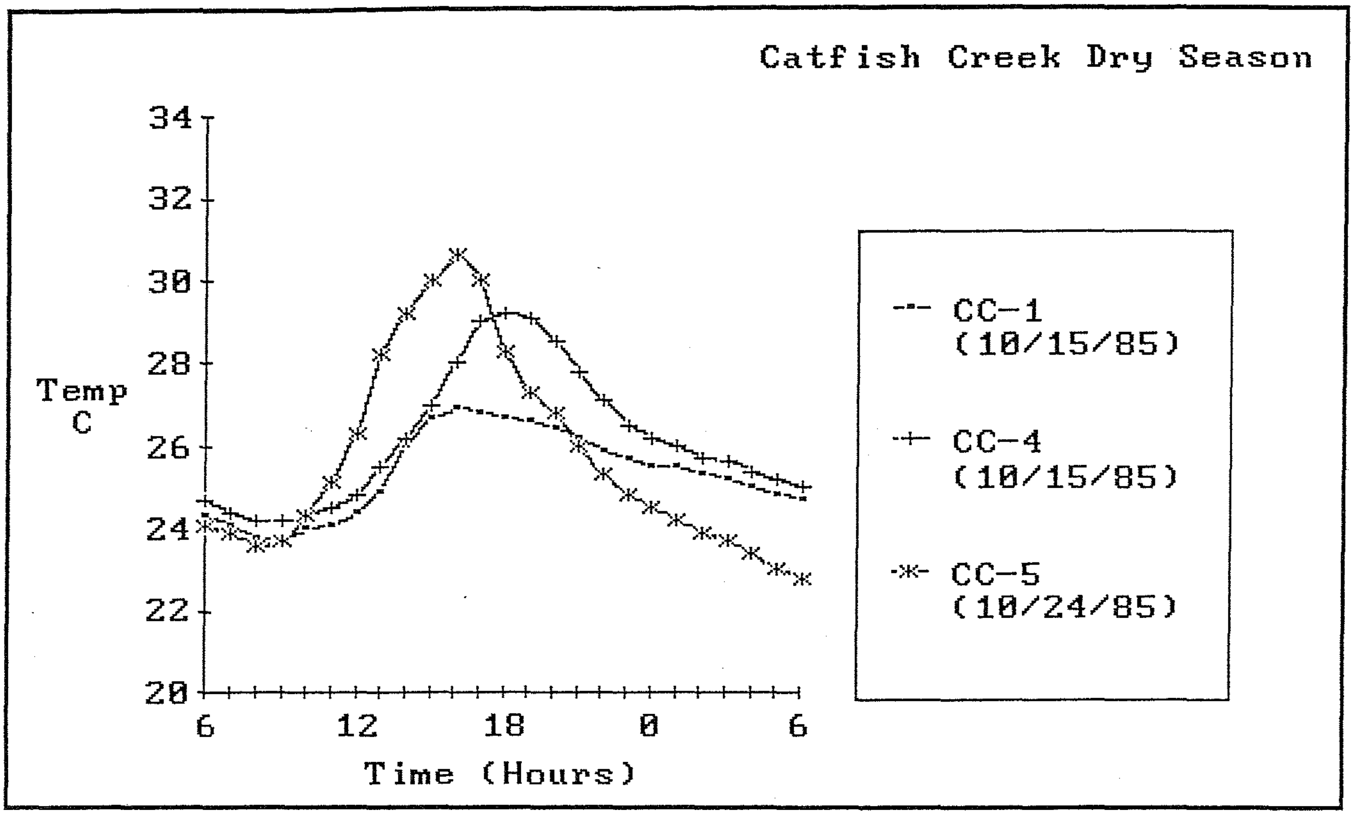


Figure 3.5 Diel Trends in Water Temperature at Stations CC-1, CC-4, and CC-5 during the Dry Season.

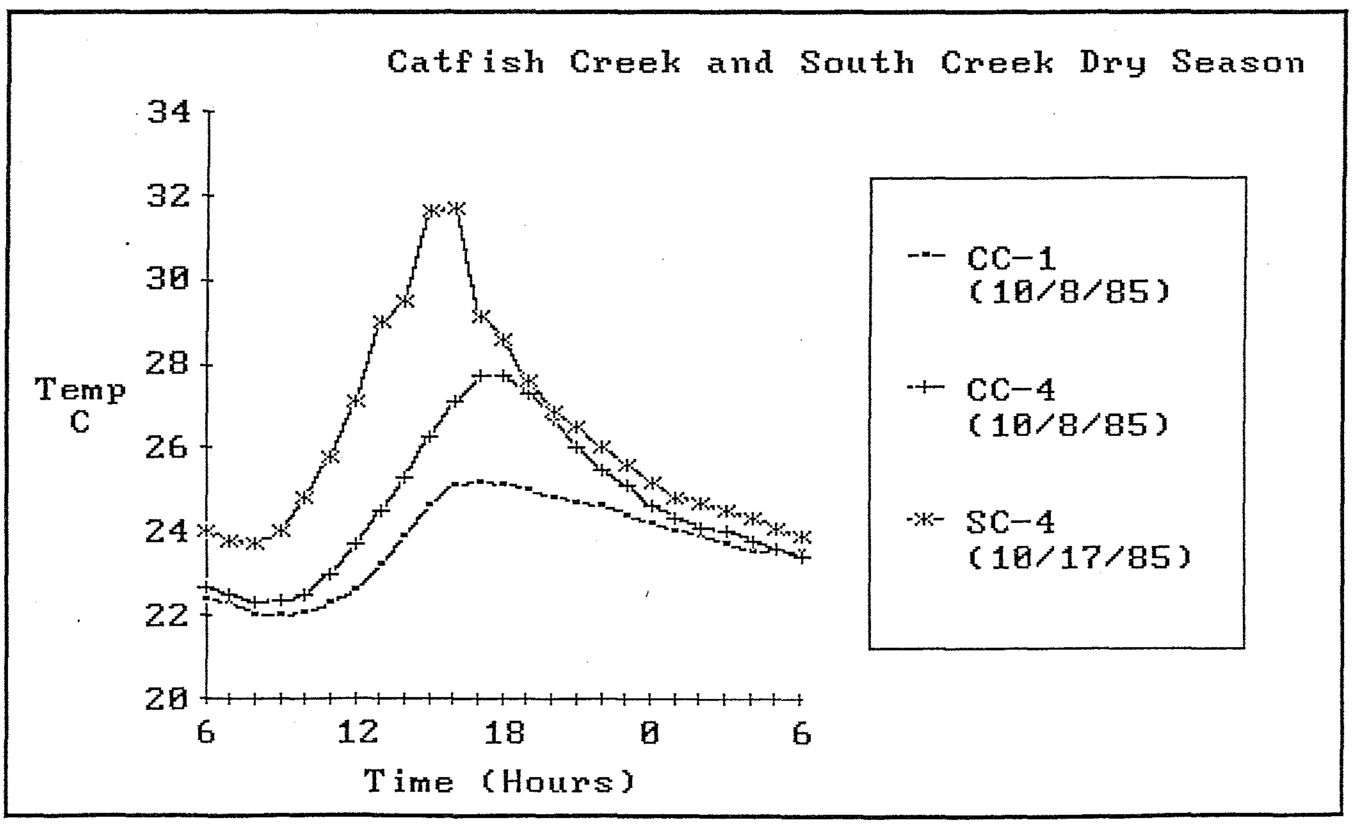


Figure 3.6 Additional Diel Trends in Water Temperature at Stations CC-1, CC-4, and SC-4 during the Dry Season.

was encountered during the morning, with a maximal temperature of approximately 31°C during the afternoon. Such conditions might be expected since the downstream segment of Catfish Creek is shaded by its steep banks during the early morning and late afternoon, while during the mid-day, its shallow surface waters receive full sunlight due to the absence of a canopy.

3.3.2.2 Wet Season Diels

During the wet season, the diel temperature curve at Station CC-5 exhibited the widest amplitude of the three Catfish Creek stations as temperature ranged approximately 27 to 33°C on September 15-16. As previously discussed, this station also exhibited the highest amplitude of the three Catfish Creek stations during the dry season.

The temperature curve, during the wet season at Station CC-4, i.e., on the same day in which Station CC-5 was monitored, was comparatively flat, ranging approximately 28 to 30°C. As previously discussed, the mid-segment had been enlarged since the dry season surveys were performed, thereby requiring a greater amount of heat exchange to raise or lower its water temperature even though shading was minimal (due to its low banks and lack of canopy). Consequently, the greater amount of water dampened its diurnal variations in water temperature.

The lowest water temperature of approximately 24°C was recorded at Station CC-1 during the wet season surveys although monitoring was performed on September 22-23 (Figure 3.7). As previously discussed, Station CC-1 is shaded by steep banks, an overhanging

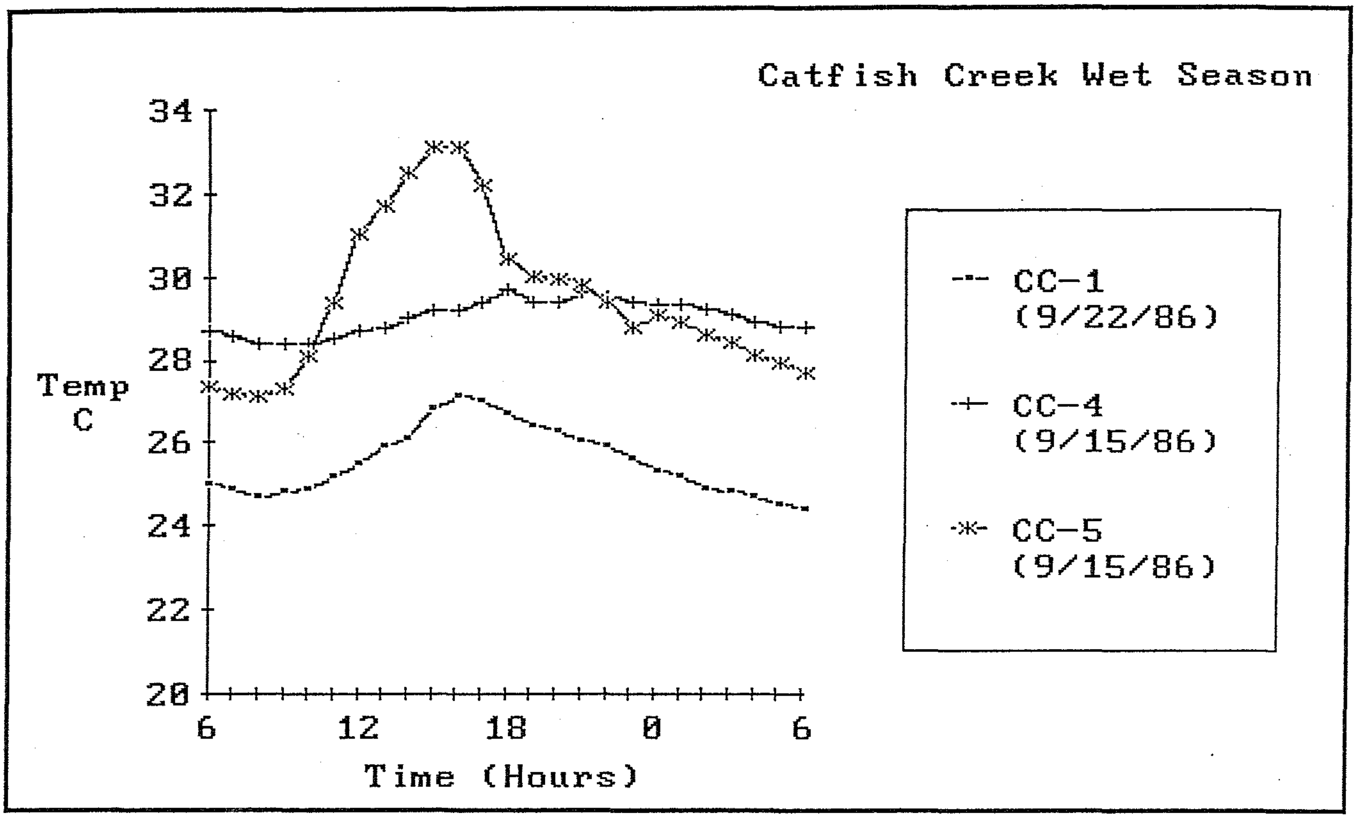


Figure 3.7 Diel Trends in Water Temperature at Stations CC-1, CC-4, and CC-5 during the Wet Season.

canopy, and an upstream culvert, thereby facilitating a cooling effect.

3.3.3 <u>Specific Conductivity</u>

3.3.3.1 Dry Season Diels

Relatively uniform conductivities were noted during the dry season sampling events at Stations CC-1, CC-4, and CC-5 as shown in Figures 3.8 and 3.9. As expected, standard deviations were low, i.e. less than 20 umhos/cm. On October 8-9, conductivities averaged 736 umhos/cm at Station CC-1 and 703 umhos/cm at Station CC-4. Similarly, conductivities averaged 668 umhos/cm at Station CC-1 and 797 umhos/cm at Station CC-4 on October 15-16.

3.3.3.2 Wet Season Diels

As evidenced in Figure 3.10, Catfish Creek exhibited relatively minor diel variations in conductivity at Stations CC-1, CC-4, and CC-5 during the wet season, with standard deviations less than 34 umhos/cm. On September 15-16, conductivities at Stations CC-4 and CC-5 averaged 712 and 695 umhos/cm, respectively. On September 22-23, conductivities at Station CC-1 averaged 743 umhos/cm.

The only possible variation of conductivity in Catfish Creek, attributed to the runoff of low-conductivity stormwater, might have been observed during a storm event which occurred on September 15. This was a minor perturbance noted at Station CC-5, the furthest station downstream on Catfish Creek.

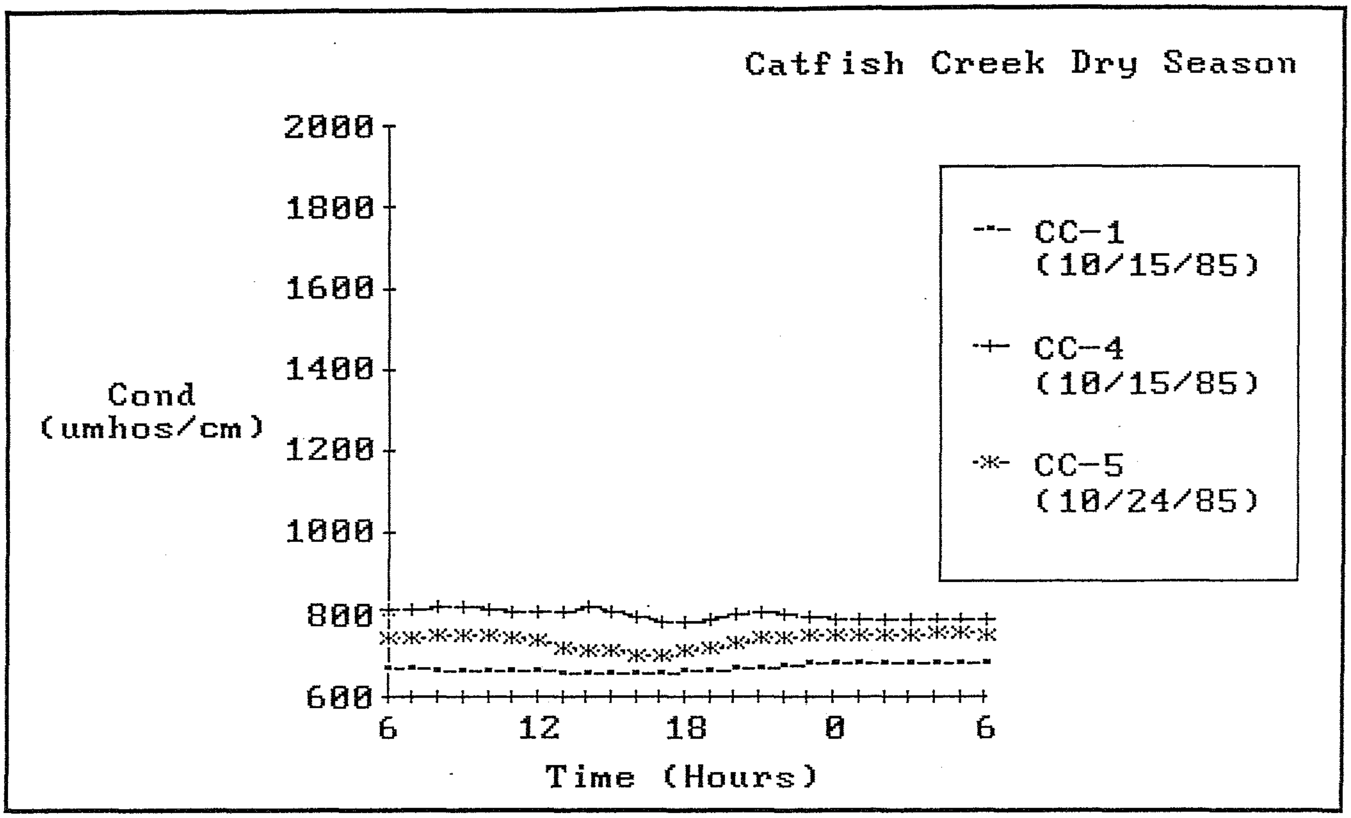


Figure 3.8 Diel Trends in Conductivity at Stations CC-1, CC-4, and CC-5 during the Dry Season.

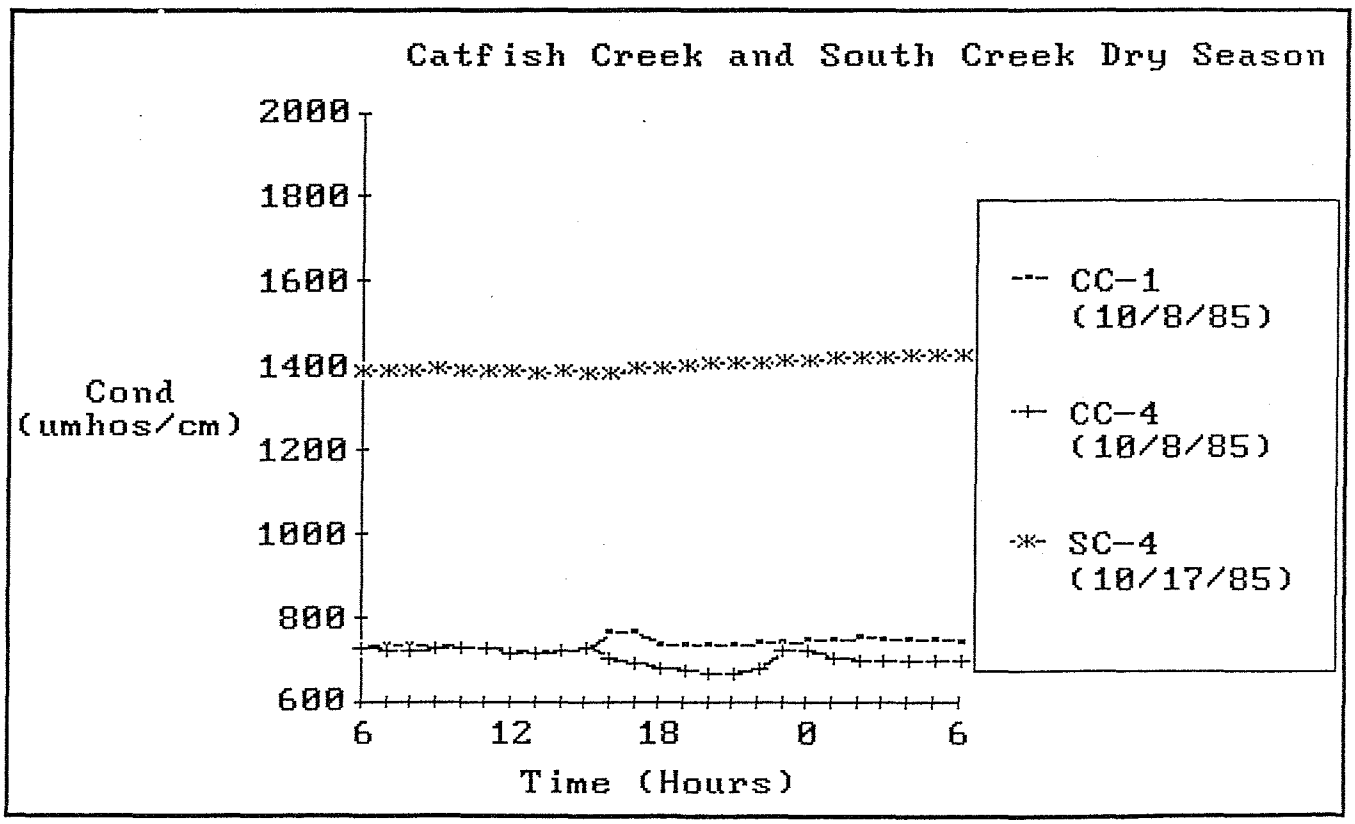


Figure 3.9 Additional Diel Trends in Conductivity at Stations CC-1, CC-4, and SC-4 during the Dry Season.

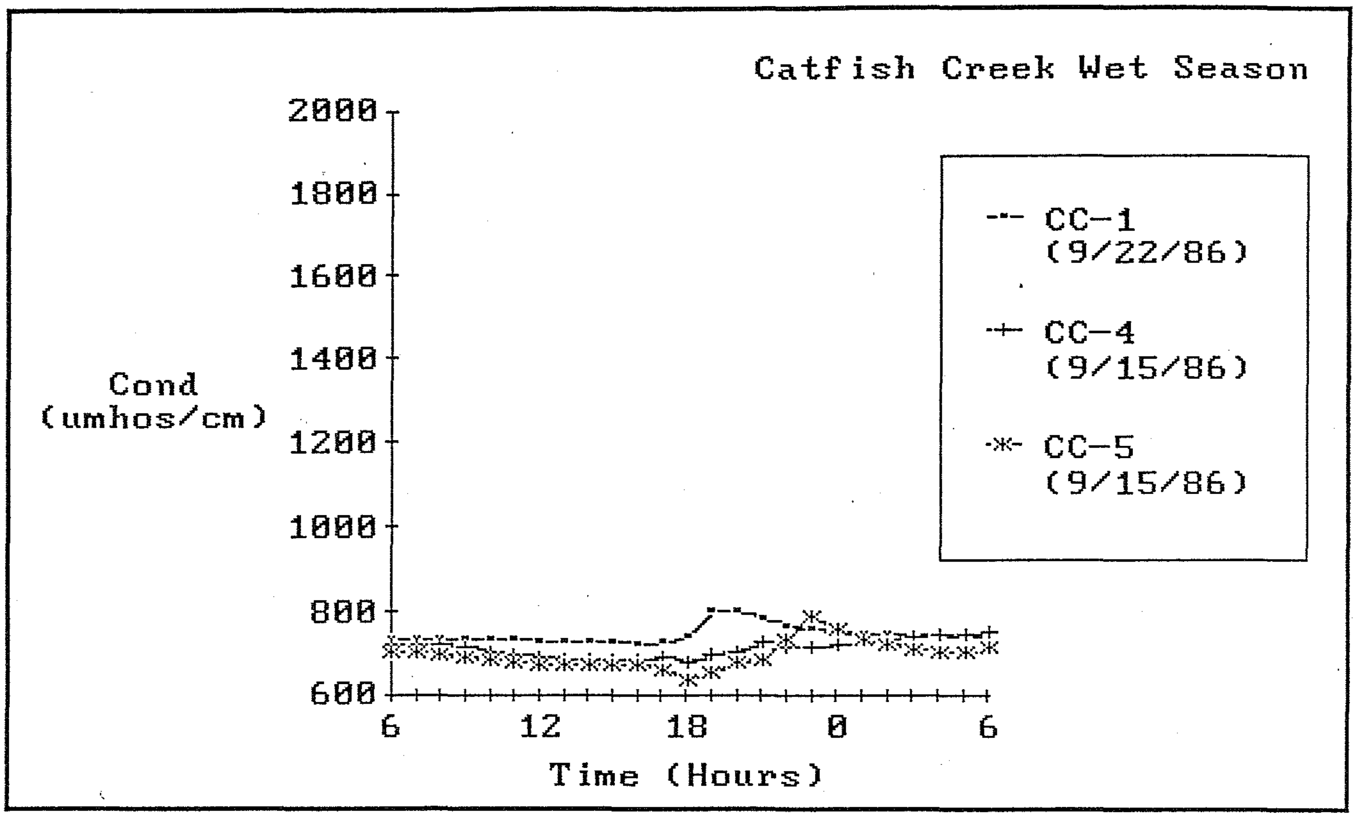


Figure 3.10 Diel Trends in Conductivity at Stations CC-1, CC-4, and CC-5 during the Wet Season.

3.3.4 Hydrogen Ion Potential

3.3.4.1 Dry Season Diels

Diel curves at Stations CC-1 and CC-4 (Figures 3.11 and 3.12) showed relatively uniform pH conditions. During the first pair of sampling events (October 8-9), pH averaged 6.8 and 6.9 at Stations CC-4 and CC-1, respectively. Likewise, during the second pair of sampling events (October 15-16), pH averaged 6.8 and 6.9 at Stations CC-4 and CC-1, respectively. Such conditions are indicative of low rates of net community (primary) production by submerged plants.

In comparison, Station CC-5 exhibited a diel trend in pH indicative of a high rate of net community production (Figure 3.11). On October 24, pH increased from a minimal level of approximately 7.0 during early morning to a maximal level of approximately 8.3 during late afternoon. This diel trend is attributed to changes in the concentration of CO_2 which reacts with water to form a weak acid, thereby affecting pH. During the photoperiod (0600 - 1800 hours), pH increased as more CO_2 was assimilated by submerged plants (during the process of photosynthesis) than was produced by heterotrophs (during the process of respiration). During the dark period, photosynthesis ceased but respiration continued, resulting in a decrease in pH as CO_2 levels increased.

3.3.4.2 Wet Season Diels

On September 15, the diel trend at Station CC-5 (Figure 3.13) showed a minor increase in pH from approximately 7.4 to 7.8 during the late morning and early afternoon hours in association

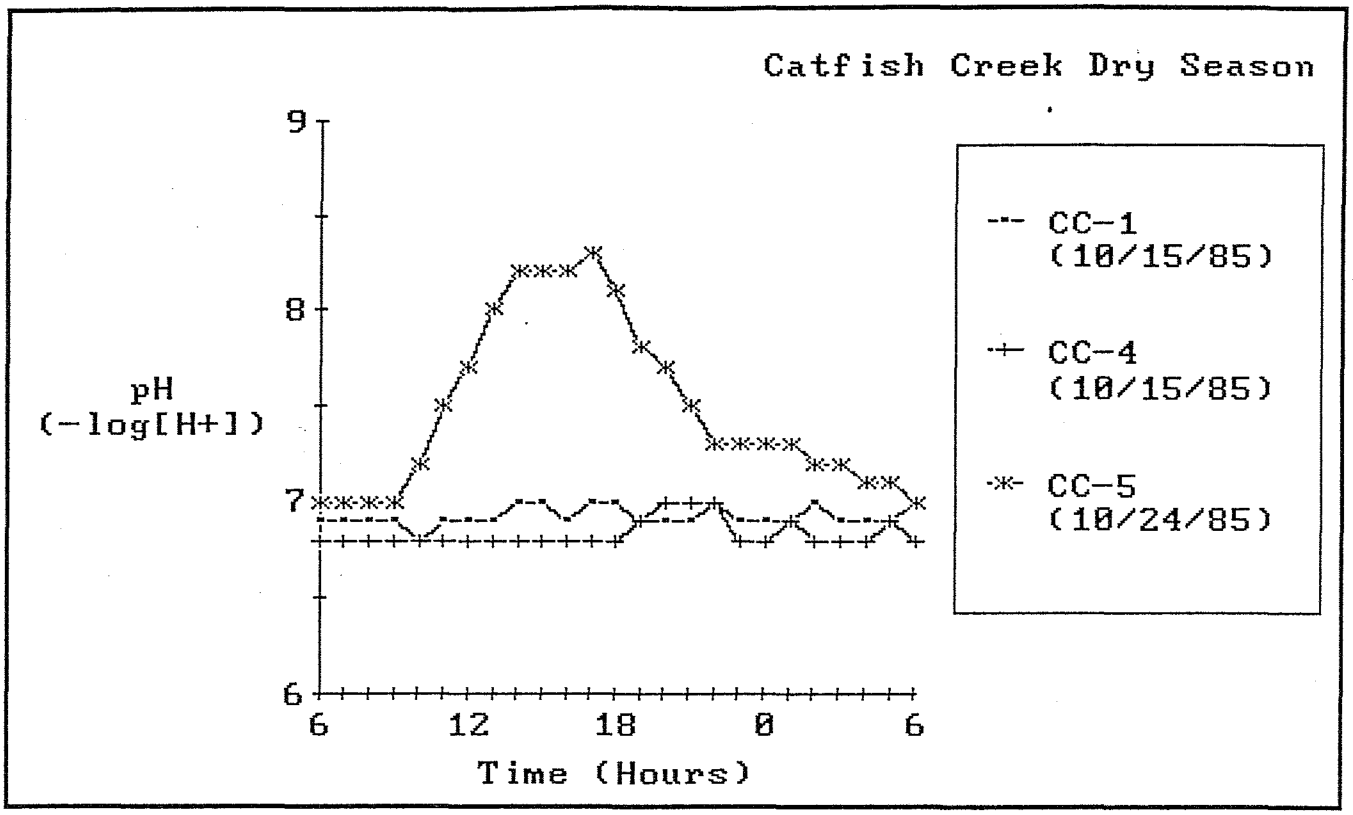


Figure 3.11 Diel Trends in pH at Stations CC-1, CC-4, and CC-5 during the Dry Season.

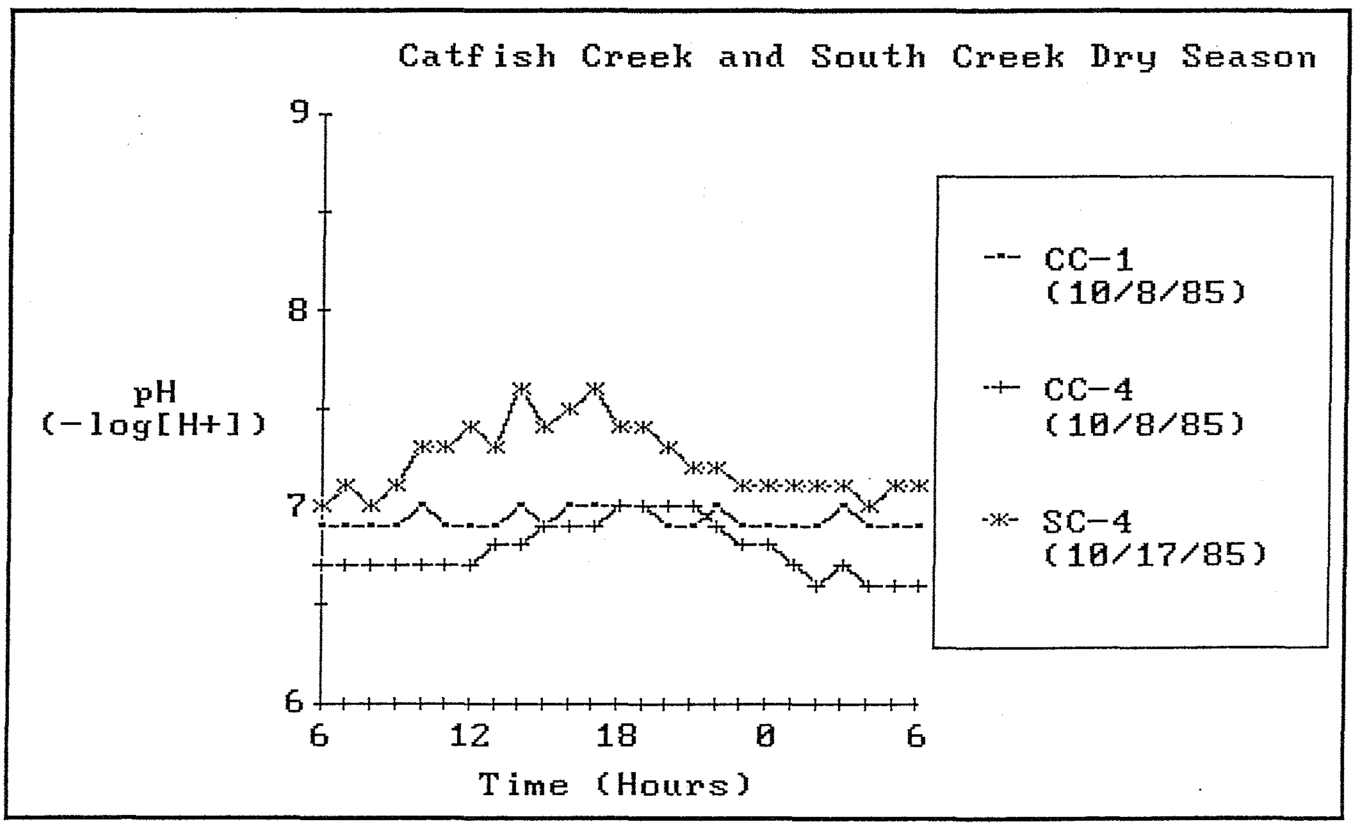


Figure 3.12 Additional Diel Trends in pH at Stations CC-1, CC-4, and SC-4 during the Dry Season.

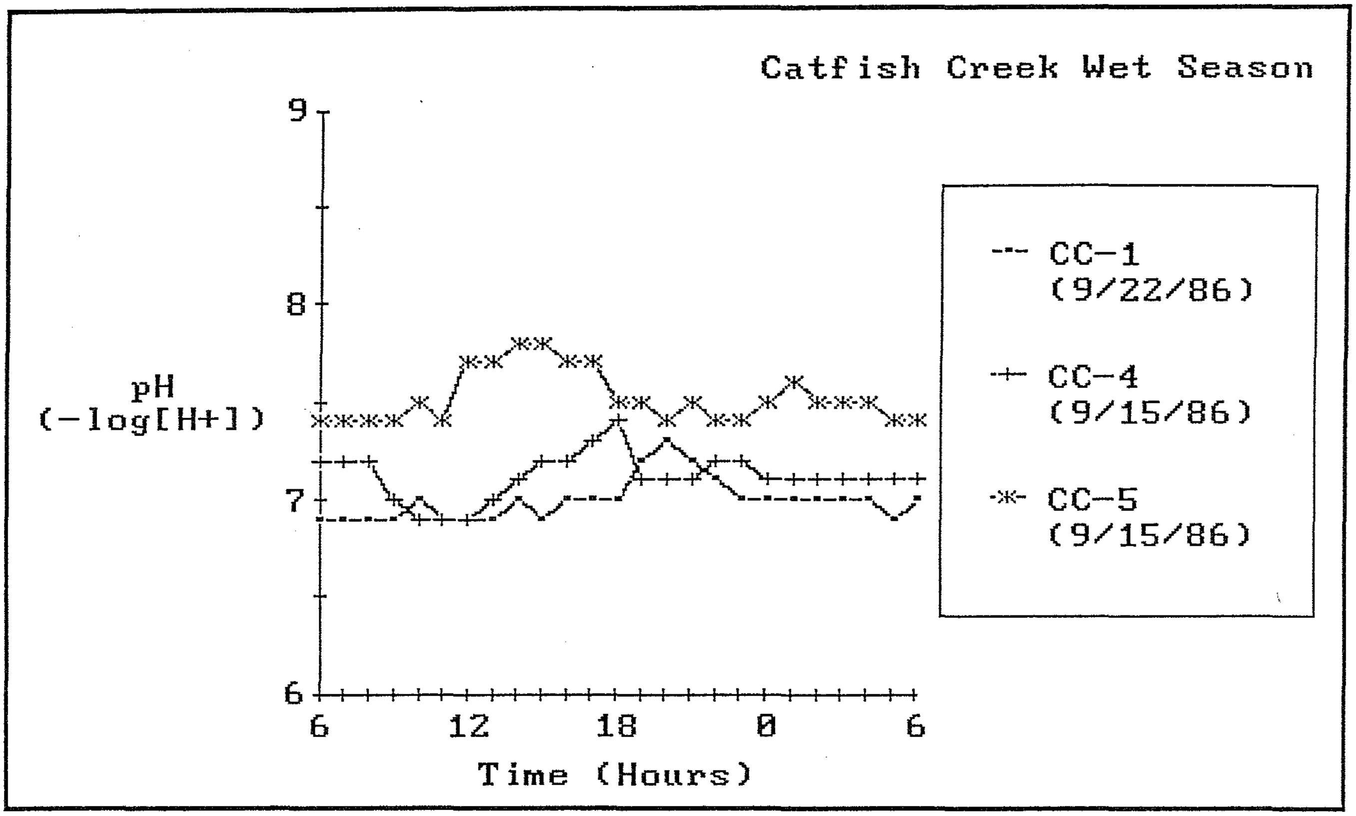


Figure 3.13 Diel Trends in pH at Stations CC-1, CC-4, ad CC-5 during the Wet Season.

with net community production, i.e. net photosynthetic uptake of CO_2. At Station CC-4, pH declined from approximately 7.2 to 6.9 during the morning (0600 - 1200 hours) and increased to approximately 7.4 during the afternoon (1200 - 1800 hours) as photosynthetic rates exceeded respiration rates. Subsequently, pH exhibited a slight decline to approximately 7.1 in association with community respiration during the dark period.

As evidenced in Figure 3.13, Station CC-1 exhibited a low and stable pH of approximately 7.0 throughout the diel cycle. This is attributed to its dystrophic nature dominated by heterotrophic organisms with little or no photosynthetic assimilation of CO_2 by submerged plants.

3.3.5 <u>Dissolved Oxygen</u>

3.3.5.1 Dry Season Diels

As evidenced in Figure 3.14, the uppermost station on Catfish Creek (CC-1) exhibited relatively uniform oxygen levels averaging 3.4 mg/l on October 8-9. Similar conditions were also observed on October 15-16 as oxygen levels averaged 3.2 mg/l, even though cloud cover was significantly higher (Figure 3.15). Even so, such conditions of constantly depressed oxygen are attributed to a combination of: (1) the lack of photosynthetic oxygen production by submerged plants; and, (2) a low but sustained rate of community respiration, i.e., oxygen consumption exceeding reaeration rates.

It is apparent that the low level of incident radiation at Station CC-1 due to its steep banks, upstream culvert, and

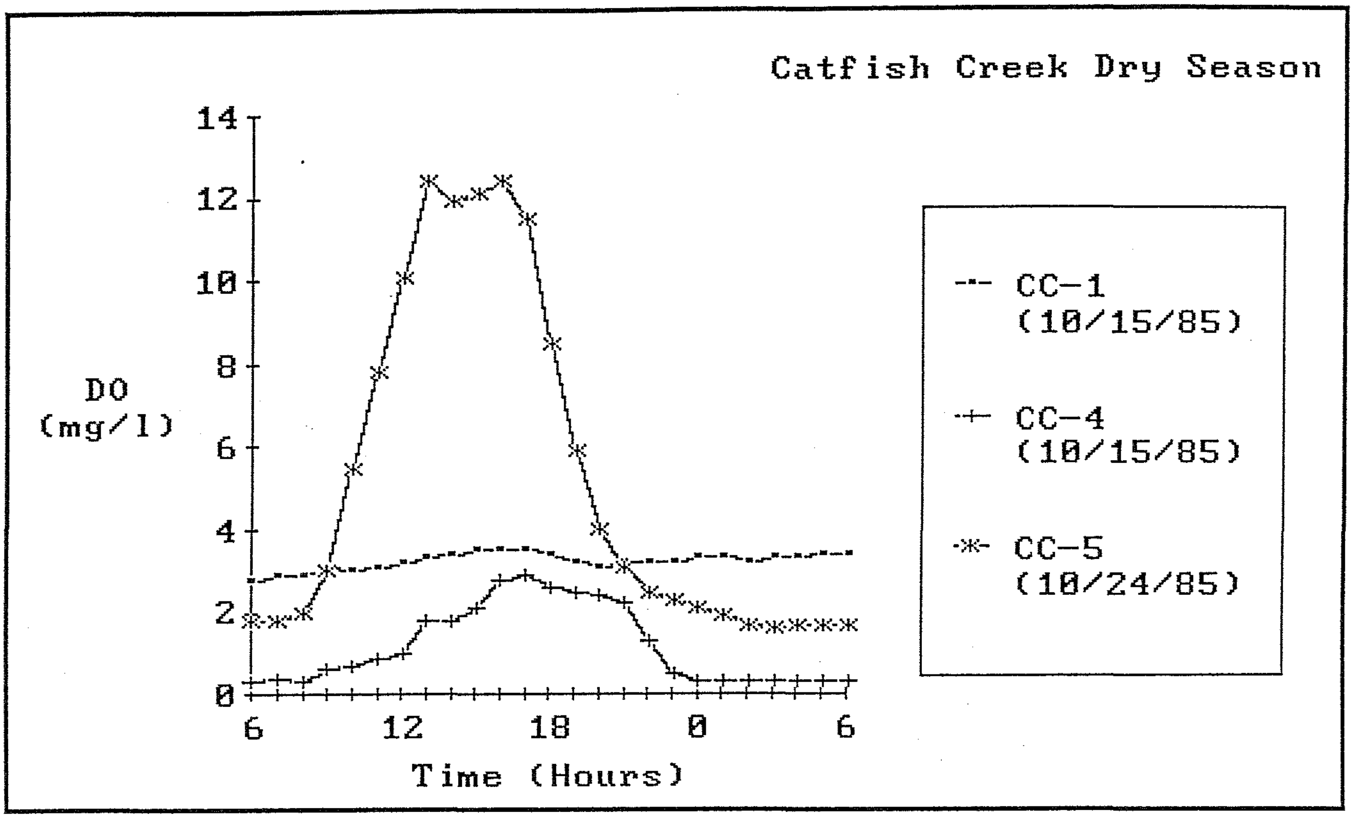


Figure 3.14 Diel Trends in Dissolved Oxygen at Stations CC-1, CC-4, and CC-5 during the Dry Season.

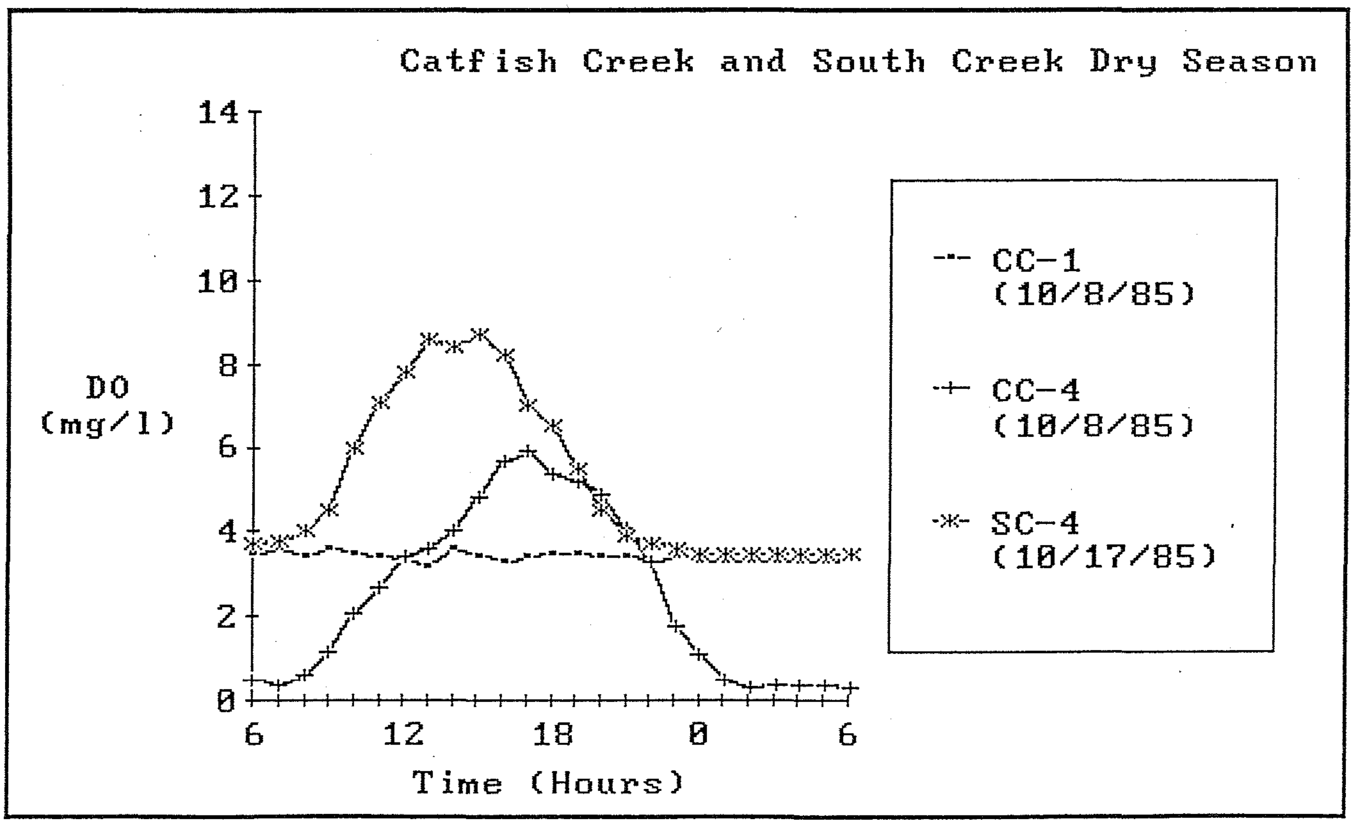


Figure 3.15 Additional Diel Trends in Dissolved Oxygen at Stations CC-1, CC-4, and SC-4 during the Dry Season.

overhanging canopy, have resulted in light-limiting conditions preventing the establishment of any submerged plants. Consequently, there was no photosynthetic production of oxygen within the water column, and therefore, community respiration depressed dissolved oxygen to low levels. Furthermore, it is likely that these effects were facilitated by the import of allochthonous organic detritus originating, in part, from the upstream wetland and from the bank-side vegetation. Evidently, detritus had accumulated and was decomposing in the bottom sediments immediately upstream of Station CC-1. Coupled with light-limiting conditions and the lack of photosynthetic oxygen production by submerged aquatic vegetation, dissolved oxygen levels were constantly depressed during the dry season even though BOD levels in the water column were reported to be low.

Oxygen depression was also observed during the dry season surveys at Station CC-4 on October 8-9 and again on October 15-16. However, substantial diurnal variations in dissolved oxygen were recorded during both events as evidenced in Figures 3.14 and 3.15. Although dissolved oxygen levels averaged 2.5 and 1.2 mg/l, increases from less than 1 to approximately 6 mg/l on October 8 and from less than 1 to approximately 3 mg/l on October 15 were observed during the photoperiod followed by similar decreases during the dark period. Of possible significance, higher cloud covers recorded during the second dry season survey at Station CC-4 (30 versus 60 percent) might have reduced photosynthetic oxygen production.

During the photoperiod, the submerged vegetation at Station CC-4 apparently contributed oxygen at a significant rate in association with organic production. During the dark period, however, oxygen was not produced due to the absence of light necessary to drive the photosynthetic process, but was consumed as a result of community respiration. As demonstrated by the generally low oxygen levels noted above, the consumption of oxygen during respiration processes, e.g. organic decomposition, exceeded the production of oxygen including reareation at Station CC-4. As previously discussed, BOD-5 levels at Station CC-4 were excessive, and perhaps, elevated rates of community respiration during the dry season.

At the lowest station in Catfish Creek (CC-5), dissolved oxygen exhibited a much larger diurnal amplitude than observed at the middle and upper stations. As evidenced in Figure 3.14, a low dissolved oxygen level of about 2 mg/l was observed at dawn, but rapidly increased as the photoperiod transpired. By mid-afternoon, dissolved oxygen peaked at a supersaturated level of approximately 12 mg/l. Thereafter, dissolved oxygen levels declined rapidly to less than 2 mg/l by midnight, while by the following morning, oxygen levels had declined to an even lower level.

Overall, dissolved oxygen at Station CC-5 was generally below saturation as it averaged 5.2 mg/l, compared to its saturation level of approximately 8 mg/l (at $26^{o}C$). Therefore, it is apparent that oxygen consumption at Station CC-5 exceeded oxygen production during the dry season as a result of an imbalance in the flora and fauna. The condition, however, was not as severe as the middle and upper reaches of Catfish Creek.

3.3.5.2 Wet Season Diels

The uppermost station on Catfish Creek (CC-1) exhibited relatively uniform and depressed dissolved oxygen levels during the wet season event (September 22-23). As shown in Figure 3.16, dissolved oxygen averaged 2.8 mg/l and ranged approximately 2.5 - 3.1 mg/l during the diel cycle. As previously discussed, uniform and depressed oxygen concentrations were also recorded during the two dry season surveys of Station CC-1 (refer to Section 3.3.5.1).

Such conditions of constantly depressed oxygen during the wet season are attributed to the following: (1) light-limiting conditions brought about by shading by the culvert, steep banks, and vegetative canopy; (2) little or no photosynthetic oxygen production within the water column due to the absence of submerged aquatic vegetation; (3) decomposing organic matter originating from the upstream wetland and bank side vegetation; and, (4) excess community respiration associated with a low P/R ratio.

At the recently enlarged middle station of Catfish Creek (CC-4), diurnal trends in dissolved oxygen followed a decline to a low level of 5 mg/l during the morning, but increased to a high level in excess of 9 mg/l by late afternoon (Figure 3.16). During the following 12 hours of darkness, dissolved oxygen steadily

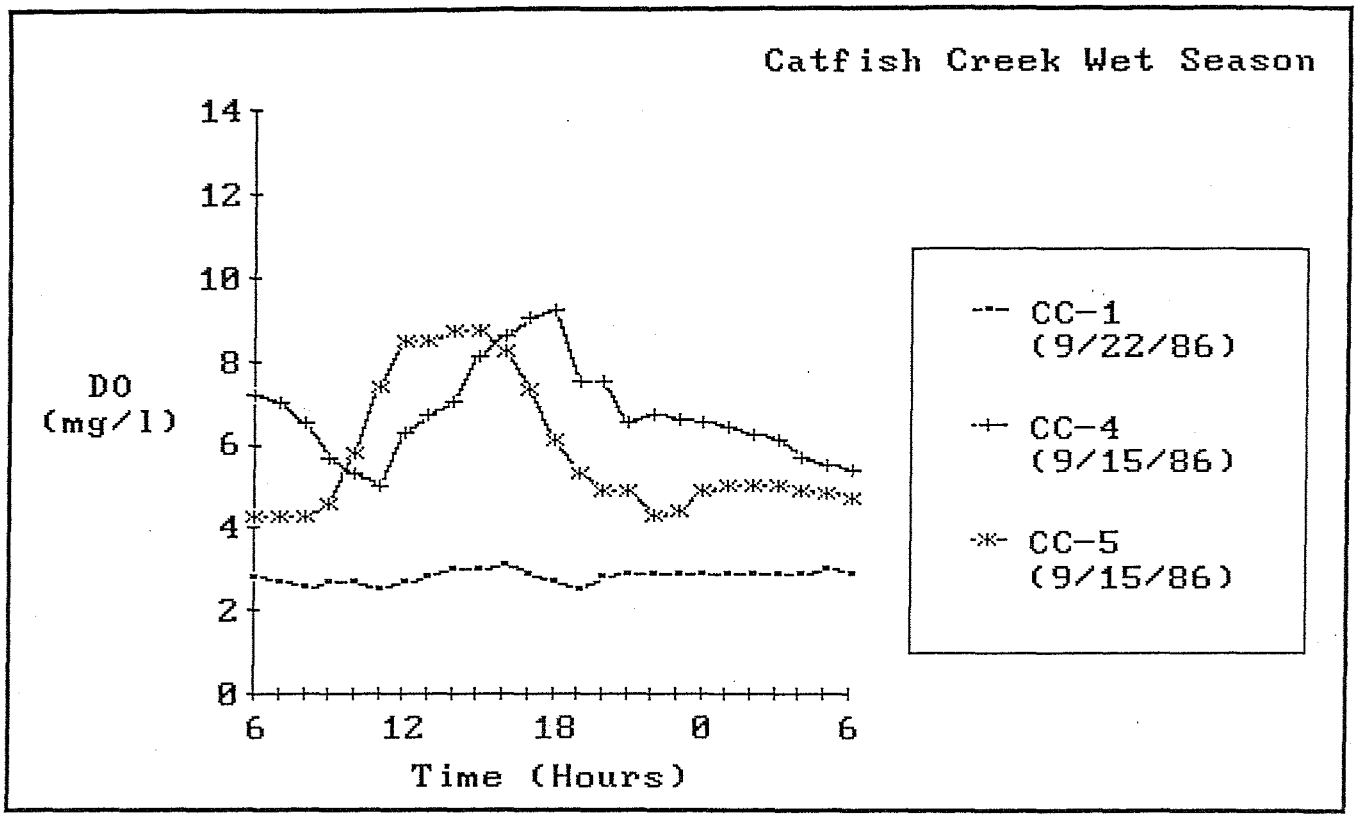


Figure 3.16 Diel Trends in Dissolved Oxygen at Stations CC-1, CC-4, and CC-5 during the Wet Season.

declined in association with heterotrophic consumption of dissolved oxygen.

In comparing the initial dissolved oxygen level to that at the end of the diel cycle at Station CC-4, it is evident that total community respiration for the diel cycle exceeded gross community primary productivity, i.e. a net change in dissolved oxygen of approximately -1.5 mg/l. Although dissolved oxygen was recorded at comparatively higher levels than was observed prior to channel enlargement, a sustained period of net community respiration could cause the same type of diurnal cycle recorded during the dry season, i.e. a substantial diurnal amplitude but below saturation, and out of compliance with water quality standards. Of possible significance, the excess BOD-5 levels recorded prior to channel enlargement might have been mitigated by the decommissioning of the wastewater treatment facility adjacent to Catfish Creek.

During the wet season survey, the most productive autotrophs (plants) of the mid-channel community were most likely phytoplankton. In contrast, prior to expansion, macrophytes such as Hydrilla dominated the community and were most likely a major contributor to the depressed oxygen regime as a result of their shading and decomposition. It is possible that such a community could gradually replace the current plankton-based community resulting in the reestablishment of the previously depressed oxygen regime.

As shown in Figure 3.16, substantial diurnal variations in dissolved oxygen were recorded at Station CC-5 during the wet season. However, the diel cycle did not exhibit as much amplitude as was observed during the dry season. During the wet season survey, performed on September 15-16, substantial increases (approximately 4 to 9 mg/l) were observed during the photoperiod, followed by substantial decreases (approximately 9 to 4 mg/l) during the dark period. In comparison to upstream conditions on the same day, oxygen levels at Station CC-5 reached minimal and maximal levels several hours earlier than at Station CC-4. This spatial difference could not have been due to cloud cover differences since sampling was performed concurrently. Likewise, seasonal differences at Station CC-5 could not have been due to cloud cover differences since observations of percent cloud cover during wet and dry season surveys were approximately the same.

3.4 South Creek

3.4.1 Community Description

Table 3.5 provides a general comparison of the habitats of the upper, middle, and lower sampling stations on South Creek. Schematic cross-sections of South Creek at these three stations are illustrated in Figure 3.3 (page 3-12). In addition, Tables 3.6, 3.7, 3.8, and 3.9 (pages 3-15 thru 3-24) provide measurements of depth, flow, turbidity, and BOD-5 taken in South Creek during the diurnal monitoring program or during past monitoring (Patton & Associates, 1985; GeoScience, 1986; CCI, 1986 and 1987).

3.4.1.1 Upper Station (SC-A)

South Creek, which exhibits the appearance of a natural meandering stream upon entering the North Tract, bifurcates into an eastern branch and a western branch. Although Station SC-A is located on the eastern branch near the bifurcation, observations of flow at this station have been toward the western branch.

In the vicinity of the bifurcation, South Creek's low, gentle sloping banks offer little or no shade (Figure 3.3). At Station SC-A, its banks rise 3 ft. with a 15° slope to a 22.5 ft. wide channel (TOB).

At the beginning of each diurnal sampling event, water levels (Table 3.6) were determined to be 0.6 ft. during the dry season survey (November 11, 1985), and slightly higher, i.e. 0.8 ft., during the wet season survey (September 21, 1986). In addition, there was no flow observed during the dry season survey and only a weak flow (less than 100 gpm) observed during the wet season survey (Table 3.7). Since no additional monitoring was performed at Station SC-A, background flow, depth, turbidity, and BOD-5 are not available for comparison to conditions during the diurnal sampling events.

In addition to the low lying banks, there are no trees to offer shade along South Creek's upper reaches. Coupled with the high level of incident radiation and its shallow sandy bottom, vegetation at Station SC-A appears to be dominated by rooted emergents.

3.4.1.2 Middle Stations (SC-4 and SC-7)

Station SC-7 is located on the eastern branch of South Creek at a cattle crossing downstream of I-75 and a dairy farm. The dairy farm is considered to be a significant source of nutrients and BOD, which could result in excess plant growth and/or oxygen depression associated with excess rates of organic decay. Station SC-4 is located along the channelized middle segment of the western branch (Figure 2.1).

In the vicinity of Station SC-7 (Figure 3.3), South Creek's banks are gently sloping (20°) and rise 5.5 ft. above its variable width channel. Its widest point is located at the cattle/ vehicle crossing where its channel is 14.5 ft. (TOB), narrowing above and below the crossing to a width of approximately 5 ft. (TOB).

On the western branch at Station SC-4, South Creek's banks rise steeply 4.5 ft. to a relatively uniform 10.5 ft. (TOB) channel. The bank slope at Station SC-4 is approximately 80°.

Past studies (CCI, 1986 and 1987) have shown water levels at Station SC-7 to average 0.4 feet during the dry season and 0.8 ft. during the wet season (Table 3.6). During the diurnal surveys, Station SC-7 exhibited expected water levels of 0.4 and 0.8 ft. at the beginning of the dry and wet season sampling events on October 16, 1985 and September 17, 1986, respectively.

At Station SC-4, the dry season water level has reportedly averaged 0.4 ft. during the past few years. At the start of the dry season sampling event on October 16, 1985, it was determined to be 0.3 ft. (Table 3.6).

In the eastern branch of South Creek at Station SC-7, weak flows (less than 100 gpm) have prevailed (CCI, 1986 and 1987). During the sampling events, however, a moderate flow (100 - 300 gpm) was observed at the onset of the dry season survey (October 16, 1985), while a strong flow (300 - 600 gpm) was observed at the onset of the wet season survey (September 17, 1986).

In the western branch of South Creek at Station SC-4, weak flows have prevailed (CCI, 1986 and 1987). During the dry season sampling event initiated on October 16, 1985, a weak flow was also observed (Table 3.7).

Station SC-7 is densely vegetated with floating and rooted emergents (50 - 75 percent cover). Its bottom is sandy with a thin layer of organic detritus. Primrose willow and Brazilian peppers line its banks but offer minimal shade due to the northeast orientation of the channel, i.e., alignment with respect to the sun's azimuth. Shading, immediately upstream of Station SC-7, therefore, results primarily from the dense growth of emergent and floating aquatic vegetation.

Further upstream, the eastern branch flows through a marsh and subsequently through several culverts beneath I-75. In addition to highway drainage, dairy farm drainage, particularly rich in nitrogenous nutrients and BOD (GeoScience, 1986, and CCI, 1986), entered the eastern branch upstream of the Palmer Ranch.

Station SC-4 is sparsely vegetated, perhaps due to the shading effect of its banks and bordering pines and palmettos. Upstream, the aquatic vegetation consists primarily of rooted emergents which exhibit a slight increase in plant coverage, perhaps in association with an increase in incident radiation and a reduction in canopy.

Turbidities (Table 3.8) reported at Station SC-7 averaged 4.8 NTU during the dry season and 4.0 NTU during the wet season, while BOD-5 levels (Table 3.9) have averaged 7.6 mg/l during the dry season and 4.4 mg/l during the wet season (Patton & Associates, 1984; GeoScience, 1985; and CCI, 1986 and 1987). These BOD levels exhibit the potential to affect dissolved oxygen. At Station SC-4, turbidities during the dry season averaged 5.3 mg/l while BOD-5 has averaged 2.7 mg/l.

3.4.1.3 Lower Station (SC-2)

Station SC-2 is located at the downstream property boundary of the North Tract where South Creek exhibits gently sloping banks as shown in Figure 3.3. At Station SC-2, South Creek's banks rise 6.0 ft. at a slope of 20° to a 30 ft. (TOB) wide channel, offering little shade during the early morning and late afternoon.

Past studies (CCI, 1986 and 1987) have shown water levels at Station SC-2 to average 0.7 ft. during the dry season and 0.6 ft. during the wet season. This anomaly, i.e. slightly lower water level during the wet season, is attributed to an unusually low water level recorded during June 1986. Correcting for this