

Biological Assessment of

River Haven Village
Wastewater Treatment Facility

Citrus County

FLA011905

Sampled September 1995

January 1996

Biology Section
Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: River Haven Village WWTF
County: Citrus
NPDES Number: No NPDES permit
State Permit Expiration Date: 30 October 1990

Toxics Sampling Inspection (XSI)

Results: Not sampled.

Compliance Biomonitoring Inspection (CBI)

Results: Not sampled.

Impact Bioassessment Inspection (IBI)

Date Sampled: 26 September 1995

Results: Quantitative measures of benthic macroinvertebrate community health indicated no adverse effects associated with the percolation ponds. Invertebrate populations at both sites reflected the harsh conditions found in a tidal wetland, which include periodic desiccation, salinity fluctuations, and the anaerobic conditions associated with decaying vegetation. While Hester-Dendy taxa richness and Shannon-Weaver diversity were very low at both sites, the test site values were actually improved compared to the background wetland. Other pollution sensitivity measures, such as the Florida Index, the macroinvertebrate component of the Lake Condition Index, and the EPT Index were all zero at both sites, additional evidence of the harsh conditions present at these wetlands. Several periphyton parameters suggested disturbance at the test site, when compared with the reference site. These included reductions in taxa richness, Shannon-Weaver diversity, and the diatom to blue-green ratio. Conversely, there was a rather dramatic decrease in chlorophyll *a* between the reference site (82.7 mg/m^2) and the test site (7.3 mg/m^2). Since nutrient concentrations were similar at both study sites, one potential explanation for these algal differences involves shading of the periphyton by *Lemna* sp. (duckweed), which was abundant at the test site, but absent from the reference site.

Water Quality Inspection (WQI)

Date Sampled: 26 September 1995

Results: Dissolved oxygen was less than Class III Water Quality Standards at both sites, ranging from 0.3 mg/L at the test site to 1.3 mg/L at reference site. Wastewater in the River Haven percolation ponds did not appear to be affecting the nutrient regime of the surrounding wetlands. Nutrients at the test site were either the same as, or lower than those found at the background wetland area. AGP at the reference site (17.4 mg dry wt/L) and at the test site (23.7 mg dry wt/L) both exceeded the "problem threshold" of 10 mg dry wt/L for marine waters.

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 River Haven Village Wastewater Treatment Facility is located in Citrus County, Florida (see maps in Appendix). Treatment consists only of extended aeration at this 0.1 MGD privately owned domestic wastewater facility. Effluent is then discharged into three percolation ponds with a surface area of approximately three acres. State permit limits are as follows: flow (.065 MGD maximum), pH (6 - 8.5 SU), BOD (30 mg/L maximum), TSS (30 mg/L maximum), NO_3 (12 mg/L maximum), and fecal coliform bacteria (200 organisms/100 mL). Mean flow to the percolation ponds has been 0.045 MGD. The facility has no direct surface water discharge. This study was performed to determine if leachate from the holding ponds, which are situated next to wetlands, may be affecting adjacent waters of the State.

Major characteristics of invertebrate community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	5	12
% Contribution of Dominant Taxon	20	61.5
Florida Index	0	0
Lake Condition Index (macro portion)	0	0
EPT Index	0	0
% Oligochaeta	20	6
% Diptera	80	79.5
% Odonata	0	6
% Coleoptera	0	1.2
% Predators	0	25.3
% Above Surface Deposit Feeders	70	32.5
% Below Surface Deposit Feeders	20	6
% Suspension Feeders	0	1.8
% Scrapers	0	2.4
% Shredders	10	31.9
Macroinvertebrate Hester-Dendy		
Number of Taxa	3	10
Shannon-Weaver Diversity	1.2	1.5
Florida Index	0	0
Lake Condition Index (macro portion)	0	0
EPT Index	0	0
% Oligochaeta	8.4	0
% Diptera	25	92.7
% Gastropoda	66.6	0
% Odonata	0	3.1
% Other	0	1
% Predators	0	25
% Above Surface Deposit Feeders	12.5	37.5
% Below Surface Deposit Feeders	8.4	0
% Suspension Feeders	0	0.5
% Scrapers	66.6	0
% Shredders	12.5	35.9

Methods

The focus of this investigation was to determine the discharger's effects on the surrounding waters. A comparison of biological community health was made between a reference site (located approximately 500 meters west of the facility), and a test site 50 meters from the percolation ponds (see maps in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical and nutrient data were also collected on the study sites. Since there was no direct surface water discharge, the effluent was not analyzed for toxicity, metals, or organic constituents. Several other parameters normally associated with these studies, including fecal and total coliforms, TSS, and total residual chlorine, were not sampled.

Benthic macroinvertebrate communities were evaluated at the reference and test site. Invertebrates were collected from multiple substrates (e.g., snags, leaf packs, vegetation) using discrete dip net sweeps. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Periphyton was sam-

Major characteristics of algal community structure of control and test sites.

	Reference Site	Test Site
Periphyton Algae		
Number of Taxa	38	20
Shannon-Weaver Diversity	3.8	2.1
Algal Density (#/sq. cm)	121,288	62,508
Chlorophyll a (mg/sq. m)	82.7	7.3
Diatom/Diatom + B-G Abundance Ratio	0.8	0.1
% Blue-green	13.6	83.9
% Green	37.1	10
% Diatoms	48.8	6.1
Phytoplankton Algae		
Number of Taxa	21	19
Shannon-Weaver Diversity	3	2.7
Algal Density (#/mL)	45,113	30,414
% Blue-green	10.5	81.8
% Green	6.5	6.6
% Diatoms	3.6	9.4
% Euglenophyceae	20.7	1.7
% Dinophyceae	16.6	0
% Chrysophyceae	3.6	9.4
% Cryptophyceae	38.5	0.6
Algal Growth Potential (mg dry wt/l) salinity adjusted	17.4	23.7

pled at both reference and test sites by incubating glass microscope slides in a standard periphytometer for 28 days. Phytoplankton was also sampled at both reference and test sites. Chlorophyll *a* was determined for periphyton communities (Ross 1990). Algal Growth Potential tests, using *Dunaliella tertiolecta*, were performed on both the reference and test site, following EPA (1974).

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. The macroinvertebrate component of the Lake Condition Index (Hulbert 1990) was employed to assess the lentic sites sampled in this survey. Species sensitivity data from other sources, such as Hudson *et al.* (1990), Lenat (1993), Farrell (1992), Chang *et al.* (1992), and Whitmore (1989), are used as appropriate.

Ephemeroptera/Plecoptera/Trichoptera Index: This is the sum of the number of EPT taxa present. Higher EPT values are associated with healthier systems.

Community structure: Substantial shifts in proportions of major groups of organisms, compared to reference conditions, may indicate degradation. In marine systems, an increase in the % tubificid oligochaetes, a decrease in the % pelecypods, and a decrease in the number of polychaete taxa are all considered indicators of disturbance (Engel *et al.* 1994).

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.

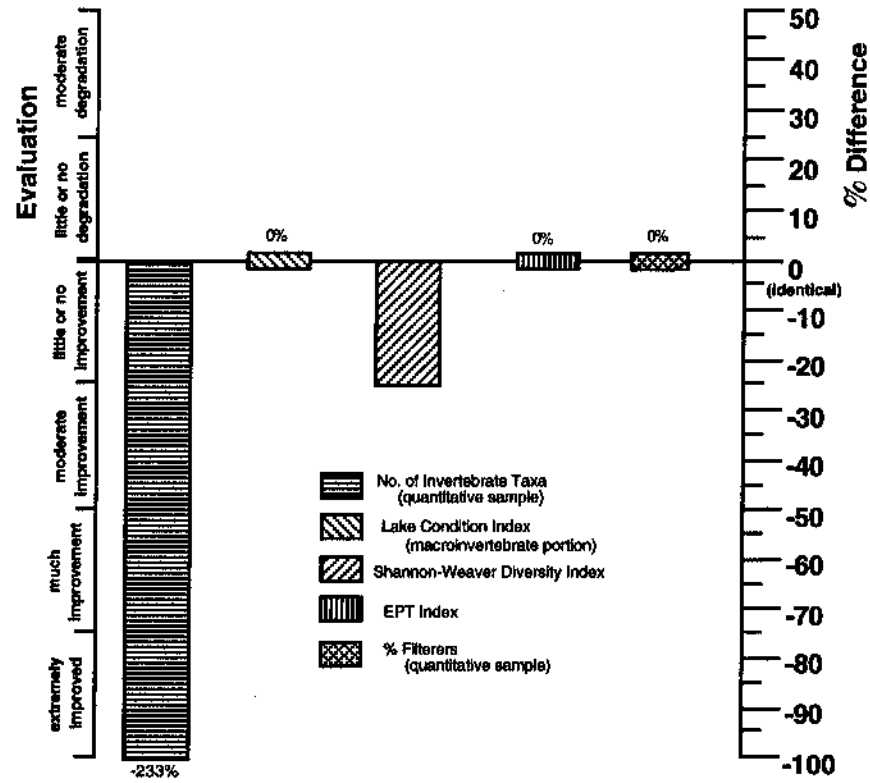
Trophic composition/feeding guilds: Disturbance can shift the feeding strategies of invertebrates.

In Florida for example, pollution may be responsible for reducing the numbers of filter-feeders (FDEP 1994) and shredders (EA Engineering 1994).

The Stream Condition Index for Florida (SCI) is a composite macroinvertebrate metric (EA Engineering 1994). The SCI assigns points to a variety of parameters, depending on how closely each parameter approaches an expected reference condition (see SCI calculation table in Appendix).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, the macroinvertebrate component of the Lake Condition Index, the EPT Index, the diatom to blue-green algae ratio, and the % filter-feeders are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving algal density, chlorophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Lisa Carter, Phyllis James, and Andrea Grainger (DEP Southwest District) and Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Elizabeth Miller, Urania Quintana, Sonia Razzaque, Lisa Tamburello, and Vicki Whiting, (Tallahassee Biology Laboratory). 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.

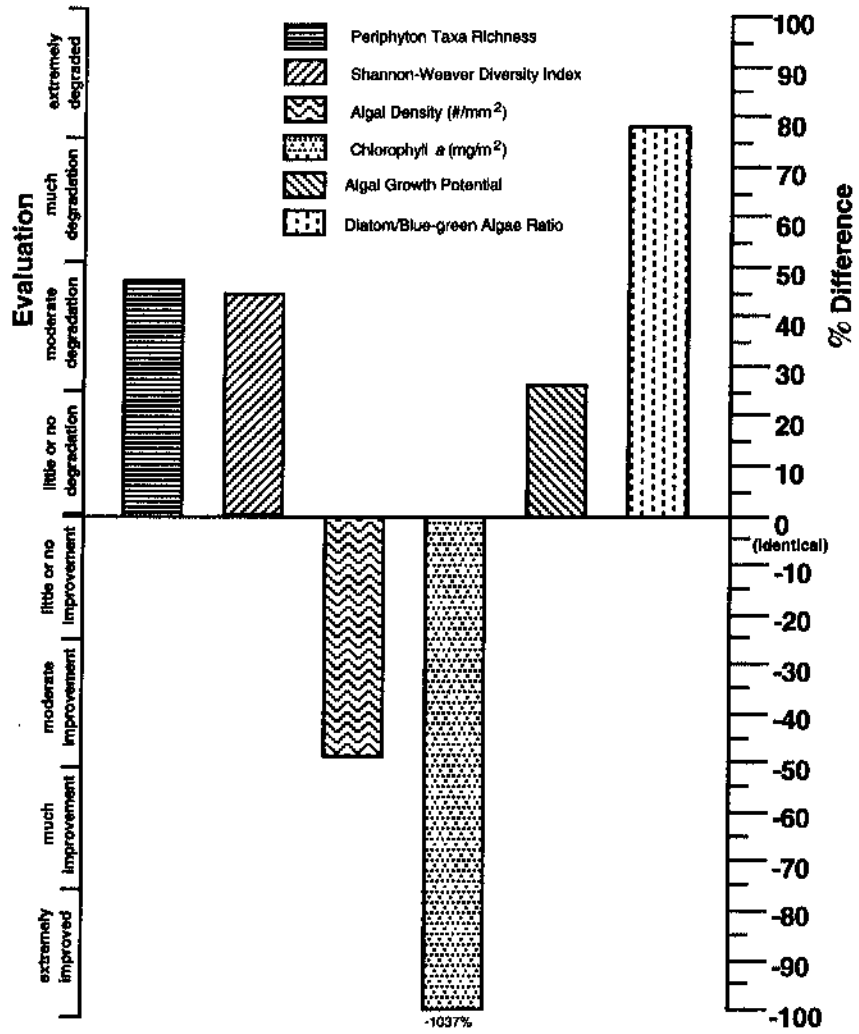


Effect of discharge on the benthic macroinvertebrate community.

Results and Discussion

The study sites were situated in tidally influenced wetland systems adjacent to the Homosassa River. Typical vegetation at the reference site, which was at the edge of a large sawgrass marsh, included red cedar, red maple, sabal palm, and red bay. The test site, located approximately 500 m southeast of the reference site, was vegetated by these same species, as well as by wax myrtle, sawgrass, elderberry, *Bacopa* spp., Canna lilies, and duckweed. Habitat quality was significantly better at the reference site (with 113 points) than at the test site (with 62 points). It should be noted, however, that these habitat assessments were based on stream criteria, and therefore, are not completely applicable to wetland systems. The test site had fewer available macroinvertebrate substrates, which were more covered by organic detritus than at the reference site. There was more disturbance from channelization near the test site, which also had a reduced riparian zone buffer width. Sediment at both the reference and test sites had an anaerobic odor, but the test site also smelled strongly of hydrogen sulfide.

Water was clear and slightly tannic at both stations. Dissolved oxygen was less than Class III Water Quality Standards at both sites, ranging from 0.3 mg/L at the test site to 1.3 mg/L at reference site. The specific conductance was slightly lower at the test site (3,850 µhmos/cm) than at the reference site (4,585 µhmos/cm). This is



Effect of discharge on the algal community.

equivalent to approximately 2 ppt to 2.5 ppt salinity. This salinity range is inhospitable to the majority of freshwater and marine taxa. Water temperature was similar at both sites (25.2 °C at the test site and 25.6 °C at the reference site), while the pH was lower at the test site (6.8 SU) than the reference site (7.6 SU).

Wastewater in the River Haven percolation ponds did not appear to be affecting the nutrient regime of the surrounding wetlands. Total Kjeldahl Nitrogen (2.8 mg/L), total phosphorus (0.2 mg/L), and nitrate-nitrite concentrations (undetected) were identical at both the reference and the test sites. Ortho-phosphate (0.2 mg/L at the reference site, 0.1 mg/L at the test site) and ammonia (0.3 mg/L at the reference site, undetected at the test site) were actually lower near the percolation ponds than at the background wetland area.

Algal growth potential (AGP) tests were adjusted to satisfy the salinity requirements of *Dunaliella tertiolecta*, a marine alga. Values at the reference site (17.4 mg dry wt/L) and at the test site (23.7 mg dry wt/L) both exceeded the "problem threshold" of 10 mg dry wt/L for marine waters (Ron Raschke, USEPA, personal communication).

Quantitative measures of benthic macroinvertebrate community health indicated no adverse effects associated with the percolation ponds. The Figure on p. 3 indicates the degree of difference between the invertebrate populations of the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the reference.

Invertebrate populations at both sites reflected the harsh conditions found in a tidal wetland, which include periodic desiccation, salinity fluctuations, and the anaerobic conditions associated with decaying vegetation. While Hester-Dendy taxa richness (3 taxa at the reference site, 10 taxa at the test site) and Shannon-Weaver diversity measurements (1.2 at the reference site, 1.5 at the test site) were very low at both sites, the test site values were actually improved compared to the background wetland. Other pollution sensitivity measures, such as the Florida Index, the macroinvertebrate component of the Lake Condition Index, and the EPT Index were all zero at both sites, additional evidence of the harsh conditions present at these wetlands. Most of the taxa present, including *Chironomus* sp., *Littoridinops monroensis*, and *Limnodrilus hoffmeisteri* at the reference site, and *Polypedilum trigonum*, *Monopelopia boliekae*, and *Libellula incesta* at the test site, are relatively common in sawgrass marshes.

The Figure on this page represents changes in the periphyton community. As was noted with the macroinvertebrates, larger differences (that is, higher percentages) correspond with greater degrees of

degradation. Several periphyton parameters suggested disturbance at the test site. Periphyton taxa richness decreased from 38 taxa at the reference site to 20 taxa at the test site, Shannon-Weaver diversity dropped from 3.8 to 2.1, and the diatom to blue-green ratio was reduced from 0.8 at the reference site to 0.1 at the test site. Conversely, there was a rather dramatic decrease in chlorophyll *a* between the reference site (82.7 mg/m^2) and the test site (7.3 mg/m^2). Since nutrient concentrations were similar at both study sites, one potential explanation for these algal differences involves shading of the periphyton by *Lemna* sp. (duckweed), which was abundant at the test site, but absent from the reference site.

Conclusions

Effluent was not sampled at this facility because there was no direct discharge into surface waters.

Dissolved oxygen was less than Class III Water Quality Standards at both sites, ranging from 0.3 mg/L at the test site to 1.3 mg/L at reference site.
Wastewater in the River Haven percolation ponds did not appear to be affecting the nutrient regime of the surrounding wetlands. Nutrients at the test site were either the same as, or lower than, those found at the background wetland area.

Algal growth potential at the reference site (17.4 mg dry wt/L) and at the test site (23.7 mg dry wt/L) both exceeded the "problem threshold" of 10 mg dry wt/L for marine waters.

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Chemistry summary table for

River Haven WWTF	Reference Site	Test Site
Nutrients (mg/L)		
Ortho-phosphate	0.2	0.1
Total phosphorus	0.2	0.2
Ammonia	0.3	0.02 U
Nitrate+Nitrite	0.02 U	0.02 U
TKN	2.8	2.8
General Phys-Chem Parameters		
Habitat Assessment	113	62
D.O. (mg/L)	1.3	0.3
pH (SU)	7.6	6.8
Conductivity (µmhos/cm)	4585	3850
Temperature (°C)	25.6	25.2
Biological Oxygen Demand, 5 day (mg/L)	3 *	3.5
Fecal coliform bacteria (org/100 mL)	60 J	120 J
Total coliform bacteria (org/100 mL)	380 J	240 J
Algal Growth Potential (mg dry wt/L) Salinity-adjusted	17.4	23.7

J - Estimated value

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

* Carbonaceous BOD was measured at the reference site

Typical Values for Selected Parameters in Florida Waters

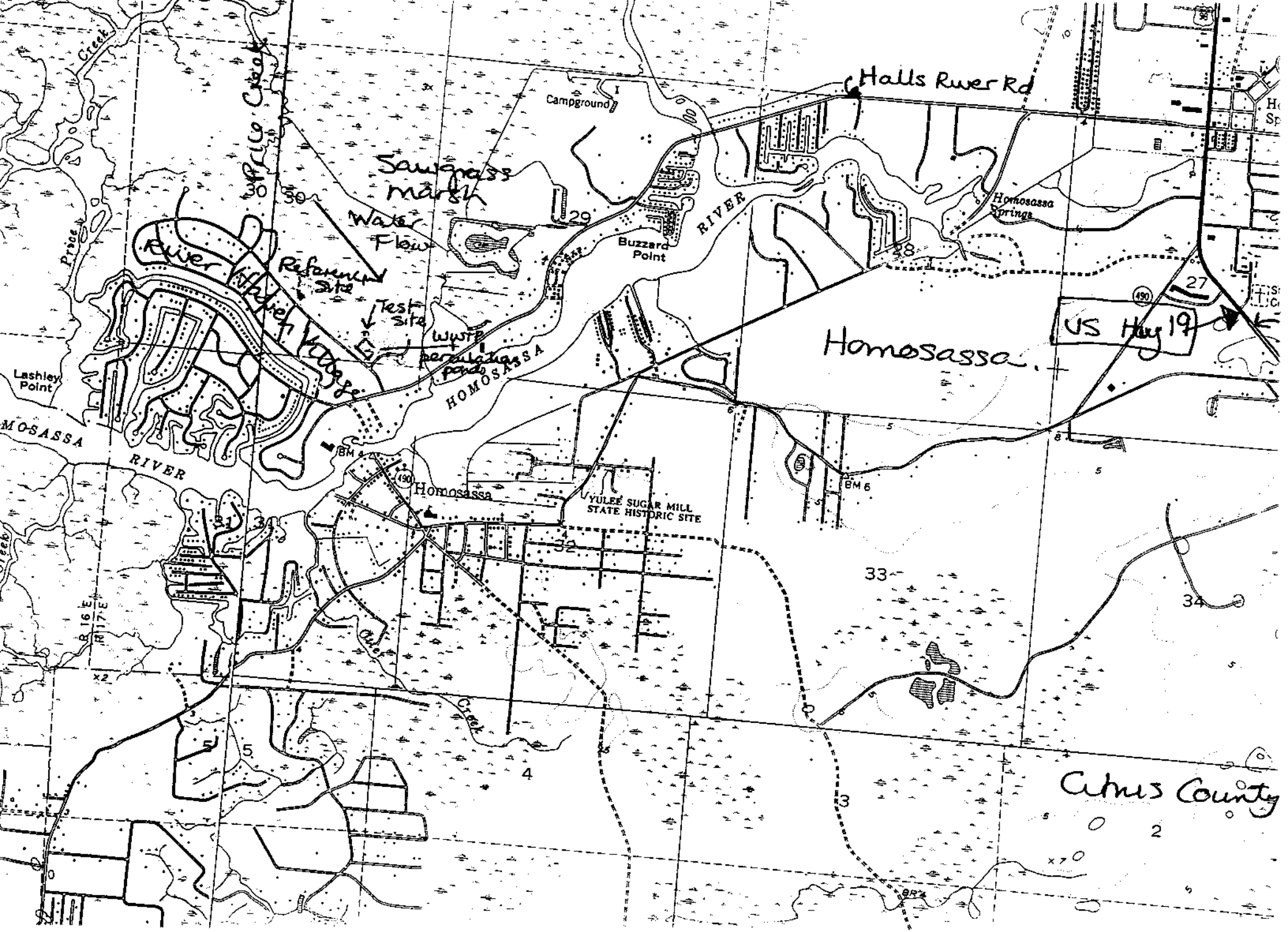
Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

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


Halls River Rd
Campground
Sawgrass marsh
Water Flow
Reference Site
Test Site
Waste percolation pond
River Wilderness Village
Buzzard Point
RIVER
Homosassa Springs
US Hwy 19
Homosassa
HOMOSASSA
Lashley Point
MOSASSA
RIVER
BM 6
YULEE SUGAR MILL STATE HISTORIC SITE
Citrus County
Creek
Prine Creek
R 16 E
R 17 E

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: Rivr Haven Village WWTP	Date Summary Prepared: 9-26-95	
Location (attach detailed map):	County: CITRUS	District: SWD
Federal Permit # and expiration date: NA	State GMS # and 4009P05958 State expiration date: Consent Order 93-1640	Facility Type: DW Industrial Municipal Federal Agricultural Other (list): PRIVATE

Function of facility:
Domestic Wastewater

Description of treatment process:
0.100 mgd extended air with discharge to 3.0 ± A. of Percolation Ponds

Receiving waters: NO DISCHARGE—	Classification: I II III	
Design Flow: 0.100	Mean Flow: .045	Flow during survey:

Discharge is: Continuous Intermittent Seasonal Rainfall dependent
Other (describe) NO DISCHARGE TO ADJACENT waters.
therefore, the best time to sample is:

If facility has a mixing zone, give details (size, parameters affected, etc.):
NA —

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

Parameter	Limit (units)
SECONDARY TREATMENT.	

Describe special permit conditions and permit modifications:

Riverhaven STP
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s):

NA —

List permit violations (from MOR data or other source) and plant upsets that occurred within past year:

Percolation ponds #1 AND #2 ARE located ADJACENT to waters of the state (OFW) AND the zone of discharge from the ponds may impact adjacent waters.

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:

NONE

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:

Additional information:

Staff contributing to this review (signature):

(Biologist)

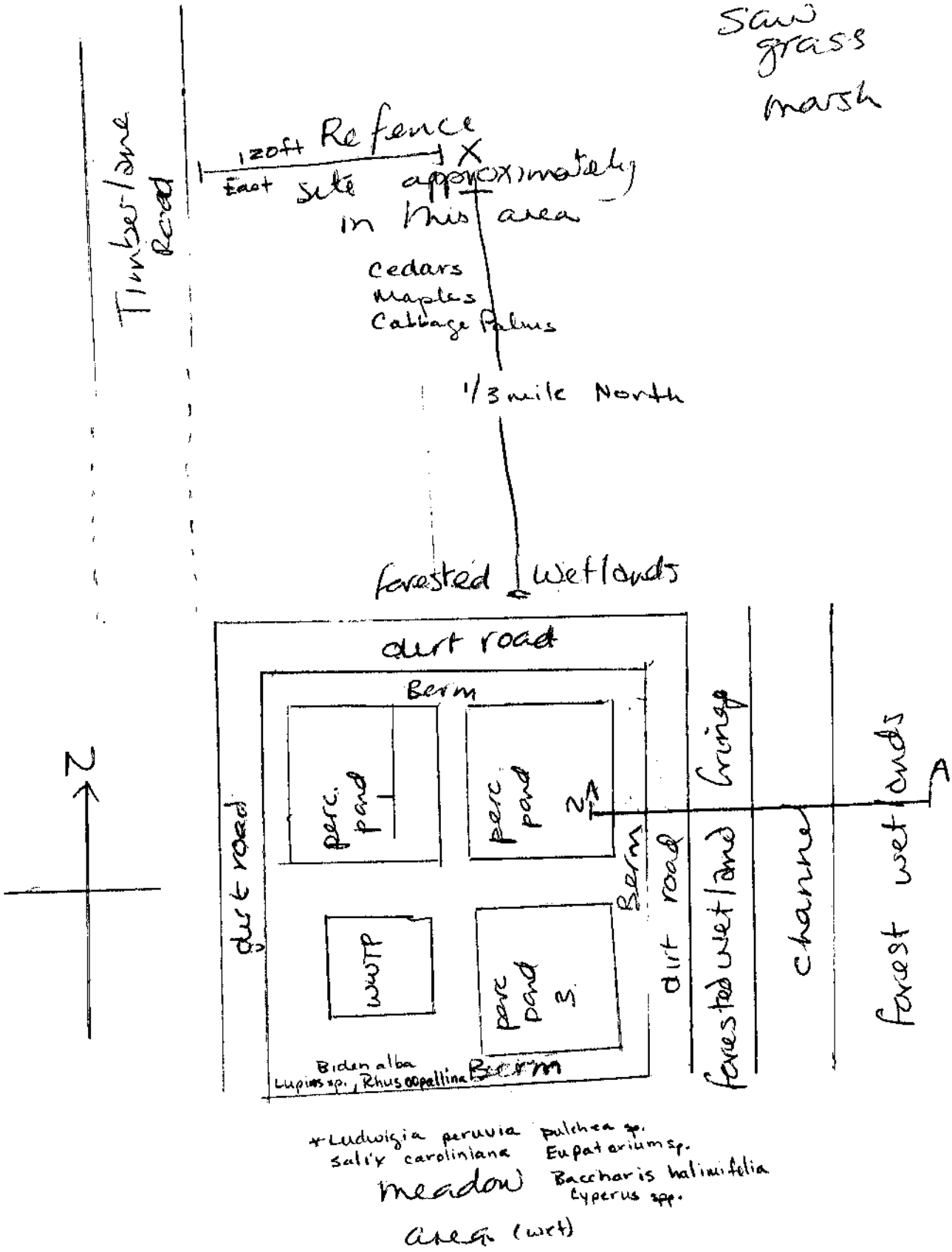
(Inspector)

(Engineer)

( )

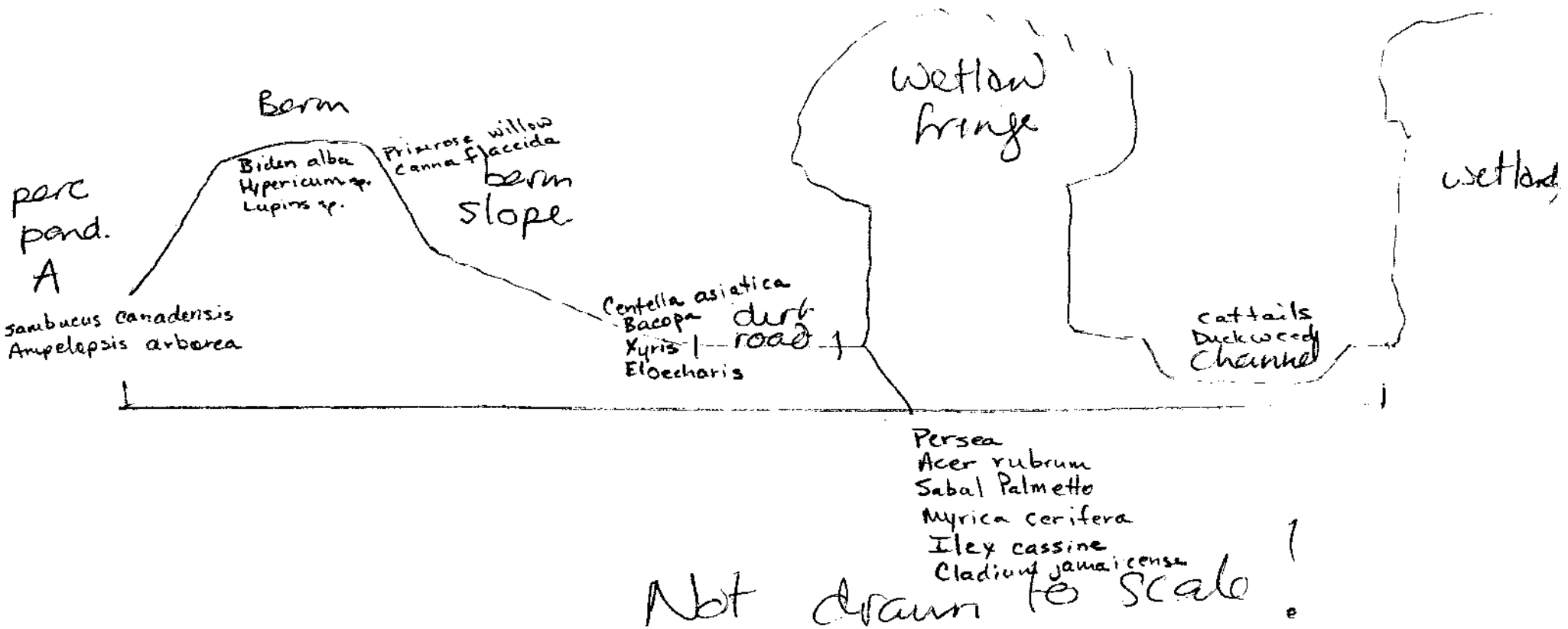
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Plan View Not drawn to scale

Cross-Section A-A



Not drawn to scale!

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (v2)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		9/26/95	wetlands to Price Creek then Homosassa River

REMARKS:	LOCATION:	FIELD ID/NAME:
Area is predominantly an undisturbed Sawgrass marsh	River Haven Village WWTP	Reference Site

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Sawgrass marsh → Bottom Substrate/ Available Cover **20**	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs (partially decayed), undercut banks, rubble, or other stable habitat. **(20)** 19 18 17 16	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. 5 4 3 2 1
Water Velocity **2**	Max. observed: >0.25 m/sec. but < 2 m/sec 20 19 18 17 16	Max. observed; 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed; 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec 5 4 3 **(2)** 1
Artificial Channelization **15**	No artificial channelization or dredging. Stream with normal, sinuous pattern 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
Deposition **18**	Less than 20% of habitats affected by ~~sand or silt~~ detritus 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 **18**	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 [redacted] 20	Over 80% of streambank surfaces consist of native plants, including trees understory shrubs, or non-woody macrophytes. Plants growing naturally. **(20)** 19 18 17 16	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, but one or two 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. 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.

113 [redacted] **TOTAL SCORE**

Comments: This site is fairly pristine. Very nice Sawgrass marsh.

ANALYSIS DATE:	ANALYST:	SIGNATURE:
9/26/95	Andrea Grainger / Lisa Carter	Andrea Grainger

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		9/26/95	2 00	Wetlands to Price Creek to Homosassa River

REMARKS:	LOCATION:	FIELD ID/NAME:
HP were in area with heavy canopy.	River Haven Village WWTP.	Reference Site

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
70%				30%			

Local Watershed Erosion (check box): None [X] Slight [ ] Moderate [ ] Heavy [ ]

Local Watershed NPS Pollution (check box): No evidence [ ] Some potential sources [X] Obvious sources [ ]

Width of riparian vegetation (m) on least buffered side: 30m

List & map dominant vegetation on back

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)

Artificially Channelized [ ] no / Artificially Impounded [ ] yes — recent, severe [ ] some recovery [ ] mostly recovered, more sinuous [X]

High Water Mark (m above bed): 0.2m

Canopy Cover % : Open : [ ] Lightly Shaded (11-45%): [X] Moderately Shaded (46-80%): [ ] Heavily Shaded: [ ]

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: [ ] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Anaerobic: [X] Other: [ ] normal swamp

Sediment Oils: Absent: [X] Slight: [ ] Moderate: [ ] Profuse: [ ]

Sediment Deposition: Sludge: [ ] Sand smothering: none [ ] slight [ ] moderate [ ] severe Silt smothering: none [ ] slight [ ] moderate [ ] severe Other: organic detritus

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand			
Leaf Packs or Mats				Mud/Muck/Silt	10	5	dip net
Aquatic Vegetation	70%	10	dip net	Other: Detritus	20	5	dip net
Rock or Shell Rubble				Other:			
Shorezone (Roots/Veg.)				*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	Surface	25.95	7.58	1.26	458.5	2.5		VOB
Mid-depth								
Bottom								

System Type : Stream: [ ] (1st - 2nd order / 3rd - 4th order / 5th - 6th order / 7th order or greater) Lake: [ ] Wetland: [X] Estuary: [ ] Other: [ ] _____

Water Odors (check box): Normal: [ ] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Other: [X] anaerobic

Water Surface Oils (check box): None: [X] Sheen: [ ] Globs: [ ] Slick: [ ]

Clarity (check box): Clear: [X] Slightly turbid: [ ] Turbid: [ ] Opaque: [ ]

Color (check box): Slightly Tannic: [X] Green (algae): [ ] Clear: [ ] Other: [ ] _____

Weather Conditions/Notes:

Sunny, few clouds, breezy

Abundance:	Absent	Rare	Common	Abundant
Periphyton	[ ]	[ ]	[X]	[ ]
Fish	[ ]	[ ]	[ ]	[X]
Aquatic Macrophytes	[ ]	[ ]	[ ]	[X]
Iron/sulfur Bacteria	[X]	[ ]	[ ]	[ ]

SAMPLING TEAM:	SIGNATURE:	DATE:
Andrea Grainger / Lisa Carter	Andrea Grainger	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		9/26/95	1200	Wetlands to Price Creek then to Homosassa River

REMARKS:	LOCATION:	FIELD ID/NAME:
Water surface had 1½ inch ~~blanket~~ mat.	River Haven Village WWTP	Test Site

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
30%							70% domestic waste to WWTP

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

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

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

List & map dominant vegetation on back

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)

20 to 25m wide.

Artificially Channelized ☐ no ☐ ☒ ☐
Artificially Impounded ☐ yes
recent, severe — some recovery — mostly recovered, more sinuous

High Water Mark (m above bed): 0.2

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

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: ☐ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Anaerobic: ☒ Other: ☐ HIGH H_2S content

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

Sediment Deposition: Sludge: ☐ Sand smothering: none slight moderate severe Silt smothering: none slight moderate severe (Other: decayed wood debris)

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	5	~~by~~ 2	dipnet	Sand			
Leaf Packs or Mats	10	6	dipnet	Mud/Muck/Silt	60	6	dipnet
Aquatic Vegetation	25	6	dipnet	Other:			
Rock or Shell Rubble				Other:			
Shorezone (Roots/Veg.)				*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	~~Sal~~	Secchi (m):
Top	N/M	25.23	6.78	0.30	3850	2.1		Not measured due to lemna
Mid-depth								
Bottom								

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: ☒ H_2S

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

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

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

Weather Conditions/Notes:
Sunny, breezy and few to no clouds
see screen for notes.

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

PTO

SAMPLING TEAM: Andrea Granger/Lisa Carter

SIGNATURE: Andrea Granger / Lisa Carter

DATE: 9/26/95

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (v2)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		9/26/95	wetlands to Price Creek then to Manasota River

REMARKS:	LOCATION:	FIELD ID/NAME:
Sunny, few clouds, breezy	River Haven Village WWTP	TEST SITE

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Bottom Substrate/ Available Cover [10]	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs (partially decayed), undercut banks, rubble, or other stable habitat. 20 19 18 17 16	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. (10) 9 8 7 6	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. 5 4 3 2 1
Water Velocity [1]	Max. observed: >0.25 m/sec. but < 2 m/sec 20 19 18 17 16	Max. observed; 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed; 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec 5 4 3 2 (1)
Artificial Channelization [8]	No artificial channelization or dredging. Stream with normal, sinuous pattern 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
Deposition Thick organic deposition of decaying woody material [4]	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 [13]	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 [8]	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 [18]	Over 80% of streambank surfaces consist of native plants, including trees understory shrubs, or non-woody macrophytes. Plants growing naturally. 20 19 (18) 17 16	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, but one or two 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. 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.

[62] TOTAL SCORE

Comments: Deposition of rotting woody material was extremely high + a nuisance - like, H2S overwhelming

ANALYSIS DATE:	ANALYST:	SIGNATURE:
9/26/95	Andrea Grainger, Lisa Carter	Andrea Grainger

Benthic macroinvertebrate taxa list for River Haven WWTF, collected via Hester-Dendy artificial substrates in Price Creek Marsh, on 26 September, 1995. Densities, in number/m^2, represent the mean of three replicates.

	Reference Site	Test Site
Oligochaeta		
Limnodrilus hoffmeisteri	2	-
Gastropoda		
Littoridinops sp.	4	-
Littoridinops monroensis	12	-
Odonata		
Enallagma sp.	-	2
Erythemis sp.	-	2
Libellula incesta	-	2
Undetermined Coenagrionidae	-	4
Undetermined Odonata	-	2
Hemiptera		
Mesovelia sp.	-	2
Diptera		
Chironomus sp.	6	-
Larsia berneri	-	2
Monopelopia boliekae	-	26
Odontomyia sp.	-	2
Polypedilum sp.	-	6
Polypedilum trigonum	-	131
Stratiomys sp.	-	2
Tribelos atrum	-	2
Undetermined Chironomidae	-	6

Benthic macroinvertebrate taxa list for River Haven WWTF, collected via 20 discrete dip net sweeps in Price Creek Marsh, on 26 September, 1995.

	Reference Site	Test Site
Oligochaeta		
Bratislavia unidentata	1	-
Dero trifida	-	4
Limnodrilus hoffmeisteri	-	1
Gastropoda		
Physella sp.	-	2
Odonata		
Erythemis sp.	-	4
Ischnura sp.	-	1
Undetermined Coenagrionidae	-	4
Coleoptera		
Undetermined Curculionidae	-	1
Diptera		
Chironomus sp.	1	-
Goeldichironomus sp.	1	-
Kiefferulus sp.	1	-
Larsia sp.	-	2
Larsia berneri	-	3
Larsia decolorata	-	2
Monopelopia boliekae	-	4
Odontomyia sp.	1	-
Polypedilum trigonum	-	51
Stratiomys sp.	-	2
Tanytarsus sp.	-	1
Undetermined Chironomidae	-	1

Phytoplankton taxa list and densities (#/mL) for River Haven WWTF, collected via subsurface grabs in Price Creek Marsh, on 26 September, 1995.

	Reference Site	Test Site
Cyanophyta		
Aphanocapsa sp.	731	1848
Chroococcus sp.	-	168
Dactylococcopsis sp.	-	5209
Gomphosphaeria sp.	183	-
Lyngbya sp.	-	168
Merismopedia sp.	1826	-
Microcystis sp.	548	1848
Oscillatoria sp.	183	14,955
Raphidiopsis sp.	-	336
Spirulina sp.	365	336
Undetermined Cyanophyceae	913	-
Chrysophyta		
Mallomonas sp.	1644	-
Bacillariophyta		
Amphora sp.	365	-
Bacillaria sp.	183	-
Chaetoceros sp.	-	336
Cyclotella sp.	183	168
Diploneis sp.	-	168
Melosira sp.	-	168
Navicula sp.	548	1008
Nitzschia sp.	365	840
Pennales	-	168
Chlorophyta		
Botryococcus sp.	183	-
Chlorella sp.	183	336
Chlorococcum sp.	-	168
Cosmarium sp.	183	-
Dunaliella sp.	1461	-
Gloeocystis sp.	-	168
Undetermined Chlorophyceae	913	1344
Euglenophyta		
Euglena sp.	4931	-
Eutreptia sp.	1279	-
Phacus sp.	2192	504
Undetermined Euglenophyceae	913	-
Dinophyta		
Peridinium sp.	913	-
Undetermined Dinophyceae	6575	-
Cryptophyta		
Cryptomonas sp.	17,351	168

Periphyton taxa list and densities (#/cm^2) for River Haven WWTF, collected via glass microscope slides in Price Creek Marsh, on 26 September, 1995.

	Reference Site	Test Site
Cyanophyta		
Anabaena sp.	600	-
Aphanocapsa sp.	-	815
Dactylococcopsis sp.	1501	544
Lyngbya sp.	600	272
Merismopedia sp.	300	-
Microcystis sp.	600	19,024
Oscillatoria sp.	10,207	30,710
Spirulina sp.	600	272
Synechococcus sp.	-	815
Undetermined Cyanophyceae	1501	-
Undetermined Scytonemataceae	600	-
Bacillariophyta		
Achnanthes exigua	6305	-
Achnanthes hauckiana	600	-
Achnanthes hungarica	-	544
Achnanthes lanceolata	300	-
Achnanthes linearis	600	-
Amphora sp.	300	-
Amphora acutiuscula	3002	-
Bacillaria paradoxa	600	272
Caloneis sp.	-	272
Cocconeis placentula	-	272
Diploneis sp.	300	-
Fragilaria sp.	-	544
Fragilaria construens	-	272
Fragilaria pinnata	-	272
Gomphonema affine	3002	-
Gomphonema parvulum	-	272
Navicula capitata hungarica	2702	272
Navicula minima	600	-
Navicula oblonga	300	-
Navicula rhynchocephala	300	-
Navicula viridula	8706	272
Nitzschia amphibia	901	272
Nitzschia fonticola	3002	272
Nitzschia frustulum	1501	-
Nitzschia microcephala	600	-
Nitzschia obtusa	600	-
Nitzschia palea	24,318	-
Pennales	600	-

Chlorophyta		
Actinastrum sp.	2702	5164
Characium sp.	5404	-
Chlamydomonas sp.	1201	-
Chlorococcum sp.	-	1087
Cosmarium sp.	300	-
Dunaliella sp.	300	-
Gloeocystis sp.	600	-
Oedogonium sp.	3903	-
Scenedesmus sp.	300	-
Stigeocloniums sp.	30,322	-
Euglenophyta		
Phacus sp.	300	-
Dinophyta		
Cryptomonas sp.	300	-