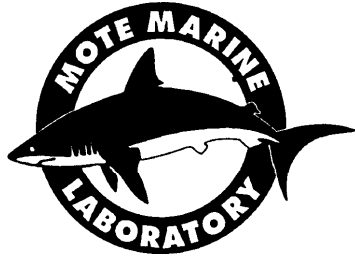


# CHASSAHOWITZKA NATIONAL WILDLIFE REFUGE STATUS AND TRENDS



## A Report

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## **ABSTRACT**

Shallow water environments offshore of the Chassahowitzka River, west-central Florida, were sampled for submerged aquatic vegetation and water quality to establish baseline estuarine conditions in a relatively unstudied national wildlife refuge, and identify indicators of trophic status. Samplings were a continuation of a program begun in May 1996 and were conducted during Spring (May 1997) and early Fall (September 1997) to characterize conditions accompanying historical minimum and maximum periods of freshwater inflow. Stations were also selected to characterize conditions within the Chassahowitzka and Homosassa Rivers, within tidal creeks between the two rivers, and at several of the major spring vents of the Chassahowitzka Spring complex.

Chassahowitzka Bay is a large, shallow (< 2 m), exposed mosaic of saltmarsh, seagrass beds, and algal assemblages growing on an extensive karstified limestone shelf. Algal and/or seagrass cover was nearly continuous with moderate densities. Drift algae, followed by *Caulerpa paspaloides* were the most common species during the spring samplings with reduced drift algal densities during the fall sampling of 1997. Other changes in species abundances and density were also noted.

The water column during the study was well mixed and nutrients, chlorophyll, and trophic state indices were low, indicating "Good" water quality overall. The northern region apparently received a higher nutrient loading than the southern region, as indicated by higher trophic state indices. Algal growth was nitrogen limited in the coastal region and nitrate contributed by the Chassahowitzka Springs was rapidly removed from the water column within the Chassahowitzka River. From the main spring to offshore, organic nitrogen in the water column increased with increasing salinity. Biomass along the riverine gradient was bimodal with minimum values near the mouth of the Chassahowitzka River in a zone of high salinity variation. Sediment nutrient concentrations also displayed spatial patterns. The nitrogen content of sediment organics was relatively consistent, while phosphorus appeared to be preferentially released.

As nitrogen loadings from both groundwater discharge and atmospheric deposition appear to be increasing, continued monitoring should concentrate on obtaining the data necessary to evaluate trends in water quality and submerged aquatic vegetation. For trend detection, more frequent sampling is desirable.

## **INTRODUCTION**

The Chassahowitzka National Wildlife Refuge, under the management of the U.S. Fish and Wildlife Service, is a 115 square kilometer area that encompasses the mouth and a portion of the Chassahowitzka River as well as numerous islands and near-shore marine waters out to a distance of between 1 and 3 kilometers offshore. Located on the central west coast of Florida, this shallow portion of the Gulf of Mexico is receiving more attention as trends of increasing nutrients in

groundwater discharges are documented (Jones *et al.*, 1997; Dixon, 1997). Atmospheric loadings of inorganic nitrogen in wet deposition have also increased in recent years (Dixon, 1997) at national monitoring stations in Florida (National Atmospheric Deposition Program; Verna Wellfield and Bradford Forest). In addition to documenting baseline conditions in the Refuge, the USFWS has begun a data collection program designed to document trends in water quality and vegetation which may be attributed to increasing nutrient loads to the region.

Chassahowitzka Bay and adjoining inshore waters are bounded by an extensive system of tidal wetlands, intertidal shoals and oyster reefs, and include extensive, shallow, subtidal beds of submerged aquatic vegetation. Geologically, the area represents a mixture of marsh archipelago and a limestone shelf embayment situated along a low energy, low-gradient, micro-tidal, and non-barrier coast (Hine and Belknap, 1986). Coastal hydrology is dominated by the discharge of several spring groups (Homosassa, Hidden River, Halls River, Chassahowitzka). The Chassahowitzka complex accounts for approximately 7.58 cubic meters per second, while the various springs contributing to the Homosassa River total nearly 10.02 cubic meters per second (Jones *et al.*, 1997). Discharges are greatest in September and October, and least in June and July (Yobbi, 1992). Spring flows from a groundwater basin of approximately 492 square kilometers are supplemented by runoff from a poorly delimited coastal basin area of about 800 square kilometers. Rainfall (142 cm per year average) is greatest from May through September and least in November (Yobbi, 1992). Depending on their depths, individual spring vents' discharge variable mixtures of fresh and saltwater and both the quality and quantity of discharge can vary tidally (Yobbi, 1992). Summarized from Jones *et al.* (1997), the specific conductance, nitrate-nitrogen concentrations and whether water quality varies tidally appear in Table 1 for individual named springs of the Chassahowitzka and Homosassa systems. Water levels at the Chassahowitzka main spring also vary tidally and are reported in real time by the Tampa District Office of the U.S. Geological Survey ([http://www-tampa.er.usgs.gov/Realtime/data/023\\_10650\\_gh.html](http://www-tampa.er.usgs.gov/Realtime/data/023_10650_gh.html)).

Table 1. Specific conductance, nitrate-nitrogen concentrations and occurrence of tidal variation in individual springs. Water quality data are averages of a number of samplings between 1993 and 1997. (From Jones *et al.*, 1997.)

<u>Spring</u>	<u>Specific Conductance (umhos/cm)</u>	<u>N03-N (mg/l)</u>	<u>Tidal Variation In Quality (Yes/No)</u>
<u>Chassahowitzka</u>			
Chassahowitzka #1	770	0.47	N
Chassahowitzka Main	1730	0.42	Y
Crab Creek	5294	0.46	Y
Baird	11426	0.21	Y
Ruth	2977	0.44	Y
Potter Creek	9770	0.33	Y
Betejay Head Spring	671	0.27	N
Blue Run	7747	0.26	Y
<u>Homosassa</u>			
Abdoney	489	0.46	N
Belcher	455	0.44	N
Trotter #1	462	0.44	N
Trotter Main	429	0.42	N
McClain	548	0.36	N
Pumphouse	506	0.39	N
Homosassa River #1	4160	0.39	Y(?)
Homosassa Main #1	3245	0.43	Y
Homosassa Main #2	5694	0.42	Y
Homosassa Main #3	1339	0.44	Y
Hall's River Head	7297	0.32	Y
Hidden River Head	1449	0.66	Y(?)
Hidden River #2	2162	0.53	Y(?)

Major ion chemistry of Homosassa and Chassahowitzka springs is dominated by sodium chloride, with more calcium and bicarbonate in the Chassahowitzka (Estevez *et al.*, 1991 ; Jones *et al.*, 1997). A groundwater and spring discharge monitoring program together with other trend analyses conducted by the Southwest Florida Water Management District (SWFWMD, 1994; Jones *et al.*, 1997; Dixon, 1997) has documented increasing trends of nitrogen in spring discharges with sources attributed to inland development and subsequent residential and golf course fertilization (Jones *et al.*, 1997). Nitrate levels in the discharge are presently near 0.4 - 0.5 mg/l or between 40 and 50 times background groundwater concentrations. Concentrations of total phosphorus are typically near analytical detection limits (Yobbi, 1992).

Coastal plant communities are dominated by hammock forest, the wettest of which (with live oak [*Quercus virginiana*], southern red cedar [*Juniperus silicicola*], and cabbage palm [*Sabal palmetto*]) intergrades with marshes of sawgrass (*Cladium jamaicense*) and saltmarsh dominated by black needlerush (*Juncus roemerianus*). Cattail (*Typha* spp.) and giant reed (*Phragmites australis*) also occur in the fresher regions. Spring runs punctuate the hammock forest and are fringed by mixed hardwoods, bald cypress (*Taxodium distichum*) (Wolfe, 1990), and numerous sedge, rush, and grass marshes intolerant of saltwater. Clear, mineralized flows in the spring runs permit luxuriant growth of tape grass (*Vallisneria neotropicalis*). Other common submerged fresh to brackish water species include sago pondweed (*Potamogeton pectinatus*), watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), and naiad (*Najas guadalupensis*), with *Potamogeton illinoensis* occurring near the spring head. Floating rafts of both *Potamogeton* and *Myriophyllum* mixed with *Enteromorpha* spp. and filamentous algae occur at times in the upper river, particularly in areas of low current velocity. Filamentous forms of green and blue-green algae are also common with the blue green alga, *Lyngbya* spp., at nuisance levels in the main spring.

The near shore bottom is shallow and low in relief. Bottoms are limestone covered by veneers of organic and carbonate sediments lacking quartz sand (Hine and Belknap, 1986). In the coastal area, submerged aquatic vegetation (SAV) is extensive. Contiguous beds of dense SAV cover more than 90 % of inshore (< 2 m depth) areas (McNulty *et al.*, 1972; Wolfe, 1990). Dominant vascular plants are turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), and shoalgrass (*Halodule wrightii*) (Iverson and Bittaker, 1986). Widgeon grass (*Ruppia maritima*) grows in lower salinity inshore waters. Planktonic and benthic algal communities of the immediate area are unstudied but reports from nearby, similar areas depict a rich, abundant flora (Phillips, 1960; Earle, 1969; Dawes, 1974). The bulk of the waters within the study area are designated as Class II (Shellfish propagation or harvesting, F.A.C. 17-302) by the Florida Department of Environmental Protection (FDEP).

The present study was performed to describe SAV and water chemistry during a dry and a wet season; to establish a 1996-97 baseline of ecological conditions; and to report on existing indicators of eutrophication in the near coastal waters along an undeveloped area, the Chassahowitzka National Wildlife Refuge (Figure 1).

## **MATERIALS AND METHODS**

In 1997, sampling dates were chosen in May and September in order to sample historically dry and wet conditions. The May sampling also provided continuity with the May 1996 sampling. Sampling for SAV took place from May 19 through May 21, 1997, with methods described below. Water quality sampling took place during the early morning of May 21 and was repeated during the late afternoon of the same day. The wet season sampling took place September 15-17, 1997 with the water quality run conducted the early morning and late afternoon of September 17. Sampling times were selected based on observed patterns of hypoxia and supersaturation in other

water bodies (Marshall and Leverone, 1994). Mote Marine Laboratory (MML) conducted all sampling and analysis with sampling assistance from Refuge personnel and vessels.

For coastal SAV, the study area encompassed a 115 square kilometer coastal area. Most stations were in open waters between Homosassa Point (28°46.5'N) to the north, to Raccoon Point (28 °36.3'N), and seaward of saltmarshes and the extensive tidal creek system. Stations extended out to the entrance marker for Chassahowitzka (82°44.3'W).

Sampling for SAV in 1997 revisited all 30 stations established in May 1996 (Figure 1). During 1996, station selection was performed with assistance from the U.S. Environmental Protection Agency (Dr. Kevin Summers) following EMAP (Environmental Monitoring and Assessment Program) protocols which allow the unbiased estimations of the areal extent of a selected level of a given parameter (*i.e.*, the percentage of a region with dissolved oxygen values greater than 5.0 mg L<sup>-1</sup>). The Refuge was gridded into fifty 1 km<sup>2</sup> hexagons and a series of random stations identified within each polygon. For SAV, the study area was limited to the near coastal waters outside of the mouths of the Chassahowitzka and Homosassa Rivers. Polygons were eliminated from consideration if they consisted of predominantly land rather than open water, as a study of vegetation in tidal creeks was not intended. From the area bounded by the Refuge, 30 polygons were selected for SAV sampling. Of the potential stations identified within the polygon, sites were visited in order until SAV was observed.

Cover and abundance of submerged aquatic vegetation (SAV) were measured using a rapid-survey technique (Braun-Blanquet, 1932). At each station, an observer on each side of the vessel surveyed two quadrats, each 0.25 m<sup>2</sup> in area. Each observer listed species and major plant groups (seagrass; drift algae, etc.) and assigned a cover-abundance value for each taxon or group (Table 2). Upper scale values (5-2, inclusive) pertained to cover only. Other scale values were estimators of abundance (number of individuals per species). Four replicate quadrats were used to assess within and between station variability. Attributes were calculated as follows:

$$\begin{aligned} \text{Frequency} &= N_o/N_t \\ \text{Abundance} &= \text{sum of B-B scale values}/N_o \\ \text{Density} &= \text{sum of B-B scale values}/N_t \end{aligned}$$

where  $N_o$  is the number of occupied quadrats and  $N_t$  is the total number of quadrats. The drift algae were lumped into a single category of miscellaneous algae with frequency, abundance, and density estimated as for the attached species. Secchi depths were recorded during SAV surveys and underwater photographs secured at most stations during both May and September. During the September sampling, canopy height was also estimated by species to differentiate between varying morphologies, growth habits, and resultant biomass of a given species.

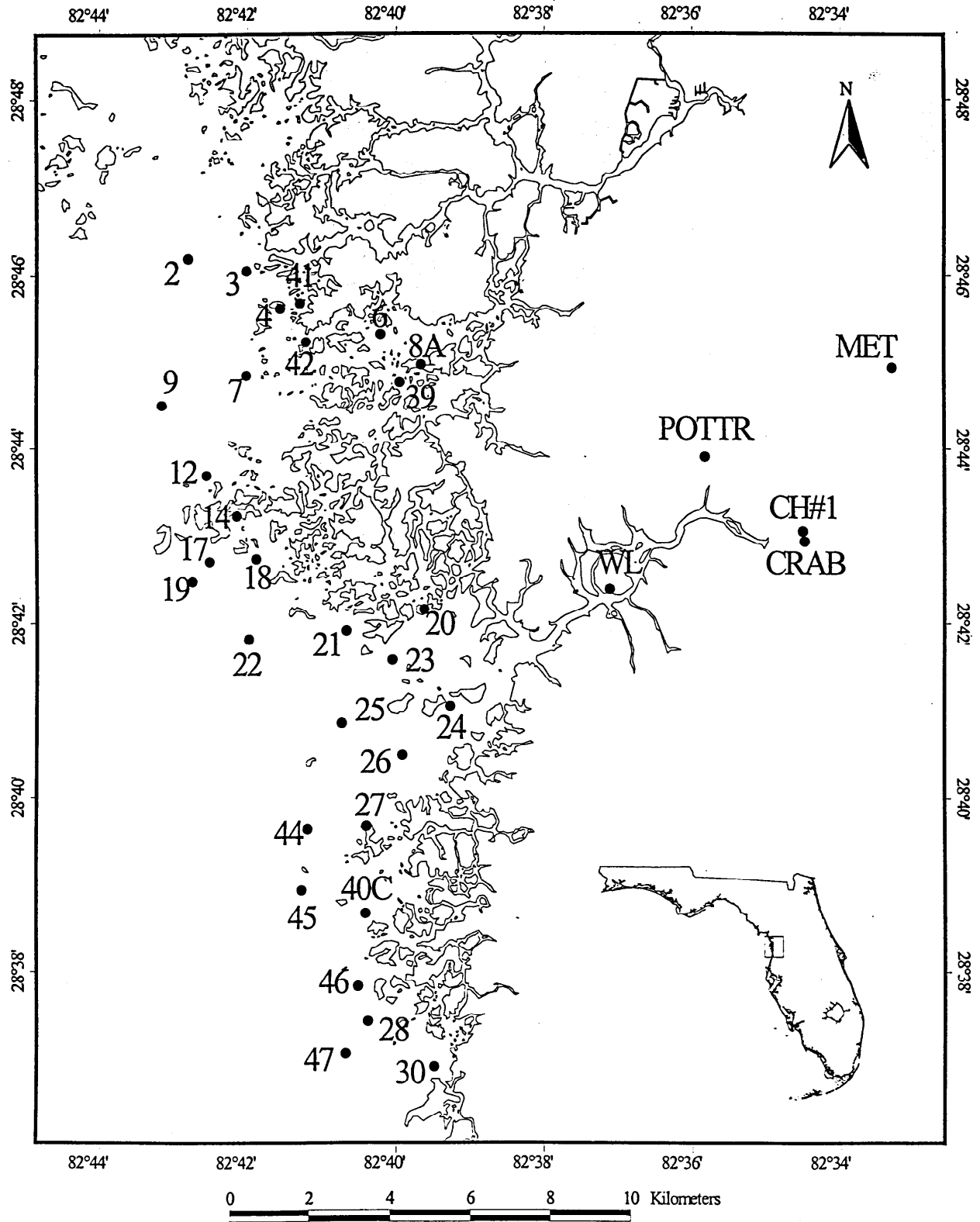


Figure 1. Chassahowitzka National Wildlife Refuge, Chassahowitzka, Florida. Thirty coastal stations, secondary spring vents sampled (CH#1, CRAB, POTTR), meteorological station (MET), and water level station (WL).

On September 16, 1997, a researcher (Mr. Joe Conti) performing similar B-B surveys in the St. Martin's Marsh area to the north of the Refuge and the Homosassa River accompanied MML crews and cross-calibrated techniques and species identifications. During May and September, stations in the Chassahowitzka River and coastal Stations 24, 26, and 44 were sampled for wet weight biomass and percentage of attached vascular SAV. During May, quadrats (0.25m<sup>2</sup>) for biomass were placed in areas of light, typical, and heavy growth, while during September, five Braun-Blanquet quadrats were sampled at either randomly (in the coastal region) or at equal distances across the width of the river.

Table 2. Scalars used for Braun-Blanquet cover-abundance ratings of submerged aquatic vegetation in Chassahowitzka Bay.

Value	Relative Number	Percent Cover	Remarks
5	any number	greater than 75%	
4	any number	50%-75%	
3	any number	25%-50%	
2	any number	5%-25%	
1	numerous	less than 5%	- or scattered with up to 5%
+	few	small	- assigned 0.5 value
r	solitary	small	- assigned 0.1 value

During May and September, *in situ* parameters were collected in the early morning and late afternoon at all 30 SAV stations. A subset of 20 polygons (generally those nearer shore) was sampled during the morning for water quality (nutrients, chlorophyll, and phytoplankton). *In situ* samplings consisted of measurements of depth, temperature, conductivity (salinity), dissolved oxygen, and percent saturation of oxygen. Instrumental measurements were made at near surface and near bottom unless depths were less than 1 m, in which case only a middepth reading was made. Water quality analyses consisted of nutrients (nitrate-nitrite-nitrogen, ammonium-nitrogen, total Kjeldahl nitrogen, orthophosphate, total phosphorus), chlorophylls (chlorophyll *a*, *b*, *c*, pheophytin, and chlorophyll *a* corrected for pheophytin), and phytoplankton enumeration. Analytical methods and detection limits were the same as used for the 1996 sampling and are detailed in Table 3. Instrumental readings, collection, preservation and analysis of water quality samples were performed according to MML's Florida Department of Environmental Protection-approved Comprehensive Quality Assurance Plan. Trophic state indices were calculated according to the methods of Hand *et al.* (1988), as the average of individual percentiles for a limiting nutrient, chlorophyll, and Secchi depth, with a "GOOD" rating equivalent to a value of 50 or lower and analogous to a chlorophyll concentration of 10 ug/l. Indices were computed without Secchi percentiles when Secchi depths were greater than bottom, and numeric values of one half of the limit of detection used when sample concentrations, were less than the limit of detection. Samples

for phytoplankton enumeration were preserved with Utermohl's solution (potassium iodide, iodine, and acetic acid). Both total organisms and total dinoflagellates were counted using twelve 1.00 ml aliquots in Sedgewick-Rafter counting chambers under 100X magnification. Dinoflagellates, diatoms, and cysts were counted separately as increasing nitrogen nutrient concentrations favor the growth of flagellates (Officer and Ryther, 1980).

Table 3. Detection limits, analytical methods, and data quality objectives for water quality samples; Chassahowitzka River and the coastal region.

<b>Parameter</b>	<b>Detection Limit</b>	<b>Method Number</b>	<b>Maximum Precision (%RSD)</b>	<b>Recovery Limits (%)</b>
Ortho-phosphorus	0.005 mg/l	4500-PF	15	87-115
Total Phosphorus	0.05 mg/l	365.4	13	80-111
Ammonium Nitrogen	0.005 mg/l	350.1	20	86-113
Nitrate-Nitrite-Nitrogen	0.005 mg/l	353.2	15	81-116
Total Kjeldahl Nitrogen	0.05 mg/l	351.2	18	86-119
Chlorophylls	0.5 ug/l	10200H (1,2)	28	Not Appl.

Seven salinity-based stations in the nine kilometer run of the Chassahowitzka River (including the main boil), were also sampled for *in situ* and water quality parameters, as were six stations in the 13 km run of the Homosassa River, and five in several of the tidal creeks between the two rivers. Additional water quality samples were collected from three of the smaller individual spring vents contributing to the Chassahowitzka system. Locations of all stations appear in Table 4. Additional parameters measured at the springs during May, 1997, included calcium, sodium, magnesium, and iron. The Homosassa, tidal creek, and spring stations were sampled for both physical and chemical parameters, but were not sampled for SAV. Samples collected within the riverine portions of the Chassahowitzka and the Homosassa Rivers were combined with selected stations offshore to examine gradients in water quality with respect to salinity (Figure 2).

Incident photosynthetically active radiation (PAR) and air temperature were recorded continuously for the duration of the sampling at the maintenance facility of the Chassahowitzka National Wildlife Refuge (Figure 1, Station MET) using a LiCor 1000 (with 190SB) and a Ryan Tempmentor, respectively. Temperature readings were made approximately 0.6 m above grade. Relative tidal heights were recorded during the sampling periods, but do not permit inter-sampling comparisons as instrument installations were not registered to a vertical datum. Tide levels were recorded with an ISCO 4230 bubbler flow meter, located at 28°42.39'N, 82°37.12'W on the eastern bank of Little Gator Creek, just off the main stem of the Chassahowitzka River (Figure 1, Station WL).

**Table 4. Geographic locations of all stations, decimal degrees.**

Station	Latitude Decimal Deg.	Longitude Decimal Deg.	Station	Latitude Decimal Deg.	Longitude Decimal Deg.
<b>Tidal Creeks</b>			<b>Chassahowitzka Coastal Area</b>		
PETTY	28.7660700	-82.6448334	2	28.7697619	-82.7136666
7CABBG	28.7312645	-82.6567223	3	28.7674873	-82.7004434
ROSE	28.7361533	-82.6446666	4	28.7603473	-82.6927508
MASON	28.7358200	-82.6449167	6	28.7552940	-82.6702202
UMASON	28.7603756	-82.6263056	7	28.7474566	-82.7004702
<b>Homosassa River</b>			8A	28.7494843	-82.6612509
H0	28.7688478	-82.6448334	9	28.7417113	-82.7195300
HO.5	28.8005280	-82.5958890	12	28.7281232	-82.7094717
H1	28.7955978	-82.6049166	14	28.7202912	-82.7026642
H2	28.7854866	-82.6190000	17	28.7116276	-82.7088333
H3	28.7835422	-82.6278889	18	28.7121534	-82.6982493
H4	28.7751256	-82.6758056	19	28.7078457	-82.7127493
<b>Other Spring Vents</b>			20	28.7024598	-82.6605267
POTTR	28.7316670	-82.5972780	21	28.6985438	-82.6778323
CRAB	28.7174440	-82.5752780	22	28.6969613	-82.6999176
CH#1	28.7155560	-82.5749170	23	28.6930399	-82.6676668
<b>Chassahowitzka River</b>			24	28.6841511	-82.6546688
R0	28.7157922	-82.5759167	25	28.6809056	-82.6788623
R1	28.7148478	-82.5765833	26	28.6748492	-82.6654727
R1.3	28.7161229	-82.5870556	27	28.6611806	-82.6733638
R1.7	28.7204843	-82.5992758	28	28.6239569	-82.6729453
R2	28.7142938	-82.6086689	30	28.6152076	-82.6583058
R2.5	28.7159866	-82.5871389	39	28.7460726	-82.6659716
R3	28.7026256	-82.6236666	40C	28.6445134	-82.6735569
R4	28.6934589	-82.6405000	41	28.7613183	-82.6882500
			42	28.7537383	-82.6868606
			44	28.6605959	-82.6865281
			45	28.6488478	-82.6878316
			46	28.6305713	-82.6751662
			47	28.6177342	-82.6778913

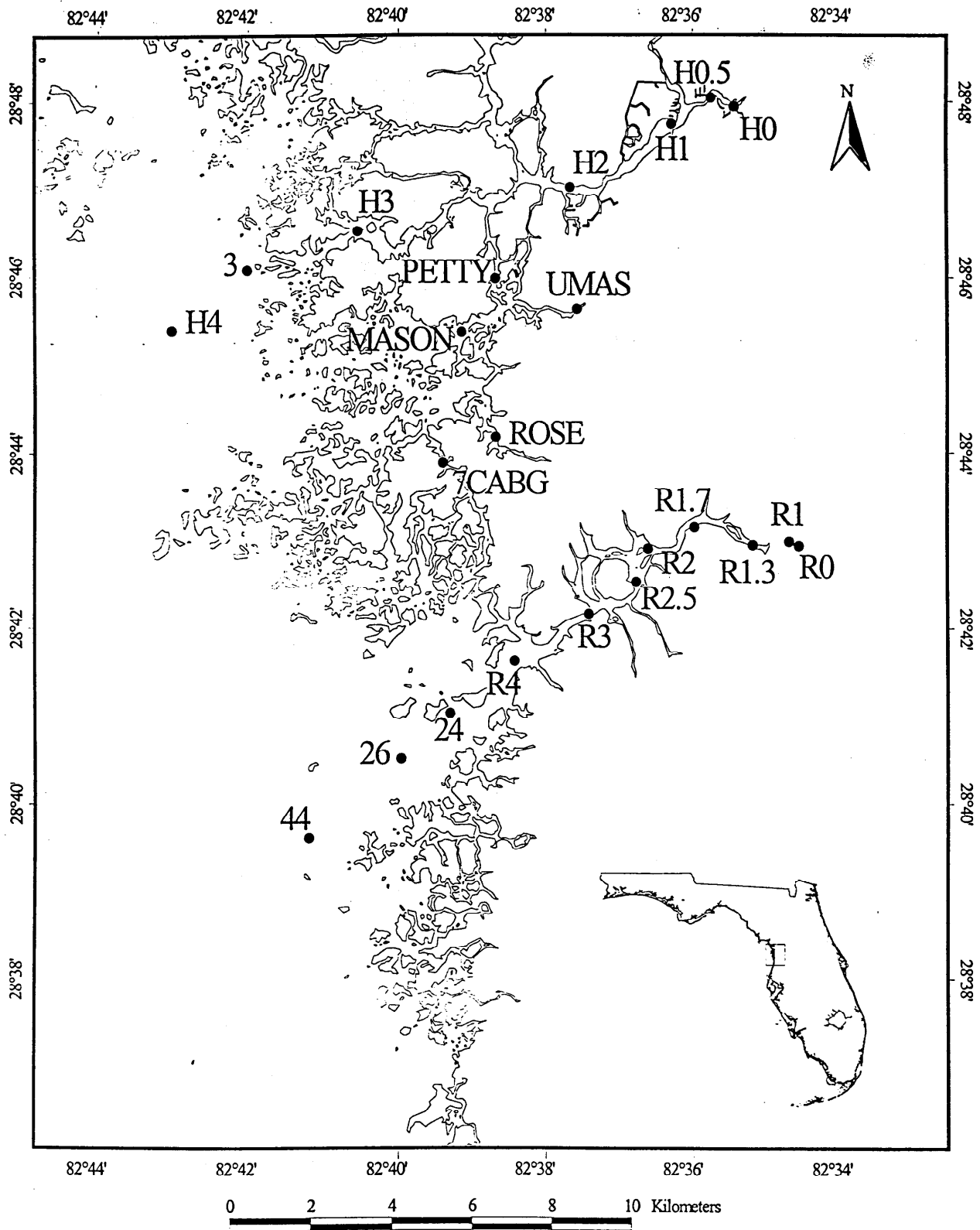


Figure 2. Chassahowitzka and Homosassa River gradient stations and the tidal creek stations at Seven Cabbage Cutoff (7CABG), Rose Creek (ROSE), Mason Creek (MASON), upper Mason Creek (UMAS), and Petty Creek (PETTY).

During both May and September samplings, sediment samples along the Chassahowitzka riverine transect were collected as a single surface grab (generally the top 2-5 cm) and were processed for grain size distribution (as % volume of various size classes) with a Coulter LS200 laser particle sizer. Analysis of sediments included the fraction greater than 2 mm in diameter. During May, riverine sediments were collected and processed for total phosphorus, total Kjeldahl nitrogen, and percent organics by combustion.

On November 5, 1997, a survey of *Thalassia* was conducted on plants which appear to consist of a single rhizome growing linearly in a fracture feature of a shallow limestone platform. **Visited** at low tide, *Thalassia* samples were excavated for examination of shoot age and morphology. Dye was used to determine that there was no obvious groundwater discharge from the fracture during the collection effort. Fracture orientation and length were mapped for comparison with other geological information of the area.

In other opportunistic surveys of the Chassahowitzka River and Refuge, a partial listing of molluscs was identified from living specimens and shell material retained from qualitative sediment samples by a 2mm sieve. The sampling was conducted on February 17, 1998 at nine riverine and coastal stations and was accompanied by collection of *in situ* water quality parameters.

## **RESULTS AND DISCUSSION**

### Study Area

The largest discharge for the Chassahowitzka River appears to be the main boil (Station RO) immediately to the northwest of the Citrus County boat launching facility. Numerous smaller vents were observed immediately upstream (including Chassahowitzka #1- Station CH#1) and some very small discharges were noted during the 1996 sampling within some of the manmade canals adjacent to the spring head. At that time, the upstream discharges were lower in conductivity than the main springs, indicating source water from a more surficial aquifer. Immediately downstream of the main spring area, the confluence with Crab Creek delivered the discharge from another sizeable vent (Station CRAB), with a conductivity higher than that of the main spring. Station R1 was immediately below this confluence, representing both discharges. Floating mats of senescent filamentous vegetation and a few cattails (*Typha* sp.) lined the sides of the river at this point, but the main stream was clear with a cloudy-blue appearance characteristic of many groundwater discharges. Beds of tapegrass (*Vallisneria*) and pondweed (*Potamogeton pectinatus*, *Potamogeton illinoensis*) were visible on the bottom with some *Hydrilla*, as well. Tidal changes in water elevation, but no reversing flows, were observed at this site.

Baird Creek and Potter Creek also contribute spring flows to the River. Stations R1.3 and Station R1.7 are located immediately downstream of each confluence. (Discharge from the spring at the head of Potter Creek was sampled as Station POTTR.) The upper 4 kilometers of the river are surrounded by a deciduous flood plain forest down to the eastern boundary of the Chassahowitzka

National Wildlife Refuge (Station R2). At the boundary, sawgrass (*Cladium jamaicensis*) and cattail dominate the bank vegetation, cabbage palm (Sabal palmetto) hammocks and *Juncus* appear, and the flood plain forest ends. Floating mats of enteromorpha-like algae, Eurasian water milfoil (*Myriophyllum spicatum*), and *Hydrilla verticillata* are very dense here. Water clarity typically decreases by this location and has acquired the brown color of dissolved humics. Reversing tidal flows are observed at this station.

By just upstream of Crawford Creek (Station R2.5) and at Dog Island (Station R3), sawgrass lines the river, while *Juncus* dominates the marsh at higher elevations. Some cattails remain and the seagrass *Ruppia maritima* is present in the river. Water clarity at Station R3, as at R2, was generally fairly low, presumably as humics precipitated with increasing salinity. At Station R4, opposite Johns Island, the marsh was dominated by *Juncus*, some *Spartina alterniflora* was present, and sawgrass ended. Water clarity was much improved by this station, and the remaining coastal waters sampled were noticeably clear. The remaining coastal stations were within and offshore of a dense archipelago of marsh (*Juncus*) islands. Oyster bars were observed in some tidal creeks but were not a dominant land form. Mangroves (*Rhizophora mangle*) were not numerous, being near the northern limits of cold tolerance for this species, and were evident chiefly as either dead and weathered stumps, or as small seedlings in the 20-50 cm size range. Offshore stations used to complete the riverine gradient analyses consisted of the coastal stations 24, 26, and 44.

Tidal creek stations located between the Chassahowitzka and Homosassa Rivers, were located in Seven Cabbage Cutoff (7CABG), Petty Creek (PETTY), Rose Creek (ROSE), and near the mouth and upstream in Mason Creek (MASON, UMASON). Development on the land surrounding each of these stations appears minimal with the exception of Mason Creek, where a medium density residential land use appears on the north bank of upper Mason Creek. *Juncus* marshes, followed by low elevation karst islands with cedars and palms are the dominant vegetation and land form apparent adjacent to the tidal creek stations.

Stations sampled in the Homosassa River extended from the limit of boat traffic near Homosassa Main (Station HO), to the mouth of the river. Forested wetlands line both sides of the river down to approximately Station H2. Residential development and recreational water-based industries are much more extensive than along the Chassahowitzka. Portions of the upper river are sea-walled. Downstream of Station H2, *Juncus* marshes become more prevalent, with frequent limestone platforms of low relief supporting cedars and cabbage palms. The limestone platforms are analogous to Johns Island on the Chassahowitzka but are much more numerous. Residential development becomes less frequent but is still a noticeable presence.

### Weather

May 1997 was extremely dry, with the Northern Coastal Basin of the Southwest Florida Water Management District reporting a rainfall of 1.8 cm; or a deficit of 7.6 cm below the historical May mean of 9.4 cm. At this time, annual deficits from 12-month historical means totaled 30.9 cm (SWFWMD, 1997a). Of the 16 Florida aquifer wells in the northern region monitored by

SWFWMD, all water level elevations were lower than in the prior May (SWFWMD, 1996) as well as being below historical means for May by between 25 cm and 2.2 m. In September, rainfall totaled 12.8 cm, a 3.3 cm deficit from the historical September value, and the annual deficit had reached 42.2 cm (SWFWMD, 1997b). Groundwater elevations were between 17 cm and 1.9 m lower than in September 1996, and were 37 cm to 2.8 m lower than historical averages for September.

The solar irradiance and air temperature a short distance inland (Station MET, Figure 1), and tide heights within the river (Station WL, Figure 1) as recorded during the sampling days appear in Figures 3 and 4. During May, the weather was fair with scattered clouds, clearing for the afternoon water quality run on the final day. Inland air temperatures were moderate (18-40°C). During September, the initial sampling days were very clear with increasing cloudiness. Air temperatures ranged from 20-45 ° C . During the last day, a severe thunder storm late in the afternoon forced abandonment of the last water quality stations (Station 8A, 39). Water quality samplings in May 1997 took place on a falling and low tide in the early morning, followed by the afternoon sampling centered around a high tide. Tidal range was less than 0.75 m (2.5 ft) with a predicted high of 0.94 m. Water quality data were collected on very comparable tidal phases during September 1997, but with predicted highs of 0.83 m. Observed tidal range was also somewhat smaller during September than in May, approximately 0.61 m (2 ft). Peak insolation was also lower during September.

### SAV Sampling

Of the 30 polygons identified for sampling in 1996, vegetation was found at all but one of the randomly chosen primary sites within each polygon. For Polygon 8, the primary site had no vegetation and the first alternate site, Station 8A, was sampled instead. Data on frequency, abundance, and density were computed on the 30 vegetated stations, and so represented an assessment of the vegetated regions only, rather than an assessment of the entire submerged study area. Assessments of the entire study area would employ data from the four unvegetated quadrats of Station 8 rather than the data from Station 8A, but were not presented. The fact that only one of the 30 primary stations was unvegetated indicates that coverage by SAV is extensive and almost continuous. (Station 40C was the primary site for Polygon 40, as the other randomly selected sites fell on land.) Sampling during 1997 revisited the 30 vegetated stations sampled during 1996, and so again represents an assessment of the vegetated regions.

Sampling of SAV was carried out at the 30 vegetated stations during May and September 1997 and individual quadrat data appear in Appendix A. Reported depths were observed and are not tidally corrected. Secchi depths during May 1997 were all greater than the water depth. During September, four stations in the northern portion of the study area (Station 3, 41, 6, and 39) recorded Secchi depths at or less than total water depths. Species encountered during 1996 and 1997 appear in Table 5 and include representatives of the algal phyla Chlorophyta and Phaeophyta, as well as marine angiosperms or seagrasses.

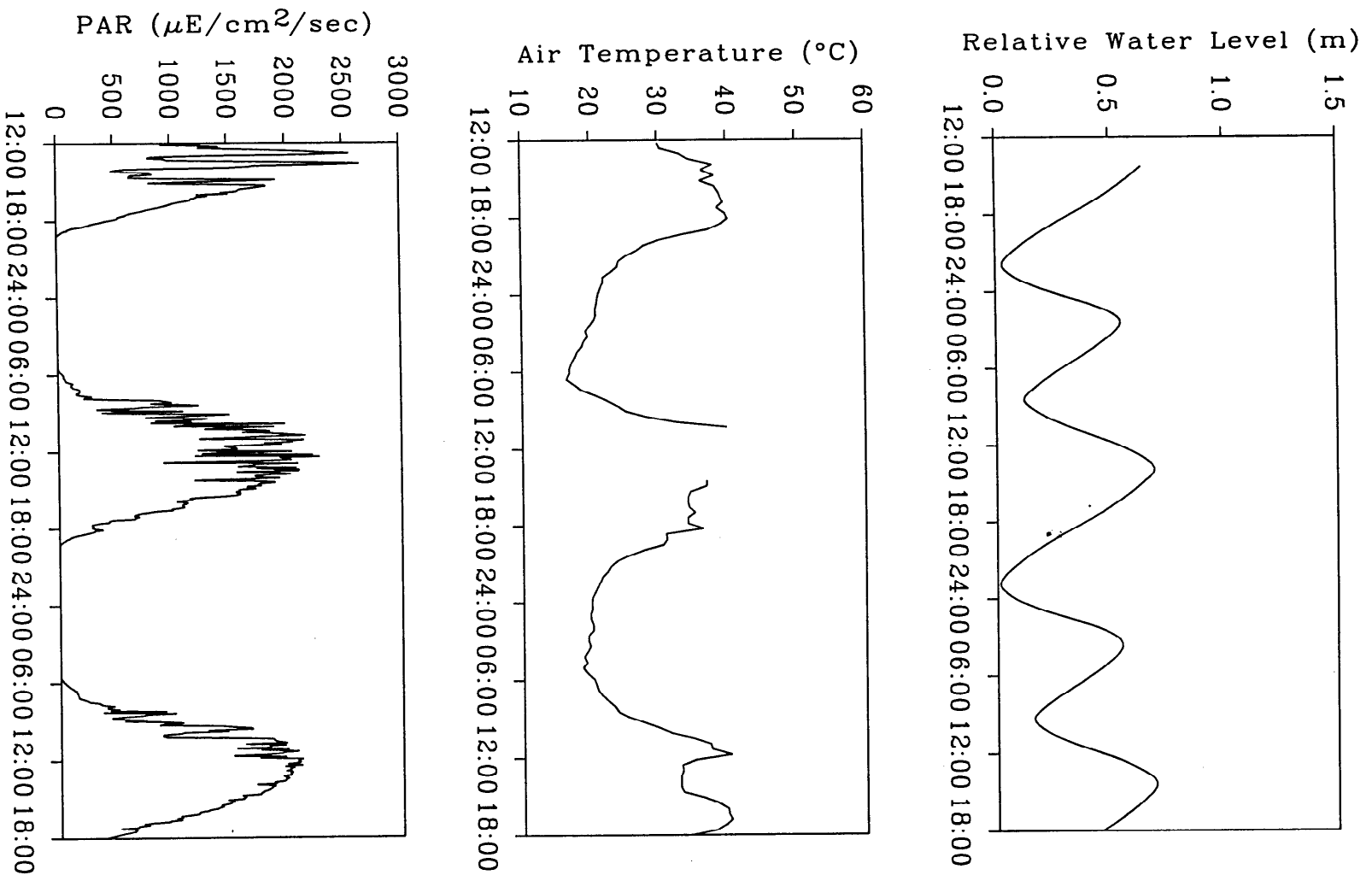


Figure 3. Relative tidal heights, air temperature, and insolation during the May 1997 sampling. Tidal heights unregistered.

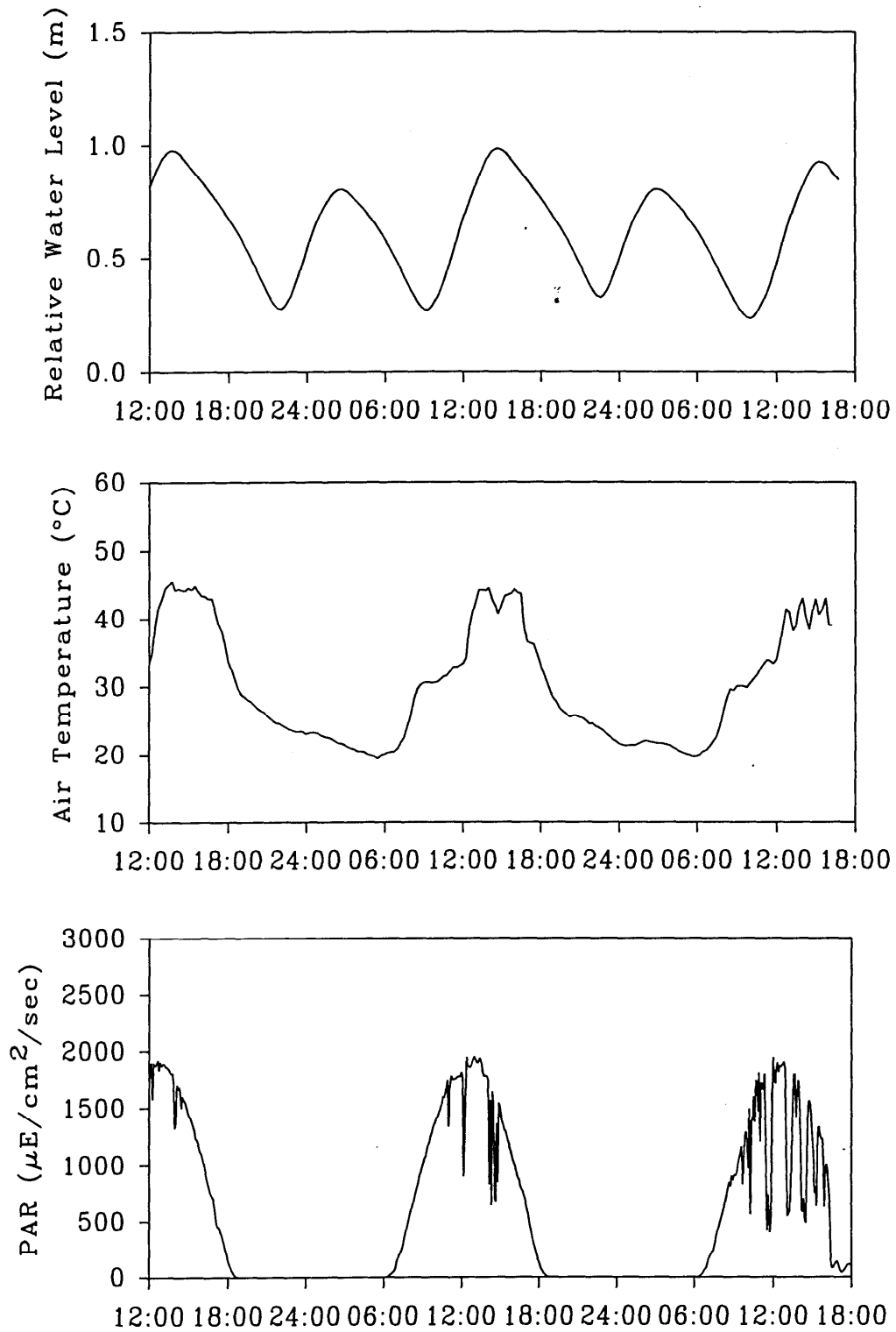


Figure 4. Relative tidal heights, air temperature, and insolation during the September 1997 sampling. Tidal heights unregistered.

Table 5. Species list for attached macroalgae and vascular SAV in the coastal area of the Chassahowitzka National Wildlife Refuge.

<u>May-96</u>	<u>May-97</u>	<u>Sep-97</u>
Acetabularia crenulata	Acetabularia crenulata	Acetabularia crenulata
Batophora oerstedii	Batophora oerstedii	Anadyomene stellata
Caulerpa ashmeadii	Caulerpa paspaloides	Avrainvillea spp.
Caulerpa paspaloides	Caulerpa prolifera .	Batophora oerstedii
Caulerpa prolifera	Chara spp.	Caulerpa paspaloides
Halimeda incrassata	Halimeda incrassata	Caulerpa prolifera
Halodule wrightii	Halodule wrightii	Chara spp.
Penicillus capitatus	Halophila englemannii	Digenia simplex
Ruppia maritima	Penicillus capitatus	Halimeda incrassata
Sargassum spp.	Ruppia maritima	Halodule wrightii
Thalassia testudinum	Syringodium filiforme	Halophila englemannii
Udotea flabellum	Thalassia testudinum	Penicillus capitatus
	Udotea flabellum	Sargassum spp.
		Thalassia testudinum
		Udotea flabellum

*Anadyomene stellata*, *Avrainvillea* spp., *Chara* spp., *Digenia simplex*, *Halophila englemannii*, and *Syringodium filiforme* were recorded in the quadrats for the first time in 1997, while *Caulerpa ashmeadii* was not found in 1997. Those attached species occurring most frequently were as follows :

May 1996	<i>Caulerpa paspaloides</i> , <i>Acetabularia</i> , <i>Batophora</i> , <i>Halodule</i> , and <i>Thalassia</i>
May 1997	<i>Caulerpa paspaloides</i> , <i>Halodule</i> , <i>Batophora</i> , <i>Acetabularia</i> , and <i>Thalassia</i>
Sept 1997	<i>Caulerpa paspaloides</i> , <i>Halodule</i> , <i>Thalassia</i> , <i>Penicillus</i> , and <i>Batophora</i>

The most frequently observed attached species in all three samplings to date (Table 6) was *Caulerpa paspaloides*, recorded in 38 %, 36 %, and 37 % of all quadrats in May 1996, May 1997, and September 1997, respectively. *Acetabularia* was observed approximately half as often in 1997 compared to May 1996. The September sampling recorded more instances of *Penicillus*, *Halodule*, and *Thalassia* than during either of the previous May events. Comparable numbers of species were observed during each sampling. Although not quantified, no problems of excessive colonization by epiphytes were noted during the surveys.

Where it occurred, *Caulerpa paspaloides* averaged a B-B abundance value of 3.2 to 3.3 in 1997, or 25-50 % coverage. This abundance was a decrease from that observed in 1996, when coverage was estimated at 50-75 % . In general, the five most frequent species declined in abundance, both between May 1996 and 1997, and between May and September 1997. Within the vegetated study area, *Caulerpa paspaloides* has consistently been the attached species with the densest coverage, near 5% coverage overall. Data by station and major species of Braun-Blanquet estimates of frequency, abundance, and density also appear in Appendix A.

In addition to attached algal and seagrass species, drift algal species were also quite common. During May 1996 and 1997, drift material was observed in 49 % and 43 % of all quadrats, respectively. By September, however, drift species were only observed in 13 % of quadrats. During May 1997, drift species were similar to those observed during May 1996; *Chondria tenuissima*, *Laurencia poitei*, and *Spyridia filamentosa*. In addition, *Digenia simplex* and *Anadyomene stellata* were collected as unattached species during the May 1997 sampling. In September 1997, drift species consisted primarily of *Laurencia poitei* and *Digenia simplex*. The attached but chlorotic *Caulerpa paspaloides* observed during 1996 was not present during the 1997 samplings.

#### Water Chemistry - Physical Parameters

Summary values of in situ parameters for all three samplings to date appear in Table 7 with individual data from 1997 contained in Appendix B. The shallow coastal waters near the mouth of the Chassahowitzka River were well mixed during both May and September samplings. Average surface to bottom differences in salinity were less than 0.1 PSU with maximum differences less than 1.6 PSU for all three samplings. Overall, September is noted for higher salinity values and lower concentrations and percent saturation of dissolved oxygen.

Table 6. Braun-Blanquet estimates of frequency, abundance, and density of the following species within the coastal vegetated regions in the Chassahowitzka National Wildlife Refuge.

Species	Frequency (%)			Abundance (BB Units)			Density (BB Units)		
	May-96	May-97	Sep-97	May-96	May-97	Sep-97	May-96	May-97	Sep-97
<i>Caulerpa paspaloides</i>	38	36	37	4.0	3.3	3.2	1.5	1.2	1.2
<i>Acetabularia crenulata</i>	31	17	12	2.1	2.2	0.6	0.7	0.4	0.1
<i>Batophora oerstedii</i>	18	18	13	0.8	1.3	0.6	0.2	0.2	0.1
<i>Halodule wrightii</i>	18	20	26	3.8	2.9	2.6	0.7	0.6	0.7
<i>Thalassia testudinum</i>	18	15	23	3.2	2.9	2.9	0.6	0.4	0.7
<i>Caulerpa prolifera</i>	13	11	11	2.6	2.2	1.6	0.3	0.2	0.2
<i>Penicillus capitatus</i>	8	8	21	1.9	0.6	1.5	0.2	0.0	0.3
<i>Ruppia maritima</i>	5	5	0	3.1	1.7	0.0	0.2	0.1	0.0
<i>Sargassum spp.</i>	5	0	7	3.5	0.0	1.5	0.2	0.0	0.1
<i>Udotea flabellum</i>	3	3	3	0.2	0.3	0.2	0.0	0.0	0.0
<i>Halimeda incrassata</i>	3	12	6	0.7	1.4	0.5	0.0	0.2	0.0
<i>Caulerpa ashmeadii</i>	1	0	0	2.0	0.0	0.0	0.0	0.0	0.0
<i>Anadyomene stellata</i>	0	0	3	0.0	0.0	0.1	0.0	0.0	0.0
<i>Avrainvillea spp.</i>	0	0	3	0.0	0.0	0.9	0.0	0.0	0.0
<i>Chara spp.</i>	0	7	1	0.0	3.5	3.0	0.0	0.2	0.0
<i>Digenia simplex</i>	0	0	8	0.0	0.0	2.4	0.0	0.0	0.2
<i>Halophila englemannii</i>	0	12	3	0.0	3.4	1.3	0.0	0.4	0.0
<i>Syringodium filiforme</i>	0	3	0	0.0	3.3	0.0	0.0	0.1	0.0
<i>Misc. Algae</i>	49	43	13	3.6	3.5	2.4	1.8	1.5	0.3
Unvegetated	3	0	3	5.0	0.0	5.0	0.1	0.0	0.1

Non-parametric testing (Kruskal-Wallis) identified a number of significant differences between the three sampling dates, with May 1996 to May 1997 varying significantly only with respect to temperature, while May to September 1997 recorded significant differences ( $p < =0.05$ ) in all four physical parameters.

Table 7. Average surface or mid-depth observations of physical parameters at 30 coastal stations, including both morning and afternoon samplings.

	<b>Salinity (PSU)</b>	<b>Temperature (Deg C)</b>	<b>Dissolved Oxygen (mg/l)</b>	<b>Percent Saturation %</b>
May 1996	20.5	27.1	6.8	97
May 1996	20.7	28.4	6.6	96
Sept 1997	26.0	29.4	5.5	83

Despite the effort to sample a wet season in September 1997, rainfall and groundwater deficits were reflected in the increased salinities observed during this month, as compared to the prior two May samplings. Predicted tidal heights were lower in September with no major weather patterns noted which would have elevated salinity values. During September, the stations with higher salinity were located in the southern portion of the Refuge (Figure 5). Salinity in May 1996 ranged between 12 and 27 PSU in the coastal stations, 14 to 28 PSU during May 1997, and 21 to 32 PSU during September 1997.

Violations of Florida water quality criteria occurred at several locations. During the early morning samplings of May 1996, May 1997, and September 1997, three, two, and 16 stations, respectively, had surface dissolved oxygen values less than the 4.0 mg/l instantaneous criteria. During September 1997, the majority of stations recording DO values below 4.0 mg/l were in the northern portion of the Refuge. A D. O. value of 1.9 mg/l was recorded at Station 20, to the north of the mouth of the Chassahowitzka River. In addition to low morning D. O. values, the average of both morning and afternoon values of both D.O. and percent saturation were also lower during September than during the May samplings. Percent saturation values account for differences in salinity and temperature between samplings by evaluating oxygen present against what is theoretically possible under thermodynamic laws. Although some portion of the low D.O. values during the afternoon may be attributed to lower insolation values, storm conditions, and the longer sampling during September, a comparison of data collected during the peak saturation period (1500-1730 hours) still identified September as having lower percent saturation values (108% versus 125% in May 1997).

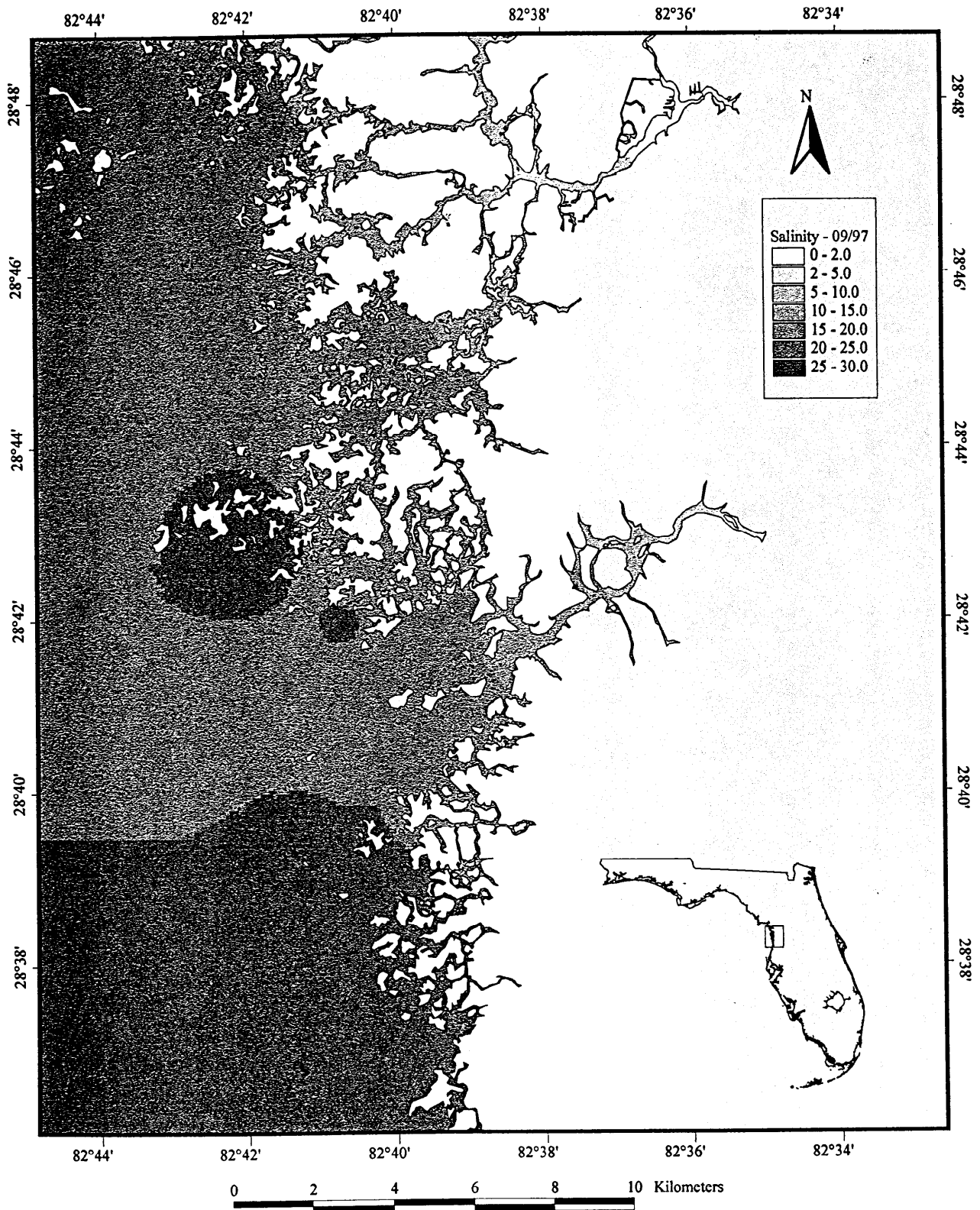


Figure 5. Distribution of salinity within the Chassahowitzka National Wildlife Refuge, September 1997.

Changes in the diurnal range of dissolved oxygen and percent saturation were also observed between the three samplings. In addition to the depressed absolute values of dissolved oxygen in September, the range in saturation was also less during this period. Early morning to late afternoon percent saturation varied by 69 % , 60 % , and then 48 % for the coastal stations in May 1996, May 1997, and September 1997, respectively, although the difference between the 1997 samplings was not statistically significant for the coastal stations.. Riverine stations expressed similar decreases in September, with the range in percent saturation approximately half of that observed for the two prior samplings. While not conclusive, the sum of the B-B abundance values at the coastal stations followed the same temporal, distribution, highest during the first May sampling, and lowest during September. Other efforts to link station dissolved oxygen data (either as concentration, percent saturation, or diurnal range) to abundances at individual stations were not successful, due in part to the extremely heterogeneous nature of the coastal vegetation, and comparatively strong tidal currents, which lessen the residence time of any particular water mass over a particular site.

For riverine stations, stratification was also minimal, with average surface to bottom differences in salinity of less than 0.5 PSU for all three samplings. A maximum value of 4 PSU was observed at Station 1.7 during September, and other instances of stratification (of about 2 PSU) were occasionally seen at Station 4, near the mouth of the River where the riverbed is deeper. Data from riverine stations were consistent with the temporal trends seen in the coastal water mass. Dissolved oxygen and percent saturation were lower in September 1997 than previously observed, while salinity was increased from 5 to 10 PSU on average within the River. Oxygen data from the Homosassa River are not strictly comparable with data from the Chassahowitzka, as it was collected mid to late morning and only once during the day.

The tidal creeks exhibited a range of salinities with PETTY, UMAS, MASON, ROSE, and 7CABG ordered from freshest to most saline. Elevated September salinities were evident at these locations also. Salinity values ranged from 8 to 17 PSU during May 1997, and from 16 to 25 PSU during September. The tidal creek stations were sampled during early to mid-morning. Percent saturation values ranged between 45-75 % with only one dissolved oxygen violation recorded, at 7CABG during May 1997 (3.2 mg/l).

Elevated September salinities were also apparent in the discharges from the other spring vents of the Chassahowitzka system. The CRAB station ranged from 3.5 to 4.6 PSU, POTTR from 3.8 to 9.8 PSU, CH#1 from 0.2 to 1.0 PSU, and the headspring, RO, from 0.6 to 3.2 PSU. The most upstream Homosassa station (HO), although not located directly over a vent, ranged between 0.6 and 2.5 PSU. In each instance, the highest salinity was recorded during the September sampling. Diurnal variations in salinity were also observed at each vent sampled directly. Dissolved oxygen was typically low at most of the vents, consistent with undersaturated groundwater. POTTR, the most saline of the vents, regularly recorded D.O. values below 4.0 mg/l. While some diurnal variation in percent saturation was observed, extensive forest canopy at most of these locations appeared to inhibit wide diurnal swings in oxygen, despite extensive rooted and algal vegetation.

## Water Chemistry - Nutrients

Water quality is characterized by a strong salinity control and a stable riverine gradient. All analytical results for the 1997 samplings appear in Appendix C, with summary values for coastal and riverine stations below in Table 8. Coastal stations were distinguished by comparatively low levels of inorganic nitrogen species, especially nitrate-nitrite-nitrogen. Inorganic or ortho-phosphorus levels were also low, but generally detectable ( $> 0.005$  mg/l), while total phosphorus concentrations were less than the analytical limit of detection (0.05 mg/l) in 75 % of the 1997 samples. Total nitrogen values were moderate and increased with increasing salinity (Figure 6), in both spatial and temporal scales and among all station categories: Inorganic N:P ratios indicate the coastal waters were strongly nitrogen limited (values less than 10) during May 1997, while increases in ammonia and nitrate-nitrite-nitrogen in September produced a more balanced system (ratios between 10 and 30), albeit with higher inorganic nutrient concentrations overall. Figure 7 illustrates the inorganic N:P ratios for the various station categories of all three samplings to date.

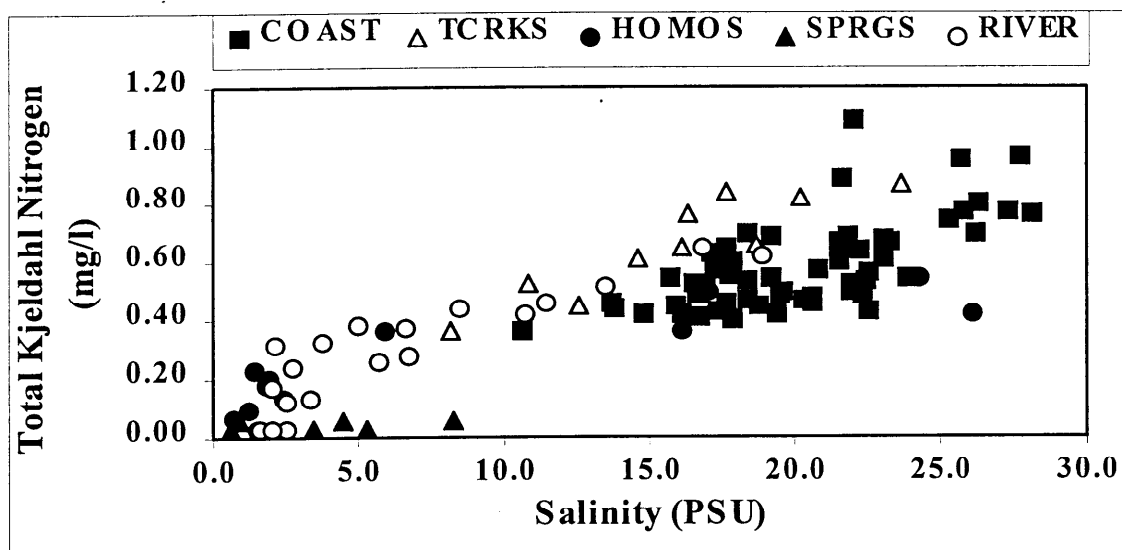


Figure 6. Total Kjeldahl nitrogen as a function of salinity; all samplings and station categories. (COAST - coastal stations, TCRKS - tidal creeks, HOMOS - Homosassa River, SPRGS - secondary spring vents, RIVER - Chassahowitzka River.)

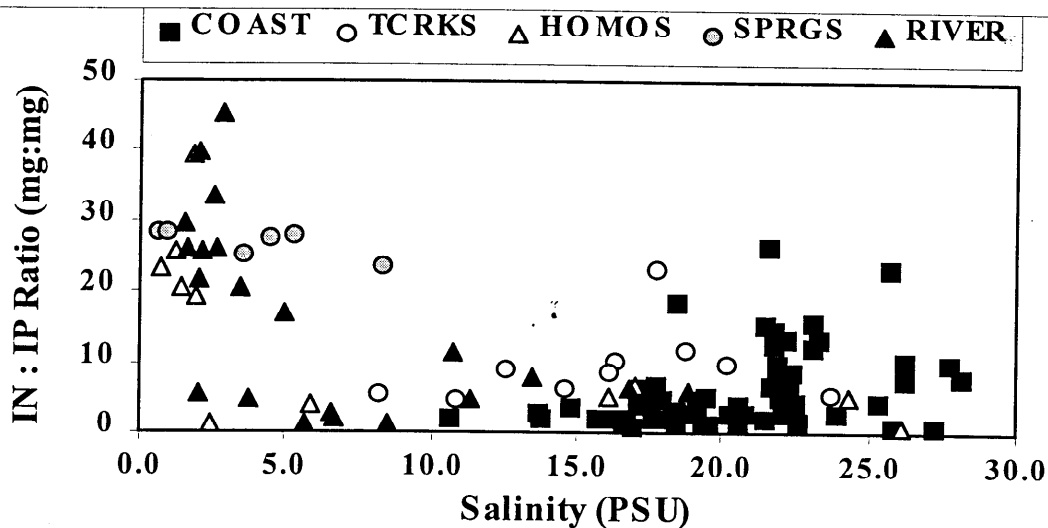


Figure 7. Inorganic Nitrogen:Phosphorus ratios as a function of salinity; all samplings and station categories. (COAST - coastal stations, TCRKS - tidal creeks, HOMOS - Homosassa River, SPRGS - secondary spring vents, RIVER - Chassahowitzka River.)

Table 8. Summary regional nutrient and chlorophyll values for May and September 1997. Values less than the limit of detection averaged as a zero value. Units are mg/l for nutrients, ug/l for chlorophyll, mg:mg for nutrient ratios, and unitless for TSI values. "Riverine" comprised of Chassahowitzka River stations only.

	<u>Coastal 5/97</u>	<u>Coastal 9/97</u>	<u>Riverine 5/97</u>	<u>Riverine 9/97</u>
PO <sub>4</sub> -P	0.004	0.007	0.005	0.011
TOTP	0.00	0.03	0.00	0.02
NH <sub>4</sub> -N	0.017	0.064	0.016	0.032
NO <sub>23</sub> -N	0.001	0.010	0.115	0.143
TKN	0.54	0.71	0.20	0.39
TN	0.55	0.72	0.32	0.54
Chl <i>a</i> , corr.	1.9	1.7	1.8	2.5
IN:IP	4.7	10.5	20.2	15.0
TN:TP	21.9	21.3	14.7	18.3
TSI	30	36	31	35

Trophic state indices were almost all “GOOD” (less than 50), with the exception of Stations 6 and 41 during September. For these stations, Secchi depths were low and increased the trophic state index from “GOOD” to a “FAIR” designation. Spatial patterns of TSI, indicate higher values (40-49) in the northern Mason Creek-Homosassa Bay area (Figure 8). Conductivity values, however, were comparable between the northern and southern regions and there is not an obvious dependence of TSI on salinity (Figure 9).

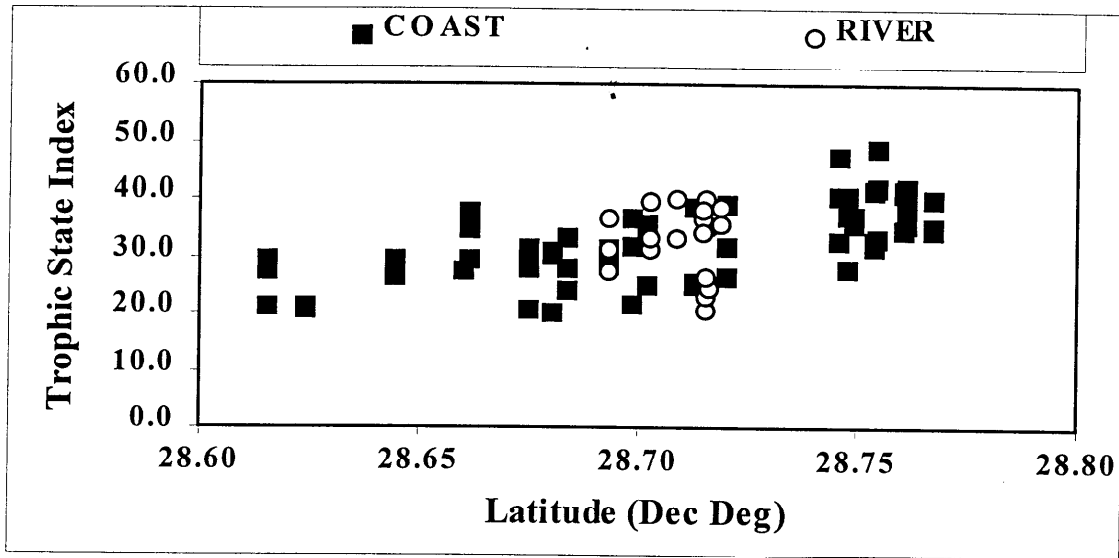


Figure 8. Spatial distribution (by latitude) of trophic state indices; all samplings, for Chassahowitzka riverine (RIVER) and coastal stations (COAST) only.

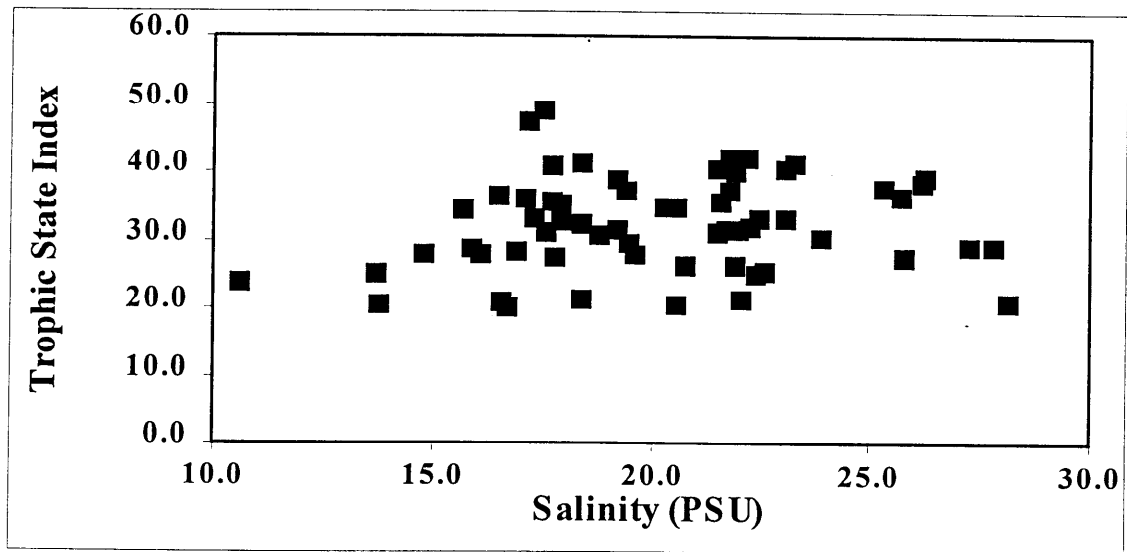


Figure 9. Lack of dependence of trophic state on salinity; coastal stations, all samplings.

The higher TSI in the northern region imply that nutrient loadings may be greater in this area, perhaps attributable to higher residential density or to influences of some of the larger watershed rivers to the north (Withlacoochee, Suwannee Rivers). A riverine influence to the north is consistent with the patterns of total and organic nitrogen increasing with salinity from the mouths of the Chassahowitzka and the Homosassa Rivers (Figure 6).

Using non-parametric tests (Kruskal-Wallis), all nitrogen and phosphorus species, trophic state indices, and inorganic N:P ratios were significantly ( $p \leq 0.05$ ) higher in May than in September of 1997 for the coastal waters. The only significant changes for the riverine stations as a group were increases in ortho-phosphorus and total nitrogen between May and September. Comparisons of May 1996 with May 1997 detected significant changes (increases) only for salinity, temperature, ammonia, and inorganic N:P ratios in the coastal waters and no changes for the riverine stations. Secchi depths, with few exceptions were greater than bottom in the shallow coastal waters and so changes in water clarity are untested.

Notable among the water quality data are the nitrate-nitrite-nitrogen concentrations collected at the various spring vents and, in the Chassahowitzka and Homosassa main stems, the rapidity with which it is removed from the water column. The most upstream sample on the Homosassa River averaged 0.38 mg/l, even though not collected directly over a spring vent. Station CH#1 and POTTR averaged between 0.43 and 0.44 mg/l, the Chassahowitzka Main spring (RO) averaged 0.40 mg/l, while CRAB recorded slightly above 0.42 mg/l. Waters in the upper river were strongly phosphorus-limited due to the excess of nitrate-nitrite-nitrogen present. Background groundwater concentrations of unimpacted systems are estimated to be near 0.01 mg/l (Jones *et al.*, 1997). Figure 10 illustrates the removal of nitrate within a short distance downstream for the Chassahowitzka stations.

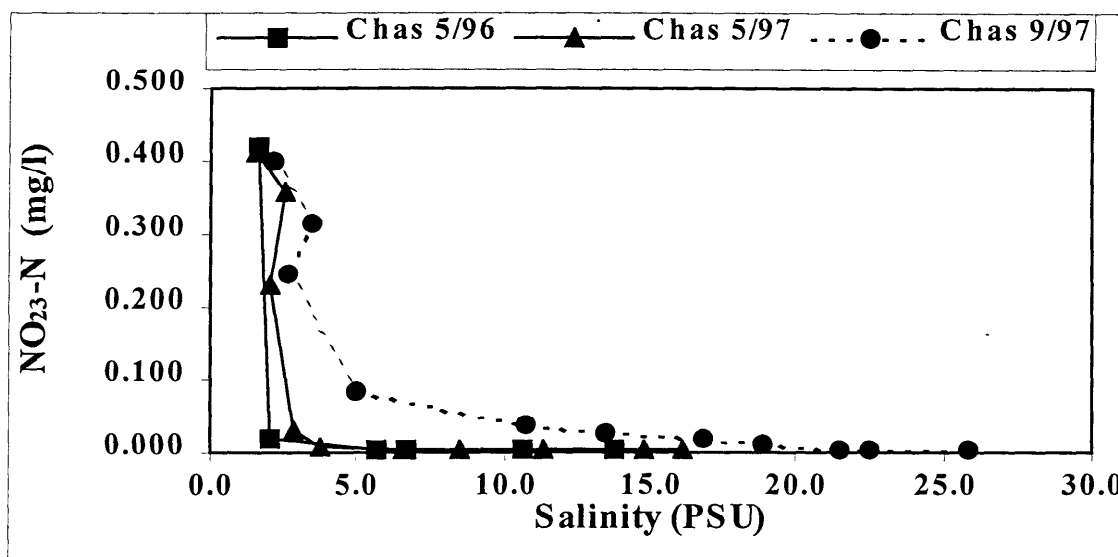


Figure 10. Gradient of nitrate-nitrite-nitrogen with respect to salinity; all Chassahowitzka River samplings.

Most nitrate-nitrite-nitrogen had been consumed by Station 2.5, although in September, measurable quantities were recorded at the mouth of the river. Perhaps in response to the increased nutrient levels in September, riverine chlorophyll concentrations (Figure 11) and TSI values (Figure 12) were also elevated with respect to the May samplings.

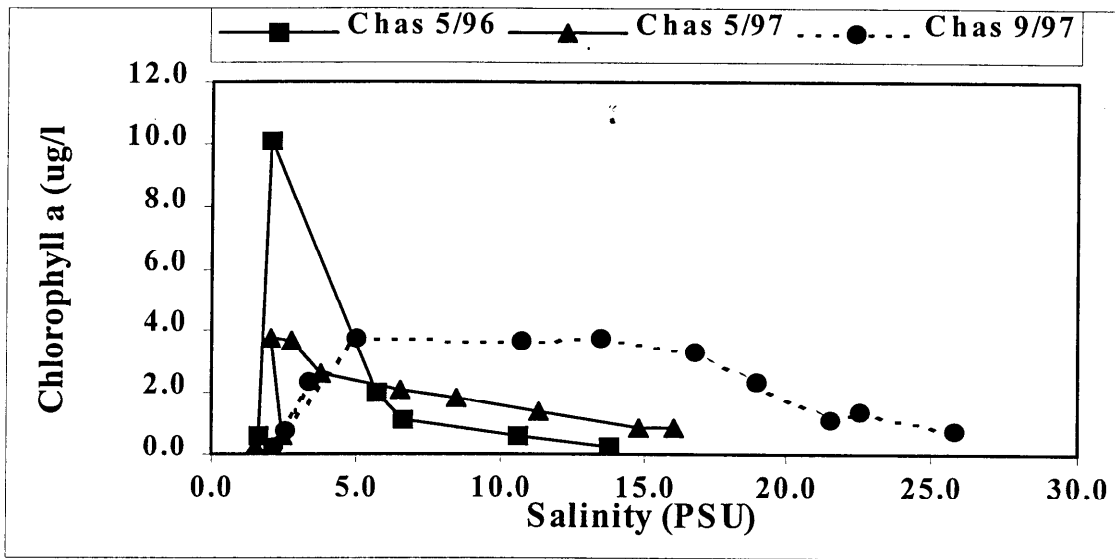


Figure 11. Gradients of Chlorophyll *a*, corrected for pheophytin, with respect to salinity; all Chassahowitzka River samplings.

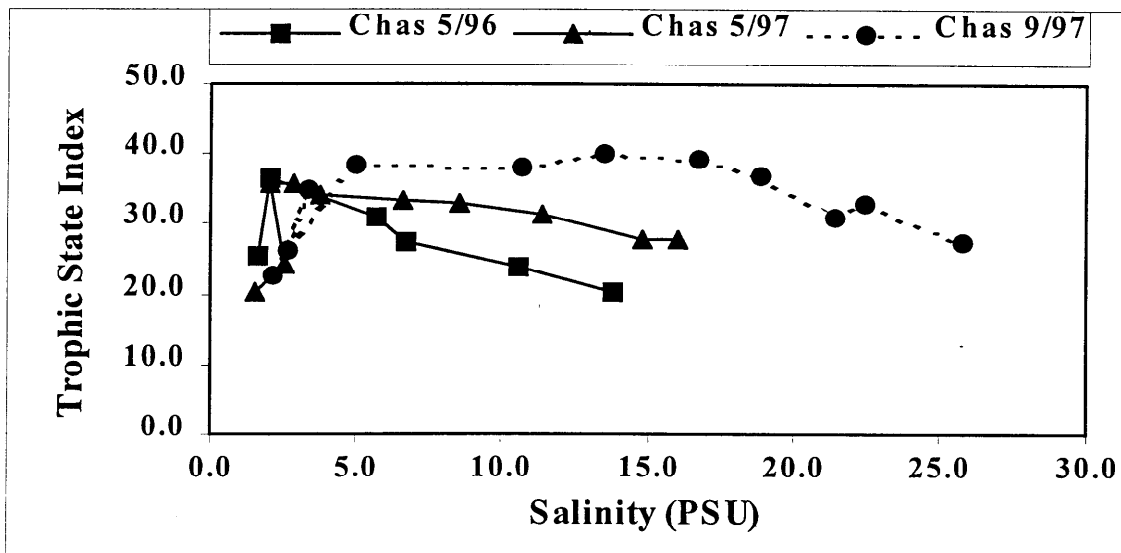


Figure 12. Gradients of Trophic State Index with respect to salinity; all Chassahowitzka River samplings.

Gradients of organic nitrogen (Figure 13) are the reverse of the gradients typical of the estuarine portions of surface watershed rivers. Even during September, when efforts were made to sample the most offshore stations for nutrients and salinities were higher than previous samplings, no decrease in nutrients with distance offshore was generally observed. The reverse gradient was present in riverine stations, as well as in coastal locations and tidal creeks (see also Figure 6). Export of organic nitrogen compounds from the forested wetlands and extensive marshes, in addition to the influence of watershed rivers to the north, would contribute to the observed reverse gradient.

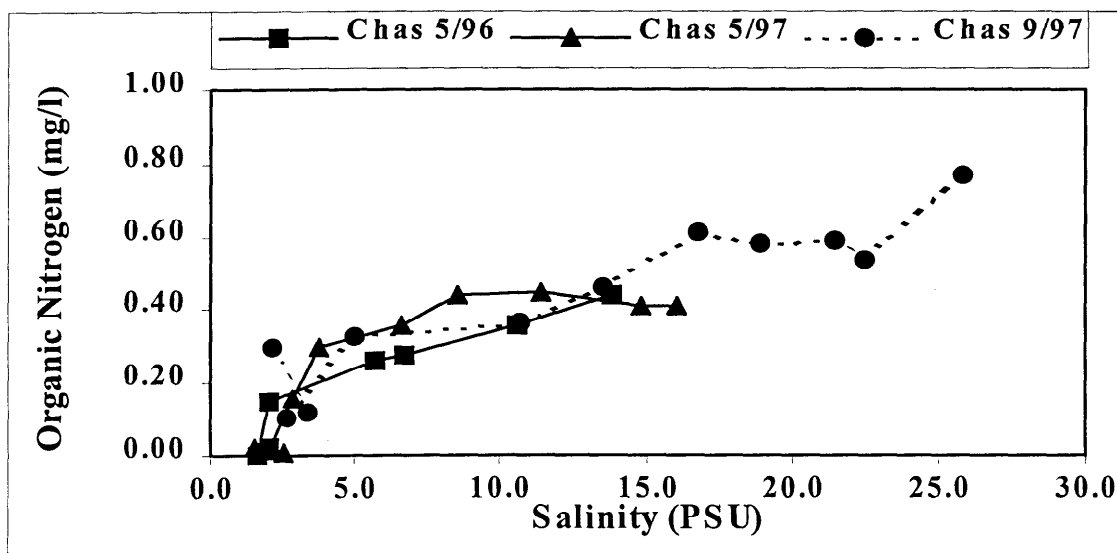


Figure 13. Reverse gradients of organic nitrogen with respect to salinity; all Chassahowitzka samplings.

Interestingly, comparison of Chassahowitzka and Homosassa riverine gradients indicate that, for a given fraction of saline waters, concentrations of nitrogen were higher in the Chassahowitzka River (Figure 14). Patterns were similar for both May and September 1997. Sampling runs on the two rivers were completed on successive days under similar tidal conditions and the results indicate that for similar proportions of fresh and saline waters, the Chassahowitzka appears to have a higher nitrogen load. Convergence of the offshore more saline stations indicate the influence of a similar offshore water mass for each system. The smaller channel widths, fewer limestone outcrops, and higher proportion of riverside marshes in the Chassahowitzka could all contribute to this result. Despite the higher nitrogen concentrations in the Chassahowitzka, the Homosassa River displayed higher chlorophyll (and therefore higher trophic state indices) for comparable salinities (Figure 15). Residence times could differ sufficiently (higher in the Homosassa) to allow phytoplankton to bloom in specific low salinity regions. Additionally, the organic nitrogen exported from the wetlands and marshes as humic substances could be in a relatively non-bioavailable form.

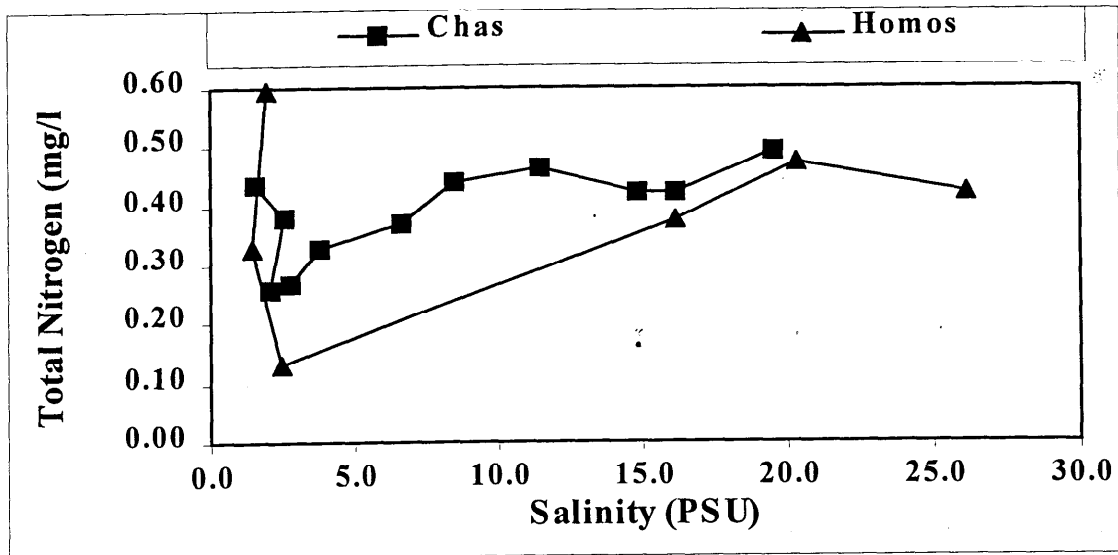


Figure 14. Comparison of total nitrogen as a function of salinity, in the Chassahowitzka and Homosassa Rivers.

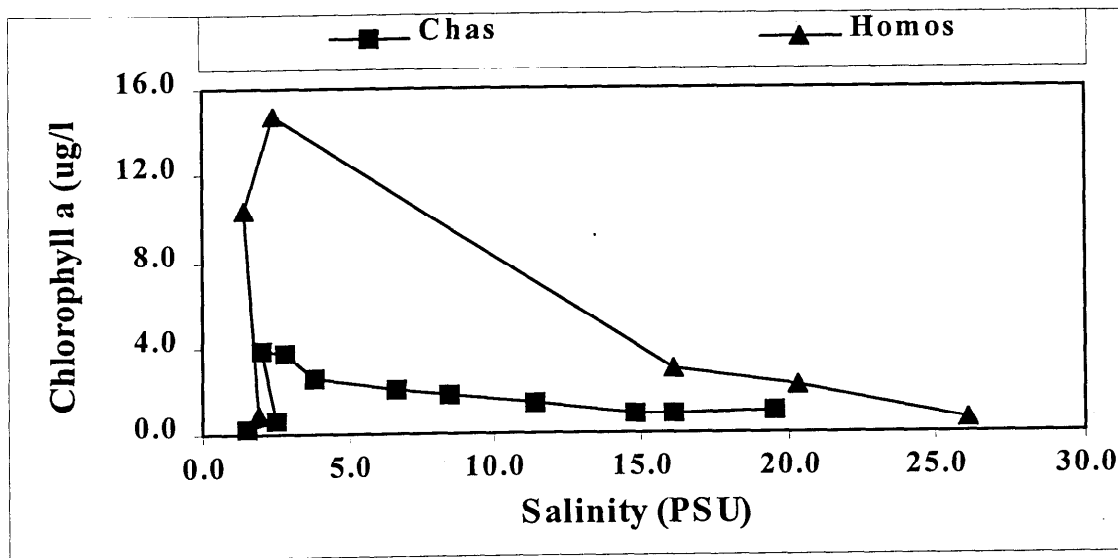


Figure 15. Comparison of chlorophyll *a*, corrected for pheophytin, as a function of salinity, in the Chassahowitzka and Homosassa Rivers.

### Phytoplankton

During 1997, phytoplankton and the dinoflagellate portions of the total community were manifestly different from the 1996 sampling. From a fairly coherent and uniform ratio of dinoflagellate:phytoplankton counts in 1996, dinoflagellates in 1997 samples formed a much smaller fraction of the total population with a greater variation in the relationship.

Whereas dinoflagellates had formed 40-60% of the total organisms counted in May 1996, dinoflagellates averaged 6% and 8 % of the total during the May and September samplings, respectively (Figure 16). Total phytoplankton counts for the coastal areas averaged 84000, 187000, and 106000 organisms/l during the three samplings. For either single samplings or for the combined database, neither salinity variations, nor a variety of nutrient concentrations displayed a direct relationship to either total concentrations or dinoflagellate ratios.

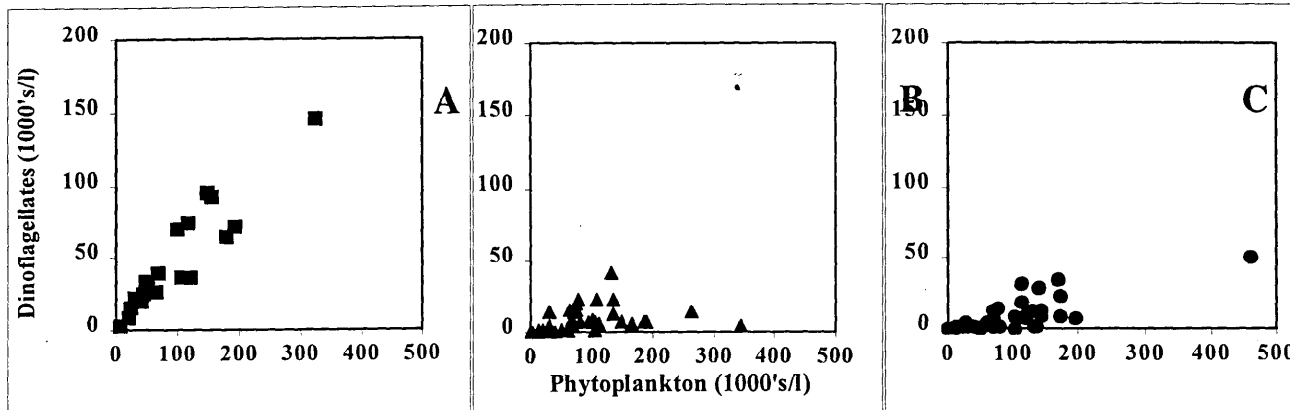


Figure 16. Dinoflagellate abundance as function of total phytoplankton concentration; riverine and coastal stations. Scales truncated. A - May 1996, B - May 1997, C - September 1997.

### Biomass

A survey of wet weight biomass along a riverine transect in May and September 1997 demonstrated distinct spatial patterns in both algal and vascular abundance (Appendix D). Although methods varied slightly between the two samplings, seasonal variations were also captured. The May sampling recorded a maximum biomass of 12 kg/m<sup>2</sup> at Station 1.3, distributed evenly between rooted (*Potamogeton pectinatus*) and algal species. (May biomass values are the arithmetic average of samples of “light”, “typical”, and “heavy” vegetation concentrations.) Total biomass reached a minimum at Station 2.5 and 3, in an area of high salinity variation. Vascular SAV (regardless of species) was primarily limited to the river (Figure 17), while algal species (both attached and drift varieties) formed a bimodal pattern with a maximum in the low salinity region of the river (generally filamentous green and blue-green varieties, minimal values at the stations upstream of the mouth of the Chassahowitzka, and higher biomass values (*Caulerpa paspaloides*, drift Rhodophyta) offshore.

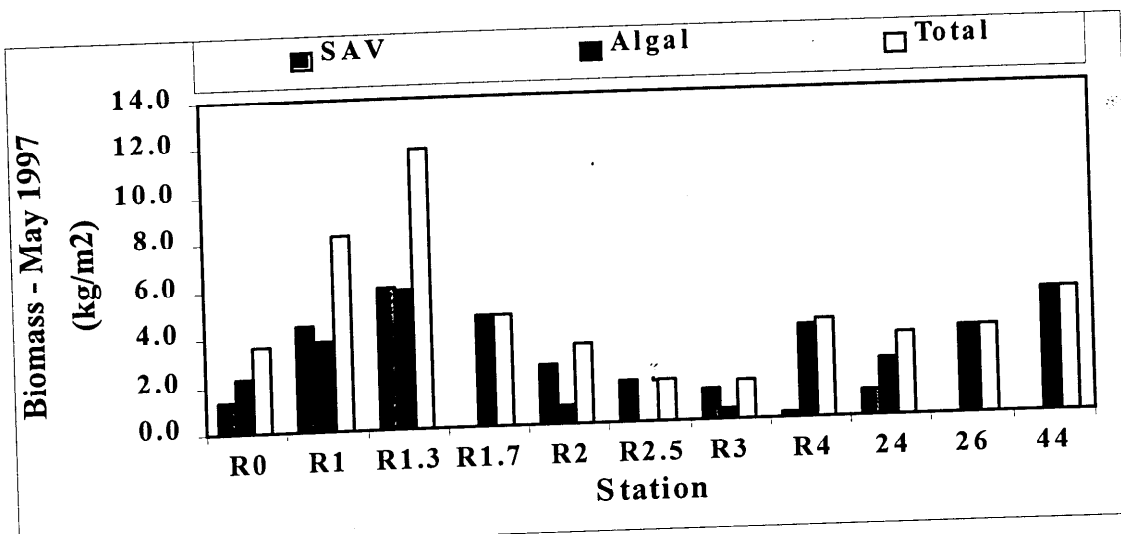


Figure 17. Riverine gradients of biomass, as the average of “light,” “typical,” and “heavy” growth, during May 1997. Allocated into vascular submerged aquatic vegetation (SAV) and macroalgal components.

During September, biomass samples represented the arithmetic average of five samples across the river channel, or randomly placed in open waters. The bimodal pattern of algal biomass is still present but the filamentous algae at the headspring was quite heavy, at 16 kg/mg<sup>2</sup>. Other than this station biomass values were lower overall with vascular species forming a minimal portion of the total (Figure 18).

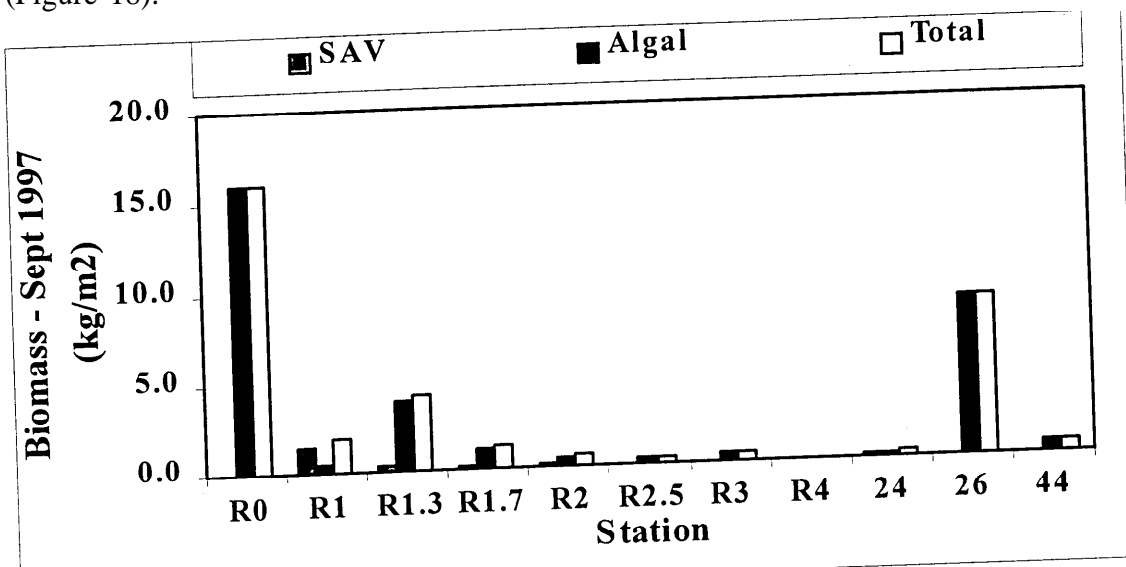


Figure 18. Riverine gradients of biomass, as the average of five evenly spaced (across channel) or randomly placed (open water) quadrats during September 1997. Allocated into vascular submerged aquatic vegetation (SAV) and macroalgal components.

## Sediments

Results of sediment nutrient analyses are presented below and in Appendix E. For the purposes of this exploratory sampling, total Kjeldahl nitrogen was assumed to be the majority of total nitrogen in the sediments since nitrate porewater concentrations are typically low. (This assumption will be tested in subsequent samplings.) During the May sample collection when nutrients were analyzed, Stations R4 and 44 were on rocky substrate and no sample was possible. Grain size results from both May and September samplings appear in Appendix E and reflect a range of conditions within the river and coastal areas.

Within the upper river (Stations R0 through R1.3) water velocity is high in midchannel and sediments consist of primarily the sand sized fraction. At Stations R1.7, R2, and at pockets between limestone outcrops at Station 26 (and other offshore stations), sediments are very unconsolidated and organic and nutrient content quite high, up to 10 mg TKN/kg dry sediment (Figure 19).

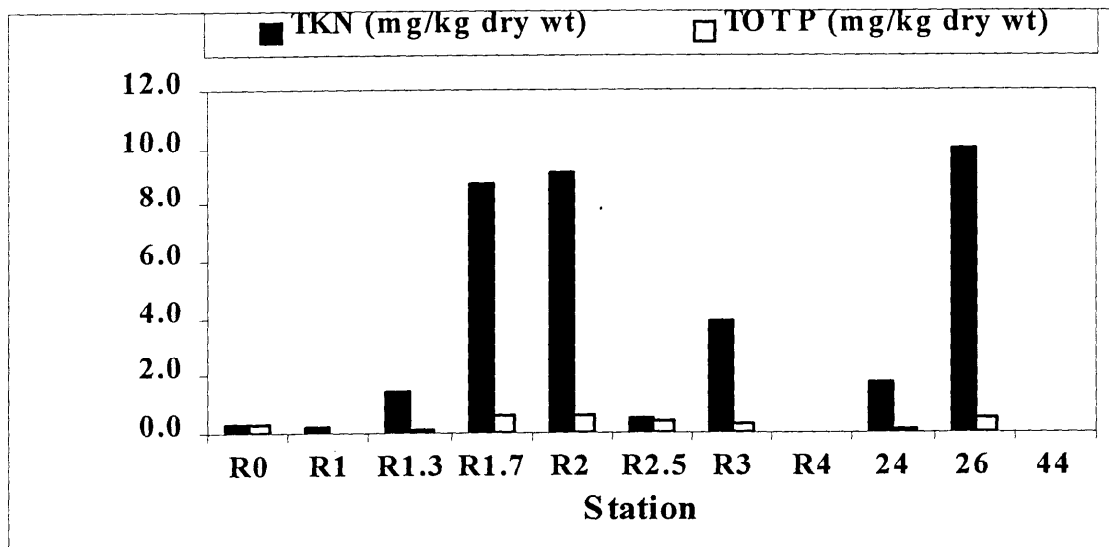


Figure 19. Riverine gradients of sedimentary total Kjeldahl nitrogen and total phosphorus during May 1997. Rocky substrate and no sample at Stations R4 and 44.

The unconsolidated nature and total nutrient content of sediment is mirrored by the spatial distribution of sediment organic content (Figure 20). Interestingly, stations with high percent organic content also have a high N:P (TKN:TOTP) ratio and could indicate that zones of organic accumulation preferentially release phosphorus (under hypoxic or anoxic conditions), and that organic sediments could act as a temporary nitrogen sink.

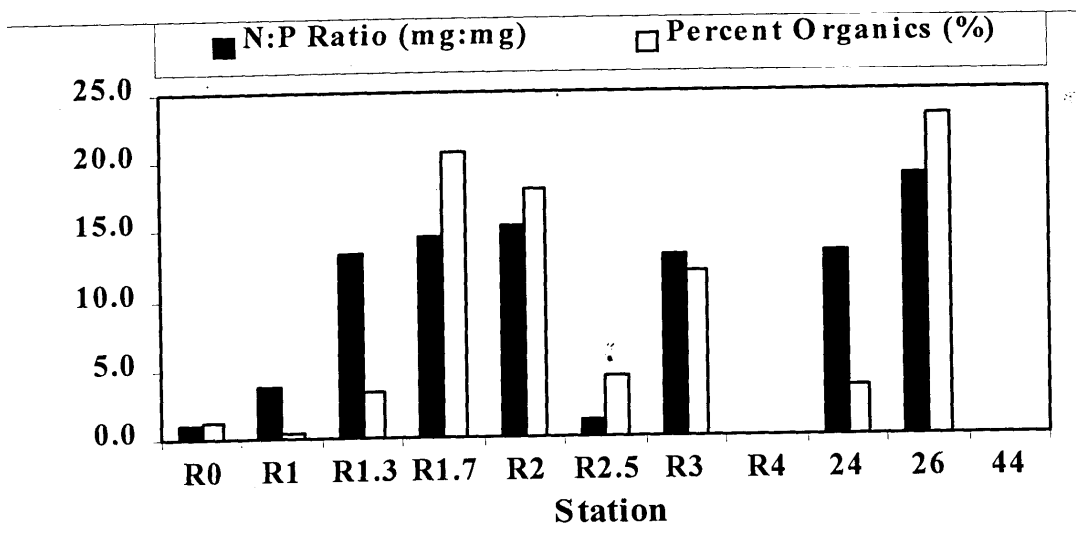


Figure 20. Riverine gradients of sedimentary N:P ratios (N from TKN only) and percent organics during May 1997.

The preferential mobilization of phosphorus from organic matter is supported by the spatial pattern of phosphorus content per weight of organic matter in the sediment rather than per total dry weight (Figure 21). In general, the phosphorus content of sedimentary organic material declines with distance downstream, while nitrogen content although slightly variable, displays no monotonic spatial trend and has a very direct relationship with sediment organic content (Figure 22). The spatial pattern of phosphorus content of organic matter is also consistent with the strong phosphorus limitation of upstream stations where nitrate-nitrite-nitrogen is present in quantity.

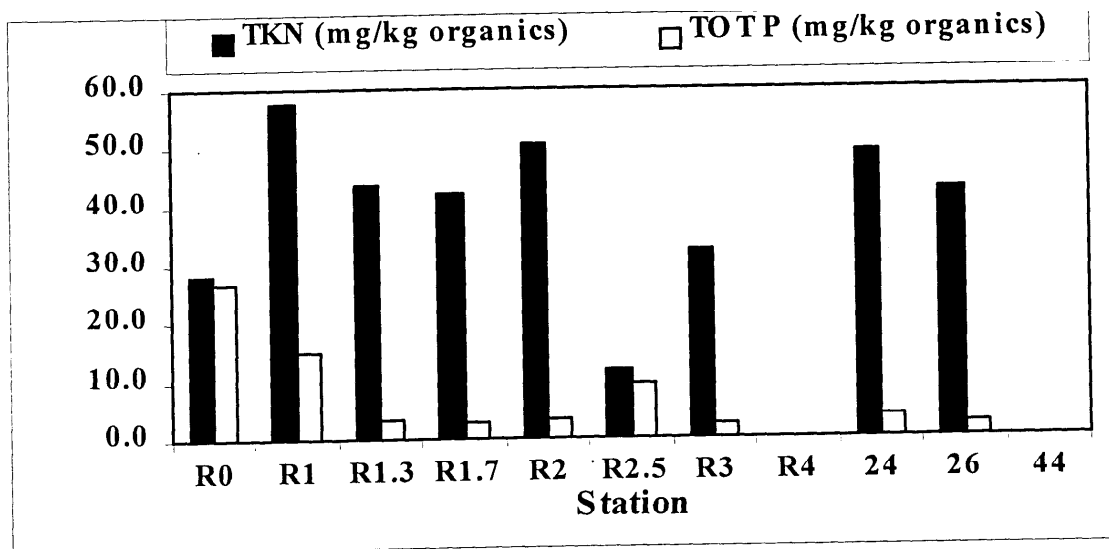


Figure 21. Riverine gradient of total Kjeldahl nitrogen and total phosphorus, normalized for sediment organic content, during May 1997.

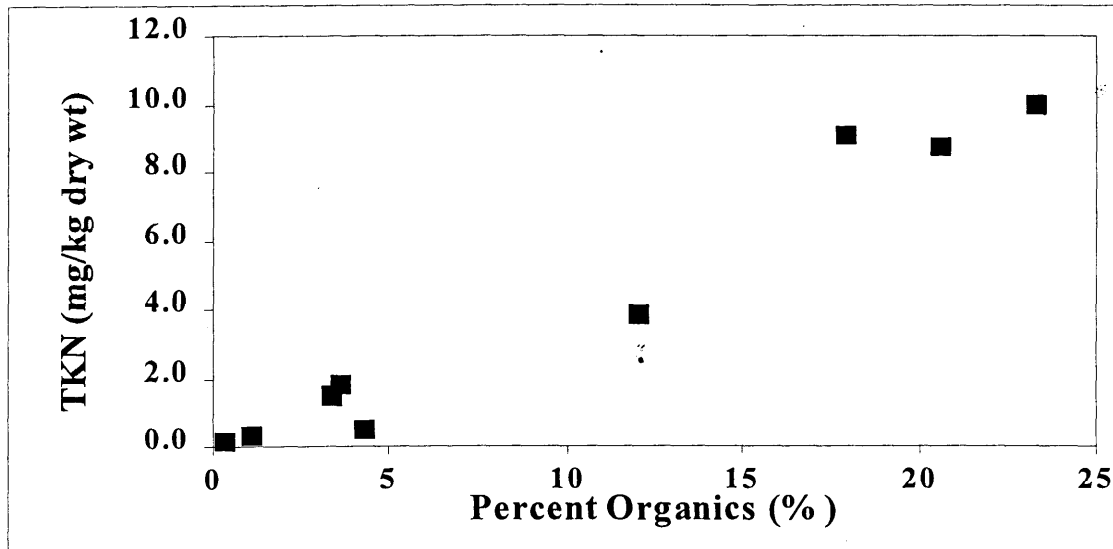


Figure 22. Sediment total Kjeldahl nitrogen content as a function of percent organic content during May 1997.

### Summary

The oligotrophic nature of the nitrogen-limited coastal waters within the Chassahowitzka National Wildlife Refuge are threatened by the prospect of increased nitrogen loads both from groundwater discharges and from atmospheric deposition. Spring discharges of the Chassahowitzka and other major spring complexes in the region already have nitrate-nitrite-nitrogen concentrations nearly 50 times that of pristine background conditions. Tidal variation in both discharge quality and quantity are evidence of a complex hydrologic structure. Within the river systems, there are numerous smaller spring vents which are largely unmapped, and there is also a high potential for substantial quantities of submarine freshwater discharge. The relative amount of direct groundwater discharge to the coastal waters is unknown at this time. Groundwaters discharging to the region are approximately 10 to 50 years old and so even the most aggressive management actions enacted at this time will only demonstrate nutrient reductions within a comparable time span.

The sampling conducted for this report was designed to collect statistically robust baseline information against which future samplings can be evaluated. Submerged aquatic vegetation (both vascular and attached macroalgal) was identified to species level and abundances estimated at 30 coastal stations. Water quality samples were collected from 20 coastal stations, as well as along the Chassahowitzka and Homosassa riverine salinity gradients. Samplings were conducted in May and September 1997, during periods of both groundwater and rainfall deficits. Ancillary samplings included both biomass and sediment nutrients along a gradient from upriver to offshore.

Initial work in the Chassahowitzka National Wildlife Refuge and Chassahowitzka River has established that the coastal area supports a heterogeneous and stable community of submerged aquatic vegetation. During the May samplings to date, vegetation in the coastal region was dominated by a variety of drift algal species, while during all samplings, *Caulerpa paspaloides* was the most frequently observed attached species. Declines in drift species frequency were noted during September 1997, and *Acetabularia* was observed approximately half as often in 1997 as in May 1996. Riverine biomass was bimodal with minimum values observed in the area of high salinity variation. September biomass values were generally lower than May observations, and the percentages of vascular plants in September data were very small.

Coastal waters are shallow and were well mixed during all samplings. September 1997 was notable for higher salinities than had been observed previously. Spring discharges were also more saline during this sampling event. Dissolved oxygen values were generally above instantaneous criteria, but some violations ( $< 4.0$  mg/l) were recorded during early morning samplings. The D.O. violations were typically in the northern portion of the Refuge coastal waters. September D.O. levels and percent saturation values were significantly lower than during the prior two samplings. Secchi depths were almost all greater than water column depths.

In coastal waters, inorganic nitrogen species, ortho-, and total phosphorus were generally quite low. During May 1997, coastal waters were strongly nitrogen limited, while higher levels of ammonium and nitrate-nitrite during September produced a more balanced water column. Trophic state indices recorded two instances of the "FAIR" category during September, with the remaining stations categorized as "GOOD". Despite waters being more saline, all nitrogen and phosphorus species, trophic state indices, and inorganic N:P ratios were significantly (Kruskal-Wallis) higher in September as compared to May 1997.

Riverine water quality is distinguished by discharge of slightly saline waters from a complex of spring vents at the head of the Chassahowitzka River. The nitrate-nitrite nitrogen concentration is generally above 0.4 mg/l, but is rapidly removed from the water column by the extensive vegetation in the freshwater portion of the river. Similar patterns of nitrate removal appear in the Homosassa River, as well. Another interesting feature of riverine water quality in both systems is that organic nitrogen is low at the spring vents and steadily increases with salinity, implying that the nearshore oligotrophic waters are diluted with higher nutrient content, more saline waters, perhaps representing nutrient loads from larger surface drainage rivers to the north. Export of organic nitrogen from forested wetlands and marshes may also contribute to the reverse gradient.

In comparing the Chassahowitzka and Homosassa Rivers, the Chassahowitzka had more nitrogen content for comparable salinity values. Conversely however, the Homosassa recorded higher chlorophyll content and trophic state indices. The differences may be attributable to comparative size and possible longer residence time of waters in the Homosassa, as well as the apparently greater proportion of marshes along the Chassahowitzka.

Specific regions of the Chassahowitzka River and offshore areas have unconsolidated, highly organic sediments. Sediment nutrient data indicate a preferential demobilization of phosphorus from organics materials, with relatively constant proportions of nitrogen in organic matter.

### Recommendations

Water column nutrients in the Refuge have been consistently low with many values (particularly of inorganic nutrients) below analytical detection limits. The oligotrophic and nitrogen-limited waters of the Refuge, however, are subjected to a variety of nutrient loadings. Inorganic nitrogen, primarily nitrate-nitrite-nitrogen, is present in substantial quantities in many of the known spring discharges, but is rapidly removed from the water column. Downstream loadings would be in the form of dissolved and detrital compounds originating from the extensive biomass in the upper river. In-Refuge sources could also include contributions by water exchange with the extensive coastal marsh system. External sources would include the import from nearby major riverine systems, direct contributions of groundwater to the coastal area, and atmospheric deposition of nitrate and ammonium nitrogen. Direct atmospheric loading of nitrogen to Refuge waters is roughly comparable to that from the major Chassahowitzka discharges, while the remaining sources are not quantifiable at this time.

As known loadings of nitrogen are predicted to increase over time, monitoring of the Refuge water column and biota should be designed to quantify areas and systems where changes can be predicted or are expected. The primary goals should be the ability to detect temporal trends in water quality and vegetation (particularly trends due to increasing nutrient loads), and to collect quantitative information at intervals, focusing on information suitable for ecological modeling. To aid in trend detections, water quality samplings would benefit from increased sampling frequency, while SAV monitoring of a more stable community do not require the same frequency. Due to the complexity of nitrogen sources to the Refuge itself, work within the Chassahowitzka River would simplify the identification of direct relationships between tidal freshwater and brackish water community responses and nitrogen loadings. Work within the coastal waters of the Refuge will allow the detection of trends, but due to the numerous sources or potential sources of nitrogen, may not be attributable to any given source.

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# **Appendix A**

## **SAV Quadrat Data Station and Species Summary**

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
5/20/97	2	1	Syringodium filiforme	Rock bottom	0.9	>B
	2	1	Udotea flabellum			
	2	2	Misc. Algae	Laurencia poitei		
	2	2	Syringodium filiforme			
	2	2	Thalassia testudinum			
	2	3	Misc. Algae	Laurencia poitei		
	2	3	Caulerpa prolifera			
	2	4	Misc. Algae	Laurencia poitei		
	2	4	Syringodium filiforme			
5/20/97	3	1	Halodule wrightii	Rock bottom	1.4	>B
	3	1	Halophila englemannii			
	3	2	Caulerpa prolifera			
	3	2	Halophila englemannii			
	3	2	Ruppia maritima			
	3	3	Halimeda incrassata			
	3	3	Halophila englemannii			
	3	4	Halimeda incrassata			
	3	4	Halophila englemannii			
5/20/97	4	1	Halodule wrightii	Rock bottom	0.8	>B
	4	1	Misc. Algae	Laurencia poitei		
	4	1	Halophila englemannii			
	4	2	Halodule wrightii			
	4	2	Halophila englemannii			
	4	3	Misc. Algae	Laurencia poitei		
	4	3	Acetabularia crenulata			
	4	3	Penicillus capitatus			
	4	3	Udotea flabellum			
	4	4	Acetabularia crenulata			
	4	4	Halodule wrightii			
	4	4	Syringodium filiforme			
5/20/97	6	1	Caulerpa prolifera	Bottom-rock	1.1	>B
	6	2	Caulerpa prolifera	Caulerpa paspaloides near		
	6	3	Caulerpa paspaloides			
	6	3	Caulerpa prolifera			
	6	4	Caulerpa paspaloides			
	6	4	Caulerpa prolifera			
5/20/97	7	1	Caulerpa paspaloides	Some Caulerpa paspaloides bleached; sediment >6ft.	1.6	>B
	7	2	Caulerpa paspaloides			
	7	3	Misc. Algae	Chondria tenuissima		
	7	3	Caulerpa paspaloides			
	7	3	Caulerpa prolifera			
	7	3	Halimeda incrassata			
	7	4	Caulerpa paspaloides			
	7	4	Caulerpa prolifera			
	7	4	Halimeda incrassata			
	7	4	Halodule wrightii			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
5/20/97	8A	1	Halodule wrightii	Sediment 4ft.	0.8	>B
	8A	1	Caulerpa paspaloides			
	8A	1	Halophila englemannii			
	8A	2	Halodule wrightii			
	8A	2	Halophila englemannii			
	8A	3	Halophila englemannii			
	8A	3	Ruppia maritima			
	8A	4	Caulerpa paspaloides			
	8A	4	Halodule wrightii			
	8A	4	Halophila englemannii			
	8A	4	Ruppia maritima			
5/20/97	9	1	Caulerpa prolifera	Rock bottom	1	>B
	9	1	Misc. Algae	Digenia simplex/Chondria tenuissima/Anadyomene stellata		
	9	1	Udotea flabellum			
	9	2	Misc. Algae	Digenia simplex/Chondria tenuissima/Anadyomene stellata		
	9	2	Udotea flabellum			
	9	3	Misc. Algae	Digenia simplex/Chondria tenuissima/Anadyomene stellata		
	9	3	Caulerpa prolifera			
	9	4	Misc. Algae	Digenia simplex/Chondria tenuissima/Anadyomene stellata		
	9	4	Caulerpa prolifera			
5/20/97	12	1	Acetabularia crenulata	Rock bottom	0.6	>B
	12	1	Misc. Algae	Chondria tenuissima/Spyridea filimentosa		
	12	1	Batophora oerstedii			
	12	2	Misc. Algae	Chondria tenuissima/Spyridea filimentosa		
	12	2	Acetabularia crenulata			
	12	2	Batophora oerstedii			
	12	2	Halimeda incrassata			
	12	3	Misc. Algae	Chondria tenuissima/Spyridea filimentosa		
	12	3	Acetabularia crenulata			
	12	3	Batophora oerstedii			
	12	3	Halimeda incrassata			
	12	3	Penicillus capitatus			
	12	4	Acetabularia crenulata			
	12	4	Batophora oerstedii			
	12	4	Halimeda incrassata			
	12	4	Penicillus capitatus			
5/20/97	14	1	Halodule wrightii	Sediment >6ft.; Penicillus in area.	1.4	>B
	14	2	Halodule wrightii			
	14	3	Halodule wrightii			
	14	4	Halodule wrightii			
5/20/97	17	1	Thalassia testudinum	Sediment 3ft. 6in.	0.8	>B
	17	2	Misc. Algae	Spyridea filimentosa		
	17	2	Thalassia testudinum			
	17	3	Thalassia testudinum			
	17	4	Thalassia testudinum			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
5/20/97	18	1	Caulerpa paspaloides	Rock bottom; Penicillus in area	1.4	>B
	18	1	Misc. Algae	Spyridea filamentosa		
	18	2	Caulerpa paspaloides			
	18	3	Caulerpa paspaloides			
	18	4	Caulerpa paspaloides			
	18	4	Halimeda incrassata			
5/20/97	19	1	Acetabularia crenulata	Rock bottom	0.8	>B
	19	1	Misc. Algae	Laurencia poitei/Spyridea filamentosa		
	19	2	Misc. Algae	Laurencia poitei/Spyridea filamentosa		
	19	2	Acetabularia crenulata			
	19	2	Batophora oerstedii			
	19	3	Misc. Algae	Laurencia poitei/Spyridea filamentosa		
	19	4	Misc. Algae	Laurencia poitei/Spyridea filamentosa		
	19	4	Acetabularia crenulata			
	19	4	Batophora oerstedii			
	19	4	Halimeda incrassata			
5/20/97	20	1	Chara spp.	Sediment 2in.	1.1	>B
	20	1	Caulerpa paspaloides			
	20	2	Chara spp.			
	20	3	Penicillus capitatus			
	20	3	Chara spp.			
	20	4	Caulerpa paspaloides			
	20	4	Chara spp.			
	20	4	Penicillus capitatus			
5/20/97	21	1	Caulerpa paspaloides	Sediment 2ft. 3in. (mud)	1.3	>B
	21	2	Caulerpa paspaloides			
	21	3	Caulerpa paspaloides			
	21	4	Caulerpa paspaloides			
5/20/97	22	1	Caulerpa prolifera	Rock bottom Caulerpa prolifera near	1.9	>B
	22	1	Misc. Algae	Laurencia poitei/Spyridea filamentosa		
	22	1	Batophora oerstedii			
	22	2	Misc. Algae	Laurencia poitei/Spyridea filamentosa		
	22	2	Batophora oerstedii			
	22	3	Misc. Algae	Laurencia poitei/Spyridea filamentosa		
	22	3	Thalassia testudinum			
	22	4	Misc. Algae	Laurencia poitei/Spyridea filamentosa		
5/20/97	23	1	Caulerpa paspaloides	Rock bottom	1.5	>B
	23	2	Misc. Algae	Chondria tenuissima		
	23	2	Caulerpa paspaloides			
	23	3	Misc. Algae	Chondria tenuissima		
	23	3	Caulerpa paspaloides			
	23	4	Misc. Algae	Chondria tenuissima		
	23	4	Caulerpa paspaloides			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
5/19/97	24	1	Halodule wrightii		1.2	>B
	24	2	Caulerpa paspaloides			
	24	2	Halodule wrightii			
	24	3	Misc. Algae	Spyridea filamentosa/Chondria tenuissima		
	24	3	Halodule wrightii			
	24	3	Ruppia maritima			
	24	4	Halodule wrightii	Acetabularia crenulata in area		
	24	4	Ruppia maritima			
5/20/97	25	1	Halodule wrightii	Rock bottom; Halodule Caulerpa prolifera in area	2.1	>B
	25	1	Caulerpa paspaloides			
	25	2	Halodule wrightii			
	25	2	Penicillus capitatus			
	25	3	Caulerpa paspaloides			
	25	4	Acetabularia crenulata			
5/19/97	26	1	Misc. Algae	Spyridea filamentosa	2.2	>B
	26	1	Caulerpa paspaloides			
	26	2	Caulerpa paspaloides			
	26	3	Caulerpa paspaloides	Photos No. 11 & 12		
	26	4	Caulerpa paspaloides			
5/19/97	27	1	Acetabularia crenulata		0.8	>B
	27	1	Batophora oerstedii			
	27	1	Halimeda incrassata			
	27	2	Acetabularia crenulata			
	27	2	Batophora oerstedii			
	27	3	Acetabularia crenulata			
	27	4	Acetabularia crenulata			
	27	4	Batophora oerstedii			
5/19/97	28	1	Misc. Algae	Chondria tenuissima/Spyridea filamentosa	0.7	>B
	28	1	Caulerpa paspaloides			
	28	2	Acetabularia crenulata			
	28	2	Batophora oerstedii			
	28	3	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	28	3	Acetabularia crenulata			
	28	3	Batophora oerstedii			
	28	3	Penicillus capitatus			
	28	4	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	28	4	Acetabularia crenulata			
	28	4	Batophora oerstedii			
	28	4	Halimeda incrassata			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
5/19/97	30	1	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	30	1	Thalassia testudinum		0.6	>B
	30	2	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	30	2	Thalassia testudinum			
	30	3	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	30	3	Batophora oerstedii			
	30	3	Thalassia testudinum			
	30	4	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	30	4	Batophora oerstedii			
	30	4	Thalassia testudinum			
5/20/97	39	1	Chara spp.	Sediment 5ft 5in; salinity 15ppt.; photos 19 & 20	0.6	>B
	39	2	Caulerpa paspaloides			
	39	2	Caulerpa prolifera			
	39	2	Chara spp.			
	39	3	Caulerpa paspaloides			
	39	3	Chara spp.			
	39	3	Halodule wrightii			
	39	4	Caulerpa paspaloides	Caulerpa prolifera near Salinity 15 ppt photos 19-20		
	39	4	Chara spp.			
	39	4	Halodule wrightii			
	39	4	Ruppia maritima			
5/19/97	40C	1	Misc. Algae	Spyridea filamentosa	1.2	>B
	40C	1	Caulerpa paspaloides	Sediment depth 5'		
	40C	2	Misc. Algae	Spyridea filamentosa		
	40C	2	Caulerpa paspaloides			
	40C	2	Halimeda incrassata			
	40C	3	Misc. Algae	Spyridea filamentosa		
	40C	3	Caulerpa paspaloides			
	40C	4	Caulerpa paspaloides	Photos No. 13, 14 & 15		
	40C	4	Misc. Algae	Spyridea filamentosa		
5/20/97	41	1	Halophila englemannii	Sediment 1ft. 6in.; Caulerpa paspaloides in area	0.7	>B
	41	2	Halodule wrightii			
	41	2	Halophila englemannii			
	41	3	Halodule wrightii			
	41	3	Halophila englemannii			
	41	4	Halodule wrightii			
	41	4	Halophila englemannii			
5/20/97	42	1	Halodule wrightii	Bottom-rock/oyster bar	0.4	>B
	42	1	Acetabularia crenulata			
	42	1	Batophora oerstedii			
	42	2	Misc. Algae	Chondria tenuissima		
	42	2	Acetabularia crenulata			
	42	2	Penicillus capitatus			
	42	3	Misc. Algae	Chondria tenuissima		
	42	4	Misc. Algae	Chondria tenuissima		
	42	4	Penicillus capitatus			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
5/19/97	44	1	Misc. Algae	Digenia simplex/Chondria tenuissima	0.6	>B
	44	1	Caulerpa paspaloides			
	44	2	Caulerpa paspaloides	Drift algae very heavy; rock bottom		
	44	2	Misc. Algae	Digenia simplex/Chondria tenuissima		
	44	2	Acetabularia crenulata			
	44	3	Misc. Algae	Digenia simplex/Chondria tenuissima		
	44	4	Misc. Algae	Digenia simplex/Chondria tenuissima		
	44	4	Caulerpa paspaloides			
5/19/97	45	1	Batophora oerstedii		1.2	>B
	45	1	Halimeda incrassata			
	45	2	Halimeda incrassata	Sediment 6'		
	45	2	Batophora oerstedii			
	45	2	Penicillus capitatus			
	45	3	Misc. Algae	Halodule, Batophora near		
	45	3	Caulerpa paspaloides			
	45	4	Misc. Algae	Penicillus near		
	45	4	Caulerpa paspaloides			
5/19/97	46	1	Misc. Algae	Chondria tenuissima/Spyridea filamentosa	0.5	>B
	46	1	Thalassia testudinum			
	46	2	Thalassia testudinum	Sediment 3.5ft.		
	46	2	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	46	2	Caulerpa paspaloides			
	46	3	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	46	3	Thalassia testudinum			
	46	4	Batophora oerstedii	Drift algae very heavy; Acetabularia in area		
	46	4	Misc. Algae	Chondria tenuissima/Spyridea filamentosa		
	46	4	Thalassia testudinum			
5/19/97	47	1	Thalassia testudinum	Thalassia widespread but sparse		1 >B
	47	1	Batophora oerstedii			
	47	2	Thalassia testudinum	38 shoots in quad, about 2 inches in length		
	47	3	Thalassia testudinum	Sediment 10in deep; sand over rock		
	47	3	Batophora oerstedii			
	47	4	Thalassia testudinum			
	7	2	Acetabularia crenulata			
	9	1	Acetabularia crenulata			
	9	2	Acetabularia crenulata			
	9	3	Acetabularia crenulata			
	9	4	Acetabularia crenulata			
	27	2	Acetabularia crenulata			
	27	4	Acetabularia crenulata			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
9/16/97	12	1	Caulerpa paspaloides			
	12	1	Penicillus capitatus		0.6	>B
	12	1	Thalassia testudinum			
	12	2	Caulerpa paspaloides			
	12	2	Halodule wrightii			
	12	2	Thalassia testudinum			
	12	3	Caulerpa paspaloides			
	12	3	Penicillus capitatus			
	12	3	Thalassia testudinum			
	12	4	Caulerpa paspaloides			
	12	4	Halodule wrightii			
	12	4	Penicillus capitatus			
	12	4	Thalassia testudinum			
9/16/97	14	1	Halodule wrightii		1.1	>B
	14	2	Halodule wrightii			
	14	2	Thalassia testudinum			
	14	3	Halodule wrightii			
	14	4	Halodule wrightii			
9/16/97	17	1	Halimeda incrassata			
	17	1	Misc. Algae	Unidentified rhodophyta Photo 13 w/ secchi (fair)	0.7	>B
	17	1	Thalassia testudinum			
	17	1	Udotea flabellum			
	17	2	Thalassia testudinum			
	17	3	Thalassia testudinum			
	17	4	Thalassia testudinum			
9/16/97	18	1	Caulerpa paspaloides			
	18	1	Penicillus capitatus		1.8	>B
	18	1	Thalassia testudinum			
	18	2	Batophora oerstedii			
	18	2	Caulerpa paspaloides			
	18	3	Caulerpa paspaloides			
	18	3	Penicillus capitatus			
	18	3	Thalassia testudinum			
	18	4	Caulerpa paspaloides			
	18	4	Penicillus capitatus			
	18	4	Thalassia testudinum			
9/16/97	19	1	Sargassum spp.			
	19	1	Thalassia testudinum	Caulerpa prolifera Batophora in area	0.8	>B
	19	2	Penicillus capitatus			
	19	2	Thalassia testudinum			
	19	2	Udotea flabellum			
	19	3	Halimeda incrassata			
	19	3	Halodule wrightii			
	19	3	Penicillus capitatus			
	19	3	Thalassia testudinum			
	19	4	Thalassia testudinum			
	19	4	Udotea flabellum			

Date	Station	Quad	Species	Comments	Depth	Secchi
					(m)	Depth (m)
9/16/97	2	1	Digenia simplex		1.1	>B
	2	1	Halimeda incrassata			
	2	2	Digenia simplex			
	2	2	Halimeda incrassata			
	2	3	Digenia simplex			
	2	3	Sargassum spp.			
	2	4	Caulerpa prolifera			
	2	4	Halimeda incrassata			
	2	4	Misc. Algae			
	2	4	Sargassum spp.			
	2	4	Udotea flabellum			
9/16/97	20	1	Caulerpa paspaloides		1.2	>B
	20	2	Caulerpa paspaloides			
	20	2	Penicillus capitatus			
	20	3	Caulerpa paspaloides			
	20	4	Halodule wrightii			
	20	4	Penicillus capitatus			
9/16/97	21	1	Caulerpa paspaloides		1.8	>B
	21	1	Penicillus capitatus			
	21	2	Caulerpa paspaloides			
	21	2	Penicillus capitatus			
	21	3	Caulerpa paspaloides			
	21	4	Caulerpa paspaloides			
	22	1	Batophora oerstedii			
9/16/97	22	1	Misc. Algae	Laurencia poitei Photo 10 (good)	2.4	>B
	22	2	Caulerpa paspaloides			
	22	2	Misc. Algae	Laurencia poitei		
	22	2	Penicillus capitatus			
	22	3	Unvegetated			
	22	4	Caulerpa prolifera			
	22	4	Digenia simplex			
	22	4	Sargassum spp.			
9/16/97	23	1	Caulerpa paspaloides		1.6	>B
	23	2	Caulerpa paspaloides			
	23	3	Caulerpa paspaloides			
	23	4	Caulerpa paspaloides			
9/15/97	24	1	Halodule wrightii		1.7	>B
	24	2	Caulerpa paspaloides			
	24	3	Caulerpa paspaloides			
	24	3	Halodule wrightii			
	24	4	Unvegetated			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
9/16/97	25	1	Halodule wrightii		2.5	>B
	25	2	Caulerpa prolifera			
	25	2	Halodule wrightii			
	25	3	Halodule wrightii			
	25	4	Caulerpa prolifera			
	25	4	Halodule wrightii			
9/15/97	26	1	Caulerpa paspaloides		2.5	>B
	26	2	Caulerpa paspaloides			
	26	3	Caulerpa paspaloides			
	26	4	Caulerpa paspaloides			
9/16/97	27	1	Batophora oerstedii			
	27	1	Halodule wrightii		1.2	>B
	27	2	Penicillus capitatus			
	27	3	Batophora oerstedii			
	27	3	Halodule wrightii			
	27	3	Penicillus capitatus			
	27	4	Halodule wrightii			
	27	4	Penicillus capitatus			
9/17/97	28	1	Acetabularia crenulata		1.5	>B
	28	1	Batophora oerstedii			
	28	2	Acetabularia crenulata			
	28	2	Batophora oerstedii			
	28	2	Misc. Algae	Digenia simplex		
	28	3	Digenia simplex			
	28	4	Batophora oerstedii			
	28	4	Thalassia testudinum			
9/16/97	3	1	Halophila englemannii		1.6	1.1
	3	2	Unvegetated			
	3	3	Halophila englemannii			
	3	4	Avrainillea spp.			
	3	4	Halophila englemannii			
9/17/97	30	1	Thalassia testudinum		1.4	>B
	30	2	Misc. Algae	Laurencia poitei		
	30	2	Thalassia testudinum			
	30	3	Batophora oerstedii			
	30	3	Thalassia testudinum			
	30	4	Batophora oerstedii			
	30	4	Misc. Algae	Laurencia poitei		
	30	4	Thalassia testudinum			
9/16/97	39	1	Caulerpa paspaloides		0.9	0.9
	39	2	Caulerpa paspaloides			
	39	3	Caulerpa paspaloides			
	39	4	Caulerpa paspaloides			
	39	4	Halodule wrightii			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
9/16/97	4	1	Halodule wrightii		0.5	-
	4	2	Halodule wrightii			
	4	3	Halodule wrightii			
	4	3	Penicillus capitatus			
	4	4	Halodule wrightii			
9/17/97	40C	1	Caulerpa paspaloides			
	40C	1	Penicillus capitatus		1.8	>B
	40C	2	Caulerpa paspaloides			
	40C	3	Caulerpa paspaloides			
	40C	3	Penicillus capitatus			
	40C	4	Caulerpa paspaloides			
9/16/97	41	1	Halodule wrightii		0.4	0.3
	41	2	Halodule wrightii			
	41	3	Halodule wrightii			
	41	4	Halodule wrightii			
9/16/97	42	1	Acetabularia crenulata			
	42	1	Caulerpa prolifera			
	42	1	Penicillus capitatus		0.8	>B
	42	2	Acetabularia crenulata			
	42	2	Caulerpa paspaloides			
	42	2	Caulerpa prolifera			
	42	2	Penicillus capitatus			
	42	3	Avrainillea spp.			
	42	3	Caulerpa prolifera			
	42	3	Penicillus capitatus			
	42	4	Avrainillea spp.			
	42	4	Caulerpa paspaloides			
	42	4	Caulerpa prolifera			
	42	4	Penicillus capitatus			
9/15/97	44	1	Caulerpa paspaloides	Batophora near		
	44	1	Misc. Algae	L. poitei Photo 4 w/ anchor (good) Quad 5 on 9/16/97	1.7	>B
	44	2	Anadyomene stellata			
	44	2	Caulerpa paspaloides			
	44	2	Misc. Algae	Laurencia poitei		
	44	3	Acetabularia crenulata			
	44	3	Digenia simplex			
	44	3	Misc. Algae	Laurencia poitei		
	44	4	Caulerpa paspaloides			
	44	4	Digenia simplex			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
9/17/97	45	1	Batophora oerstedii			
	45	1	Misc. Algae	Laurencia poitei Photo 8 w/ quad (good)	1.7	>B
	45	2	Acetabularia crenulata			
	45	2	Anadyomene stellata			
	45	2	Digenia simplex			
	45	3	Acetabularia crenulata			
	45	3	Batophora oerstedii			
	45	3	Digenia simplex			
	45	4	Anadyomene stellata			
	45	4	Batophora oerstedii			
	45	4	Digenia simplex			
9/17/97	46	1	Misc. Algae	Laurencia poitei		
	46	1	Thalassia testudinum		1.4	>B
	46	2	Misc. Algae	Laurencia poitei		
	46	2	Thalassia testudinum			
	46	3	Misc. Algae	Laurencia poitei		
	46	3	Thalassia testudinum			
	46	4	Thalassia testudinum			
9/17/97	47	1	Batophora oerstedii		1.9	>B
	47	2	Halimeda incrassata			
	47	2	Halodule wrightii			
	47	3	Batophora oerstedii			
	47	3	Halodule wrightii			
	47	3	Thalassia testudinum			
	47	4	Batophora oerstedii			
	47	4	Thalassia testudinum			
9/16/97	6	1	Caulerpa prolifera		1.2	0.8
	6	2	Caulerpa paspaloides			
	6	3	Caulerpa prolifera			
	6	4	Caulerpa prolifera			
9/16/97	7	1	Caulerpa paspaloides		1.5	-
	7	2	Caulerpa paspaloides			
	7	2	Halophila englemannii			
	7	3	Caulerpa paspaloides			
	7	4	Caulerpa paspaloides			
9/16/97	8A	1	Chara spp.			
	8A	1	Halodule wrightii		0.6	>B
	8A	2	Misc. Algae	Unidentified Rhodophyta		
	8A	2	Halodule wrightii			
	8A	4	Halodule wrightii			
	8A	4	Penicillus capitatus			

Date	Station	Quad	Species	Comments	Depth (m)	Secchi Depth (m)
9/16/97	9	1	Halimeda incrassata			
	9	1	Sargassum spp.		1	>B
	9	2	Caulerpa prolifera			
	9	2	Sargassum spp.			
	9	3	Penicillus capitatus	Unidentified Rhodophyta		
	9	3	Sargassum spp.			
	9	4	Caulerpa prolifera			
	9	4	Sargassum spp.			

	<i>Caulerpa paspaloides</i>			<i>Acetabularia crenulata</i>			<i>Halodule wrightii</i>			<i>Thalassia testudinum</i>			<i>Batophora oerstedii</i>			<i>Caulerpa prolifera</i>		
	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS
	May 1997																	
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.00	0.25	0.00	0.00	0.00	0.25	0.50	0.13
3	0.00	0.00	0.00	0.00	0.00	0.00	0.25	5.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.00	0.50
4	0.00	0.00	0.00	0.50	2.50	1.25	0.75	2.67	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.50	5.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	5.00	5.00
7	1.00	3.38	3.38	0.00	0.00	0.00	0.25	0.50	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.30	0.15
8A	0.50	2.00	1.00	0.00	0.00	0.00	0.75	3.67	2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	1.00	0.75
12	0.00	0.00	0.00	1.00	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.13	1.13	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.25	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	4.75	4.75	0.00	0.00	0.00	0.00	0.00	0.00
18	1.00	3.50	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.75	2.33	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.50	2.00	1.00	0.00	0.00	0.00
20	0.50	0.30	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	1.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.00	0.25	0.50	0.50	0.25	0.25	1.00	0.25
23	1.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.25	2.00	0.50	0.00	0.00	0.00	1.00	4.50	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.50	1.05	0.53	0.25	0.10	0.03	0.50	3.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	1.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	1.00	3.50	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.75	2.33	1.75	0.00	0.00	0.00
28	0.25	2.00	0.50	0.75	2.33	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.75	1.67	1.25	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	4.50	4.50	0.50	1.00	0.50	0.00	0.00	0.00
39	0.75	1.33	1.00	0.00	0.00	0.00	0.50	0.75	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.00	0.25
40C	1.00	4.25	4.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	0.00	0.00	0.00	0.00	0.00	0.00	0.75	1.67	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	0.00	0.00	0.00	0.50	1.50	0.75	0.25	2.00	0.50	0.00	0.00	0.00	0.25	1.00	0.25	0.00	0.00	0.00
44	0.75	0.53	0.40	0.25	1.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	0.50	4.50	2.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00	0.50	0.00	0.00	0.00
46	0.25	0.40	0.10	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.25	2.25	0.25	1.00	0.25	0.00	0.00	0.00
47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.50	0.30	0.15	0.00	0.00	0.00

	<i>Caulerpa paspaloides</i>			<i>Acetabularia crenulata</i>			<i>Halodule wrightii</i>			<i>Thalassia testudinum</i>			<i>Batophora oerstedii</i>			<i>Caulerpa prolifera</i>		
	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS
	September 1997																	
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.10	0.03
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	1.00	4.25	4.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.25	2.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	2.33	1.75
7	1.00	4.50	4.50	0.25	0.50	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8A	0.00	0.00	0.00	0.00	0.00	0.00	0.75	2.67	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	1.00	0.88	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.05	0.53
12	1.00	1.63	1.63	0.00	0.00	0.00	0.50	1.25	0.63	1.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.75	2.75	0.25	4.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00
18	1.00	1.88	1.88	0.00	0.00	0.00	0.00	0.00	0.00	0.75	1.50	1.13	0.25	2.00	0.50	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.13	1.00	3.50	3.50	0.00	0.00	0.00	0.00	0.00	0.00
20	0.75	2.67	2.00	0.00	0.00	0.00	0.25	2.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	1.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.25	0.50	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.13	0.25	1.00	0.25
23	1.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.50	1.05	0.53	0.00	0.00	0.00	0.50	1.05	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.50	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	2.00	1.00
26	1.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.50	0.30	0.15	0.75	0.67	0.50	0.00	0.00	0.00	0.50	0.30	0.15	0.00	0.00	0.00
28	0.00	0.00	0.00	0.50	0.10	0.05	0.00	0.00	0.00	0.25	1.00	0.25	0.75	0.10	0.08	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	5.00	5.00	0.50	1.50	0.75	0.00	0.00	0.00
39	1.00	4.75	4.75	0.00	0.00	0.00	0.25	0.50	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40C	1.00	3.25	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	0.00	0.00	0.00	0.00	0.00	0.00	1.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	0.50	0.75	0.38	0.50	0.75	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.53	1.53
44	0.75	0.40	0.30	0.25	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.50	0.75	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.67	0.50	0.00	0.00	0.00
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00
47	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.75	0.38	0.50	0.75	0.38	0.75	0.37	0.28	0.00	0.00	0.00



	<i>Penicillus capitatus</i>			<i>Ruppia maritima</i>			<i>Sargassum spp.</i>			<i>Udotea flabellum</i>			<i>Halimeda incrassata</i>			<i>Anadyomene stellata</i>		
	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS	FREQ	ABUN	DENS
	September 1997																	
2	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.30	0.15	0.25	0.10	0.03	0.75	0.87	0.65	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.25	2.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8A	0.25	3.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.25	0.10	0.03	0.00	0.00	0.00	1.00	2.03	2.03	0.00	0.00	0.00	0.25	0.50	0.13	0.00	0.00	0.00
12	0.75	0.67	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.13	0.25	0.10	0.03	0.00	0.00	0.00
18	0.75	0.37	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.50	0.30	0.15	0.00	0.00	0.00	0.25	1.00	0.25	0.50	0.10	0.05	0.25	0.10	0.03	0.00	0.00	0.00
20	0.50	2.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.50	1.05	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.25	0.50	0.13	0.00	0.00	0.00	0.25	2.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.75	0.50	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40C	0.50	0.30	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	1.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.10	0.03
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.10	0.05
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.10	0.03	0.00	0.00	0.00





# **Appendix B**

## ***In Situ* Water Quality Data**

Station	Date	Time	Depth	Dissolved Oxygen		Percent Saturation		Conductance		Salinity		Temperature	
				Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
	(mm/dd/yy)	(hhmm)	(m)	(mg/l)	(mg/l)	(%)	(%)	(mmhos/cm)	(mmhos/cm)	(PSU)	(PSU)	(Deg C)	(Deg C)
<b>Tidal Creeks</b>													
7CABG	5/20/97	742	0.6	3.2		44		27.7		17.0		27.5	
ROSE	5/20/97	808	0.5	5.2		72		25.7		15.7		27.0	
MASON	5/20/97	834	1.1	5.2	4.9	71	67	20.9	21.0	12.5	12.5	27.5	27.5
UMAS	5/20/97	851	0.9	4.3		58		17.9		10.5		27.5	
PETTY	5/20/97	916	1.9	4.8	4.4	64	60	13.7	16.9	7.9	9.9	27.5	28.0
<b>Homosassa River</b>													
H0	5/20/97	1001	0.8	5.6		67		3.6		1.9		23.5	
H1	5/20/97	1028	1.6	8.0	7.8	100	97	2.8	2.6	1.4	1.3	26.0	26.0
H2	5/20/97	1116	1.7	8.8	6.4	114	84	4.4	8.7	2.3	4.8	28.0	28.0
H3	5/20/97	1136	1.9	5.2	5.2	73	73	25.5	25.8	15.5	15.7	28.0	28.5
H4	5/20/97	1155	2.4	6.6	7.0	98	103	40.0	40.0	25.5	25.5	28.5	28.0
<b>Other Spring Vents</b>													
POTTR	5/21/97	916	1.8	2.7	1.9	34	23	9.7	11.1	5.5	6.3	23.0	22.9
CRAB	5/21/97	950	2.3	4.3	4.3	52	52	6.5	6.5	3.6	3.5	23.2	23.2
CH#1	5/21/97	1009	2.5	5.3	5.0	62	59	1.1	1.7	0.6	0.8		23.2
<b>Chassahowitzka River</b>													
R0	5/21/97	507	2.8	4.8	4.6	57	55	3.4	3.5	1.7	1.8	23.2	23.2
R0	5/21/97	1448	3.0	7.6	5.1	90	61	2.5	3.3	1.3	1.7	23.4	23.4
R1	5/21/97	517	0.9	3.7		44		5.2		2.8		23.2	
R1	5/21/97	1457	1.0	13.9	15.8	174	197	5.2	5.6	2.8	3.0	26.0	25.7
R1.3	5/21/97	524	1.1	3.0	2.7	36	32	3.9	3.8	2.0	2.0	23.6	23.6
R1.3	5/21/97	1503	1.2	17.7	18.1	228	234	4.5	4.5	2.4	2.4	27.5	27.8
R1.7	5/21/97	535	1.0	6.1	6.1	77	77	5.1	5.1	2.7	2.7	26.1	26.1
R1.7	5/21/97	1512	1.1	9.1		121		5.9		3.2		28.9	
R2	5/21/97	526	1.5	6.1	6.0	79	79	6.9	8.2	3.8	4.5	27.0	27.5
R2	5/21/97	1517	1.7	8.6	7.5	116	102	8.6	12.2	4.8	6.9	29.5	29.1
R2.5	5/21/97	550	2.7	6.0	5.8	80	78	11.6	12.3	6.6	7.0	28.0	28.0
R2.5	5/21/97	1528	2.9	7.3	7.3	102	102	17.6	19.1	10.3	11.3	29.4	29.2
R3	5/21/97	609	4.2	5.9	5.7	79	77	14.3	15.6	8.2	9.0	28.0	28.0
R3	5/21/97	1545	4.7	7.3	7.5	102	105	20.3	21.2	12.1	12.6	29.3	29.2
R4	5/21/97	628	2.4	5.8	5.5	79	75	19.4	19.9	11.4	11.8	28.0	28.0
R4	5/21/97	1606	2.2	7.7	7.7	109	109	20.8	22.8	12.4	13.7	29.9	29.4

Station	Date	Time	Depth	Dissolved Oxygen		Percent Saturation		Conductance		Salinity		Temperature	
				Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
	(mm/dd/yy)	(hhmm)	(m)	(mg/l)	(mg/l)	(%)	(%)	(mmhos/cm)	(mmhos/cm)	(PSU)	(PSU)	(Deg C)	(Deg C)
<b>Chassahowitzka Coastal Area</b>													
2	5/21/97	736	1.5	4.4	4.3	65	64	42.0	42.0	26.9	26.9	27.5	27.5
2	5/21/97	1549	1.1	8.0	8.2	123	125	43.7	43.5	28.0	27.9	29.0	29.2
3	5/21/97	744	1.6	4.5	4.3	64	62	32.4	33.5	20.2	20.9	27.9	27.5
3	5/21/97	1556	1.5	7.6	7.9	114	119	38.7	38.5	24.5	24.3	29.5	29.8
4	5/21/97	757	0.9	4.3		61		32.8		20.4		27.0	
4	5/21/97	1603	0.7	8.7		130		35.6		22.3		30.0	
6	5/21/97	834	0.9	4.7		66		28.2		17.3		27.5	
6	5/21/97	1621	1.7	7.6	8.2	112	121	31.1	32.0	19.2	19.8	29.8	30.0
7	5/21/97	916	1.0	5.0	5.2	71	75	31.3	32.3	19.4	20.0	28.0	28.0
7	5/21/97	1652	1.1	8.2	8.5	122	128	35.9	35.6	22.5	22.3	29.5	30.0
8A	5/21/97	900	0.6	5.0		70		27.9		17.1		27.0	
8A	5/21/97	1634	1.0	8.2	8.3	119	122	29.2	29.1	17.9	17.9	30.0	30.2
9	5/21/97	724	1.3	4.8	4.8	70	70	38.5	37.7	24.4	23.8	27.0	27.5
9	5/21/97	1540	1.2	8.1	8.3	122	126	40.9	40.5	26.1	25.8	29.0	29.5
12	5/21/97	716	0.6	4.5		63		34.8		21.8		26.8	
12	5/21/97	1534	1.0	8.2	8.5	123	128	37.3	37.1	23.5	23.4	29.5	29.8
14	5/21/97	936	0.2	6.9		97		30.8		19.1		27.0	
14	5/21/97	1703	0.3	8.1		122		35.9		22.5		30.2	
17	5/21/97	708	0.7	4.8		67		36.3		22.9		26.0	
17	5/21/97	1526	1.1	7.7	7.8	116	119	39.1	39.3	24.8	24.9	29.5	30.0
18	5/21/97	947	0.9	6.4		91		34.9		21.9		27.0	
18	5/21/97	1707	0.9	8.1		122		36.4		22.9		29.5	
19	5/21/97	702	0.7	5.1		72		37.4		23.7		26.5	
19	5/21/97	1521	1.3	7.8	8.1	118	125	41.8	41.1	26.7	26.2	29.0	30.0
20	5/21/97	612	0.6	1.4		19		28.5		17.5		26.8	
20	5/21/97	1617	0.9	9.3		139		32.1		20.0		30.5	
21	5/21/97	818	0.8	4.0		57		34.3		21.5		26.8	
21	5/21/97	1628	1.1	8.2	8.3	123	125	35.1	35.1	22.1	22.1	30.1	30.2
22	5/21/97	651	1.2	5.3	4.8	76	70	37.2	37.2	23.5	23.5	27.5	27.5
22	5/21/97	1511	1.5	7.6	7.8	114	117	40.9	41.3	26.1	26.4	29.0	29.0
23	5/21/97	620	0.9	3.0		42		27.5		16.8		27.5	
23	5/21/97	1622	0.9	8.7		128		32.1		20.0		29.5	

Station	Date	Time	Depth	Dissolved Oxygen		Percent Saturation		Conductance		Salinity		Temperature	
				Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
	(mm/dd/yy)	(hhmm)	(m)	(mg/l)	(mg/l)	(%)	(%)	(mmhos/cm)	(mmhos/cm)	(PSU)	(PSU)	(Deg C)	(Deg C)
24	5/21/97	831	1.4	5.1	5.3	70	72	23.5	23.6	14.2	14.2	27.0	27.0
24	5/21/97	1801	1.6	8.3	8.3	119	119	25.5	25.4	15.5	15.5	29.6	29.7
25	5/21/97	806	1.4	4.8	4.6	67	65	29.5	29.8	18.2	18.4	27.3	27.4
25	5/21/97	1637	2.0	8.6	9.0	127	133	32.8	33.8	20.5	21.2	29.7	29.7
26	5/21/97	633	1.7	5.4	5.3	75	74	25.3	25.6	15.4	15.6	27.8	27.8
26	5/21/97	1757	1.4	8.4	8.3	120	119	26.1	26.0	15.9	15.9	29.3	29.4
27	5/21/97	754	0.3	4.9		67		30.8		19.1		25.7	
27	5/21/97	1752	0.4	9.8		145		30.0		18.6		30.4	
28	5/21/97	735	0.6	5.4		76		31.9		19.9		26.6	
28	5/21/97	1737	0.4	8.4		125		32.0		20.0		30.2	
30	5/21/97	718	0.5	4.1		58		33.7		21.1		26.6	
30	5/21/97	1731	0.5	8.0		122		33.7		21.1		31.3	
39	5/21/97	846	0.5	5.9		83		29.1		17.9		27.5	
39	5/21/97	1626	1.1	9.2	9.4	137	139	32.0	31.5	19.8	19.5	30.0	30.0
40C	5/21/97	744	0.7	4.0		57		32.1		20.0		27.3	
40C	5/21/97	1745	0.6	9.9		148		31.9		19.9		30.4	
41	5/21/97	810	0.4	4.8		67		30.9		19.2		27.0	
41	5/21/97	1608	0.9	8.1		121		33.8		21.1		30.0	
42	5/21/97	824	1.4	4.5	4.4	64	62	31.1	31.5	19.3	19.5	27.5	27.5
42	5/21/97	1615	1.1	7.9	8.1	118	121	34.8	34.7	21.8	21.7	29.8	30.0
44	5/21/97	645	1.0	4.9	4.7	69	66	30.7	30.8	19.0	19.1	27.4	27.4
44	5/21/97	1647	1.0	9.2	9.2	135	135	32.2	32.3	20.0	20.1	29.5	29.6
45	5/21/97	654	0.6	4.4		62		31.2		19.3		26.9	
45	5/21/97	1713	1.0	9.7	9.8	143	145	31.6	31.8	19.7	19.8	29.9	30.0
46	5/21/97	703	0.6	5.0		70		31.9		19.9		26.5	
46	5/21/97	1720	0.7	8.4		126		32.0		19.9		30.9	
47	5/21/97	710	0.9	5.3		75		32.6		20.3		27.0	
47	5/21/97	1724	0.9	8.7		129		32.5		20.3		30.0	

Station	Date	Time	Depth	Dissolved Oxygen		Percent Saturation		Conductance		Salinity		Temperature	
				Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
	(mm/dd/yy)	(hhmm)	(m)	(mg/l)	(mg/l)	(%)	(%)	(mmhos/cm)	(mmhos/cm)	(PSU)	(PSU)	(Deg C)	(Deg C)
<b>Tidal Creeks</b>													
7CABG	9/16/97	808	0.9	4.1		60		38.8		24.6		28.0	
ROSE	9/16/97	822	0.6	4.7		69		34.7		21.7		28.5	
MASON	9/16/97	833	1.0	5.1	4.7	73	68	32.3	32.3	20.1	20.1	28.5	28.5
UMAS	9/16/97	847	1.3	4.9	4.4	70	63	28.6	29.1	17.5	17.9	28.5	28.5
PETTY	9/16/97	903	1.0	4.8	4.6	68	65	26.5	26.7	16.1	16.3	28.0	28.5
<b>Homosassa River</b>													
H0	9/16/97	948	1.3	6.4	6.5	76	78	1.3	4.6	0.6	2.5	23.5	23.5
H0.5	9/16/97	1003	1.2	7.0	9.0	85	109	2.5	3.9	1.2	2.1	24.5	24.5
H1	9/16/97	1021	1.2	7.9	7.7	98	97	3.2	4.7	1.7	2.5	26.0	26.5
H2	9/16/97	1045	2.3	7.0	5.1	95	72	11.6	23.5	6.5	14.1	29.0	29.5
H3	9/16/97	1103	3.6	5.0	4.7	73	69	30.7	31.8	18.9	19.7	29.0	29.5
H4	9/16/97	1124	2.0	5.8	5.5	87	83	40.9	40.9	26.1	26.1	29.0	29.0
<b>Other Spring Vents</b>													
POTTR	9/17/97	849	2.0	3.9	3.6	49	45	14.9	16.7	8.6	9.8	24.0	23.5
CRAB	9/17/97	907	3.0	5.7	5.7	68	70	8.0	8.2	4.4	4.6	23.5	23.5
CH#1	9/17/97	921	2.9	6.3	6.3	74	74	1.8	2.0	0.9	1.0	23.5	23.5
<b>Chassahowitzka River</b>													
R0	9/17/97	518	1.7	6.2	5.5	74	66	4.4	6.0	2.3	3.2	23.5	23.5
R0	9/17/97	1912	3.6	7.3	6.5	87	77	3.7	4.2	1.9	2.2	23.5	23.0
R1	9/17/97	529	1.0	6.0	5.6	71	68	7.5	7.7	4.1	4.3	23.0	23.5
R1	9/17/97	1856	1.0	7.3	7.1	87	84	5.2	5.2	2.8	2.8	23.0	23.0
R1.3	9/17/97	540	1.7	5.6	5.1	67	62	5.1	5.1	2.7	2.7	23.5	24.0
R1.3	9/17/97	1845	1.8	9.9	10.2	125	129	4.9	5.0	2.6	2.7	26.0	26.0
R1.7	9/17/97	552	1.2	5.7	4.9	74	67	10.1	17.0	5.7	9.9	27.0	28.0
R1.7	9/17/97	1850	1.2	6.2	5.3	84	73	13.1	15.8	7.5	9.2	28.5	28.9
R2	9/17/97	540	1.2	3.4	3.0	46	42	19.1	22.1	11.3	13.2	27.5	28.3
R2	9/17/97	1823	2.1	5.1	4.7	73	65	22.8	18.6	13.7	10.9	30.0	29.0
R2.5	9/17/97	600	3.2	3.4	3.7	47	52	23.5	25.3	14.1	15.3	28.0	28.5
R2.5	9/17/97	1816	3.7	6.6	7.4	97	109	31.5	32.0	19.5	19.8	29.2	30.0
R3	9/17/97	615	3.2	3.6	3.7	52	54	28.3	28.8	17.3	17.7	28.5	29.0
R3	9/17/97	1807	3.9	6.5	7.3	94	109	31.5	32.9	19.5	20.4	29.2	30.0
R4	9/17/97	625	1.8	4.0	3.8	57	55	31.1	30.9	19.3	19.1	28.5	29.0
R4	9/17/97	1759	1.8	6.8	7.0	101	104	33.4	31.0	20.8	19.2	29.9	30.0

Station	Date	Time	Depth	Dissolved Oxygen		Percent Saturation		Conductance		Salinity		Temperature	
				Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
	(mm/dd/yy)	(hhmm)	(m)	(mg/l)	(mg/l)	(%)	(%)	(mmhos/cm)	(mmhos/cm)	(PSU)	(PSU)	(Deg C)	(Deg C)
<b>Chassahowitzka Coastal Area</b>													
2	9/17/97	727	1.4	3.9	3.9	58	59	40.8	40.9	26.0	26.1	28.5	29.0
2	9/17/97	1551	1.6	7.6	7.6	118	118	42.5	42.6	27.2	27.2	30.5	30.4
3	9/17/97	737	1.8	3.6	3.5	54	52	35.3	37.6	22.1	23.7	29.3	29.8
3	9/17/97	1557	2.4	6.2	5.8	95	89	38.8	39.3	24.6	24.9	30.0	30.0
4	9/17/97	748	0.9	3.4		49		36.9		23.3		28.0	
4	9/17/97	1606	1.1	7.9	7.5	122	114	37.2	37.0	23.4	23.3	31.0	30.7
6	9/17/97	820	1.4	3.7	3.5	54	52	35.2	34.8	22.1	21.8	29.1	29.0
6	9/17/97	1625	2.0	7.3	7.4	112	113	36.9	36.8	23.2	23.1	30.8	31.0
7	9/17/97	854	1.1	3.8	3.7	56	55	36.8	36.7	23.2	23.1	28.8	29.0
7	9/17/97	1636	1.5	7.1	7.0	107	108	38.1	38.5	24.1	24.3	30.3	30.5
8A	9/17/97	842	0.8	3.6		53		35.0		21.9		28.8	
9	9/17/97	715	1.0	4.0	4.1	59	60	38.6	38.2	24.5	24.2	28.2	28.8
9	9/17/97	1538	1.6	6.2	6.3	96	96	41.5	41.5	26.5	26.5	30.0	30.0
12	9/17/97	705	0.9	3.4		50		39.7		25.3		28.0	
12	9/17/97	1529	1.3	7.6	7.7	115	118	40.2	40.5	25.5	25.7	30.0	30.2
14	9/17/97	910	0.1	5.1		78		45.9		29.7		28.5	
14	9/17/97	1650	0.8	7.6		118		41.5		26.4		30.7	
17	9/17/97	655	0.8	3.4		51		41.1		26.3		28.0	
17	9/17/97	1520	1.6	7.7	7.8	118	120	41.4	41.3	26.4	26.3	30.2	30.3
18	9/17/97	925	0.7	4.2		63		40.5		25.8		28.2	
18	9/17/97	1740	1.5	7.1	7.0	109	108	41.5	41.5	26.5	26.4	30.0	30.1
19	9/17/97	650	0.7	3.5		53		41.6		26.6		28.0	
19	9/17/97	1516	1.7	7.2	7.3	112	113	42.4	42.5	27.1	27.2	30.1	29.9
20	9/17/97	819	0.5	3.7		54		39.2		24.9		28.5	
20	9/17/97	1630	1.1	6.4	6.3	93	92	47.2	46.3	30.7	30.0	25.0	25.5
21	9/17/97	935	0.7	4.5		68		39.8		25.3		29.0	
21	9/17/97	1748	1.5	6.0	5.8	92	89	41.1	41.1	26.2	26.2	30.0	30.0
22	9/17/97	640	1.5	4.4	4.3	66	65	41.8	41.7	26.7	26.6	29.0	29.2
22	9/17/97	1505	2.1	7.4	7.6	114	118	42.8	43.2	27.4	27.7	30.2	30.2
23	9/17/97	809	1.0	4.9	4.9	74	72	35.8	35.9	22.5	22.6	29.5	29.5
23	9/17/97	1627	1.4	6.3	6.2	98	96	43.6	43.0	28.0	27.5	30.5	30.5
24	9/17/97	613	0.9	5.0		74		35.4		22.2		28.5	

Station	Date	Time	Depth	Dissolved Oxygen		Percent Saturation		Conductance		Salinity		Temperature	
				Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
	(mm/dd/yy)	(hhmm)	(m)	(mg/l)	(mg/l)	(%)	(%)	(mmhos/cm)	(mmhos/cm)	(PSU)	(PSU)	(Deg C)	(Deg C)
24	9/17/97	1746	2.3	7.7	7.6	117	117	35.3	35.1	22.1	22.0	31.0	31.5
25	9/17/97	758	1.3	4.1	4.5	61	68	40.1	41.0	25.5	26.1	29.0	29.5
25	9/17/97	1617	2.4	6.7	6.6	106	100	43.9	43.9	28.1	28.2	31.5	29.0
26	9/17/97	625	1.8	4.7	4.5	69	67	36.7	37.0	23.1	23.3	29.0	29.0
26	9/17/97	1609	2.0	6.7	6.7	104	104	40.5	42.5	25.7	27.2	30.5	30.5
27	9/17/97	746	0.5	3.4		50		41.6		26.6		28.0	
27	9/17/97	1601	1.4	7.4	7.4	117	117	40.5	40.8	25.7	25.9	32.0	32.0
28	9/17/97	723	0.6	4.5		67		45.5		29.4		27.5	
28	9/17/97	1520	1.3	6.4	6.5	103	103			30.4	30.5	31.0	31.0
30	9/17/97	714	0.5	3.6		55		45.6		29.5		27.5	
30	9/17/97	1500	1.5	7.2	7.2	116	115	44.3	44.1	28.4	28.3	32.0	32.0
39	9/17/97	833	0.8	3.5		52		35.1		22.0		29.0	
40C	9/17/97	735	0.9	3.1		46		44.9		29.0		28.0	
40C	9/17/97	1536	1.7	6.9	6.9	109	109	43.3	43.5	27.7	27.9	31.0	31.0
41	9/17/97	758	0.9	3.1		46		34.3		21.4		29.0	
41	9/17/97	1611	1.0	7.8	7.5	119	115	36.8	36.8	23.1	23.1	31.0	31.0
42	9/17/97	810	0.8	3.0		44		37.1		23.4		28.0	
42	9/17/97	1620	2.4	7.0	6.9	106	105	37.0	37.1	23.3	23.4	30.7	30.5
44	9/17/97	638	1.1	4.8	4.9	72	74	42.2	42.2	27.0	27.0	28.5	28.5
44	9/17/97	1554	1.4	6.9	6.9	108	108	44.1	44.1	28.3	28.3	31.0	31.0
45	9/17/97	646	0.8	4.8		72		42.7		27.3		28.5	
45	9/17/97	1547	1.7	6.9	7.0	109	110	44.1	44.1	28.3	28.3	31.0	31.0
46	9/17/97	658	0.7	4.6		69		45.1		29.1		27.5	
46	9/17/97	1527	1.4	6.6	6.6	105	105			30.3	30.1	31.0	31.0
47	9/17/97	707	0.9	5.0		76		46.1		29.8		28.0	
47	9/17/97	1513	1.8	6.6	6.6	105	107			31.5	31.8	31.0	31.0

# **Appendix C**

**Water Quality Data  
Phytoplankton Data  
Trophic State Indices**

Station	Date	Time	Conductance	Salinity	Ortho- Phosphorus	Total Phosphorus	Ammonium- Nitrogen	Nitrate- nitrite- Nitrogen	Total Kjeldahl Nitrogen	Chl a (µg/l)	Chl b (µg/l)	Chl c (µg/l)	Chl a Corrected (µg/l)	Pheophytin (µg/l)
			(mmhos/cm)	(PSU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
		<b>Tidal Creeks</b>												
7CABG	5/20/97	742	28.7	17.7	0.007	U0.05	0.148	0.015	0.84	5.5	U0.5	U0.5	4.6	1.1
ROSE	5/20/97	808	26.7	16.3	0.011	U0.05	0.099	0.013	0.76	3.0	U0.5	0.7	2.4	0.9
MASON	5/20/97	834	21.1	12.6	0.006	U0.05	0.044	0.010	0.45	2.0	U0.5	0.9	1.3	1.1
UMAS	5/20/97	851	18.3	10.8	0.009	U0.05	0.033	0.010	0.52	3.6	U0.5	0.9	2.7	1.4
PETTY	5/20/97	916	14.3	8.2	0.008	U0.05	0.036	0.009	0.36	3.6	U0.5	1.1	3.0	0.9
		<b>Homosassa River</b>												
H0	5/20/97	1001	3.7	1.9	0.021	U0.05	0.013	0.394	0.20	1.1	U0.5	U0.5	0.9	U0.5
H1	5/20/97	1028	2.8	1.4	0.005	U0.05	U0.005	0.100	0.23	11.5	U0.5	1.4	10.4	1.2
H2	5/20/97	1116	4.6	2.4	0.005	U0.05	U0.005	U0.005	0.13	17.0	U0.5	2.0	14.7	2.8
H2	5/20/97	1116	4.5	2.4	0.005	U0.05	U0.005	U0.005	0.22	18.4	U0.5	2.1	15.6	3.7
H3	5/20/97	1136	26.4	16.1	0.006	U0.05	0.016	0.015	0.36	4.0	U0.5	0.9	3.0	1.6
H4	5/20/97	1155	40.8	26.1	0.007	U0.05	U0.005	U0.005	0.42	0.5	U0.5	U0.5	0.7	U0.5
		<b>Other Spring Vents</b>												
POTTR	5/21/97	916	9.5	5.3	0.016	U0.05	U0.005	0.446	U0.05	U0.5	U0.5	U0.5	U0.5	U0.5
CRAB	5/21/97	950	6.5	3.5	0.018	U0.05	0.012	0.442	U0.05	U0.5	U0.5	U0.5	U0.5	U0.5
CH#1	5/21/97	1009	1.2	0.6	0.016	U0.05	U0.005	0.451	U0.05	U0.5	U0.5	U0.5	U0.5	U0.5
		<b>Chassahowitzka River</b>												
R0	5/21/97	507	2.9	1.5	0.014	U0.05	U0.005	0.412	U0.05	U0.5	U0.5	U0.5	U0.5	U0.5
R1	5/21/97	517	4.7	2.5	0.011	U0.05	0.014	0.356	U0.05	0.9	U0.5	U0.5	0.6	0.5
R1.3	5/21/97	524	3.8	2.0	0.006	U0.05	0.007	0.232	U0.05	4.9	U0.5	0.9	3.8	1.7
R1.7	5/21/97	535	5.2	2.8	U0.005	U0.05	0.084	0.029	0.24	6.6	U0.5	1.1	3.7	4.6
R2	5/21/97	526	7.0	3.8	0.005	U0.05	0.018	0.006	0.32	3.7	U0.5	0.9	2.6	1.7
R2.5	5/21/97	550	11.7	6.6	0.005	U0.05	0.011	U0.005	0.37	2.6	U0.5	0.9	2.1	0.8
R3	5/21/97	609	14.7	8.5	0.005	U0.05	U0.005	U0.005	0.44	2.6	U0.5	0.8	1.8	1.2
R4	5/21/97	628	19.3	11.4	U0.005	U0.05	0.009	U0.005	0.46	1.8	U0.5	U0.5	1.4	0.6

Station	Date	Time	Conductance	Salinity	Ortho- Phosphorus	Total Phosphorus	Ammonium- Nitrogen	Nitrate- nitrite- Nitrogen	Total Kjeldahl Nitrogen	Chl a	Chl b	Chl c	Chl a Corrected	Pheophytin
			(mmhos/cm)	(PSU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
<b>Chassahowitzka Coastal Area</b>														
3	5/21/97	744	32.5	20.3	0.006	U0.05	0.011	0.005	0.47	2.5	U0.5	0.8	2.2	U0.5
4	5/21/97	757	32.9	20.6	0.006	U0.05	0.022	U0.005	0.48	3.5	U0.5	0.9	2.2	2.0
6	5/21/97	834	28.1	17.3	U0.005	U0.05	0.013	U0.005	0.43	2.6	U0.5	0.7	1.9	1.1
7	5/21/97	916	31.5	19.6	0.005	U0.05	U0.005	U0.005	0.50	1.0	U0.5	0.6	0.8	U0.5
8A	5/21/97	900	27.8	17.1	0.005	U0.05	0.018	U0.005	0.63	2.0	U0.5	0.9	2.1	U0.5
14	5/21/97	936	35.4	22.3	0.006	U0.05	0.033	0.005	0.49	1.7	U0.5	0.6	1.4	U0.5
18	5/21/97	947	35.3	22.2	0.006	U0.05	0.032	0.005	0.60	U0.5	U0.5	U0.5	U0.5	U0.5
18	5/21/97	947	35.5	22.4	0.005	U0.05	0.038	0.005	0.53	U0.5	U0.5	U0.5	0.5	U0.5
20	5/21/97	612	29.7	18.4	U0.005	U0.05	0.044	U0.005	0.70	1.5	U0.5	0.6	1.2	U0.5
21	5/21/97	818	35.0	22.0	0.006	U0.05	0.028	U0.005	1.09	1.7	U0.5	0.6	1.4	0.5
23	5/21/97	620	28.6	17.6	U0.005	U0.05	U0.005	U0.005	0.43	1.7	U0.5	0.7	1.4	U0.5
24	5/21/97	831	24.4	14.8	U0.005	U0.05	0.006	U0.005	0.42	1.1	U0.5	U0.5	0.9	U0.5
25	5/21/97	806	29.9	18.5	U0.005	U0.05	0.014	U0.005	0.47	1.0	U0.5	U0.5	0.7	U0.5
25	5/21/97	806	30.3	18.8	0.005	U0.05	0.012	U0.005	0.45	1.2	U0.5	0.7	1.3	U0.5
26	5/21/97	633	26.4	16.1	0.005	U0.05	0.008	U0.005	0.42	1.0	U0.5	0.5	0.9	U0.5
27	5/21/97	754	31.4	19.5	U0.005	U0.05	0.010	U0.005	0.49	1.2	U0.5	0.5	1.0	U0.5
28	5/21/97	735	32.9	20.6	0.005	U0.05	U0.005	U0.005	0.46	0.5	U0.5	U0.5	U0.5	U0.5
30	5/21/97	718	35.1	22.1	0.005	U0.05	0.011	U0.005	0.52	0.6	U0.5	0.6	U0.5	U0.5
39	5/21/97	846	29.0	17.9	U0.005	U0.05	0.009	U0.005	0.60	1.3	U0.5	0.6	1.4	U0.5
40C	5/21/97	744	33.2	20.8	0.005	U0.05	0.012	U0.005	0.57	0.6	U0.5	U0.5	0.6	U0.5
41	5/21/97	810	31.0	19.2	0.006	U0.05	0.026	U0.005	0.69	3.9	U0.5	0.9	3.0	1.2
42	5/21/97	824	31.0	19.2	0.005	U0.05	0.016	U0.005	0.54	1.8	U0.5	0.6	1.3	0.8
<b>Tidal Creeks</b>														
7CABG	9/16/97	908	37.4	23.7	0.009	0.05	0.036	0.012	0.87	6.5	U0.5	1.1	5.3	1.6
ROSE	9/16/97	922	32.4	20.2	0.006	U0.05	0.042	0.017	0.82	3.4	U0.5	0.6	2.4	1.5
MASON	9/16/97	933	30.2	18.7	0.008	0.05	0.072	0.023	0.66	4.4	U0.5	0.7	3.3	1.5
UMAS	9/16/97	947	26.4	16.1	0.010	U0.05	0.053	0.033	0.65	5.5	U0.5	1.0	4.3	1.7
UMAS	9/16/97	948	24.8	15.0	0.010	0.05	0.051	0.033	0.67	5.5	U0.5	0.7	4.3	1.7
PETTY	9/16/97	1003	24.2	14.6	0.013	U0.05	0.055	0.029	0.61	5.8	U0.5	0.9	3.9	2.8

Station	Date	Time	Conductance	Salinity	Ortho- Phosphorus	Total Phosphorus	Ammonium- Nitrogen	Nitrate- nitrite- Nitrogen	Total Kjeldahl Nitrogen	Chl a ( $\mu\text{g/l}$ )	Chl b ( $\mu\text{g/l}$ )	Chl c ( $\mu\text{g/l}$ )	Chl a Corrected ( $\mu\text{g/l}$ )	Pheophytin ( $\mu\text{g/l}$ )
			(mmhos/cm)	(PSU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	( $\mu\text{g/l}$ )	( $\mu\text{g/l}$ )	( $\mu\text{g/l}$ )	( $\mu\text{g/l}$ )	( $\mu\text{g/l}$ )
		<b>Homosassa River</b>												
H0	9/16/97	1048	1.4	0.7	0.016	U0.05	0.007	0.365	0.07	0.6	U0.5	U0.5	0.6	U0.5
H0.5	9/16/97	1103	2.4	1.2	0.010	U0.05	0.012	0.245	0.10	1.2	U0.5	U0.5	0.9	0.5
H1	9/16/97	1121	3.4	1.8	U0.005	U0.05	U0.005	0.096	0.18	6.6	U0.5	0.8	5.3	1.8
H2	9/16/97	1145	10.5	5.9	0.006	U0.05	U0.005	0.022	0.36	8.4	U0.5	1.1	5.8	3.8
H3	9/16/97	1203	27.7	17.0	0.012	0.05	0.042	0.040	0.50	4.9	U0.5	1.0	3.4	2.3
H4	9/16/97	1224	38.3	24.3	0.008	U0.05	0.025	0.016	0.54	2.1	U0.5	0.6	1.7	0.5
		<b>Other Spring Vents</b>												
POTTR	9/17/97	949	14.4	8.3	0.018	U0.05	U0.005	0.420	0.06	1.3	U0.5	0.6	1.3	U0.5
CRAB	9/17/97	1007	8.1	4.5	0.015	U0.05	U0.005	0.409	0.06	U0.5	U0.5	0.5	U0.5	U0.5
CH#1	9/17/97	1021	1.9	0.9	0.015	U0.05	U0.005	0.425	0.06	U0.5	U0.5	U0.5	U0.5	U0.5
		<b>Chassahowitzka River</b>												
R0	9/17/97	618	4.0	2.1	0.016	U0.05	0.008	0.399	0.31	U0.5	U0.5	U0.5	U0.5	U0.5
R1	9/17/97	629	6.3	3.4	0.016	U0.05	0.012	0.314	0.13	2.8	U0.5	0.7	2.4	0.5
R1.3	9/17/97	640	4.9	2.6	0.010	U0.05	0.014	0.247	0.12	1.9	U0.5	U0.5	0.8	1.7
R1.7	9/17/97	652	9.0	5.0	0.008	U0.05	0.048	0.086	0.38	5.6	U0.5	1.0	3.8	2.7
R2	9/17/97	640	18.2	10.7	0.008	0.06	0.051	0.039	0.42	5.3	U0.5	1.3	3.7	2.4
R2.5	9/17/97	700	22.4	13.5	0.009	0.07	0.044	0.027	0.51	5.5	U0.5	1.0	3.8	2.7
R3	9/17/97	715	27.4	16.8	0.009	U0.05	0.040	0.018	0.65	5.3	U0.5	1.1	3.3	3.2
R4	9/17/97	725	30.5	18.9	0.008	U0.05	0.035	0.011	0.62	3.8	U0.5	0.8	2.4	2.2
		<b>Chassahowitzka Coastal Area</b>												
3	9/17/97	837	34.9	21.9	0.009	0.05	0.052	0.021	0.52	3.6	U0.5	0.9	2.6	1.4
4	9/17/97	848	36.8	23.3	0.008	0.07	0.090	0.016	0.67	5.3	U0.5	1.2	3.3	3.1
6	9/17/97	920	34.7	21.8	0.008	0.05	0.102	0.014	0.68	4.0	U0.5	1.1	3.0	1.5
7	9/17/97	954	36.5	23.1	0.007	0.05	0.100	0.011	0.68	3.0	U0.5	0.9	2.4	0.8
8A	9/17/97	942	34.7	21.8	0.007	U0.05	0.075	0.012	0.69	2.8	U0.5	0.8	2.3	0.6
14	9/17/97	1010	41.1	26.3	0.007	U0.05	0.041	0.010	0.80	4.8	U0.5	1.2	4.0	1.2
18	9/17/97	1025	41.0	26.2	0.008	0.07	0.065	0.016	0.70	1.9	U0.5	0.8	1.4	0.7
20	9/17/97	919	34.4	21.6	0.006	0.06	0.147	0.012	0.89	1.4	U0.5	U0.5	0.9	0.8
21	9/17/97	1035	40.3	25.7	0.008	0.05	0.164	0.021	0.95	1.3	U0.5	U0.5	1.1	U0.5

Station	Date	Time	Conductance	Salinity	Ortho-	Total	Ammonium-	Nitrate-	Total	Chl a	Chl b	Chl c	Chl a	Pheophytin
					Phosphorus	Phosphorus	Nitrogen	nitrite-	Kjeldahl				Corrected	
								Nitrogen	Nitrogen					
			(mmhos/cm)	(PSU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	( $\mu$ g/l)	( $\mu$ g/l)	( $\mu$ g/l)	( $\mu$ g/l)	( $\mu$ g/l)
21	9/17/97	1035	39.6	25.2	0.007	U0.05	0.164	0.020	0.84	1.2	U0.5	0.6	0.9	0.6
23	9/17/97	809	34.6	21.7	0.007	U0.05	0.042	0.006	0.65	1.7	U0.5	0.6	1.1	1.0
24	9/17/97	715	33.6	21.0	0.006	U0.05	0.017	U0.005	0.58	2.2	U0.5	0.8	1.8	0.7
24	9/17/97	715	35.7	22.5	0.006	0.07	0.023	U0.005	0.56	2.1	U0.5	0.6	1.4	1.0
25	9/17/97	858	37.7	23.9	0.007	0.06	0.018	U0.005	0.54	1.2	U0.5	U0.5	1.0	U0.5
26	9/17/97	727	34.2	21.5	0.006	U0.05	0.009	U0.005	0.60	1.9	U0.5	0.6	1.1	1.3
27	9/17/97	845	39.7	25.3	0.008	U0.05	0.031	U0.005	0.74	3.3	U0.5	1.2	2.4	1.4
28	9/17/97	824	43.8	28.2	0.006	U0.05	0.038	0.010	0.76	0.7	U0.5	U0.5	U0.5	U0.5
30	9/17/97	814	43.2	27.8	0.006	U0.05	0.047	0.012	0.96	1.4	U0.5	0.7	1.0	0.6
39	9/17/97	933	34.2	21.5	0.007	0.06	0.100	0.008	0.67	2.8	U0.5	0.7	2.2	0.7
40C	9/17/97	837	42.5	27.3	0.008	U0.05	U0.005	U0.005	0.77	1.2	U0.5	0.6	1.0	U0.5
41	9/17/97	858	35.3	22.2	0.007	0.05	0.074	0.021	0.64	4.0	U0.5	0.7	3.0	1.5
42	9/17/97	910	36.5	23.1	0.008	U0.05	0.083	0.016	0.61	2.1	U0.5	0.7	1.4	1.1
44	9/17/97	738	40.4	25.8	0.008	U0.05	U0.005	0.005	0.77	0.9	U0.5	U0.5	0.8	U0.5

Station	Date	Phytoplankton	Dinoflagellates	Diatoms	Cysts	Other	Trophic	Trophic	Latitude	Longitude
							State	State		
							Index	Index		
		(1000's / l)	(1000's / l)	(1000's / l)	(1000's / l)	(1000's / l)			Decimal Deg.	Decimal Deg.
<b>Tidal Creeks</b>										
7CABG	5/20/97	104	2	88	7	7	GOOD	40.1	28.731306	-82.65672
ROSE	5/20/97	67	5	58	2	2	GOOD	35.4	28.736194	-82.64467
MASON	5/20/97	27	U2	25	U2	2	GOOD	30.8	28.755917	-82.6525
UMAS	5/20/97	108	22	81	U2	5	GOOD	36.8	28.760417	-82.62631
PETTY	5/20/97	31	14	7	4	5	GOOD	35.7	28.766111	-82.64483
<b>Homosassa River</b>										
H0	5/20/97	14	U2	14	U2	U2	GOOD	29.4	28.798889	-82.59064
H1	5/20/97	75	20	14	2	40	GOOD	44.1	28.795639	-82.60492
H2	5/20/97	131	41	22	U2	68	GOOD	35.8	28.783583	-82.62789
H2	5/20/97	113	27	54	11	22	GOOD	41.3	28.783583	-82.62789
H3	5/20/97	29	U2	25	2	2	GOOD	35.8	28.775167	-82.67581
H4	5/20/97	20	2	16	U2	2	GOOD	25.9	28.756333	-82.71708
<b>Other Spring Vents</b>										
POTTR	5/21/97	U2	U2	U2	U2	U2	GOOD	20.6	28.731667	-82.59728
CRAB	5/21/97	U2	U2	U2	U2	U2	GOOD	20.6	28.716889	-82.57614
CH#1	5/21/97	4	U2	4	U2	U2	GOOD	20.7	28.715556	-82.57492
<b>Chassahowitzka River</b>										
R0	5/21/97	2	U2	2	U2	U2	GOOD	20.3	28.715722	-82.57658
R1	5/21/97	13	2	11	U2	U2	GOOD	24.3	28.7165	-82.57867
R1.3	5/21/97	113	5	88	2	18	GOOD	35.7	28.715861	-82.58669
R1.7	5/21/97	106	7	83	U2	16	GOOD	35.7	28.719167	-82.59983
R2	5/21/97	41	U2	31	U2	11	GOOD	34.1	28.715167	-82.61033
R2.5	5/21/97	36	U2	29	U2	7	GOOD	33.2	28.708833	-82.613
R3	5/21/97	32	4	22	2	5	GOOD	33.0	28.702667	-82.62367
R4	5/21/97	52	2	27	U2	23	GOOD	31.4	28.6935	-82.6405

Station	Date	Phytoplankton	Dinoflagellates	Diatoms	Cysts	Other	Trophic State Index	Trophic State Index	Latitude	Longitude
		(1000's / l)	(1000's / l)	(1000's / l)	(1000's / l)		(1000's / l)		Decimal Deg.	Decimal Deg.
<b>Chassahowitzka Coastal Area</b>										
3	5/21/97	81	7	70	U2	4	GOOD	34.8	28.767667	-82.70031
4	5/21/97	189	7	158	4	20	GOOD	34.8	28.760556	-82.69253
6	5/21/97	164	5	153	U2	5	GOOD	33.2	28.754972	-82.67036
7	5/21/97	149	7	126	5	11	GOOD	27.8	28.747722	-82.70097
8A	5/21/97	345	4	333	U2	9	GOOD	35.8	28.749139	-82.66142
14	5/21/97	93	7	70	U2	16	GOOD	31.7	28.720278	-82.7025
18	5/21/97	74	4	58	U2	13	GOOD	21.9	28.712722	-82.69808
18	5/21/97	61	2	45	U2	14	GOOD	24.7	28.712722	-82.69808
20	5/21/97	102	9	65	U2	29	GOOD	32.3	28.702333	-82.66
21	5/21/97	135	13	93	U2	29	GOOD	31.6	28.698667	-82.6785
23	5/21/97	135	23	101	U2	11	GOOD	31.0	28.693167	-82.667
24	5/21/97	72	14	58	U2	U2	GOOD	27.8	28.683667	-82.65517
25	5/21/97	70	9	61	U2	U2	GOOD	26.5	28.680333	-82.67933
25	5/21/97	72	16	54	U2	2	GOOD	30.7	28.680333	-82.67933
26	5/21/97	74	16	58	U2	U2	GOOD	27.8	28.675	-82.66617
27	5/21/97	68	9	41	U2	18	GOOD	29.3	28.661333	-82.67367
28	5/21/97	32	4	29	U2	U2	GOOD	20.6	28.624	-82.67267
30	5/21/97	77	22	49	U2	7	GOOD	21.2	28.6155	-82.65833
39	5/21/97	264	14	235	U2	14	GOOD	32.7	28.745861	-82.66569
40C	5/21/97	63	16	38	U2	9	GOOD	26.3	28.6445	-82.6735
41	5/21/97	1611	31	1544	U2	36	GOOD	38.9	28.761306	-82.68806
42	5/21/97	187	7	162	U2	18	GOOD	31.6	28.754056	-82.68708
<b>Tidal Creeks</b>										
7CABG	9/16/97	834	5	825	4	U2	GOOD	47.4	28.731306	-82.65672
ROSE	9/16/97	137	2	124	9	2	GOOD	35.4	28.736194	-82.64467
MASON	9/16/97	70	7	47	11	5	GOOD	42.7	28.755917	-82.6525
UMAS	9/16/97	2	U2	U2	U2	2	GOOD	41.4	28.760417	-82.62631
UMAS	9/16/97	9	U2	7	2	U2	GOOD	44.7	28.760417	-82.62631
PETTY	9/16/97	111	32	45	34	U2	GOOD	40.3	28.766111	-82.64483

Station	Date	Phytoplankton	Dinoflagellates	Diatoms	Cysts	Other	Trophic State Index	Trophic State Index	Latitude	Longitude
		(1000's / l)	(1000's / l)	(1000's / l)	(1000's / l)	(1000's / l)			Decimal Deg.	Decimal Deg.
<b>Homosassa River</b>										
H0	9/16/97	U2	U2	U2	U2	U2	GOOD	25.0	28.798889	-82.59064
H0.5	9/16/97	11	U2	5	4	2	GOOD	26.7	28.800528	-82.59589
H1	9/16/97	169	34	63	50	22	GOOD	38.4	28.795639	-82.60492
H2	9/16/97	128	13	36	63	16	GOOD	40.7	28.783583	-82.62789
H3	9/16/97	68	13	29	22	5	GOOD	41.8	28.775167	-82.67581
H4	9/16/97	111	18	68	23	2	GOOD	33.7	28.756333	-82.71708
<b>Other Spring Vents</b>										
POTTR	9/17/97	2	U2	U2	U2	2	GOOD	31.0	28.731667	-82.59728
CRAB	9/17/97	13	2	5	U2	5	GOOD	20.6	28.716889	-82.57614
CH#1	9/17/97	U2	U2	U2	U2	U2	GOOD	20.8	28.715556	-82.57492
<b>Chassahowitzka River</b>										
R0	9/17/97	23	2	4	14	4	GOOD	22.7	28.715722	-82.57658
R1	9/17/97	52	2	14	34	2	GOOD	35.1	28.7165	-82.57867
R1.3	9/17/97	29	2	11	13	4	GOOD	26.2	28.715861	-82.58669
R1.7	9/17/97	81	2	58	9	13	GOOD	38.6	28.719167	-82.59983
R2	9/17/97	22	2	13	7	U2	GOOD	38.1	28.715167	-82.61033
R2.5	9/17/97	70	4	31	22	14	GOOD	39.9	28.708833	-82.613
R3	9/17/97	77	14	38	22	4	GOOD	39.4	28.702667	-82.62367
R4	9/17/97	41	2	18	16	5	GOOD	36.8	28.6935	-82.6405

Station	Date	Phytoplankton	Dinoflagellates	Diatoms	Cysts	Other	Trophic	Trophic	Latitude	Longitude
							State	State		
							Index	Index		
		(1000's / l)	(1000's / l)	(1000's / l)	(1000's / l)	(1000's / l)			Decimal Deg.	Decimal Deg.
		Chassahowitzka Coastal Area								
3	9/17/97	49	U2	43	4	2	GOOD	39.8	28.767667	-82.70031
4	9/17/97	58	5	43	7	2	GOOD	41.3	28.760556	-82.69253
6	9/17/97	133	2	119	11	2	GOOD	42.1	28.754972	-82.67036
7	9/17/97	142	13	97	20	13	GOOD	40.5	28.747722	-82.70097
8A	9/17/97	70	2	52	11	5	GOOD	37.0	28.749139	-82.66142
14	9/17/97	460	50	351	43	16	GOOD	39.1	28.720278	-82.7025
18	9/17/97	171	9	97	36	29	GOOD	38.3	28.712722	-82.69808
20	9/17/97	138	29	75	25	9	GOOD	35.6	28.702333	-82.66
21	9/17/97	119	7	86	14	11	GOOD	36.5	28.698667	-82.6785
21	9/17/97	75	5	63	7	U2	GOOD	28.4	28.698667	-82.6785
23	9/17/97	49	U2	32	11	5	GOOD	31.4	28.693167	-82.667
24	9/17/97	43	2	25	13	4	GOOD	34.3	28.683667	-82.65517
24	9/17/97	102	9	29	38	27	GOOD	33.1	28.683667	-82.65517
25	9/17/97	72	13	25	29	5	GOOD	30.4	28.680333	-82.67933
26	9/17/97	27	4	4	18	2	GOOD	31.0	28.675	-82.66617
27	9/17/97	196	7	120	63	5	GOOD	37.6	28.661333	-82.67367
28	9/17/97	173	23	126	18	5	GOOD	20.7	28.624	-82.67267
30	9/17/97	4	U2	U2	U2	4	GOOD	29.1	28.6155	-82.65833
39	9/17/97	102	U2	92	9	2	GOOD	40.6	28.745861	-82.66569
40C	9/17/97	U2	U2	U2	U2	U2	GOOD	29.1	28.6445	-82.6735
41	9/17/97	124	11	79	22	13	GOOD	41.9	28.761306	-82.68806
42	9/17/97	142	9	93	16	23	GOOD	32.9	28.754056	-82.68708
44	9/17/97	2	U2	U2	U2	2	GOOD	27.5	28.660167	-82.68667

Station	Date	Secchi	Total	Inorganic	Chlorophyll	Secchi	Total N	Total P	Limit	Trophic	Category
		Depth	N:P Ratio	N:P Ratio						State	
		(m)	(mg:mg)	(mg:mg)	(%-ile)	(%-ile)	(%-ile)	(%-ile)	(%-ile)	Index	
<b>Tidal Creeks</b>											
7CABG	5/20/97	-9	34.2	23.29	39	-9	53	41	41	40	GOOD
ROSE	5/20/97	-9	30.9	10.18	29	-9	51	41	41	35	GOOD
MASON	5/20/97	-9	18.4	9.00	21	-9	41	41	41	31	GOOD
UMAS	5/20/97	-9	21.2	4.78	31	-9	43	41	42	37	GOOD
PETTY	5/20/97	-9	14.8	5.63	33	-9	36	41	39	36	GOOD
<b>Homosassa River</b>											
H0	5/20/97	-9	23.8	19.38	15	-9	46	41	44	29	GOOD
III	5/20/97	-9	13.2	20.50	51	-9	34	41	38	44	GOOD
H2	5/20/97	-9	5.3	1.00	56	-9	16	41	16	36	GOOD
H3	5/20/97	-9	15.0	5.17	33	-9	37	41	39	36	GOOD
H4	5/20/97	-9	16.9	0.71	12	-9	39	41	40	26	GOOD
<b>Other Spring Vents</b>											
POTTR	5/21/97	-9	18.8	28.03	0	-9	41	41	41	21	GOOD
CRAB	5/21/97	-9	18.7	25.22	0	-9	41	41	41	21	GOOD
CH#1	5/21/97	-9	19.0	28.34	0	-9	41	41	41	21	GOOD
<b>Chassahowitzka River</b>											
R0	5/21/97	-9	17.5	29.61	0	-9	40	41	41	20	GOOD
R1	5/21/97	-9	15.2	33.64	9	-9	37	41	39	24	GOOD
R1.3	5/21/97	-9	10.3	39.83	36	-9	29	41	35	36	GOOD
R1.7	5/21/97	-9	10.8	45.20	36	-9	30	41	36	36	GOOD
R2	5/21/97	-9	13.0	4.80	31	-9	34	41	38	34	GOOD
R2.5	5/21/97	-9	14.9	2.70	27	-9	36	41	39	33	GOOD
R3	5/21/97	-9	17.7	1.00	25	-9	40	41	41	33	GOOD
R4	5/21/97	-9	18.5	4.60	22	-9	41	41	41	31	GOOD
<b>Chassahowitzka Coastal Area</b>											
3	5/21/97	-9	19.0	2.67	28	-9	41	41	41	35	GOOD
4	5/21/97	-9	19.3	4.08	28	-9	42	41	42	35	GOOD
6	5/21/97	-9	17.3	6.20	26	-9	39	41	40	33	GOOD
7	5/21/97	-9	20.1	1.00	14	-9	42	41	42	28	GOOD
8A	5/21/97	-9	25.3	4.10	27	-9	47	41	44	36	GOOD
14	5/21/97	-9	19.8	6.33	22	-9	42	41	42	32	GOOD
18	5/21/97	-9	21.4	8.60	7	-9	44	41	43	25	GOOD
20	5/21/97	-9	28.1	18.60	19	-9	49	41	45	32	GOOD
21	5/21/97	-9	43.7	5.08	22	-9	58	41	41	32	GOOD
23	5/21/97	-9	17.3	2.00	22	-9	39	41	40	31	GOOD
24	5/21/97	-9	16.9	3.40	15	-9	39	41	40	28	GOOD
25	5/21/97	-9	18.1	2.90	21	-9	40	41	41	31	GOOD
26	5/21/97	-9	16.9	2.10	15	-9	39	41	40	28	GOOD
27	5/21/97	-9	19.7	5.00	17	-9	42	41	42	29	GOOD
28	5/21/97	-9	18.5	1.00	0	-9	41	41	41	21	GOOD
30	5/21/97	-9	20.9	2.70	0	-9	43	41	42	21	GOOD
39	5/21/97	-9	24.1	4.60	22	-9	46	41	44	33	GOOD
40C	5/21/97	-9	22.9	2.90	9	-9	45	41	43	26	GOOD
41	5/21/97	-9	27.7	4.75	33	-9	49	41	45	39	GOOD
42	5/21/97	-9	21.7	3.70	21	-9	44	41	43	32	GOOD

Station	Date	Secchi	Total	Inorganic	Chlorophyll	Secchi	Total N	Total P	Limit	Trophic	Category
		Depth	N:P Ratio	N:P Ratio						State	
		(m)	(mg:mg)	(mg:mg)	(%-ile)	(%-ile)	(%-ile)	(%-ile)	(%-ile)	Index	
<b>Tidal Creeks</b>											
7CABG	9/16/97	-9	17.6	5.33	41	-9	54	54	54	47	GOOD
ROSE	9/16/97	-9	33.5	9.83	29	-9	52	41	41	35	GOOD
MASON	9/16/97	-9	13.7	11.88	34	-9	48	54	51	43	GOOD
UMAS	9/16/97	-9	27.3	8.60	38	-9	48	41	45	41	GOOD
PETTY	9/16/97	-9	25.6	6.46	36	-9	47	41	44	40	GOOD
<b>Homosassa River</b>											
H0	9/16/97	-9	17.4	23.25	9	-9	40	41	40	25	GOOD
H0.5	9/16/97	-9	13.8	25.70	15	-9	35	41	38	27	GOOD
H1	9/16/97	-9	11.0	39.40	41	-9	31	41	36	38	GOOD
H2	9/16/97	-9	15.3	4.08	42	-9	37	41	39	41	GOOD
H3	9/16/97	-9	10.8	6.83	34	-9	44	54	49	42	GOOD
H4	9/16/97	-9	22.2	5.13	24	-9	44	41	43	34	GOOD
<b>Other Spring Vents</b>											
POTTR	9/17/97	-9	19.2	23.47	21	-9	41	41	41	31	GOOD
CRAB	9/17/97	-9	18.8	27.43	0	-9	41	41	41	21	GOOD
CH#1	9/17/97	-9	19.4	28.50	0	-9	42	41	42	21	GOOD
<b>Chassahowitzka River</b>											
R0	9/17/97	-9	28.4	25.44	0	-9	49	41	45	23	GOOD
R1	9/17/97	-9	17.8	20.38	29	-9	40	41	41	35	GOOD
R1.3	9/17/97	-9	14.7	26.10	14	-9	36	41	39	26	GOOD
R1.7	9/17/97	-9	18.6	16.75	36	-9	41	41	41	39	GOOD
R2	9/17/97	-9	7.7	11.25	36	-9	41	58	41	38	GOOD
R2.5	9/17/97	1.4	7.7	7.89	36	50	44	61	44	43	GOOD
R3	9/17/97	1.6	26.7	6.44	34	46	48	41	45	42	GOOD
R4	9/17/97	2	25.2	5.75	29	39	47	41	44	38	GOOD
<b>Chassahowitzka Coastal Area</b>											
3	9/17/97	1.1	10.8	8.11	31	57	44	54	49	46	GOOD
4	9/17/97	-9	9.8	13.25	34	-9	49	61	49	41	GOOD
6	9/17/97	0.8	13.9	14.50	33	67	49	54	52	50	FAIR
7	9/17/97	-9	13.8	15.86	29	-9	49	54	52	41	GOOD
8A	9/17/97	-9	28.1	12.43	29	-9	49	41	45	37	GOOD
14	9/17/97	-9	32.4	7.29	37	-9	52	41	41	39	GOOD
18	9/17/97	-9	10.2	10.13	22	-9	49	61	55	38	GOOD
20	9/17/97	-9	15.0	26.50	15	-9	54	58	56	36	GOOD
21	9/17/97	-9	19.4	23.13	18	-9	55	54	55	37	GOOD
23	9/17/97	-9	26.2	6.86	18	-9	48	41	45	31	GOOD
24	9/17/97	-9	8.0	4.25	22	-9	45	61	45	33	GOOD
25	9/17/97	-9	9.1	2.93	17	-9	44	58	44	30	GOOD
26	9/17/97	-9	24.1	1.92	18	-9	46	41	44	31	GOOD
27	9/17/97	-9	29.7	4.19	29	-9	50	41	46	38	GOOD
28	9/17/97	-9	30.8	8.00	0	-9	51	41	41	21	GOOD
30	9/17/97	-9	38.9	9.83	17	-9	55	41	41	29	GOOD
39	9/17/97	0.9	11.3	15.43	28	63	48	58	53	48	GOOD
40C	9/17/97	-9	30.9	0.63	17	-9	51	41	41	29	GOOD
41	9/17/97	0.3	13.2	13.57	33	96	48	54	51	60	FAIR
42	9/17/97	-9	25.0	12.38	22	-9	47	41	44	33	GOOD
44	9/17/97	-9	31.0	0.94	14	-9	51	41	41	28	GOOD

# **Appendix D**

## **Biomass Data**

Station	Quad	Percent	Vascular	Algal	Total
		Vascular	Biomass	Biomass	Biomass
		(%)	(kg wet wt/m2)	(kg wet wt/m2)	(kg wet wt/m2)
<b>May-97</b>					
R0	1	50	2.60	2.60	5.20
R0	2	0	0.00	2.00	2.00
<b>R0 Average</b>		25	1.30	2.30	3.60
R1	1	60	1.92	1.28	3.20
R1	2	50	4.40	4.40	8.80
R1	3	56	7.17	5.63	12.80
<b>R1 Average</b>		55	4.50	3.77	8.27
R1.3	1	45	9.54	11.66	21.20
R1.3	2	77	6.78	2.02	8.80
R1.3	3	29	1.62	3.98	5.60
<b>R1.3 Average</b>		50	5.98	5.89	11.87
R1.7	1	0	0.00	4.40	4.40
R1.7	2	0	0.00	4.40	4.40
R1.7	3	0	0.00	5.20	5.20
<b>R1.7 Average</b>		0	0.00	4.67	4.67
R2	1	100	5.20	0.00	5.20
R2	2	50	1.00	1.00	2.00
R2	3	50	1.40	1.40	2.80
<b>R2 Average</b>		67	2.53	0.80	3.33
R2.5	1	100	0.40	0.00	0.40
R2.5	2	100	1.20	0.00	1.20
R2.5	3	100	3.60	0.00	3.60
<b>R2.5 Average</b>		100	1.73	0.00	1.73
R3	1	100	0.20	0.00	0.20
R3	2	100	0.80	0.00	0.80
R3	3	70	2.80	1.20	4.00
<b>R3 Average</b>		90	1.27	0.40	1.67
R4	1	10	0.08	0.72	0.80
R4	2	30	0.48	1.12	1.60
R4	3	0	0.00	10.00	10.00
<b>R4 Average</b>		13	0.19	3.95	4.13
24	5	90	0.72	0.08	0.80
24	6	80	1.92	0.48	2.40
24	7	10	0.72	6.48	7.20
<b>24 Average</b>		60	1.12	2.35	3.47
26	5	0	0.00	3.20	3.20
26	6	0	0.00	3.60	3.60
26	7	0	0.00	4.40	4.40

Station	Quad	Percent Vascular (%)	Vascular Biomass (kg wet wt/m2)	Algal Biomass (kg wet wt/m2)	Total Biomass (kg wet wt/m2)
<b>26 Average</b>		0	0.00	3.73	3.73
44	5	0	0.00	5.20	5.20
44	6	0	0.00	5.60	5.60
44	7	0	0.00	4.80	4.80
<b>44 Average</b>		0	0.00	5.20	5.20
Sep-97					
R0	1	0	0.00	26.96	26.96
R0	2	0	0.00	0.96	0.96
R0	3	0	0.00	1.06	1.06
R0	4	0	0.00	46.88	46.88
R0	5	0	0.00	3.76	3.76
<b>R0 Average</b>		0	0.00	15.92	15.92
R1.0	1	2	0.02	1.02	1.04
R1.0	2	100	2.54	0.00	2.54
R1.0	3	100	2.08	0.00	2.08
R1.0	4	95	2.28	0.12	2.40
R1.0	5	5	0.08	1.50	1.58
<b>R1.0 Average</b>		60	1.40	0.53	1.93
R1.3	1	40	0.68	1.02	1.70
R1.3	2	20	0.57	2.29	2.86
R1.3	3	0	0.00	10.60	10.60
R1.3	4	5	0.16	3.04	3.20
R1.3	5	2	0.05	2.49	2.54
<b>R1.3 Average</b>		13	0.29	3.89	4.18
R1.7	1	2	0.01	0.39	0.40
R1.7	2	5	0.14	2.64	2.78
R1.7	3	5	0.12	2.34	2.46
R1.7	4	0	0.00	0.00	0.00
R1.7	5	100	0.36	0.00	0.36
<b>R1.7 Average</b>		22	0.13	1.07	1.20
R2	1	30	0.13	0.31	0.44
R2	2	2	0.03	1.71	1.74
R2	4	100	0.24	0.00	0.24
R2	5	0	0.00	0.00	0.00

Station	Quad	Percent Vascular (%)	Vascular Biomass (kg wet wt/m2)	Algal Biomass (kg wet wt/m2)	Total Biomass (kg wet wt/m2)
<b>R2 Average</b>		33	0.10	0.50	0.61
R2.5	1	1	0.01	0.59	0.60
R2.5	2	0	0.00	0.00	0.00
R2.5	3	0	0.00	1.20	1.20
R2.5	4	0	0.00	0.00	0.00
R2.5	5	0	0.00	0.00	0.00
<b>R2.5 Average</b>		0	0.00	0.36	0.36
R3	1	0	0.00	0.00	0.00
R3	2	0	0.00	0.00	0.00
R3	3	0	0.00	0.60	0.60
R3	4	0	0.00	2.00	2.00
R3	5	100	0.04	0.00	0.04
<b>R3 Average</b>		20	0.01	0.52	0.53
R4	1	0	0.00	0.00	0.00
R4	2	0	0.00	0.32	0.32
R4	3	0	0.00	0.00	0.00
R4	4	0	0.00	0.00	0.00
R4	5	0	0.00	0.00	0.00
<b>R4 Average</b>		0	0.00	0.06	0.06
24	1	100	0.03	0.00	0.03
24	2	0	0.00	0.20	0.20
24	3	50	0.60	0.60	1.20
24	4	0	0.00	0.00	0.00
24	5	100	0.04	0.00	0.04
<b>24 Average</b>		50	0.13	0.16	0.29
26	1	0	0.00	10.40	10.40
26	2	0	0.00	6.80	6.80
26	3	0	0.00	8.80	8.80
26	4	0	0.00	9.60	9.60
26	5	0	0.00	8.80	8.80
<b>26 Average</b>		0	0.00	8.88	8.88
44	1	0	0.00	0.20	0.20
44	2	0	0.00	0.52	0.52
44	3	0	0.00	0.72	0.72
44	4	0	0.00	1.04	1.04
44	5	0	0.00	0.96	0.96
<b>44 Average</b>		0	0.00	0.69	0.69

# **Appendix E**

**Sediment Nutrient Data**  
**Sediment Grain Size Data**

Station	Date	Total	Total	N:P Ratio	Total	Total	Percent	Percent
		Kjeldahl N	Phosphorus	Kjeldahl N	Phosphorus	Solids	Organics	
		(mg/kg dry wt)	(mg/kg dry wt)	(mg:mg)	(mg/kg org)	(mg/kg org)	(%)	(%)
R0	5/20/97	0.31	0.29	1.1	28.09	26.55	70.6	1.1
R1	5/20/97	0.17	0.05	3.8	57.67	15.00	73.8	0.3
R1.3	5/20/97	1.48	0.11	13.3	43.65	3.29	60.7	3.4
R1.7	5/20/97	8.71	0.61	14.4	42.29	2.94	15.2	20.6
R2	5/20/97	9.08	0.60	15.2	50.74	3.33	19.3	17.9
R2.5	5/20/97	0.51	0.41	1.3	11.86	9.42	43.9	4.3
R3	5/20/97	3.86	0.30	13.1	32.20	2.47	34.5	12.0
R4	Rocky, no sample							
24	5/20/97	1.77	0.13	13.4	49.03	3.67	51.4	3.6
26	5/20/97	9.96	0.53	18.8	42.74	2.27	11.9	23.3
44	Rocky, no sample							

Station	Date	Percent	Percent	Percent	Percent	Percent	Percent	Mean	Median	Modal	Standard	Skewness	Kurtosis
		Solids	Moisture	Organic	Sand	Silt	Clay	Grain Size	Grain Size	Grain Size	Deviation		
		(%)	(%)	(%)	(%)	(%)	(%)	(microns)	(microns)	(microns)			
R0	5/20/97	70.6	29.4	1.1	93.6	5.6	0.8	207	212	169	2.56	-1.69	5.91
R1	5/20/97	73.8	26.2	0.3	97.2	2.5	0.3	307	357	429	2.10	-2.28	9.87
R1.3	5/20/97	60.7	39.3	3.4	71.0	27.2	1.8	113	154	154	3.98	-0.86	0.28
R1.7	5/20/97	15.2	84.8	20.6	72.5	26.4	1.1	106	125	154	3.37	-0.51	0.89
R2	5/20/97	19.3	80.7	17.9	62.2	35.5	2.4	98	102	128	4.95	-0.19	-0.30
R2.5	5/20/97	43.9	56.1	4.3	76.4	22.2	1.5	175	196	2379	5.03	-0.52	-0.19
R3	5/20/97	34.5	65.5	12.0	70.9	26.6	2.5	139	151	140	5.54	-0.41	-0.37
R4	Rocky, no sample												
24	5/20/97	51.4	48.6	3.6	87.3	12.1	0.6	751	2080	2379	5.49	-1.39	0.85
26	5/20/97	11.9	88.1	23.3	66.9	31.7	1.4	105	120	169	3.96	-0.38	0.06
44	Rocky, no sample												
R0	9/15/97	40.8	59.2	9.6	75.8	22.3	1.8	151	162	154	4.46	-0.62	0.29
R1.0	9/15/97	78.7	21.3	0.3	96.9	2.7	0.4	266	300	391	2.12	-2.21	9.70
R1.3	9/15/97	52.4	47.6	3.0	88.4	11.0	0.6	175	177	154	2.83	-0.82	2.61
R1.7	9/15/97	51.4	48.6	2.9	82.8	16.3	0.9	147	158	154	3.13	-0.83	1.68
R2	9/15/97	42.1	57.9	6.9	71.6	26.9	1.5	105	132	154	3.70	-0.67	0.52
R2.5	9/15/97	32.5	67.5	10.5	69.3	28.4	2.2	219	327	2379	7.89	-0.45	-0.98
R3	9/15/97	57.3	42.7	3.4	83.3	15.2	1.5	642	1599	2379	6.58	-1.44	0.85
R4	9/15/97	44.5	55.5	4.0	83.7	15.2	1.1	371	491	2379	5.95	-0.77	-0.20
24	9/15/97	30.6	69.4	9.5	74.5	24.2	1.3	154	185	296	4.47	-0.49	0.01
26	9/15/97	17.0	83.0	20.1	79.4	19.6	0.9	308	328	2379	5.99	-0.52	-0.62
44	9/15/97	58.8	41.2	3.1	86.9	11.7	1.4	369	557	2379	5.01	-1.20	1.03