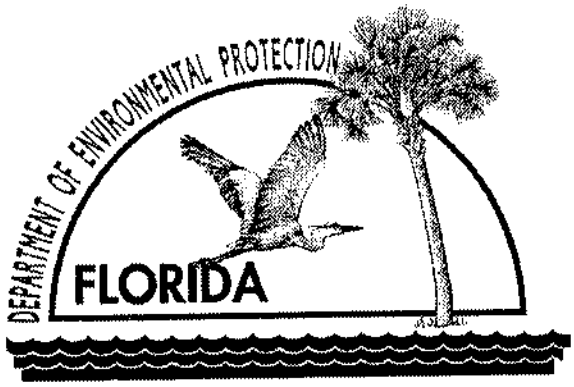
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Biological Assessment of

Crescent City Wastewater Treatment Plant

Putnam County

NPDES #FL0021610

Sampled October 1997

FILE COPY
DO NOT REMOVE

May 1998

Biology Section
Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: Crescent City WWTP
County: Putnam
NPDES Number: FL0021610
State Permit Expiration Date: 4 June 1998

Toxics Sampling Inspection (XSI)

Date Sampled: 6 October 1997

Results: The organic pollutant, 2,4,6–trichlorophenol (2.2 µg/L) was detected in the effluent at less than acutely toxic levels. Copper (21.9 µg /L) and silver (0.15 µg/L) (at a hardness of 146.1 mg CaCO3) were detected in the effluent at levels that exceeded Class III water quality standards, Rules 62-302.530(24) and (60) FAC.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 6 October 1997

Results: The effluent was not acutely toxic to the water flea, *Ceriodaphnia dubia*, or the fish, *Cyprinella leedsi*.

Impact Bioassessment Inspection (IBI)

Date Sampled: 6 October 1997

Results: The algal communities in Crescent Lake were typical of those suffering from nutrient enrichment. Chlorophyll *a* at both sites was higher than the values found in 60% of other Florida lakes. Algal density at the test site was higher than the control site, probably related to the greater concentrations of nutrients there. Quantitative measures of macroinvertebrate community health indicate that both the control an test sites were very stressed. Nutrient enrichment in Crescent Lake has been linked to agricultural activities in the drainage basin. These activities have resulted in periodic algal blooms, dissolved oxygen depletion, and substrate quality reduction. The similarity between the control and test site benthic communities suggests that the Crescent City WWTP discharge was not substantially exacerbating the already degraded conditions of the lake.

Water Quality Inspection (WQI)

Date Sampled: 6 October 1997

Results: AGP exceeded the 5 mg dry wt/L "problem threshold" at the control and test sites, but was higher at the test site due to the influence of the discharge. Total phosphorus concentrations at the control and test sites were higher than those found in approximately 70% and 80% of Florida lakes, respectively. Increases of total phosphorus and nitrate+nitrite at the test site were associated with the discharge. Total and fecal coliforms complied with Class III water quality standards at both stations.

These fifth year inspections provide the necessary information to evaluate the facility's impact on its receiving waters and to provide the basis for specific condition recommendations for permit renewal.

Introduction

The Crescent City Wastewater Treatment Plant is located on Crescent Lake in Putnam County, Florida (see maps in Appendix). Wastewater treatment at this 0.25 MGD municipal facility consists of aeration, clarification, digestion, and chlorination and dechlorination for disinfection. The effluent is discharged approximately 50 meters from the western shore of the Class III Crescent Lake.

Effluent limits for the Crescent City WWTP are listed in Table 1. Past monthly operating reports indicate the facility exceeded its one time maximum fecal coliform limit in November, 1996 (see Facility Summary in Appendix). Also, the monthly permit limit for total nitrogen was exceeded in January, February, and July of 1997.

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a control site, (located approximately 100 meters from the eastern tip of Bear Island in Crescent Lake), and a test site (50 meters from the western shore of Crescent Lake, adjacent to the discharge) (see maps in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute toxicity bioassays, using the water flea, *Ceriodaphnia dubia,* and the fish, *Cyprinella leedsi,* as test organisms, were performed on an effluent sample (Weber 1993). The effluent was analyzed for metals and for organic constituents (base, neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on the effluent and samples from the control and the test sites. Methods used for all chemical analyses are on file at the DEP Central Chemistry Laboratory in Tallahassee.

Benthic macroinvertebrate communities were evaluated at control and test sites. Invertebrates were collected by taking three replicate petite Ponar grabs at each site (Ross 1990). Phytoplankton were collected by taking subsurface grab samples and chlorophyll *a* was determined for phytoplankton communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller et al. (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed to determine the effects of a discharge. These are briefly discussed here.

Taxa richness: Stress tends to reduce the number of different types of organisms present in a system, although moderate nutrient enrichment may sometimes be correlated with increased algal taxa richness.

Shannon-Weaver diversity: This index is specified in the Florida Administrative Code as a measure of biological integrity. Low diversity scores are undesirable. They represent conditions where only a few organisms are abundant, to the exclusion of other taxa. Excessive numerical dominance of a single type of organism (a high % contribution of the dominant taxon) is a related measure which is also associated with disturbance.

Numbers of pollution sensitive taxa: Some organisms become rare or absent as the intensity or duration of disturbance increases. For example, the Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy. Species sensitivity data from other sources, such as Chang et al. (1992), Farrell (1992), Hudson et al. (1990), Hulbert (1990), Lenat (1993), and Whitmore (1989), are used as appropriate.

Community structure: Substantial shifts in proportions of major groups of organisms, compared to control conditions, may indicate degradation.

Algal biomass: High algal biomass (algal density or chlorophyll *a*) implies nutrient stress. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions in flowing streams.

The Lake Condition Index (LCI) for Florida is a composite metric (Hulbert, 1990) used to evaluate the health of lentic systems. The LCI utilizes diversity, nutrient content, chlorophyll *a*, as well as the presence of pollution sensitive macroinvertebrates (see LCI calculation table in Appendix). A site with a high LCI score is considered healthy or unaltered.

Trophic composition/feeding guilds: Disturbance can shift the feeding strategies of invertebrates. In Florida for example, pollution may be responsible for reducing the numbers of filter-feeders (FDEP 1994) and shredders (EA Engineering 1994).

For graphical purposes, the percent differences between the control and test sites involving the number of taxa, the diversity index, the Florida Index, the Lake Condition Index and the percent filter-feeders, are measured as the control site minus test site divided by the control site. The percent differences between sites involving the algal density, chlorophyll *a*, and algal growth potential are measured as the test site minus control site divided by the control site.

The following personnel were involved in this investigation: Tim McKelvey and Stephanie Jenkins (DEP Northeast District) and Lyn Burton, Jennifer Eichelberger, Ken Espy, Marshall Faircloth, Russel Frydenborg, Joy Jackson, Scott Lashbrook, Elizabeth Miller, Urania Quintana, Johnny Richardson, Lisa Tamburello, David Whiting, Vicki Whiting, and Steve Wolfe (DEP Central Biology Laboratory in Tallahassee). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.

Results and Discussion

With a few exceptions, most habitat parameters at the test site were the same as those found at the control site (see Habitat Assessment sheets in Appendix). There were some alterations to the littoral zone and the associated plant communities at the test site that were not present at the control site. The predominant land use at the control site was forest/natural (70%) compared to the test site which consisted mainly of residential (70%) usage. The test site substrate was sand (70%) with some rock/shell rubble (30%). In addition to sand (50%) at the control site, detritus (40%) and mud/muck (10%) were present.

All of the physical/chemical measurements were nearly identical at the control and test sites (Table 1). The Secchi depth measurements were low at both stations (control = 0.4 m, test = 0.3 m), a result of both color and algal turbidity (see Physical/Chemical Data Sheets in Appendix).

The organic contaminant, 2,4,6–trichlorophenol (2.2 µg/L), was found in the effluent (Table 1). Copper (21.9 µg/L) and silver (0.15 µg/L) concentrations in the effluent were above Class III water quality standards, representing violations of Rules 62-302.530(24) and (60) FAC. Aluminum, cadmium, iron, lead, and zinc were detected at levels that complied with Class III water quality standards.

The effluent was not acutely toxic to the water flea, *Ceriodaphnia dubia*, or the fish, *Cyprinella leedsi*.

Fecal and total coliforms complied with the facility's permit limit and Class III water quality standards (Table 1).

Localized increases in nutrient levels were associated with the Crescent City WWTP discharge (Table 1). Total phosphorus increased from 0.12 mg/L at the control site to 0.16 mg/L at the test site, values higher than those found in approximately 70% and 80% of Florida lakes, respectively (See *Typical Values for Selected Parameters in Florida Waters* in Appendix). The total phosphorus concentration of the effluent was 1.8 mgL. Similarly, nitrate+nitrite levels at the test site (0.079 mg/L) were higher than those values found in approximately 75% of other Florida lakes, and were apparently associated with nutrient inputs from the effluent. Concentrations of ammonia and TKN were not elevated in the effluent or at either sample site.

The control site AGP (6.6 mg dry wt/L) was consistent with previous values obtained from Crescent Lake (Frydenborg *et al.* 1990). The test site AGP (14.2 mg dry wtL) reflected the increased nutrient input from the discharge. AGP values above 5 mg dry wt/L are considered to be above the "problem threshold" (Raschke and Schultz 1987). The AGP of the effluent was 16.7 mg dry wt/L.

Algal communities at both the control and test sites were dominated by diatoms, mainly *Melosira* sp. (70% and 57% at control and test sites, respectively). *Melosira* sp. is tolerant of nutrient enriched conditions. Although diversity was 47% lower at the control site than at the test site, community structure was nevertheless similar at both sites (Figure 1). Algal density at the test site was 85% higher than that of the control site. The increase in algal density at the test site implies that the higher algal taxa richness there was related to nutrient (and elevated AGP) inputs from the discharge. Chlorophyll *a* was 23 µg/L at the control site and 28 µg/L at the test site. Chlorophyll *a* at both sites was higher than the values found in 60% of other Florida lakes.

Table 1. Effluent limits and summary of chemistry data.

	Effluent Limits	Effluent Sample	Control Site	Test Site
Organic Constituents (µg/L)				
2,4,6–Trichlorophenol	-	2.2 I	-	-
Metals (µg/L)				
Aluminum	≤ 1,500 **	79 I	-	-
Arsenic	≤ 50 **	40 U	-	-
Cadmium	≤ 1.5 **c	0.32 A	-	-
Chromium	≤ 282.4 **c	10 U	-	-
Copper	≤ 16.4 ** c	21.9 A	-	-
Iron	≤ 1,000 **	47 A	-	-
Lead	≤ 5.2 **c	0.57 A	-	-
Mercury	≤ 0.012 **	0.10 U	-	-
Nickel	≤ 217.3 **c	7 U	-	-
Selenium	≤ 5.0 **	50 U	-	-
Silver	≤ 0.07 **	0.15 I	-	-
Zinc	≤ 146.2 **c	77 A	-	-
Nutrients (mg/L)				
Ortho-phosphate	-	1.8 A	0.051	0.063 A
Total phosphorus	14.8 *	1.8	0.12	0.16
Ammonia	-	0.056	0.018 I	0.010 I
Nitrate+Nitrite	-	18	0.004 U	0.079
TKN	-	1.5	1.4	1.6
Total Nitrogen	40 *	19.5	1.4	1.7
General Phys-Chem Parameters				
Habitat Assessment	-	-	119	101
D.O. (mg/L)	≥ 5.0 *	-	8.4	9.0
pH (SU)	6.0–8.5 *	-	6.8	7.0
Conductivity (µmhos/cm)	-	-	361	350
Temperature (°C)	-	-	26.7	26.9
T.S.S. (mg/L)	60 *	3	7	11
C.B.O.D., 5 day (mg/L)	60 *	4	< 2	< 2
Tot. Residual Chlorine (mg/L)	0.01 *	-	-	-
Flow (MGD)	0.250 *	0.175	-	-
Hardness (mg CaCO3)	-	146.1	-	-
AGP (mg dry wt/L)	-	16.7	6.6	14.2
Toxicity				
Bioassay Fish	-	not toxic	-	-
Bioassay Invertebrate	-	not toxic	-	-
Microbiology (# organisms/100 mL)				
Fecal Coliforms	800 *	90 B	< 3 K	20 B
Total Coliforms	-	2,000	< 3 K	53 B

* Permit limit - Reflects one-time grab event

** Class III water quality standard

c - Value is calculated based on hardness

A - Value reported is the mean of two or more determinations

B - Results based on colony counts outside the acceptable range

I - Value reported is less than the minimum quantitation limit, and greater than or equal to the minimum detection limit

K - Actual value is known to be less than value given

U - Material analyzed for but not detected; value reported is the minimum detection limit

Table 2. Major characteristics of macroinvertebrate and algal community structure of control and test sites.

	Control Site	Test Site
Macroinvertebrate Ponar		
Number of Taxa	10	13
Florida Index	2	2
Shannon-Weaver Diversity	2.0	2.0
Lake Condition Index	3	5
Community Composition		
% Amphipoda	0.0	2
% Diptera	10	20
% Gastropoda	3	60
% Isopoda	33	1
% Oligochaeta	50	17
% Pelecypoda	4	1
Functional Feeding Groups		
% Browsers	17	1
% Predators	7	14
% Scrapers	0.0	60
% Shredders	1	2
% SubSurface Deposit Feed.	50	16
% Surface Deposit Feeders	4	4
% Suspension Feeders	5	1
Phytoplankton Algae		
Number of Taxa	14	23
Shannon-Weaver Diversity	1.8	2.7
Chlorophyll a (µg/L)	22.7	28.4 A
Algal Density (#/mL)	2,495	4,604
% Blue-green	12	15
% Green	13	19
% Diatoms	75	65
AGP (mg dry wt/L)	6.6	14.2

A - Value reported is the mean of two or more determinations

There was little difference in the quantitative measures of macroinvertebrate community health between the control and test site (Figure 2). Taxa richness, while being somewhat depressed at both sites, increased from 10 taxa at the control site to 13 taxa at the test site. Both the control and test site had identically low values for Shannon-Weaver diversity (2.0) and the Florida Index (2) (Table 2). The macroinvertebrate component of the Lake Condition Index was slightly higher at the test site (with 5 points) compared to the control site (3 points), but well below the expected 12 points in an unimpaired lake (see LCI calculation table in Appendix). The percentage of filter feeders was low at both sites, although there were fewer at the test site (1%) compared to the control site (5%).

Conclusions

The habitat quality as well as physical/chemical measures were similar at both of the sample sites in Crescent Lake.

The organic compound, 2,4,6–trichlorophenol was present in the effluent. Copper (21.9 µg/L) and silver (0.15 µg/L) were detected in the effluent above Class III water quality standards, representing violations of Rules 62-302.530(24) and (60) FAC.

The effluent sample was not acutely toxic to the water flea, *Ceriodaphnia dubia*, or to the fish, *Cyprinella leedsi*.

Total phosphorus concentrations at the control and test sites were higher than those found in approximately 70% and 80% of Florida lakes, respectively. Increased concentrations of total phosphorus and nitrate+nitrite at the test site were associated with the discharge.

AGP exceeded the 5 mg dry wt/L "problem threshold" at the control and test sites, but was higher at the test site due to the influence of the discharge.

The algal communities in Crescent Lake were typical of those suffering from nutrient enrichment. Chlorophyll *a* at both sites was higher than the values found in 60% of other Florida lakes. Algal density at the test site was higher than the control site, probably related to the greater amounts of nutrients there.

Quantitative measures of macroinvertebrate community health indicate that both the control and test sites were very stressed. Nutrient enrichment in Crescent Lake has been linked to agricultural activities in the drainage basin. These activities have resulted in periodic algal blooms, dissolved oxygen depletion, and substrate quality reduction (Frydenborg *et al.* 1990). The similarity between the control and test site benthic communities

suggests that the Crescent City WWTP discharge was not substantially exacerbating the already degraded conditions of the lake.

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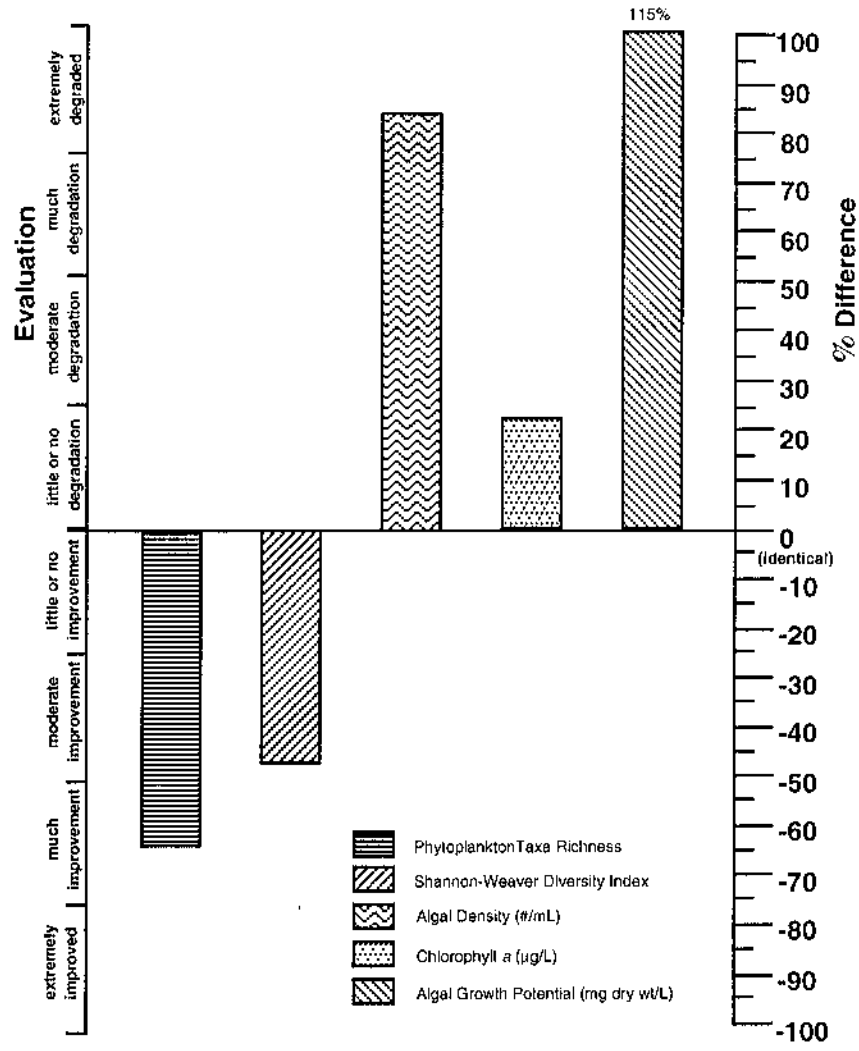


Figure 1. Effect of discharge on the phytoplankton community.

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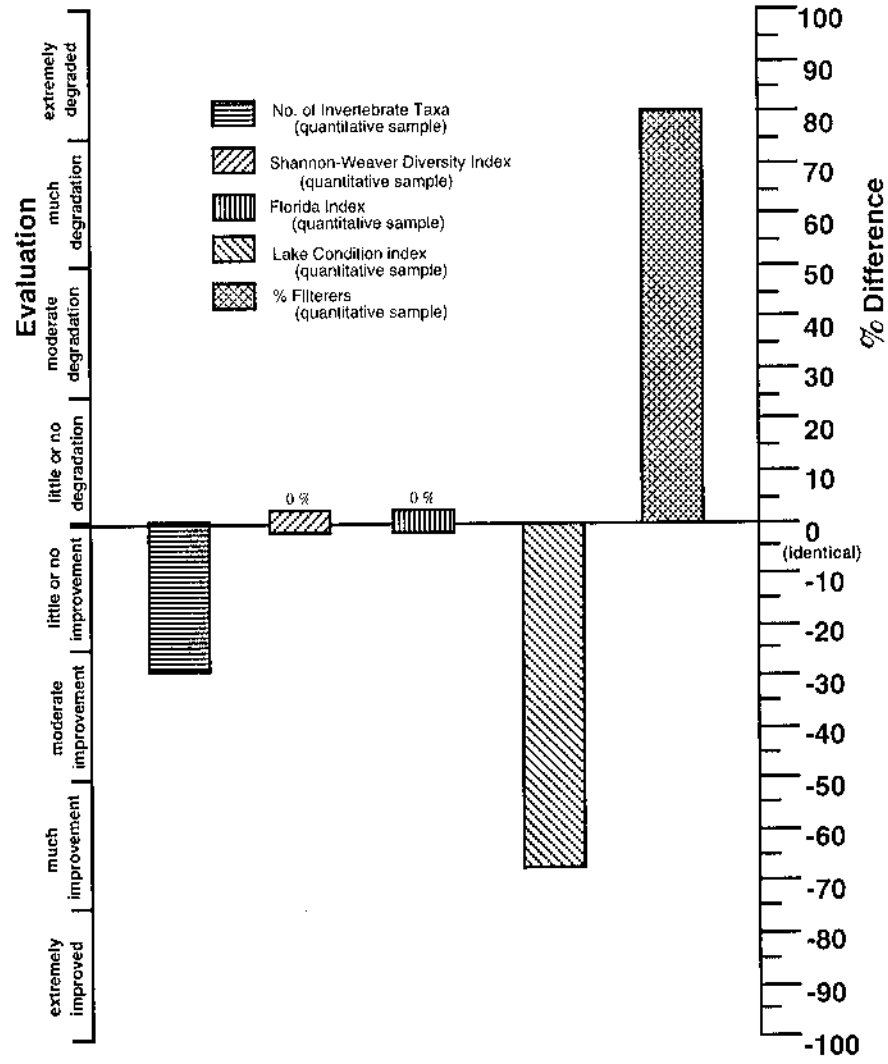


Figure 2. Effect of discharge on the macroinvertebrate community.

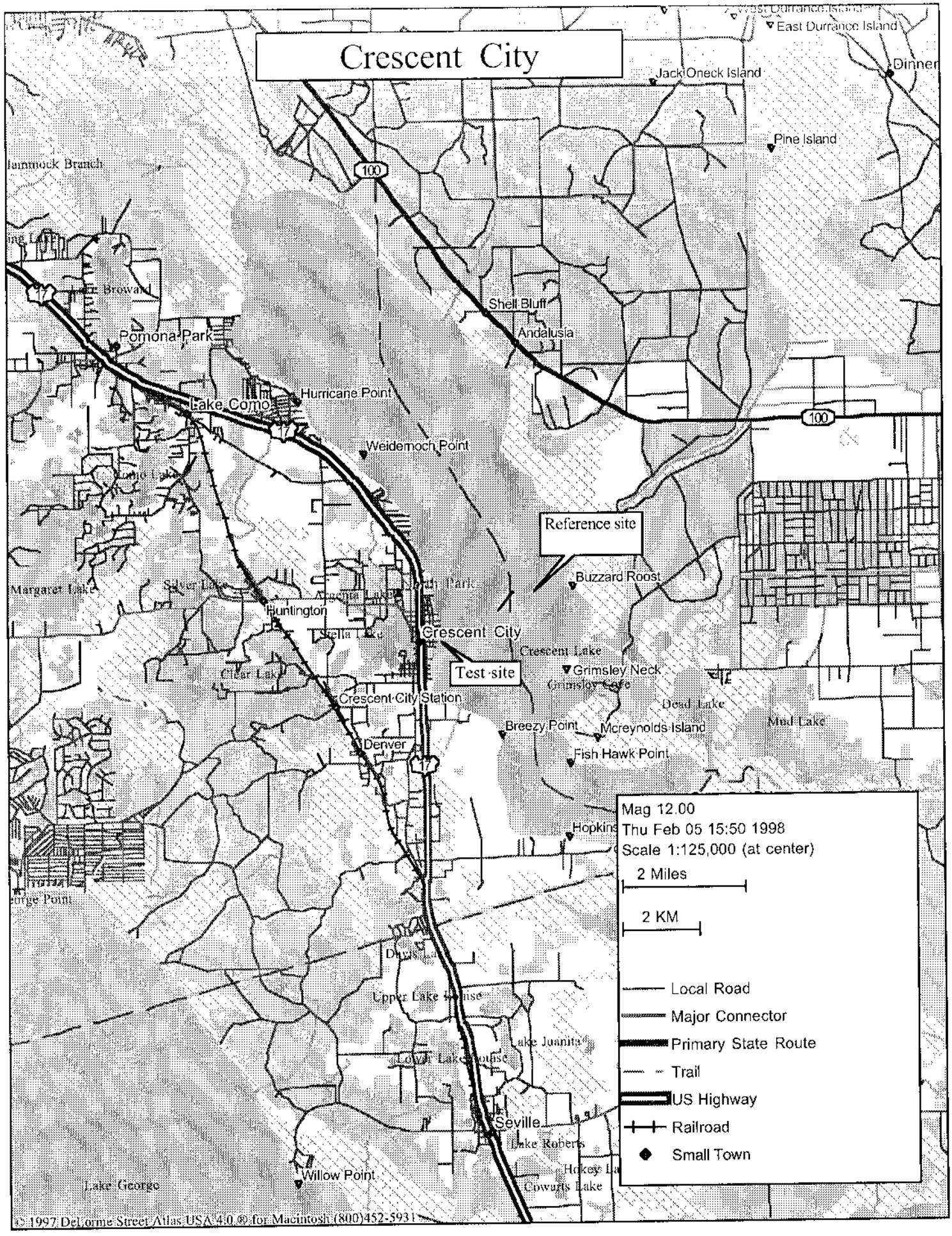
Typical Values for Selected Parameters in Florida Waters

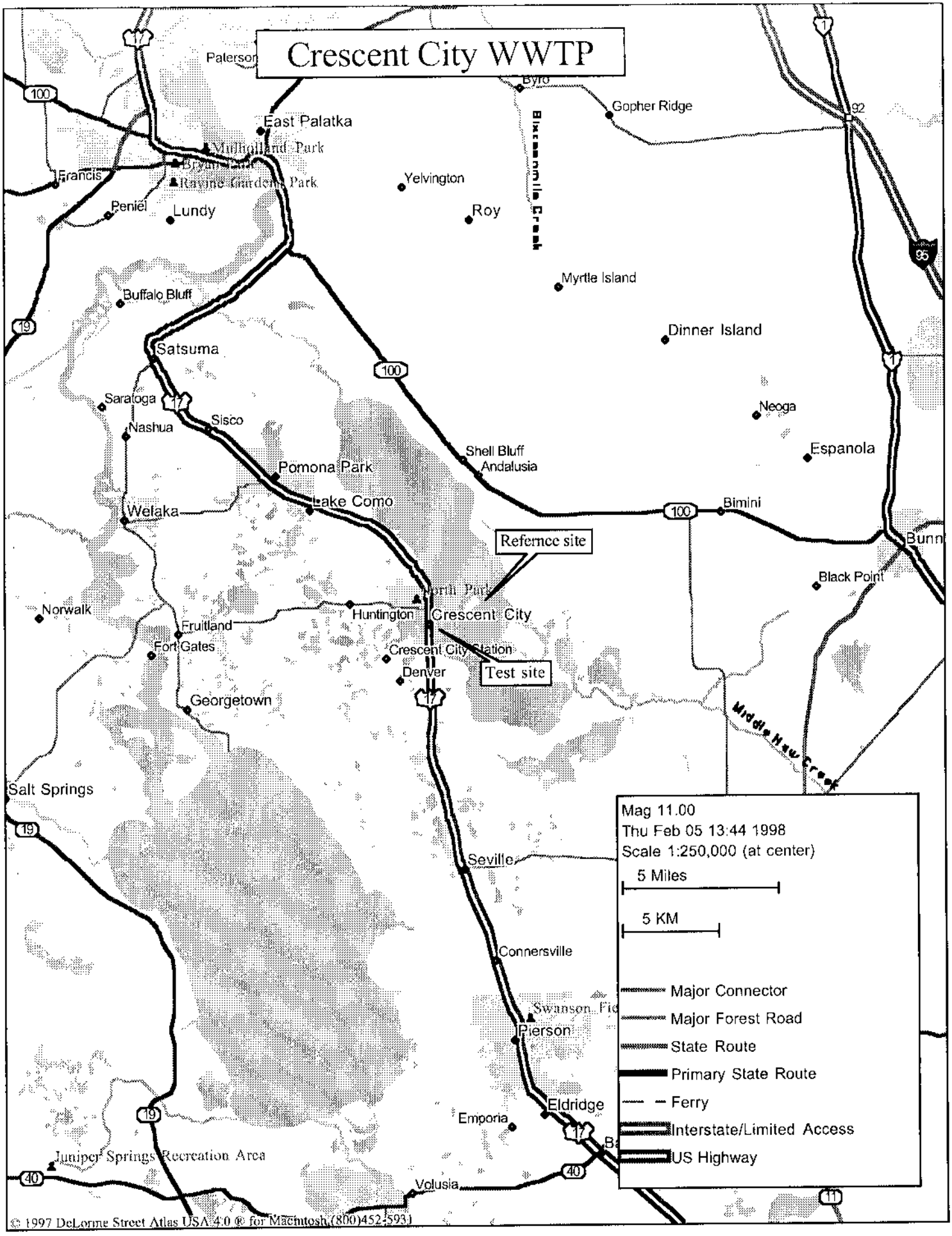
Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

Percentile Distribution

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%
STREAMS (1617 stations)											
Phytoplankton Chlorophyll *a*	0.22	0.52	0.94	1.60	3.02	4.63	6.72	9.87	14.68	27.35	48.70
Periphyton Chlorophyll *a*	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90
Qualitative Taxa Richness	9.00	12.00	17.00	20.00	22.00	24.50	26.00	28.00	31.00	37.00	53.00
H-D Taxa Richness	6.00	6.50	9.00	11.50	13.00	15.00	17.00	21.50	26.00	29.00	32.00
TKN	0.30	0.39	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80
Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60
NO2-NO3	0.01	0.01	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	1.51
Ortho Phosphorus	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
NH3+NH4	0.01	0.02	0.02	0.03	0.04	0.06	0.08	0.12	0.15	0.21	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.10	0.14	0.23
Total Phosphorus	0.01	0.02	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.23	0.42
Ortho-Phosphorus	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.21	0.32
Turbidity	1.00	1.25	1.55	2.05	2.75	4.50	6.45	9.60	14.10	26.00	40.00
ESTUARIES (690 stations)											
Phytoplankton Chlorophyll *a*	2.14	3.28	4.49	5.13	6.00	6.93	7.94	9.60	12.40	17.60	22.20
Dredge Diversity	1.34	1.53	1.91	2.28	2.56	2.90	3.15	3.59	4.01	4.53	4.98
Dredge Taxa Richness	4.00	6.00	9.00	11.00	15.00	18.50	25.00	35.00	41.00	62.00	90.00
TKN	0.26	0.34	0.42	0.50	0.59	0.69	0.76	0.82	0.95	1.30	1.49
NH3+NH4	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.13	0.22	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.08	0.17	0.23
Total Phosphorus	0.01	0.02	0.06	0.07	0.10	0.11	0.14	0.17	0.23	0.43	0.59
Ortho-Phosphorus	0.01	0.02	0.03	0.04	0.04	0.05	0.07	0.09	0.12	0.21	0.44
Turbidity	3.50	4.00	4.50	5.05	5.40	5.60	6.30	6.80	8.00	11.40	11.75

Units:
Phytoplankton Chlorophyll *a* (ug/L), Periphyton Chlorophyll *a* (mg/m^2), Nutrients (mg/L), Turbidity (NTU), Taxa richness and diversity values are for macroinvertebrates


Crescent City
East Durrance Island
Jack Oneck Island
Dinner
Pine Island
Hammock Branch
100
Shell Bluff
Andalusia
Pomona Park
Hurricane Point
Lake Como
Weidemoch Point
Reference site
Buzzard Roost
Margaret Lake
Huntington
Crescent City
Crescent Lake
Test site
Grimsley Neck
Crimsley Cove
Clear Lake
Crescent City Station
Dead Lake
Mud Lake
Breezy Point
Mcreynolds Island
Denver
Fish Hawk Point
Hopkins
Upper Lake
Lake Juanita
Seville
Lake Roberts
Willow Point
Lake George
Cowarts Lake
Mag 12.00
Thu Feb 05 15:50 1998
Scale 1:125,000 (at center)
2 Miles
2 KM
Local Road
Major Connector
Primary State Route
Trail
US Highway
Railroad
Small Town
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Crescent City WWTP
Paterson
East Palatka
Midhollland Park
Bryan Gdn
Ravine Gardens Park
Francis
Peniel
Lundy
Yelvington
Roy
Gopher Ridge
Byro
Myrtle Island
Buffalo Bluff
Satsuma
Saratoga
Nashua
Sisco
Pomona Park
Lake Como
Welaka
Shell Bluff
Andalusia
Dinner Island
Neoga
Espanola
Bimini
Bunn
Black Point
Reference site
North Park
Huntington
Crescent City
Crescent City Station
Test site
Denver
Norwalk
Fruitland
Fort Gates
Georgetown
Salt Springs
Seville
Connersville
Swanson Fie
Pierson
Eldridge
Emporia
Juniper Springs Recreation Area
Volusia
Middle Haw Creek
Mag 11.00
Thu Feb 05 13:44 1998
Scale 1:250,000 (at center)
5 Miles
5 KM
Major Connector
Major Forest Road
State Route
Primary State Route
Ferry
Interstate/Limited Access
US Highway
© 1997 DeLorme Street Atlas USA 4.0 ® for Macintosh (800)452-5931

DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: CRESCENT CITY WWTP		Date Summary Prepared: 10-7-97
Location (attach detailed map):	County: PUTNAM	District: NED
Federal Permit # FL0021610 and expiration date: 7-31-98	State GMS # and 3154 MO1816 State expiration date: 6-4-98	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility:

Description of treatment process:
0.250 MGD EXTENDED AERATION WWTP CONSISTING OF 1 AERATION BASIN, 1 CLARIFIER, 1 DIGESTER, AND 1 CHLORINE CONTACT CHAMBER

Receiving waters: CRESCENT LAKE	Classification: I II (III)	
Design Flow: .250 MGD	Mean Flow:	Flow during survey:

Discharge is: Continuous Intermittent Seasonal Rainfall dependent
Other (describe)

therefore, the best time to sample is:

If facility has a mixing zone, give details (size, parameters affected, etc.):
NO MIXING ZONE

List effluent limits (if necessary, attach relevant paperwork):

Parameter	Limit (units)
FLOW	0.250 MGD
CBOD5	ANN - 20 mg/L MONTHLY - 30 mg/L WEEKLY - 45 mg/L ONETIME MAX - 60 mg/L
TSS	SAME AS CBOD5
TOTAL PHOSPHOROUS	ANN - 7.9, MO - 7.9 mg/L WEEKLY - 11.1, ONE TIME MAX - 14.8
TOTAL NITROGEN	ANN + MO - 20 mg/L WEEKLY - 30 mg/L ONE TIME MAX - 40 mg/L

Describe special permit conditions and permit modifications:

DO - 5.0 MINIMUM
PH - 6.0 MIN - 8.5 MAX
Cl_2 RESIDUAL 0.5 MIN, 0.01 MAXIMUM
FECAL COLIFORM - 200 ANNUAL
[illegible] MAX

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

(Facility)

Description of permitted outfall(s):
GRAVITY LINE TO CRESCENT LAKE

List permit violations (from MOR data or other source) and plant upsets that occurred within past year:
7/97 - * TOTAL NITROGEN 20.50 mg/L VIOLATES MONTHLY LIMIT
2/97 " 21.30 mg/L
1/97 " 20.1 mg/L
FECAL COLIFORM - 11/96 - 1600 - VIOLATES ONE TIME MAXIMUM

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:
NO CURRENT ENFORCEMENT ACTIONS

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:
OVERALL, MOR RESULTS DO NOT SHOW ANY SEASONAL TRENDS ~~DEERT~~ THERE HAS BEEN AN INCREASE IN THE MONTHLY FLOW (THEY'RE NOW ABOUT 70% CAPACITY)
ALSO, TOTAL NITROGEN HAS INCREASED THIS YEAR (SEE ABOVE)

Additional information:

Staff contributing to this review (signature):
(Biologist)
(Inspector)
(Engineer)
( )
( )
( )

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: NED	STORET STATION NUMBER: 20030275	DATE (M/D/Y): 10-6-97	TIME: 1300	RECEIVING BODY OF WATER: CRESCENT LAKE

REMARKS: windy & choppy	COUNTY: PUTNAM	LOCATION: EASTERN TIP OF BEAR ISLAND, APPROX. 100 YARDS OFF SHORE OF ISLAND	FIELD ID/NAME: REFERENCE SITE

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Land-Use in Watershed (specify relative percent in each category):

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
70%		5%	5%	20%			

Local Watershed Erosion (check box): None ☐ Slight ☑ Moderate ☐ Heavy ☐

Local Watershed NPS Pollution (check box): No evidence ☐ Slight ☐ Moderate potential ☑ Obvious sources ☐

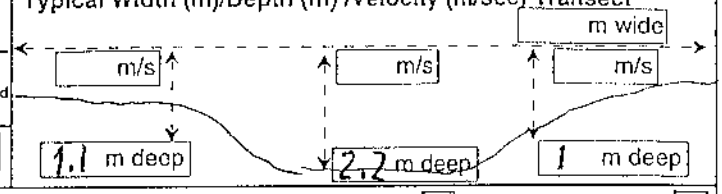
Width of riparian vegetation (m) on least buffered side: > 18 m | *List & map dominant vegetation on back*

Artificially Channelized ☑ no ☐ recent, severe ☐ some recovery ☐ mostly recovered, more sinuous

Artificially Impounded ☐ yes

High Water Mark: .05 (m above present water level) + 1.1 (present depth in m) = 1.15 (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



Canopy Cover % : Open : ☒ Lightly Shaded (11-45%): ☐ Moderately Shaded (46-80%): ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: ☒ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Anaerobic: ☐ Other: ☐

Sediment Oils: Absent: ☒ Slight: ☐ Moderate: ☐ Profuse: ☐

Sediment Deposition: Sludge: ☐ Sand smothering: none, slight, moderate, severe — Silt smothering: none, slight, moderate, severe — Other:

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand	50	1	PONAR
Leaf Packs or Mats				Mud/Muck/Silt	10	1	PONAR
Aquatic Vegetation				Other: detritus	40	1	PONAR
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):	SALINITY		Secchi (m):
Top								0.4m
Mid-depth	3.5 ft	26.7	6.8	8.4	361	0.2		
Bottom	7 ft							

System Type : Stream: ☐ (1st - 2nd order, 3rd - 4th order, 5th - 6th order, 7th order or greater) Lake: ☑ Wetland: ☐ Estuary: ☐ Other: ☐

Water Odors (check box): Normal: ☑ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Other: ☐

Water Surface Oils (check box): None: ☑ Sheen: ☐ Globs: ☐ Slick: ☐

Clarity (check box): Clear: ☐ Slightly turbid: ☑ Turbid: ☐ Opaque: ☐

Color (check box): Tannic: ☑ Green (algae): ☐ Clear: ☐ Other: ☐

Weather Conditions/Notes:
WARM, 80°F, PARTLY CLOUDY
WIND OUT OF NE @ 15-20
CHOP ON LAKE, rough

Abundance:	Absent	Rare	Common	Abundant
Periphyton	☐	☐	☑	☐
Fish	☐	☐	☐	☑
Aquatic Macrophytes	☐	☐	☐	☑
Iron/sulfur Bacteria	☑	☐	☐	☐

SAMPLING TEAM: Tim McKeivey & Stephanie Jenkins

SIGNATURE: Timothy McKelvey

DATE: 10/6/97

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (4-22-96)

SUBMITTING AGENCY CODE: 8051 / SUBMITTING AGENCY NAME:	STORET STATION NUMBER: 20030275	DATE (M/D/Y): 10-6-97	RECEIVING BODY OF WATER: CRESCENT LAKE

REMARKS:	COUNTY: PUTNAM	LOCATION:	FIELD ID/NAME: REFERENCE SITE

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Substrate Types & Availability [20]	Greater than 30% snags, logs, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock, or other stable habitat. (20) 19 18 17 16	16% to 30% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 15% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable or smothered. 5 4 3 2 1
Water Velocity [1] (TIDAL LAKE)	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 4 3 2 (1)
Artificial Channelization [20]	No artificial channelization or dredging. ~~Stream with normal, sinuous pattern~~ LAKE (20) 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Habitat Smothering [18]	Less than 20% of habitats affected by sand or silt accumulation 20 19 (18) 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability [20]	Stable. No evidence of erosion or bank failure. Little potential for future problems. (20) 19 18 17 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 13 12 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width [20]	Width of native vegetation (least buffered side) greater than 18 m (20) 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system 10 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality [20]	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody macrophytes. Normal, expected plant community for given sunlight & habitat conditions. (20) 19 18 17 16	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated and/or poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

[0] Add **5 points** if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

Comments

[119] **TOTAL SCORE**

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-6-97	Tim McKelvey	Tim McKelvey

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: 805 / SUBMITTING AGENCY NAME: FDEP	STORET STATION NUMBER: 20030410	DATE (M/D/Y): 10-6-97	TIME: 1400	RECEIVING BODY OF WATER: CRESCENT LAKE

REMARKS:	COUNTY: PUTNAM	LOCATION: WESTERN SHORE OF LAKE, APPROX 100-150 FT. FROM SHORE @ OUTFALL	FIELD ID/NAME: -33T SITE

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Land-Use in Watershed (specify relative percent in each category):

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
100%				70 80%	20%		

Local Watershed Erosion (check box): None ☐ Slight ☒ Moderate ☐ Heavy ☐

Local Watershed NPS Pollution (check box): No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☒

Width of riparian vegetation (m) on least buffered side: 10m

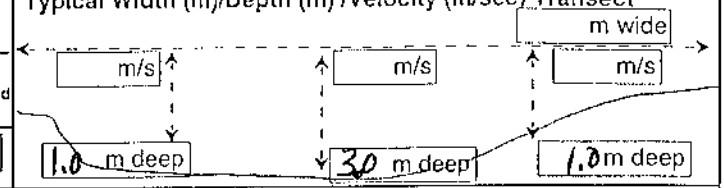
List & map dominant vegetation on back

Artificially Channelized ☒ no ☐ recent, severe ☐ some recovery ☐ mostly recovered

Artificially Impounded ☐ yes ☐ more sinuous

High Water Mark: 0.05 (m above present water level) + 1.1 (present depth in m) = 1.15 (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



Canopy Cover % : Open : ☒ Lightly Shaded (11-45%): ☐ Moderately Shaded (46-80%): ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: ☒ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Anaerobic: ☐ Other: ☐

Sediment Oils: Absent: ☒ Slight: ☐ Moderate: ☐ Profuse: ☐

Sediment Deposition: Sludge: ☐ Sand smothering: none ☐ slight ☐ moderate ☐ severe ☐ Silt smothering: none ☐ slight ☐ moderate ☐ severe ☐ Other:

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand	70%	2	PONAR
Leaf Packs or Mats				Mud/Muck/Silt			
Aquatic Vegetation				Other:			
Rock or Shell Rubble	30%	1	PONAR	Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):	SALINITY		Secchi (m):
Top								0.3m
Mid-depth	3 FT	76.9°	7.04	9	350	0.2		
Bottom	6 FT							

System Type : Stream: ☐ (1st - 2nd order ☐ 3rd - 4th order ☐ 5th - 6th order ☐ 7th order or greater ☐) Lake: ☒ Wetland: ☐ Estuary: ☐ Other: ☐

Water Odors (check box): Normal: ☒ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Other: ☐

Water Surface Oils (check box): None: ☒ Sheen: ☐ Globs: ☐ Slick: ☐

Clarity (check box): Clear: ☐ Slightly turbid: ☒ Turbid: ☐ Opaque: ☐

Color (check box): Tannic: ☒ Green (algae): ☐ Clear: ☐ Other: ☐

Weather Conditions/Notes: Windy, heavy chop on lake, rough, overcast

Abundance:	Absent	Rare	Common	Abundant
Periphyton	☐	☐	☒	☐
Fish	☐	☐	☐	☒
Aquatic Macrophytes	☐	☐	☒	☐
Iron/sulfur Bacteria	☒	☐	☐	☐

SAMPLING TEAM: Tim McKelvey & Stephanie Jenkins

SIGNATURE: Tim McKelvey

DATE: 10/6/97

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (4-22-96)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y): 10-6-97	RECEIVING BODY OF WATER:

REMARKS:	COUNTY:	LOCATION: TEST SITE	FIELD ID/NAME:

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Substrate Types & Availability [20]	Greater than 30% snags, logs, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock, or other stable habitat. (20) 19 18 17 16	16% to 30% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 15% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable or smothered. 5 4 3 2 1
Water Velocity [1]	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 4 3 2 (1)
Artificial Channelization [20]	No artificial channelization or dredging. ~~Stream with normal, sinuous pattern~~ LAKE (20) 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Habitat Smothering [15]	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation (15) 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability [20]	Stable. No evidence of erosion or bank failure. Little potential for future problems. (20) 19 18 17 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 13 12 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width [10]	Width of native vegetation (least buffered side) greater than 18 m 20 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system (10) 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality [15]	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody macrophytes. Normal, expected plant community for given sunlight & habitat conditions. 20 19 18 17 16	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. (15) 14 13 12 11	25% to 50% of riparian zone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated and/or poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

[ ] Add 5 points if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

Comments

[10] **TOTAL SCORE**

ANALYSIS DATE: 10-6-97	ANALYST: Tim McKelvey	SIGNATURE: Tim McKelvey

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Crescent City WWTP
County: Putnam
Contact / District: Tim McKelvey / NED
NPDES Permit #: FL0021610
LIMS Sample #: 193507 LIMS Job #: 97-OCT-02-13
sample log: 10-5-97 CR
Test Type: Screening / Definitive
Static / Static Renewal / Flow-through
Temperature range: room 24.5-25.5°C
incubator 25.5-26.5°C
Test Number: 1 of 2
Remarks: D = dead, M = missing

Sample Collection: Date 10-6-97 Time 1400
Test Beginning: Date 10-7-97 Time 1400
Test Ending: Date 10-9-97 Time 1430
Organism Batch #: 40 Diluent Batch #: 41
Organism Age: <24 hours
Test Organism: Ceriodaphnia dubia

Instrument Calibrations:	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.2 @ 24.1	8.4 @ 24.0 °C	1014 @ 1012 1018 @ 1005 @ 25.4 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.7 @ 24.8	8.3 @ 24.7 °C	1054 @ 1036 1017 @ 1005 @ 25.3 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	25.2 @ 25.3	8.1 @ 26.0 °C	1054 @ 1036 1014 @ 1005 @ 25.6 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) 0 hr	UNCORRECTED Cond. (mmhos/cm) 24 h	UNCORRECTED Cond. (mmhos/cm) 48 h
Ctl	A	5	5	5	8.0		8.3	24.9		24.7	7.9	8.1	7.7	170		175
Ctl	B	5	5	5			8.2			24.4			8.0			180
Ctl	C	5	5	5			8.2			24.3			8.0			180
Ctl	D	5	5	5			8.2			24.3			8.0			180
100%	A	5	5	5	7.0		8.2	24.7		24.4	7.7		7.9	575		630
100%	B	5	5	5			8.1			24.2			7.9			620
100%	C	5	5	5			8.2			24.1			7.9			610
100%	D	5	5	5			8.1			24.2			8.0			625
Measured/Loaded by:		MF	MF	MF	MF		ND	MF		ND	MF		ND	MF		ND
Recorded by:		DW	MF	MF	DW		MF	DW		MF	DW		MF	DW		MF

Water Quality Parameters Verified by MF

	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			0.56	—	Tim McKelvey
Lab Total Residual Cl2 (mg/L):		<0.05	<0.05	D4500	ND/MF
Alkalinity (mg/L as $CaCO_3$):		70	92	Hach	ND
Hardness (mg/L as $CaCO_3$):		50	190	Hach	ND
Total ammonia (mg/L as N)		<0.07	<0.07	D1426	KR

Ammonia Control ppt Sample 41 ppt

Investigators' Signatures

Killie Kolster

Marbell Faircloth

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Crescent City WWTP
County: Putnam
Contact / District: Tim McKelvey
NPDES Permit #: FL0021610
LIMS Sample #: 193507 LIMS Job #: 97-OCT-07-13
sample log: 10-15-97 KR
Test Type: Screening / Definitive
Static / Static Renewal / Flow-through
Temperature range: room 24.5 25.5 °C
incubator 25.5 26.5 °C
Test Number: 2 of 2
Remarks: D = dead, M = missing

Sample Collection: Date 10-6-97 Time 1400
Test Beginning: Date 10-7-97 Time 1430
Test Ending: Date 10-9-97 Time 1430
Organism Batch #: 76 Diluent Batch #: well
Organism Age: 12 days
Test Organism: Cyprinella leedsi

Instrument Calibrations:	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.7 @ 24.3	8.4 @ 24.0 °C	104.4 @ 103.6 1018 @ 1005 @ 25.4 °C 10145 @ 10044
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.7 @ 24.8	8.3 @ 24.7 °C	105.1 @ 103.6 1017 @ 1005 @ 25.3 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	25.2 @ 25.3	8.1 @ 26.0 °C	105.4 @ 103.6 1014 @ 1005 @ 25.6 °C 10140 @ 10044

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) / Cond. (µmhos/cm) 0 hr	24 h	48 h
ctz A	D19	5	5	5	7.7	8.0	8.2	25.5	26.0	25.3	7.7	7.4	7.2	260	265	265
ctz B	D17	5	5	5	7.7	8.0	8.2	25.8	25.8	25.1	7.8	7.3	7.2	260	265	260
ctz C	D15	5	5	5	7.7	8.0	8.2	25.8	24.9	26.3	7.8	7.3	7.2	260	255	265
ctz D	D16	5	5	5	7.7	8.0	8.2	25.8	25.0	25.3	7.8	7.3	7.2	260	255	260
100% A	D17	5	5	5	6.9	7.3	7.8	25.1	24.8	25.4	7.6	6.9	7.2	620	635	635
100% B	D18	5	5	5	6.9	7.3	7.8	25.0	24.9	25.4	7.7	7.0	7.1	620	630	640
100% C	D19	5	5	5	6.9	7.2	7.8	24.9	25.2	25.0	7.7	6.7	7.0	620	625	640
100% D	D20	5	5	5	6.9	7.3	7.8	25.0	25.3	25.4	7.8	6.9	7.0	620	635	645
Measured/Loaded by:		DW	DW	ND	MF	MF	ND	MF	MF	ND	MF	MF	ND	MF	MF	ND
Recorded by:		MF	MF	ND	DW	DW	MF	DW	DW	MF	DW	DW	MF	DW	DW	MF

Investigators' Signatures

Billie Ralston

Marshall Faircloth

Jeff Wolf

Water Quality Parameters verified by MF

	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			0.56	—	Tim McKelvey
Lab Total Residual Cl2 (mg/L):	<0.03		<0.03	DR100	ND/MF
Alkalinity (mg/L as $CaCO_3$):	125		95	Hach	ND
Hardness (mg/L as $CaCO_3$):	125		145	Hach	ND
Total ammonia (mg/L as N):	<0.017		<0.017	Orion	KR

Ammonia Meter #98136 Ammonia Meter Slope: 56.3 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: <1 ppt

Lake Condition Index Factors

Lake Condition Index = 2 (Class A spp.) + Class B spp + ($\bar{d}$ + TP + TN + Chl a) factors

	Macroinvertebrates									
	Class A	Class B	d		TP (mg/L)		TN (mg/L)		Chl a (ug/L)	
			≥3	≥2 <3	≤0.05	>0.05 ≤0.1	≤0.6	>0.6 ≤1.0	<6	≥6 ≤10
Index Factor	+2	+1	+2	+1	+2	+1	+2	+1	+2	+1

Index Ranges

Unaltered Lakes:	≥ 20
Moderately Altered Lakes:	≥ 6 <20
Grossly Altered Lakes:	≤ 5
Unaltered but Dystrophic:	≥ 7

LAKE CONDITION INDEX

Class A

Hexagenia orlando
Cernotina truncona (= Polycentropus flavus)
Orthotrichia spp.
Oxyethira spp.*
Oecetis spp.
Palaemonetes paludosus*
Chaoborus cf. albatus
Pagastiella spp.
Paralauterborniella nigrohalteralis
Pseudochironomus spp.
Djalmabatista pulcher
Nilothauma spp.
Clinotanypus pinguis
Stictochironomus devinctus
Cryptotendipes sp.
Ablabesmyia - probably all species but annulata in particular

*mainly associated with vegetation

Class B

Caenis diminuta
Gammarus spp.
Hyalella azteca*
Gomphus spp.
Aphylla williamsoni
Pachydiplax longipennis*
Nectopsyche spp.*
Byssanodonta cubensis
Corbicula fluminea
Unionidae
Campeloma floridense
Procladius ~~bellus~~ sp.
Polypedilum halterale
P. illinoense
Nimbocera pinderi
Einfeldia spp.

*mainly associated with vegetation

Class C

Chironomus - all species but decorus and crassicaudatus in particular
Glyptotendipes paripes
Cryptochironomus spp.
Coelotanypus spp.
Tanypus spp.
Limnodrilus hoffmeisteri
Helobdella stagnalis
Hyalopyrgus aequicostatus
Viviparus georgianus
Chaoborus punctipennis
Ceratopogonidae

Phytoplankton taxa list and densities (#/mL) for the Crescent City WWTP, collected via subsurface grabs in Crescent Lake, on October 6, 1997.

	Control Site	Test Site
Bacillariophyceae		
Coscinodiscus sp.	66	75
Cyclotella sp.	49	277
Melosira sp.	1757	2617
Undetermined Pennales	–	25
Chlorophyceae		
Actinastrum sp.	–	25
Ankistrodesmus sp.	–	151
Closterium sp.	33	–
Coelastrum sp.	–	25
Elakatothrix sp.	33	–
Eudorina sp.	–	25
Oocystis sp.	16	101
Pteromonas sp.	16	25
Scenedesmus sp.	197	252
Schroederia sp.	–	75
Staurastrum sp.	16	75
Tetraedron sp.	–	25
Tetrastrum sp.	–	50
Undetermined Chlorophyceae	–	50
Cyanophyceae		
Anabaena sp	66	75
Aphanocapsa sp.	49	176
Dactylococcopsis sp.	49	126
Gloeocapsa sp	–	75
Gloeothece sp.	–	25
Merismopedia sp.	–	50
Microcystis sp.	131	176
Dinophyceae		
Peridinium sp.	–	25
Euglenophyceae		
Phacus sp.	16	–

Benthic macroinvertebrate taxa list for the Crescent City WWTP collected via Ponar grab samples in Crescent Lake, on October 6, 1997. Densities, in number/m^2, represent the mean of three replicates.

	Control Site	Test Site
Amphipoda		
Gammarus sp.	–	28
Diptera		
Chaoborus punctipennis	14	–
Chironomus sp.	–	28
Cladopelma sp.	–	14
Cladotanytarsus sp.	–	14
Coelotanypus sp.	28	125
Conchapelopia sp.	28	–
Glyptotendipes paripes	–	14
Glyptotendipes sp.	–	14
Paralauterborniella nigrohalterale	–	14
Probezzia sp.	42	–
Procladius sp.	–	111
Stictochironomus devinctus	42	–
Undetermined Chironomidae	–	14
Gastropoda		
Littoridinops monroensis	–	806
Undetermined Hydrobiidae	42	264
Isopoda		
Cyathura polita	500	14
Oligochaeta		
Haber speciosus	–	14
Ilyodrilus templetoni	14	–
Limnodrilus hoffmeisteri	736	292
Pelecypoda		
Undetermined Sphaeriidae	69	14

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0021610 11	12 970604 17	18 X	19 S	20 I

Remarks

21 66

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0021610 11	12 970606 17	18 X	19 S	20 I

Remarks

21 66