

TASK 7 – REPORT

**SEAGRASSES, ASSOCIATED FAUNA AND FAUNAL
HABITAT REQUIRMENTS DOCUMENTATION
AND ANALYSIS**

For the Project:

**FRESHWATER FLOW AND ECOLOGICAL
RELATIONSHIPS IN BISCAYNE BAY**

SFWMD Contract No. C-15967-WO04-06

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MAY 2004

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Seagrasses, Associated Fauna and Faunal Habitat
Requirements Documentation and Analysis

	<u>Page No.</u>
EXECUTIVE SUMMARY	ES-1
INTRODUCTION	1-1
BACKGROUND	1-1
PURPOSE AND SCOPE	1-1
CHEMICAL AND PHYSICAL HABITAT LIFE CYCLE	2-1
REQUIREMENTS OF SEAGRASSES	
GENERAL	2-1
LIMITING FACTORS ON SEAGRASS OCCURRENCE	2-2
<i>Patterns of Zonation</i>	
<i>Salinity</i>	
<i>Light</i>	
<i>Temperature</i>	
<i>Nutrients</i>	
<i>Epiphytes</i>	
<i>Sediment Types and Thickness</i>	
<i>Wave and Current Energy</i>	
<i>Biological Factors-Competition, Grazing and Disease</i>	
SUMMARY OF LIMITING FACTORS ON SEAGRASS	
OCCURRENCE BY SPECIES	2-21
<i>Thalassia testudinum</i>	
<i>Syringodium filiforme</i>	
<i>Halodule wrightii</i>	
<i>Ruppia maritima</i>	
<i>Halophila decipiens</i>	
<i>Halophila englemannii</i>	
<i>Halophila johnsonii</i>	

SITE SPECIFIC INFORMATION REGARDING SEAGRASSES IN BISCAYNE BAY	3-1
EXISTING SEAGRASS MAPS	3-1
IMPLICATIONS OF THE KNOWN CONTROLS IN SEAGRASS DISTRIBUTION, EXISTING SEAGRASS MAPS OF BISCAYNE BAY AND MFLs	3-29

REFERENCES	REF-1 - 24
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<u>FIGURES</u>	<u>DESCRIPTION</u>	
1.	Zonation of Seagrasses in an Area of Tampa Bay	2-4
2.	Maximum Depth of Occurrence of Seagrass Species at St. Croix	2-5
3.	Distribution of Shoal Grass and Tape Grass within the Caloosahatchee River	2-7
4.	Location of Nutrient Sampling Sites in Biscayne Bay	2-17
5.	General Location Map showing Sub-regions	3-4
6.	Distribution of Johnson Seagrass within Biscayne Bay	3-5
7.	Snake Creek/Oleta River Sub-region	3-7
8.	Northern Biscayne Bay Sub-region	3-8
9.	Miami River/Government Cut Sub-region	3-9
10.	Central Biscayne Bay Sub-region	3-10
11.	South-Central Biscayne Bay Sub-region	3-11
12.	Southern Biscayne Bay Sub-region	3-12
13.	Level 1 Fixed Transect Station Locations in Biscayne Bay	3-14
14.	a - n: Seagrass Transect Composition at DERM Level 1 Locations in Biscayne Bay	3-16 - 3-22
15.	Level 2 DERM Sampling Polygons and Distribution of Thalassia Testudinum	3-23
16.	Mean BBCA Abundance and Related Cover of Thalassia Testudinum	3-24
17.	Halodule Density in Biscayne Bay	3-30
18.	Halodule and Ruppia Coverages in Biscayne Bay	3-31
19.	Current and Predicted Distribution of Turtlegrass in Biscayne Bay	3-34
20.	Current and Predicted Occurrence of Mixed Shoal Grass- Wigeongrass in Biscayne Bay	3-35

<u>TABLES</u>	<u>DESCRIPTION</u>	
1.	Summary of Literature Concerning the Salinity Tolerance of the grass, <i>Thalassia testudium</i>	2-11
2.	Maximal depth limit, light attenuation coefficient (Kd), and minimal light requirements of tropical and subtropical seagrasses	2-13
3.	Modified Braun-Blanquet Cover-Abundance Scale	3-15
4.	Fishes Occurring in Biscayne Bay which are of Major or Minor Importance to Commercial, Sport or Bait Fisheries in Biscayne Bay	3-26
5.	Seagrass Dependent Invertebrates that are of Major Importance to Commercial, Sport or Bait Fisheries	3-28

<u>APPENDICES</u>	<u>DESCRIPTION</u>
A.	Nutrient Data from 35 Sampling Sites Located within Biscayne Bay
B.	Meeder and Boyer Report on Total Ammonia Concentrations
C.	Excerpts from the July 2000, the National Oceanic and Atmospheric Administration released Technical Memorandum NOS NCCOS CCMA #145, an Environmental History and Annotated Bibliography of Biscayne Bay (Cantillo, et. al. 2000).
D.	March 2003, Dial Cordy and Associates, Inc. published a Final Report regarding their Environmental Baseline Study that was conducted for the U.S. Army Corps of Engineers concerning potential modifications at Miami Harbor.
E.	September 2002, Final Recovery Plan for Johnson's Seagrass, by the Johnson's Seagrass Recovery Team, for the National Marine Fisheries Service, NOAA
F.	1980s, the Metro-Dade Department of Environmental Resources Management (DERM) developed a draft Aquatic Preserve Management Plan for Biscayne Bay.
G.	Fishes which are Valuable as Aquarium Fishes

EXECUTIVE SUMMARY

Task 7 was devoted to the examination of issues related to minimum flows and levels for Biscayne Bay beyond salinity, including the chemical and physical habitat requirements of seagrasses, and potential preferences for key faunal species (e.g., pink shrimp), and for specific combinations of physical conditions, chemical constituents and habitats.

The results of this work effort indicate that a key chemical parameter, the water column concentration of dissolved nutrients, primarily nitrogen species, may covary with increased or decreased freshwater flows into the western shoreline of Biscayne Bay. Actual loading rates for existing and proposed water deliveries to Central and South Central Biscayne Bay are being developed by Joe Boyer and Jack Meeder of Florida International University (pers. comm.), and monitoring conducted by Meeder and Boyer (2001) suggest that ammonia concentrations may have already exceed the levels at which they “may be toxic to some marine fish”. Increases in nitrogen load may negatively impact total cover of all seagrasses along the western shoreline of the Bay. This is a potential issue due to the documented increase in drift algae and epiphytic microalgae and fauna that has negatively impacted seagrass meadows in other estuaries in Florida and elsewhere.

Research is ongoing on the detailed distribution of seagrasses within Biscayne Bay, but most of this work was unavailable for incorporation into this report. When available, this information should be used to prepare the most detailed current seagrass meadow distribution map, by species, or combination of seagrass species for the Bay. In particular the presence of shoal grass, shoal grass/wigeongrass mixed meadows, and monospecific wigeongrass would be key indicators of reduced salinity conditions. Modeling efforts to date provide some indication that predictions of future distributions of seagrass species could be made if the nutrient enrichment factor is accurately accounted for and added as a component of the model.

Finally, while the hypothesis that polyhaline shoal grass habitat is the most important juvenile pick shrimp habitat in Biscayne Bay has been proposed (J. Browder, pers. comm.) the ongoing research project to attempt to verify this hypothesis is not yet complete, and conclusions cannot be drawn at this time. In the absence of this study being complete, the recommendation is made here that a full gradient of low salinity to higher salinity seagrass habitats (i.e., inshore monospecific wigeongrass → wigeongrass/shoal grass mixed meadow → shoal grass dominant meadow → offshore turtle grass dominant meadow) be an

interim target indicator for establishment of minimum flows and levels for Central and South Central Biscayne Bay. For other parts of the Bay, the currently existing distribution and species combinations of seagrass should be maintained.

INTRODUCTION

BACKGROUND

As one component of the effort to develop an MFL rule for Biscayne Bay, in mid-2003 the South Florida Water Management District (SFWMD) issued a work order to undertake a study entitled, *Freshwater Flow and Ecological Relationships in Biscayne Bay*. SFWMD entered into an agreement (Contract No. C-15967-WO04-06) with the consultant team of Barnes, Ferland and Associates, Applied Technology Management, Inc. and Lewis Environmental Services, Inc. to conduct a variety of activities, which will assist the District in developing the MFL rule for Biscayne Bay.

A report was submitted to the SFWMD during January 2004, titled *Freshwater Flow and Ecological Relationships in Biscayne Bay*. This report included a summary of Tasks 1-6 efforts. The objectives for Tasks 1-6 were to develop an ecological basis in support of an MFL for Biscayne Bay and its sub-regions that focuses on salinity as the single determining factor for causing significant harm to the existing floral and faunal resources in the Bay. To utilize flora and fauna as an indicator of a level of harm in Biscayne Bay, as defined by Section 373.042 F.S., the District recognizes that chemical and physical water quality parameters and factors that may act synergistically with salinity in the Bay, must also be considered. Thus, the contract was amended to include additional work (Task 7).

PURPOSE AND SCOPE

Task 7 expands the focus of significant harm beyond salinity to include other parameters and factors that are directly or indirectly related to freshwater inflows to the Bay, which may cause or contribute to significant harm. Specifically, this task will include obtaining additional information and performing additional analyses to develop ecological correlations between seagrasses and associated fauna and faunal habitat requirements within the six (6) sub-regions of the Bay (Snake Creek/Oleta River, Northern Biscayne Bay, Miami River/Government Cut, Central Biscayne Bay, South-Central Biscayne Bay and Southern Biscayne Bay).

Task 7 involves an intensive review and documentation of all existing available information (including but not limited to published literature, unpublished literature, data, research, interviews with experts, field studies, mesocosm studies, etc.) to identify, analyze, and develop ecological correlations of the following:

1. Chemical and physical habitat life cycle requirements for:
 - turtle grass (*Thalassia testudinum*)
 - shoal grass (*Halodule wrightii*)
 - manatee grass (*Syringodium filiforme*)
 - paddle grass (*Halophila decipiens*)
 - Johnson's seagrass (*Halophila johnsonii*)
 - wigeongrass (*Ruppia maritima*);
2. Locations within Biscayne Bay where the six (6) seagrasses are currently typically found;
3. Habitat conditions/variables/requirements that make the above-referenced locations suitable for those seagrasses (i.e. chemical water quality parameters, physical water quality parameters, turbidity, light attenuation, sediment quality, sediment depth, natural and anthropogenic physical disturbances/processes, etc.);
4. Biological factors that can affect seagrasses (e.g., disease, competition, increased grazing by herbivores, shading, excessive growth of epiphytes);
5. Dynamics of competition and succession of seagrasses with other seagrasses; and
6. Fauna that prefer/rely on specific seagrasses, seagrass communities and seagrass habitats, at any stage of their life cycle.

CHEMICAL AND PHYSICAL HABITAT LIFE CYCLE REQUIREMENTS OF SEAGRASSES

GENERAL

Worldwide there are 59 species of seagrass (Green and Short 2003). Seven of these species occur in Biscayne Bay: turtle grass (*Thalassia testudinum*), shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), paddlegrass (*Halophila decipiens*), stargrass (*Halophila englemanii*), Johnson's seagrass (*Halophila johnsonii*), and wigeongrass (*Ruppia maritima*).

Macroalgae also occur mixed with seagrass meadows, and as dominant macrophytes where sediment thickness is too shallow (< 15 cm), water depths too great, or too turbid to transmit the required levels of light. Generally, macroalgae fall into three categories as to life-form: epiphytic on other plants, drift and attached. Epiphytic algae on seagrasses include small forms (i.e. diatoms, dinoflagellates, coralline red algae, filamentous green and bluegreen algae) that remain on leaves, and larger forms that break off and establish often as clumps of drift algae. Drift algae include *Acanthophora* spp., *Spyridia* spp., *Hypnea* spp., *Laurencia* spp. and *Gracilaria* spp. Attached rhizophytic green algae are very common mixed with seagrasses in the Bay, or as stand-alone communities in hardbottom areas mixed with sponges and soft corals and include *Halimeda* spp., *Penicillus* spp., and *Caulerpa* spp.

Seagrass distribution consists of few meadows around the mouth of the Oleta River, large areas of shoal grass and manatee grass in the northern portion of the Bay transitioning to predominantly turtle grass in the southern three sub-regions. A band of shoal grass occurs along the western shore of the central and south-central portions of the Bay. Graduate level research in progress indicates that some wigeongrass occurs mixed with shoalgrass where the lowest salinities occur (D. Mir-Gonzalez, pers. comm.) along the western shoreline at the mouths of some of the canals. It appears that Johnson's seagrass, a species designated as "threatened" by the federal government, does not occur south of Virginia Key (NMFS, 2002), but the reasons for this pattern of spatial distribution are not known.

As noted by Alleman et al. (1995), many species of small shrimp (both caridian shrimp and juvenile penaeid shrimp), crabs, polychaete worms, clams, snails, echinoderms and fish (both adult and juvenile) are found in seagrass habitats. The commercially and recreationally important fish and shellfish species, pink

shrimp (*Farfantepenaeus duorarum*), stone crabs (*Menippe mercenaria*), spiny lobster (*Panulirus argus*) and spotted seatrout (*Cynoscion nebulosus*) are important components of the fauna of seagrass meadows.

LIMITING FACTORS ON SEAGRASS OCCURRENCE

Patterns of Zonation - Seagrass meadows are not uniform features of all marine waters. Their distribution around the Gulf of Mexico and Atlantic Coast shorelines indicates on a broad scale what the major limiting factors are. For the Gulf of Mexico, seagrasses are limited to protected waters in estuaries with good transparency, or in the semi-protected offshore waters of the Florida Keys, or the Florida Big Bend area, characterized as part of the zero energy shoreline (Moore, 1963, Zieman and Zieman 1989, Onuf et al. 2003, Creed et al. 2003). They become more sparse off Alabama and Mississippi, and essentially disappear offshore of Louisiana except for Chandeleur Sound (Eleuterius 1987) where water turbidity is high and salinities seasonally low. The exception is wigeongrass, which appears to be expanding its distribution in the inshore waters of Louisiana where it forms large monotypic stands (Eleuterius 1987). The normal mix of seagrasses that are less tolerant of brackish water appears again in the estuaries of south Texas (Onuf et al. 2003).

For the Atlantic Coast, a similar pattern exists, with seagrasses extending up the coast from the Florida Keys through Biscayne Bay to the Mosquito Lagoon north of Cape Canaveral only within protected inshore waters behind barrier islands, where the last remnants of beds of wigeongrass finally disappear and give way to freshwater macrophytes like *Vallisneria* in the St. Johns River (Creed et al. 2003; Lewis, personal observations). An apparent gap exists in Georgia and South Carolina, although wigeongrass may occur inshore and has not been studied, with a resumption of large seagrass beds behind the barrier islands of North Carolina (Koch and Orth 2003). This is the northernmost limit of shoalgrass, where it mixes with the southernmost extent of eelgrass, *Zostera marina*, a temperate species.

Obviously then, on a gross scale, water temperature, wave energy, water clarity and salinity limit the species composition and distribution of the seagrass species of interest.

On a more local scale, nearly all tropical-subtropical seagrass beds exhibit zonation (Zieman 1987). Zonation refers to a distribution of bands of species or mixes of species more or less parallel to the coastline in zones extended seaward. In many cases the zonation stops as all seagrass occurrence stops with increasing

depth. This has been interpreted as a result of light limitation, where the minimum amount of light necessary to produce positive production to offset respiration needs is exceeded, and seagrasses cannot survive at these depths (Phillips and Lewis 1983). In very clear waters this depth can be 40 meters (131 feet) (Phillips and Lewis 1983). In most estuarine or lagoonal ecosystems, however, this is rarely more than 2-3 meters.

Local zonation patterns in Florida have been described by Zieman (1987, pages 54-55) as follows:

“Numerous studies in Florida from Phillips (1960) and Strawn (1961) to Lewis et al. (1985), have illustrated patterns of zonation in the state’s seagrass beds (Figure 1). Localized conditions create much variability, but patterns of zonation exhibit a definite commonality. The general pattern described below represents a typical gradient observed through clear waters in Florida. In turbid water areas, the same pattern could be expected, but the ranges of various species would be attenuated. A vertical zonation gradient that extends 10-15 m [in depth] in the Keys or the Dry Tortugas, would be compressed to 2 m or less in highly impacted estuaries such as Tampa Bay or northern Biscayne Bay, or even in certain basins in Florida Bay that are free of any human impact.

Halodule wrightii and *Ruppia maritima* L. generally are found in the shallowest water and appear to be more tolerant of exposure to air and direct sunlight than other species. The relatively high flexibility of their leaves allows these species to conform to the damp sediment surface during periods of exposure, thus minimizing leaf surfaces available for desiccation. *Thalassia testudinum* may be found in waters nearly as shallow. The shallowest *H. wrightii*, *R. maritima* and *T. testudinum* flats are commonly exposed by spring low tides, frequently with considerable leaf mortality.

All the species may be found, singly or mixed, throughout the range of 1-10 m: however, *T. testudinum* is unquestionably dominant in most areas, frequently forming extensive meadows that stretch for tens of kilometers. Although the absolute depth limit for this species is deeper, mature meadows of *Thalassia* are not found below 10-12 m (Figure 2). At this depth, *Syringodium filiforme* Kutzing replaces *Thalassia* and forms meadows down to the region of 15 m. Past the maximum depth for *Syringodium* development, *H. wrightii* often occurs, but rarely develops extensively at depth. Fine carpets of *Halophila* spp. can occur at depths greater than 40 m. In the shallow but highly turbid waters off the Shark River in southwest Florida, *Halophila* is sparse but widespread.

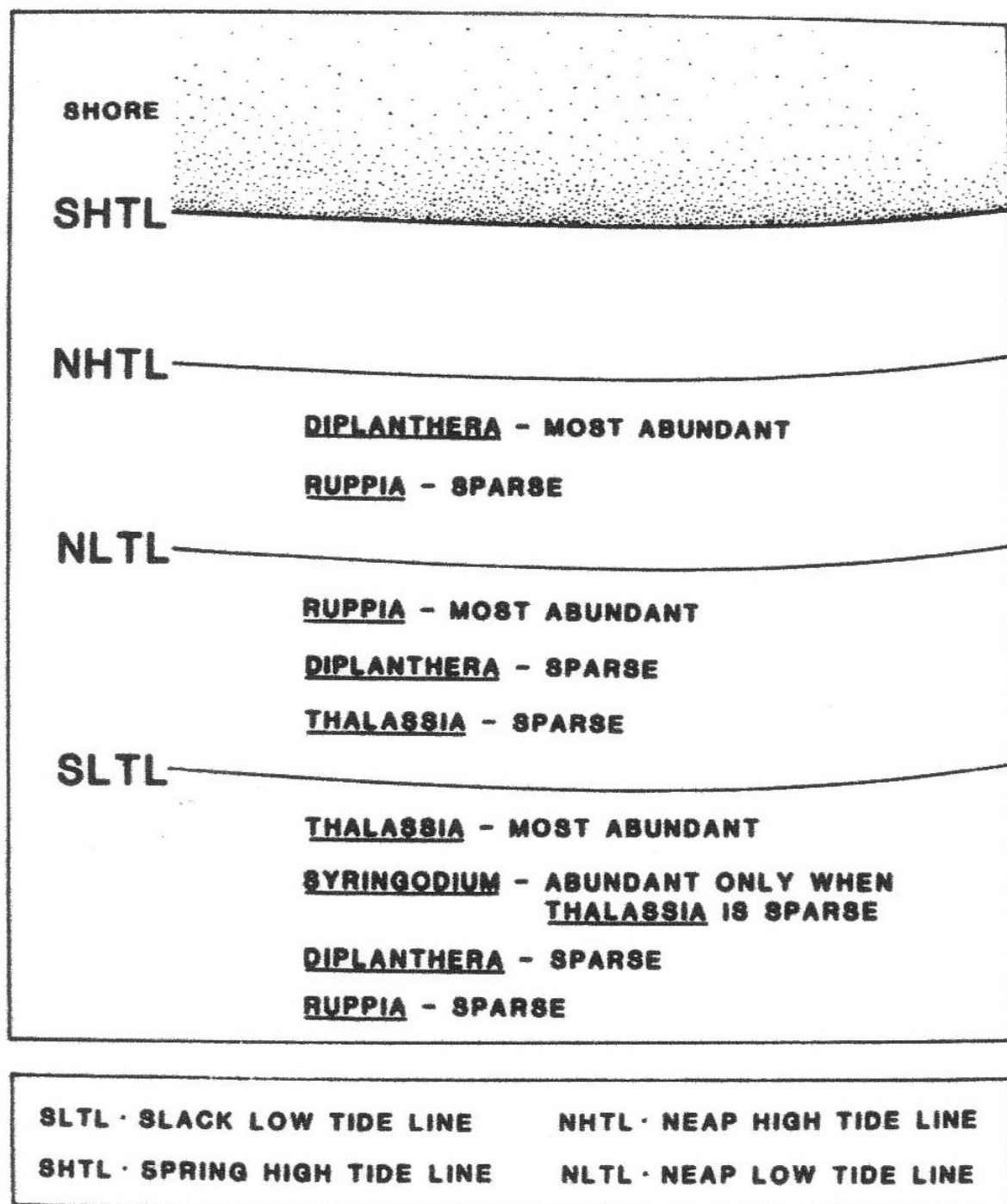


Figure 1. Zonation of seagrasses in an area of Tampa Bay. (From Phillips, 1960).

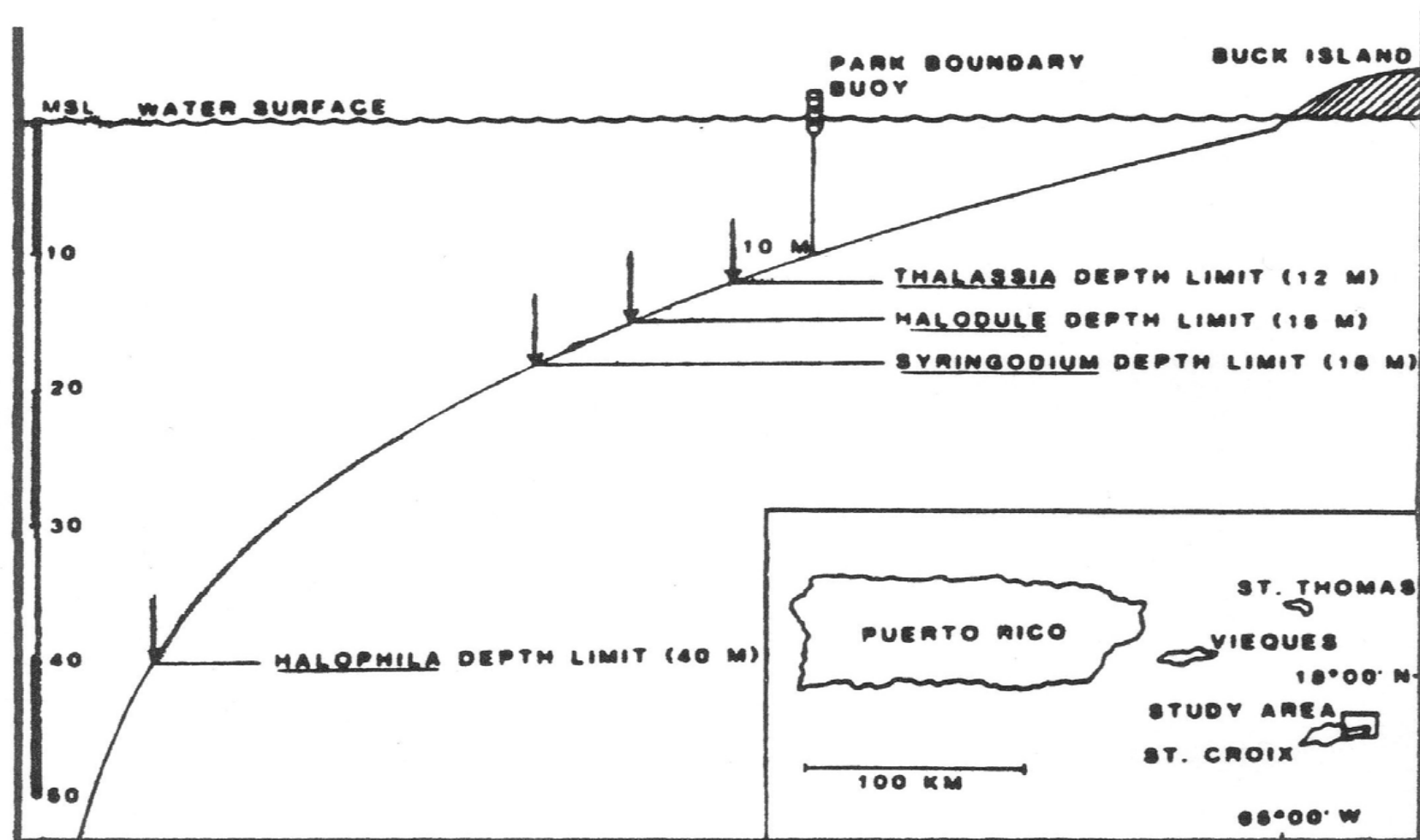


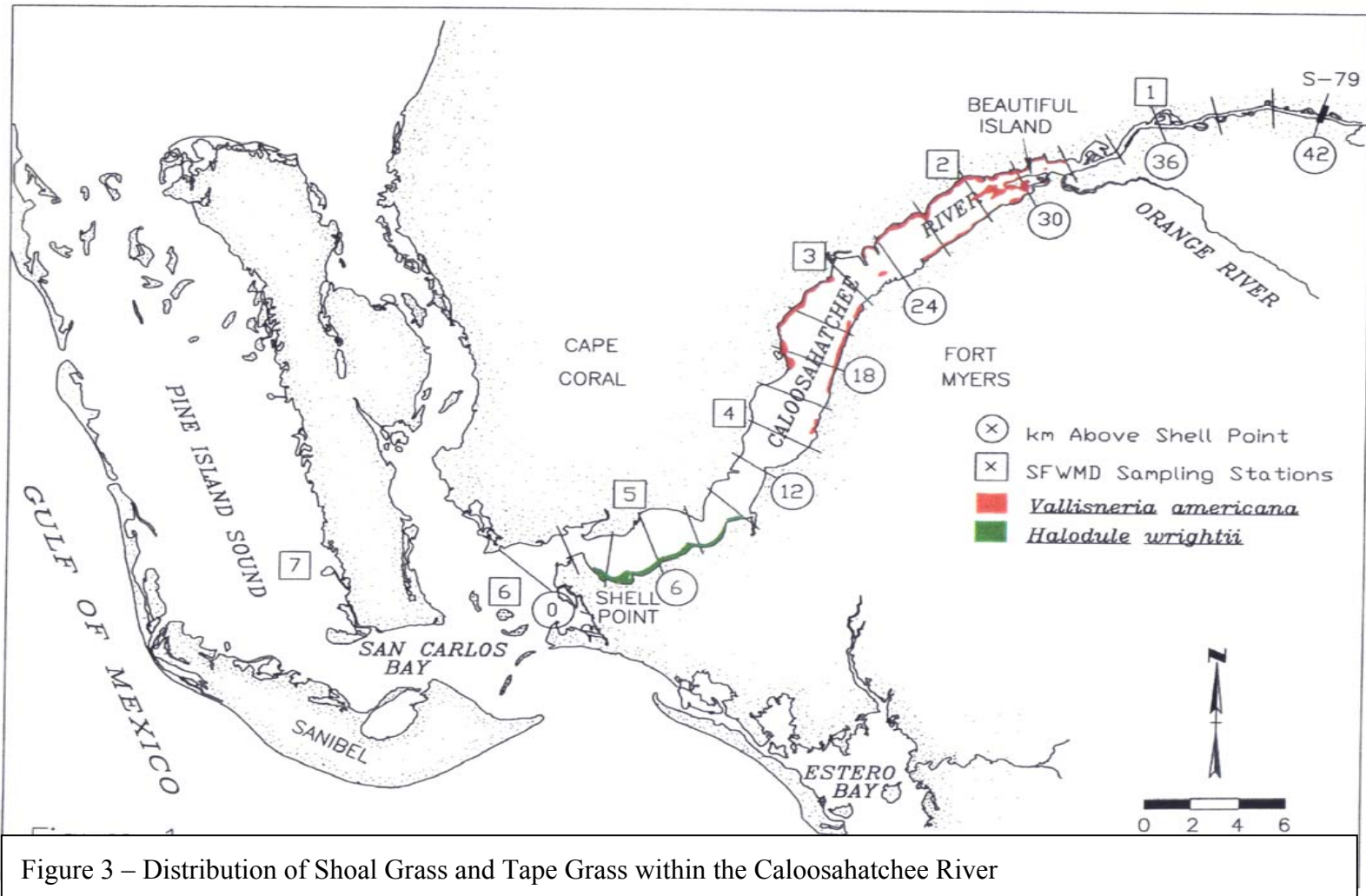
Figure 2. Maximum depth of occurrence of seagrass species at St. Croix. (From Phillips and Lewis, 1983).

Of all the major species *S. filiforme* often has the most discontinuous distribution. It is commonly found intermixed with *T. testudinum* in deeper portions of the latter's range, but is virtually never found in waters as shallow as *Thalassia* or *Halodule*, because its stiff leaves do not bend sufficiently to conform to the sediment surface and reduce desiccation. *Syringodium* leaves are quite brittle, compared to those of other species, and break easily if bent at a sharp angle. However, the plant seems well adapted to both turbulence and rapid water flow. In highly turbulent waters immediately behind the Florida Reef Tract, *Syringodium* is commonly found either in dense monospecific stands or intermixed with *Thalassia*. Both plants seem to possess sufficient leaf strength and root holding capacity to exist in this rigorous environment. Dense stands of *Syringodium* are also commonly found in deep channels throughout the Florida Keys, where tidal current velocities are very high, and high turbidity reduces the incident light."

Lateral zonation with decreasing depth can also extend up into tidal streams with freshwater flows that reduce the salinities to freshwater at various times. Such conditions are reported in the Caloosahatchee River (SFWMD 2003b). Figure 3 shows the distribution of shoal grass and tape grass (*Vallisneria americana*) in the Caloosahatchee River above Shell Point. While tape grass is able to tolerate some salinity increases, Doering et al. (1999) and Bortone and Turpin (2000) discuss the biology of tapegrass in the Caloosahatchee River note that it stop growing at 15 psu, and that generally growth was inversely related to salinity. The disjunct distribution of shoal grass and tape grass shown in Figure 3 is similar to that described by Estevez and Sprinkel (1999) for the tidal Suwannee River. In their study, a zone of wigeongrass existed downstream in the river, separated by a zone lacking any rooted macrophytes upstream, followed by a zone of tape grass. Tape grass was mixed with twelve other freshwater macrophytes within the study area extending 10 kilometers upstream from the mouth of the river.

Seagrass distribution and zonation specifically in Biscayne Bay is discussed in more detail in the next section of this report.

Salinity - As stated by Sklar and Browder (1998) "Although estuarine organisms are generally euryhaline, few occur throughout the entire range of salinities from full seawater strength to brackish. Rather, several communities of organisms occur within an estuary, each more abundantly within a relatively narrow part of the salinity spectra...As a result, shifts in isohalines cause major changes in community structure...Such shifts reduce or eliminate suitable living habitat by placing favorable salinities out of reach of animals that require bottom or shoreline habitat not found in the new location..."



Fourqurean et al. (2003) have recently published the results of water quality sampling and seagrass occurrence by species and cover for 677 stations in Florida Bay sampled between March 1991 and March 2000. The sampling and correlations derived from the data were intended to attempt to construct "habitat requirements" models for the five species of seagrass encountered: turtle grass, manatee grass, shoal grass, paddle grass and wigeongrass. No stargrass was observed in the sampling, and Johnson's seagrass has never been observed south of Key Biscayne in Biscayne Bay, and therefore is not known to occur in Florida Bay. Eight seagrass community types, including no seagrass, were identified, and characterized as to the various sampled parameters.

For salinity, the results can be summarized as: "*Ruppia-Halodule* communities had the lowest and most variable salinity...while yearly mean salinity in the *H. decipiens*, *Syringodium filiforme*, and dense mixed-species beds was relatively high, with low variability. Intermediate yearly mean salinities and relatively high annual variability were found in the *Halodule wrightii*, dense *Thalassia*, and sparse *Thalassia* communities."

Tomasko et al. (2000) summarized the extent of knowledge about salinity impacts on the distribution and health of seagrasses as follows:

"For seagrasses, a wealth of information exists on the ability of different species to adjust to fluctuations in salinity. Early work by Jagels (1973, 1983) showed that *T. testudinum*, which is perhaps the most common species in southwest Florida, has specialized cells in the leaf epidermal layer that help this species tolerate salinity stresses. In one of the earliest studies on salinity tolerances in seagrasses, McMillan and Moseley (1967) grew four species (collected in Texas) at salinities up to 74 ppt. The species they examined are all found in southwest Florida. Of the four species, *Syringodium filiforme* (manatee grass) showed the lowest upper salinity tolerance limit, as growth stopped when plants were exposed to salinities higher than 45 ppt. The three remaining species, *T. testudinum* (turtle grass), *Halodule wrightii* (shoal grass) and *Halophila englemanni* (star grass) all continued to grow at salinities up to and beyond 60 ppt.

A study on a Caribbean population of turtle grass by Gessner (1971) showed that while cellular damage occurred at salinities twice that of natural seawater (ca. 70 ppt), no cellular damage occurred at salinities 20% higher than natural seawater (ca. 42 ppt). In another study from Texas, Pulich (1986) found that turtle grass

shoal grass, star grass and wigeongrass (*Ruppia maritima*, a common species in southwest Florida) all had physiological mechanisms that allowed them to tolerate salinities up to 47 ppt. Also in Texas, Tomasko and Dunton (1995) documented vigorous growth of shoal grass in the hypersaline Laguna Madre, where salinities ranged from 38 to 48 ppt.

In a study conducted in Tampa Bay, Lazar and Dawes (1991) examined the physiological ecology of two populations of wigeongrass from distinctly different locations. The first population was from Old Tampa Bay, an area where annual average salinities tend to be less than 22 ppt (Boler 1986 as illustrated by Estevez 1989). The second population was from Lower Tampa Bay, where salinities average between 27 and 30 ppt. Both populations showed broad and similar abilities to photosynthesize at the experimental salinities of 0, 17.5, and 35 ppt.

Additionally, a number of studies have examined responses to salinity variation for macroalgae in southwest Florida. For the common brown algae, *Sargassum filipendula*, plants collected from a variety of locations in the Tampa Bay area showed similar photosynthetic and respiratory rates when cultured at salinities of 15, 25 and 35 ppt, although plants did not do well when grown in salinities of 5 ppt (Dawes 1987; Dawes and Tomasko 1988; Dawes 1989). For the common red algae, *Gracilaria tikvahiae*, Lapointe et al. (1984) found no significant difference in growth rates for plants cultured for 2 weeks at 16 and 26 ppt even though the plants were originally grown at a salinity of 26 ppt. Koch and Lawrence (1987) found that for the related species *G. verrucosa*, plants originally cultured at 10 ppt salinity did not differ in their photosynthesis or respiratory rates when grown 20 days at either 10 or 32 ppt."

Tomasko and Hall (1999) examined density, biomass, productivity and epiphyte loads of short shoots of turtle grass at eight locations representing a gradient of freshwater influence in Charlotte Harbor for a period of one year with bimonthly sampling. Physical factors such as water temperature, salinity and light extinction coefficients were also measured. They concluded that the observed variations in productivity could be described by a linear combination of the independent variables water temperature and salinity. There was no clear relationship between water clarity and production. They cautioned that, "The use of field studies for estimating lower salinity tolerances of seagrasses might be

inappropriate for those systems where water clarity is positively associated with salinity.”

Doering and Chamberlain (2000) in a more controlled experiment found that turtle grass collected from the Caloosahatchee Estuary, Florida, cultured at five constant salinities ((i.e., 6, 12, 18, 25, or 35 psu) and given unlimited light, showed blade biomass and elongation rates positively correlated with the test salinities, with increases as the salinity increased. Although turtle grass survived at 6 psu for the six weeks of the two experiments, growth parameters were negatively impacted at salinities between 6 and 12 psu. Table 1 from Doering and Chamberlain (2000, p. 95) summarizes the literature reports concerning salinity tolerance of turtle grass.

Table 1 - Summary of literature concerning the salinity tolerance of turtle grass, *Thalassia testudinum* (modified from Doering and Chamberlain 2000).

TOLERANCE	CONDITIONS	LOCATION	REFERENCE
Optimum 28-36 psu Lowest 10 psu	Field Observations	Florida	Phillips 1960
Upper limit 60 psu	Indoor tanks, outdoor ponds, 55 day exposure*	Texas	McMillan and Mosely 1967
Died at 5 psu Survival 10-30 psu Upper limit 60 psu	Laboratory, 2 week constant exposure	Texas	McMillan 1974
Optimum 17-36 psu Lowest 6 psu	Field observation	Florida	Zimmerman and Livingston 1976
Optimum 24-35 psu	Literature summary	Florida	Zieman and Zieman 1989 Zieman 1982
Occurrence 30-40 psu	Field observation	Texas	Adair et al. 1994
Survival 5-35 psu	Field observations	Florida	Tomasko and Hall 1999
Optimum 22-36 psu	Field observation	Florida	Doering and Chamberlain 2000
Survival 6-35 psu	Indoor tanks	Florida	Doering and Chamberlain 2000
Maximum growth rates 30-40 psu Lowest growth rates at 5 psu and 45 psu	Field observations and outdoor tanks	Biscayne Bay, Florida	Lirman and Cropper 2003
Occurrence 16-35, dense beds	Field	Florida Bay, Florida	Fourqurean et al. 2003
Occurrence 18-35, sparse beds	Field	Florida Bay, Florida	Fourqurean et al. 2003

Thus all the seagrasses, and mixed seagrass communities exhibited some apparent habitat requirements for specific mean salinities, and could tolerate various ranges of variation. A summary of the pertinent data from Fourqurean et al. (2003) describes the salinities found various seagrass communities within Florida Bay as follows: *Ruppia-Halodule* communities had the lowest and most

variable salinities (~ 9-23 psu), while yearly mean salinity in the *H. decipiens-Syringodium*-dense mixed beds was relatively high, with low variability (~ 32-35 psu). Intermediate yearly mean salinities and relatively high annual variability were reported for shoalgrass, dense turtle grass and sparse turtle grass areas (~11-36 psu).

As previously noted and discussed by URS Greiner Woodward Clyde (1999) for the St. Lucie Estuary, the work of Montague and Ley (1993) in Florida Bay indicated that mean salinity had a relatively poor correlation with seagrass biomass, but the standard deviation of salinity was the best predictor of seagrass biomass. Thus the degree and reoccurrence frequency of salinity variation may be more important as a limiting factor on seagrass meadow species composition, distribution and biomass.

Data that documents salinity values at selected locations in Biscayne Bay have been collected since 1993 by researchers at Florida International University pursuant to contracts with SFWMD and EPA/NOAA. Although the monitoring program also involves sites in Florida Bay, waters of the Keys to the Dry Tortugas and the SW Florida Shelf, data for the 35 sampling sites located within Biscayne Bay have been culled and are presented in Appendix A. cursory analyses of salinity values indicate that the salinity of surface waters within Biscayne Bay have varied from lows of 6.21 ppt (near water surface) and 7.2 ppt (near sediment surface) at (Station 102-western side of the Bay near Black Point) on July 16, 2002 to a high of 42.3 ppt (also Station 102) on May 11, 1999. Salinity values of surface waters have averaged 32.54 ppt for all Biscayne Bay monitoring locations for the 1999-2002 period (Jones and Boyer, 2003).

From the perspective of MFLs, the goal to manage shoal grass and overlying salinities to maximize production of shrimp in a polyhaline zone (18-30 psu) along the west shore of Central and South-Central Biscayne Bay would appear to be best accomplished by lowering mean annual salinity and increasing variability in salinity to reestablish a range of salinities to support a *Ruppia-Halodule* gradient into deeper water where *Thalassia* would likely predominate.

Light - Dennison et al. (1993) summarized the data available at that time for habitat requirements for seagrasses, primarily focused on assessing water quality in Chesapeake Bay using submerged aquatic vegetation, both marine angiosperms and freshwater macrophytes, as indicators of water quality. Light requirements of sixteen species of seagrasses were included in their Table 1 (p. 88). That table is used here in a modified form (Table 2) to report their data for just species found in Biscayne Bay, and add additional data sources.

Table 2 - Maximal depth limit, light attenuation coefficient (Kd), and minimal light requirements of tropical and subtropical seagrasses (modified from Dennison et al. (1993).

SEAGRASS SPECIES	LOCATION	MAXIMAL DEPTH LIMIT (m)	Kd; LIGHT ATTENUATION COEFFICIENT (m ⁻¹)	MINIMAL LIGHT REQUIREMENT (% OF SURFACE LIGHT)
<i>Halodule wrightii</i>	Florida	1.9	0.93	17.2
<i>Halophila decipiens</i> *	St. Croix, USVI	40.0	0.08	4.4
<i>H. decipiens</i> *	NW Cuba	24.3	0.10	8.8
<i>Halophila englemannii</i> *	NW Cuba	14.4	0.10	23.7
<i>Ruppia maritima</i> *	Brazil	0.7	3.57	8.2
<i>Syringodium filiforme</i> *	NW Cuba	16.5	0.10	19.2
<i>S. filiforme</i> *	Florida (US)	6.8	0.25	18.3
<i>S. filiforme</i>	Florida (US)	1.9	0.93	17.2
<i>Thalassia testudinum</i> *	NW Cuba	14.5	0.10	23.5
<i>T. testudinum</i> *	Puerto Rico	1.0-5.0	0.35-1.50	24.4 ± 4.2
<i>T. testudinum</i> *	Florida (US)	7.5	0.25	15/3
<i>T. testudinum</i> **	Tampa Bay, Florida (US)	1.63 - 2.01	0.80-0.94	22.5
Dense <i>T. testudinum</i> ***	Florida Bay, Florida (US)	0.8-2.6	N/A	20-70
Sparse <i>T. testudinum</i> ***	Florida Bay, Florida (US)	0.9-2.6	N/A	20-50
<i>T. testudinum</i> ****	Charlotte Harbor, Florida (US)	0.5-0.7	2.39	23

* Originally from Duarte 1991

** Added data from Dixon and Leverone 1995, Dixon 2000

*** Added data from graphs in Fourqurean et al. (2003)

**** Added data from Tomasko and Hall (1999)

Although data that documents various water quality parameters at selected locations in Biscayne Bay have been collected since 1993 by researchers at Florida International University pursuant to contracts with SFWMD and EPA/NOAA, light is not one of the parameters that is monitored. Light extinction has

reportedly been monitored throughout Biscayne Bay by Miami-Dade DERM, but these data have not been provided to the team and therefore no analysis is available.

Temperature - Zieman (1982) notes that when discussing temperature limits in seagrasses, one must be careful to factor in “time of exposure”, as, like most marine organisms, seagrasses can tolerate extreme short term temperature change, but not chronic temperature changes of a similar magnitude. Because seagrasses have buried rhizomes, the poor thermal conductivity of the sediments, as noted again by Zieman (1982), provides protection of acute temperature changes that would need to penetrate to the rhizome to cause lethal stress.

It is difficult to separate temperature change specifically from exposure and drying effects, particularly for species like shoalgrass, which as its name implies, is more common on shallow shoals, where it is exposed to air, and drying, exposure to the direct rays of the sun, and rapid temperature change all at the same time.

Zieman (1982) reports that the turtle grass grows best in Biscayne Bay at water temperatures of 20°C to 30°C, with an optimum of 28°C to 30°C. This species can tolerate short term exposure to high temperatures (33°C-35°C), but “growth rapidly falls off if this temperature is sustained.” Leaves are killed by temperatures of 35°C-40°C, but rhizomes are apparently unaffected. These were acute tests of tolerance, but in a real world situation, the ΔT or change from ambient temperature is more important as tropical organisms often live close to their temperature tolerance in summer. Temperatures of 4°C above ambient were enough to kill all fauna and flora present within the thermal plume of the power plant at Turkey Point on Biscayne Bay before it was taken off line in a constructed radiator system of internal canals.

McMillan and Phillips (1979) discuss the chill tolerance of temperate and tropical species of seagrasses and note that differences in response to chilling temperatures of 2°C were demonstrated with populations of turtle grass, shoalgrass and manatee grass from shallow bays in the northern Gulf of Mexico withstanding these temperatures, but similar populations from the southern Gulf and Caribbean were severely damaged by the same temperatures.

Data that documents water temperatures at the water surface and at the sediment surface at selected locations in Biscayne Bay have been collected since 1993 by researchers at Florida International University pursuant to contracts with SFWMD and EPA/NOAA. Although the monitoring program also involves sites

in Florida Bay, waters of the Keys to the Dry Tortugas and the SW Florida Shelf, data for the 35 sampling sites located within Biscayne Bay have been culled and are presented in Appendix A. cursory analyses of bottom temperatures indicate that temperatures have varied from a low of 13.52° C (Station 111 - Featherbed Bank) on January 10, 2002 to a high of 33.1° C (Station 122 - West Arsenicker) on July 11, 2000. Water temperatures at the sediment surface have averaged 25.90° C for all Biscayne Bay monitoring locations for the 1999-2002 period (Jones and Boyer, 2003).

Nutrients - The nutrients, nitrogen and phosphorus, are essential to the growth of all plants, including seagrasses. Because seagrasses live in a system where a portion of the plant is in the water column, and a portion in the sediments (a true root system), there has been controversy about where these essential nutrients come from and in what form.

There is general agreement now that the primary source of nutrients for seagrasses is the sediment porewater (Fourqurean et al. 1992). Nitrogen is derived from three sources: 1) Microbially recycled nitrogen from organic matter, (e.g., seagrass leaf detritus); 2) Dissolved ammonium and nitrate in the water column; and, 3) Ammonium from the microbial fixation of dissolved nitrogen. Phosphorous is only available as soluble reactive phosphorous in the porewater. Phosphorous as phosphate is readily exchanged with porewater in silicious sediments, but carbonate sediments bind phosphate, thus producing circumstances where nitrogen may be the limiting nutrient in silicious sediments, and phosphate in carbonate sediments. Seagrasses may take up nutrients through their leaves (McRoy and Barsdate 1970), but due to the absolute requirement for high levels of light to support photosynthesis, seagrasses survive best in clear, nutrient-poor waters.

If nutrients are added to the water column, as with the discharge of urban runoff, farm animal and human wastes, and agriculture fertilizers, they are preferentially taken up faster, and used more efficiently by phytoplankton, benthic algae, and algal epiphytes on seagrasses. This process leads to competition for light, as these other plant groups capture the light before it reaches the seagrasses, and thus shades out and reduces the amount of light reaching seagrass leaves. This effect, similar to eutrophication in freshwater lakes, leads to the reduction in density and eventually loss of seagrass meadows and their replacement with an algal dominated benthic community (Zieman 1975, Orth and Moore 1983, Cambridge and McComb 1984, Lewis et al. 1985).

In only a few circumstances have efforts been successful in reducing anthropogenic sources of nutrient input and the return of seagrasses due to a

reduction in water column nutrients (Johansson and Lewis 1992, Lewis et. al 1999 - Tampa Bay, Florida).

Data that documents nutrient concentrations at selected locations in Biscayne Bay (Figure 4) have been collected since 1993 by researchers at Florida International University pursuant to contracts with SFWMD and EPA/NOAA. Although the monitoring program also involves sites in Florida Bay, waters of the Keys to the Dry Tortugas and the SW Florida Shelf, data for the 35 sampling sites located within Biscayne Bay have been culled and are presented in Appendix A.

Cursory analyses of nutrient values indicate that the concentration of Total Nitrogen at the monitoring stations within Biscayne Bay has varied from a low of 0.0426 (Station 112-Sands Cut eastern side of the Bay) on January 11, 2002 to a high of 1.3436 (Station 101 - Convoy Point) on August 14, 1997.

For Total Phosphorus, cursory analyses of data reported by Jones and Boyer (2003) indicate that the concentration of Total Phosphorus at the monitoring stations within Biscayne Bay has varied from a low of 0.0004 (Station 101-Convoy Point - western side of the Bay) on April 12, 2001 to a high of 0.0494 (Station 104 - Biscayne National Park - Marker C) on September 5, 2002.

In addition to Jones and Boyer (2003), water quality data for nearshore areas of Biscayne Bay from near the Cutler Channel to near Turkey Point were collected monthly from October 1998 through December 1999 and reported by Meeder and Boyer (2001). Among other things, the authors found that:

- 1) ...nutrient concentrations (especially ammonium), were elevated in the canals adjacent to the landfill,
- 2) The median value of un-ionized ammonia at Station 12 was 122 ppb which may be toxic to some marine fish", and
- 3) Their results indicate a strong correlation between elevated ammonium concentrations with:
 - a. Decreased abundance of *Thalassia*
 - b. Increased abundance of *Halodule* and fast growing algae species, and
 - c. The increase in filamentous algal cover.

Due to its relevancy to the establishment of an MFL rule for Biscayne Bay, the entire report is attached as Appendix B. Included in Appendix B are Figures 21 - 27 from the Meeder and Boyer report which show Salinity, Ammonium, Ammonia, Nitrate, Phosphorus, Total Organic Carbon, and Total Organic Nitrogen concentrations within the area of interest follow.

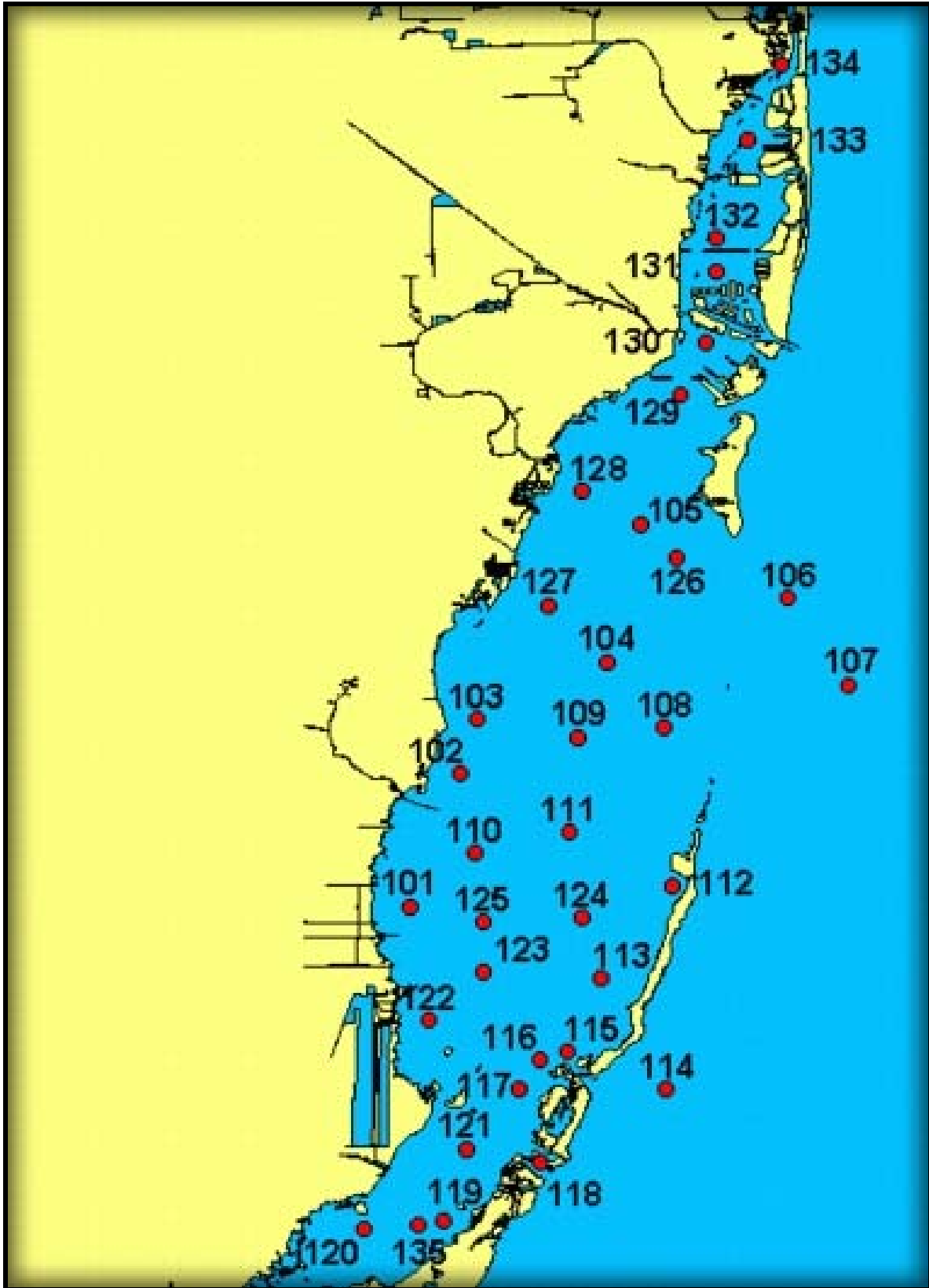


Figure 4
Location of Nutrient Sampling Sites in Biscayne Bay

Epiphytes - Miller-Myers and Virnstein (2000, p 115) note that “Seagrass blades provide structure for the attachment and growth of epiphytic algae, which are a major food sources for invertebrates (Virnstein 1987). Nutrient enrichment is suspected as a direct cause of increased epiphytic algae on seagrass blades (Silberstein et al. 1986; Tomasko and Lapointe 1991). Although epiphytes provide food for invertebrate communities, too much epiphytic coverage inhibits light availability for seagrass photosynthesis. Light attenuation by epiphytes has been found to be directly correlated with epiphytic biomass (Harden 1994). Reduction of available light creates stress on seagrass and is a probable cause of seagrass habitat decline (Backman and Barilotti 1976; Czerny and Dunton 1995; Cambridge and McComb 1984).”

Dawes (1987) reports that 66 species of algal epiphytes were recorded from seagrass blades collected in the Anclote Estuary on the west coast of Florida (Ballantine and Humm 1975) and 41 species from similar collections in the Indian River (Hall and Eiseman 1981). These algal epiphytes are predominantly filamentous bluegreens, but included some red algae and brown algae. Predominant species included *Calothrix crustacea*, *Cladophora vagabunda*, *Giffordia mitchellae*, *Polysiphonia binneyi*, *Cladosiphon occidentalis* and *Stictyosiphon simplex*.

Dawes (1987) states that “Information regarding faunal epiphytes of Florida or Gulf of Mexico seagrass communities is limited.” Ninety metazoan species from 11 phyla were reported by Lewis and Hollingsworth (1982) as epiphytes on seagrass in Barbados. The dominant groups were nematodes, followed by copepods. Tomasko and Hall (1999) report that turtle grass blades collected during a study at eight stations in Charlotte Harbor, Florida, had epiphyte loads generally much higher than similar collections in Sarasota Bay and the Florida Keys, but that most of the epiphyte biomass was due to barnacles and limpets, not algae “which were rarely encountered.”

Very little information is available regarding epiphytes growing on seagrasses in Biscayne Bay. No published reports were found which identified the epiphyte species present in Biscayne Bay. What little information has been collected on this subject was revealed during an interview with Danielle Mir-Gonzalez, Dr. Joe Boyer and Dr. Jack Meeder on February 18, 2004. During the discussion, a question was asked about observed epiphyte loads on seagrass at the 208 sites and four transects where seagrasses and water quality have been monitored by Mrs. Mir-Gonzalez for her masters degree research project. Data was collected for epiphyte loads on turtle grass only, and some heavy loading was observed on both turtle grass where it occurred and on shoal grass around the mouths of the drainage canals within the study area from Turkey Point to Black Point. Until these data are examined in more detail after the document is made available, it is

impossible to draw specific conclusions about the implications of these observations. However, because dense epiphytic growth has been associated with stress and death of seagrasses (Cambridge and McComb 1984), these observations and eventual data need to be carefully factored into decisions about minimum flows and levels for the Bay..

Sediment Types and Thickness - Zieman (1982) notes that “seagrasses grow in a wide variety of sediments from fine muds to coarse sands depending on the type of source material, the prevailing physical flow regime, and the density of seagrass blades.” Sediment depth is more important than specific sediment type as once established, seagrasses modify the sediment by increasing the rate of sedimentation, and concentrating finer-sized particles and thus changing the sediment characteristics over time. Thus a description of the sediments in which a species of seagrass is found is not necessarily describing the sediment characteristics of the sediment into which the seagrass settled as a seed or seedling, or grew into by vegetative expansion.

Shoal grass can colonize thin sediments because of its shallow surficial root system. In zero current areas, sediments can be as thin as 1 cm (Lewis, personal observation). Turtle grass is more robust, needing 50 cm of depth for maximum growth and density, but is able to colonize areas as shallow as 7 cm (Zieman 1982).

No data which identify sediment depths in Biscayne Bay have been found.

Wave and Current Energy Regimes - Seagrass coverage, biomass and production are greatly influenced by prevailing current velocities and wave energy (Fonseca et al. 1983, Fonseca and Bell 1998, Zieman and Zieman 1989). Generally, the greater the exposure to wave energy or currents, the more patchy a seagrass bed becomes. Over the range of current velocities of 0 and 25cm/sec, percent cover by seagrasses drops to approximately 50% at the higher velocities. Above 40 cm/sec, the cover is further reduced to near zero. Fonseca et al. (2002) used a Relative Exposure Index (REI) model to predict the effects of bars on wave exposure influence in Tampa Bay, and this index has also been used to quantify declines in percent cover by seagrass as wave exposure increases. The barrier islands and shallow reefs which form the eastern boundary of Biscayne Bay protect much of the Bay, reduce wave action and allow persistence of seagrasses in open water areas.

Longshore sand bars serve a similar function, and are a commonly reported feature in seagrass meadows in Tampa Bay, Florida (Lewis et al. 1985, Lewis and Estevez 1988). Seagrass bars appear to have changed and declined over time,

but no actual study of their historical and current distribution, sediment composition or topography/bathymetry has been made. These features are theorized to be important in the long term persistence of seagrass meadows in which they are found (Lewis 2002).

Recent documented improvements to water quality in Tampa bay have increased water transparency through the removal of nutrients and associated micro- and macroalgal blooms (Johansson and Lewis 1992; Lewis et al. 1999). However, the most recent seagrass mapping efforts indicate that projected increases in total area of seagrass within that bay have stalled at around 10,500 ha (26,000 acres). The predictions and goals for seagrass recovery from the Tampa Bay Estuary Program target of 15,000 ha (37,000 acres) therefore also appear to be difficult to meet. The most likely explanation for this appears to be related to natural and man-made wave energy (i.e., large boat wakes) impacting seagrass meadows in the Bay (Lewis 2002) and has recently been substantially supported by the research of Fonseca and Bell (1998), Robbins et al (2002) and Fonseca et al. (2002).

Given the varying depths and wide variation in the extent of connections between the Bay and the Atlantic Ocean/Straits of Florida, there are unquestionably highly variable wave and current conditions in different areas of Biscayne Bay. No data have been obtained, however, that would provide insight as to the extent to which existing currents may be influencing the presence, absence and/or distribution of seagrasses in Biscayne Bay.

Competition, Grazing, and Disease - Competition between seagrass species is discussed along with succession in seagrasses by Zieman (1982) and Zieman and Zieman (1989). They describe the “blowout”, or natural localized disturbance in a turtle grass dominated seagrass bed in which a current moving in a specific direction causes a hole to form and seagrasses to be removed, leaving a crescent shaped bare area. These are common features in less protected seagrass meadows, and have a well documented series of recovery stages that start with rhizophytic algae like *Penicillus* and *Halimeda* initially colonizing the bare substrate, followed over a period of years by shoal grass and manatee grass, and eventually recovery back to turtle grass. A similar process is reported for recovery of prop scars caused by boats in shallow water (Zieman 1976). Thus shoalgrass has been referred to as an early successional or pioneer species due to its ability to rapidly colonize bare sand areas. It appears, however, to be out competed by turtle grass over a period of years. The exact adaptations of turtle grass that allow it to do this are not known. It is a more robust species, but grows more slowly. Its size alone may allow it to win out in the long run as long as limiting conditions of advantage to shoal grass, such as its tolerance of lower and more variable salinities do not exist. If they do, shoal grass will persist, and turtle

grass cannot replace it. Manatee grass can also colonize and grow faster than turtle grass in blowouts, but is less common as an early pioneer species.

Biological disturbance of seagrass beds by a wide variety of organisms has been documented (Fonseca et al. 1998). These include overgrazing by herbivore such as sea urchins (Camp et al. 1973), excessive algal and faunal epiphyte loading (Sand-Jensen 1977), burrowing shrimp (Suchanek 1983), epibenthic macrofauna (Valentine and Heck 1990), burrowing and feeding stingrays (Orth 1975, Fonseca 1994) and light shading by blooms of both phytoplankton and drift algae (Lewis et al. 1985, Johanssen and Lewis 1992, den Hartog 1994).

Diseases have been reported in seagrasses, sometimes producing very devastating losses. The “wasting disease” of the 1930’s wiped out much of the eelgrass (*Zostera marina*) in Europe and portions of North America (Short et al. 1988). Similarly, the loss of turtle grass in Florida Bay has been attributed to the pathogenic form of a marine slime mold, *Labyrinthula zosterae* (Robblee et al. 1991), as one of the contributing factors.

No data have been found that would document the extent to which competition, grazing and/or disease are having an impact on the presence, absence and/or spatial distribution of seagrasses in Biscayne Bay.

SUMMARY OF LIMITING FACTORS ON SEAGRASS OCCURRENCE BY SPECIES

Thalassia testudinum - Turtle grass is a “climax species” which does not colonize bare substrates quickly. It is robust in size and requires a minimum of 15 cm of sediment depth to exist. It grows best where the sediment depth is 50 cm or greater. It tolerates a wide range of salinities, from 6-60 psu, with an optimum between 25-35 psu (Table 1). For these reasons, and perhaps others, it does not tolerate wide ranges in salinity over short periods (i.e. 24 hours). It is therefore not found or is minimally present at the mouths of many of the canals that drain into Biscayne Bay due to episodic freshwater discharges that cause wide swings in salinity. Its maximum depth of growth in clear oligotrophic waters is approximately 7.5 meters in Florida (Table 2), and 12 m in St. Croix, USVI (Figure 2).

Syringodium filiforme - Manatee grass has less tolerance for wide swings in salinity than turtle grass. The data from McMillan and Moseley (1967) and Fourqurean et al. (2003) would indicate that it has a narrow tolerance in the range of 25-60 psu, with an optimum at 25-45 psu, and is not very tolerant of

wide swings in salinity. It can survive in depths greater than turtle grass, occurring at 6.8 m in Florida, 16.5 m in Cuba, and 18 m in St. Croix (Table 2 and Figure 2).

Halodule wrightii - Shoal grass has a greater tolerance for salinity variation than either turtle grass or manatee grass. The data from McMillan and Moseley (1967) and Fourqurean et al. (2003) would indicate that it has a wide tolerance in the range of 5-70 psu, with an optimum at 35 psu, and is tolerant of wide swings in salinity. It can survive in depths greater than turtle grass, occurring 15 m in St. Croix (Figure 2), but in Florida is normally found in depths less than 2 meters, often less than 0.5 m on shallow exposed flats or shoals. This has been attributed to the high flexibility of its leaves that allow them to conform to the damp sediment surface when exposed on low tides in shallow water, and thus avoid some of the damages from exposure and desiccation. It is referred to as the "pioneer species" and often volunteers from seeds or runners onto bare sands. It grows much faster than other seagrasses, but does not compete well with slower growing more robust species like turtle grass, if they can survive in the same environment. If they cannot, it will persist, and often mix with wigeongrass seasonally in lower salinity, shallow waters. It will, however, not tolerate freshwater for significant periods (more than 24-48 hours).

Ruppia maritima - Wigeongrass is the most tolerant of all the seagrasses to ranges in salinity. Kantrud (1991) reports a range of tolerance from 0-350 psu. It can coexist with shoalgrass in Florida Bay (Tabb et al. 1962b, Fourqurean et al. 2003). It becomes dominant when salinities fall to about 1.4 psu. It is replaced by *Chara* when salinities fall to 0.5-1.0 psu. It cannot compete well with shoal grass or turtle grass in deeper more saline waters, but is well adapted for the two most stressful ends of the salinity range for seagrasses, freshwater and hypersaline waters. It is generally limited to very shallow (<0.5 m) waters where it tolerates exposure well on low tides due to the same flexible leaf adaptation of shoal grass.

Halophila decipiens - Paddle grass has had relatively little work done on its limiting factors. It appears to do best in marine salinities of low variability and in deep waters, and may be the dominant seagrass in the deeper waters of the Gulf of Mexico (Fonseca, personal communication). It has been reported to grow to 30 m depth in the Caribbean and Gulf of Mexico (Busby and Virnstein 1993), and 40 m at St. Croix, USVI, by Phillips and Lewis (1983) (Figure 2). It has also been observed mixed with the other two species of *Halophila* in very shallow water in the Indian River Lagoon (personal observation, R. Lewis), mixed with *H. johnsonii* in Lake Worth Lagoon (personal observation, G. Braun), and in tannin stained waters mixed with *H. johnsonii* in the Ft. Lauderdale area (Dies 2000).

Halophila englemannii - Like paddle grass, star grass has received little focused attention on limiting factors. It has a wide range of tolerance for water depths, being found in shallow to deep waters (2 m - 30 m). The only work on salinity tolerance was largely inconclusive due to the death of most of the transplanted materials (McMillan and Moseley 1967). They concluded that "its salinity tolerance was greater than that of *Syringodium*, but it was not possible to compare with the other three species" [turtle grass, shoal grass and wigeongrass].

Halophila johnsonii - Johnson's seagrass (*Halophila johnsonii*) is a small, rare aquatic plant that is known only to occur along the east and southeast coast of Florida from Brevard County to Biscayne Bay. It was designated as a threatened species in 1998 pursuant to the federal Endangered Species Act, as amended. It is not currently protected under State of Florida statutes, rules or regulations, although Section 581.185 F.S. 'provides for the automatic listing as a state endangered species of "all species determined to be endangered or threatened pursuant to the federal ESA of 1973" (NMFS 2002). A federal recovery plan for this species has been developed and was approved by the National Marine Fisheries Service, National Oceanic and Atmospheric Administration in 2002. Critical Habitat was designated for this species in ten distinct areas. The largest of these areas encompasses a significant portion of Biscayne Bay, and includes portions of the Snake Creek/Oleta River, Northern Biscayne Bay and Miami River/Government Cut Sub-regions.

Johnson's seagrass is one of twelve species of *Halophila*, a genus that is distributed in warm-temperate and tropical waters worldwide (NMFS 2002). It is one of three *Halophila* species that is documented to occur in Biscayne Bay, and can be differentiated from the other species by having pairs of 2-5 cm long, linear leaves that extend upward from a rooted rhizome that is located just below the sediment surface. Johnson's seagrass somewhat resembles paddle grass, *Halophila decipiens*, with which it will occur (pers. observations) and was relatively recently recognized as a separate species. It is the first marine plant to be listed pursuant to the Endangered Species Act, and because it is a recent addition and because its Recovery Plan was very recently developed, information concerning the abundance and distribution of this species is very up-to-date.

Johnson's seagrass has been documented to occur only on the east coast of Florida, being found in coastal lagoons along approximately 200 km of coastline from approximately Sebastian Inlet (Brevard County) to Biscayne Bay, including areas of the Indian River Lagoon, Lake Worth Lagoon and Biscayne Bay. Based upon this limited range, Johnson's is thought to be the most spatially-restricted

species of seagrass in the world (NMFS 2002). The largest known areas of Johnson's seagrass within this range are in the Indian River Lagoon and Lake Worth.

Within this range, Johnson's seagrass grows in a patchy, non-contiguous distribution in water depths from within the intertidal zone to maximum depths of approximately 3 m (Kenworthy, 1993; Virnstein et. al., 1997). Due to its presence in very shallow waters, and even being exposed at extreme low tides, it is thought to be tolerant of moderate desiccation and wide temperature ranges. Although it is reported to be more commonly found in monotypic patches, it may also be present with shoal grass, manatee grass and paddle grass.

Relatively little work has been done to identify the salinity, temperature and/or water quality preferences and tolerances of Johnson's seagrass. Research to date, however suggests that Johnson's seagrass survives in at least salinities from 15-43 ppt, and that its range may be greater (NMFS, 2002). It also grows in areas of varying water clarity, from comparatively turbid areas to clear-water areas near inlets, where currents are fast and strong.

In spite of its comparatively small size, studies indicate that Johnson's seagrass serves a food source for other organisms, as a refuge, habitat and nursery for wildlife species, assists in sediment stabilization and therefore reduces turbidity and erosion.

The federal recovery team identified five criteria on which to consider designation of critical habitat: 1) populations that have been documented to persist for 10 or more years; 2) persistent flowering populations; 3) the northern and southern limits of the species range; 4) unique genetic diversity; and 5) a documented high abundance compared to other areas in the species' range. Based on these criteria, ten areas, ranging in size from approximately 2 acres to 18, 757 acres have been designated as critical habitat for Johnson's seagrass. The largest of these, and the only one to occur within the MFL project area is the Biscayne Bay area, which accounts for 83% of the designated critical habitat for this species.

The recovery plan identifies a number of actions that are to be undertaken in order to meet the recovery goal of delisting the species after assuring its persistence throughout its range. Although implementation of many of the identified actions will have no effect on MFL rule development, specific activities that are worth monitoring include:

- Locations within Biscayne Bay where the seven species of seagrass are currently typically found.
- Habitat conditions/variables/requirements that make the above referenced locations suitable for those seagrasses.
- Biological factors that can affect seagrasses.
- Dynamics of competition and succession of seagrasses with other seagrasses.
- Fauna that prefer/rely on specific seagrasses, seagrass communities and seagrass habitats.

SITE SPECIFIC INFORMATION REGARDING SEAGRASSES IN BISCAYNE BAY

EXISTING SEAGRASS MAPS

There have been no recent comprehensive mapping efforts that document the presence, absence, abundance and/or species distribution for seagrasses within Biscayne Bay (in its entirety) and there is no field effort component to map seagrasses as part of this contract. However, there is an historic database of seagrass cover in the entire Bay, and seagrass information has been developed with varying levels of detail at numerous specific areas within the Bay. Therefore, the information provided in this section and in the appendices is a narrative and graphic summary of the cumulative results of various previous seagrass analyses. The sources of these data, listed and described in order of increasing relevancy to the establishment of an MFL rule for Biscayne Bay include:

Seagrass descriptions found in *Biscayne Bay; Environmental History and Annotated Bibliography*

Seagrass information presented by Dial-Cordy and Associates as contained in their environmental assessment regarding potential modifications at the Port of Miami

Mapping efforts conducted in association with the listing of Johnson's seagrass (*Halophila johnsonii*) as a threatened species

Seagrass information contained in the *Biscayne Bay Aquatic Preserve Management Plan*

Results of analyses of aerial photography to determine benthic conditions in Biscayne Bay by the Florida Fish and Wildlife Conservation Commission's Marine Research Institute

Results of seagrass mapping and/or monitoring conducted by the Miami-Dade County Department of Environmental Resources Management (DERM)

Seagrass mapping currently being conducted by researchers at Florida International University

Seagrass descriptions found in Biscayne Bay; Environmental History and Annotated Bibliography.

In July 2000, the National Oceanic and Atmospheric Administration released Technical Memorandum NOS NCCOS CCMA #145, an Environmental History and Annotated Bibliography of Biscayne Bay (Cantillo, et. al. 2000). While not very specific regarding seagrasses, information is provided in this document concerning the species of seagrass present and the threats to the continued health of seagrasses in the Bay (Appendix C), the most pertinent of which is:

“The major vascular plants found in Biscayne Bay are *Thalassia testudinum*, (turtle grass), *Halodule wrightii* (Cuban shoal grass), and *Syringodium filiforme* (manatee grass). *Thalassia* is dominant in many areas of the Bay and *Thalassia* beds support a rich animal community (Zieman, 1982). ... There is a progression of these seagrasses with distance from shore in non-disturbed areas of Biscayne Bay. Intertidally, there is a band of *Halodule*. From sublittoral, there is a band of *Thalassia* interspersed with *Halodule* and *Syringodium*. This thins out into green alga and a sand bottom towards mid-Bay. Seagrasses in the northern part of the Bay have been heavily impacted by man’s activities and the normal *Thalassia* community is not observed north of the Port of Miami.”

Relevancy of this information to the establishment of MFL for Biscayne Bay: Although the compilation of the data is relatively recent, there was no field work associated with the development of this report. This fact, together with the lack of detailed spatial distribution of individual seagrass species gives this document weak applicability to the MFL project.

Seagrass information presented by Dial-Cordy and Associates as contained in their environmental assessment regarding proposed modifications at the Miami Harbor.

In March 2003, Dial Cordy and Associates, Inc. published a Final Report regarding their Environmental Baseline Study that was conducted for the U.S. Army Corps of Engineers concerning potential modifications at Miami Harbor. This General Reevaluation Report included the Miami River/Government Cut sub-region of Biscayne Bay and eastward of Government Cut into the Atlantic Ocean. The presence/absence, spatial distribution and comparative density of each species of seagrass were mapped along 35 transects within the area of potential impact. A figure showing the location of the transects and tables showing the frequency of occurrence, abundance and density of each species of seagrass found within the project area is attached in Appendix D.

A summary of this seagrass mapping effort is that:

“Marine seagrass species observed within the study area includes *Halodule wrightii*, *Halophila decipiens*, *Syringodium filiforme* and *Thalassia testudinum*. Of the 35 transects surveyed, marine seagrasses species were observed at 25 transects.... Seagrass occurrence in these areas consisted of mixed Submerged Aquatic Vegetation (SAV) with *H. decipiens* and *H. wrightii*, mixed SAV with *H. wrightii*, and *T. testudinum*, mixed SAV of *T. testudinum* and *S. filiforme*, mixed beds of all species and, monospecific beds of *T. testudinum* , and monospecific beds of *H. decipiens*. No *H. johnsonii* was observed while surveying the 35 transects.”

Relevancy of this information to the establishment of MFL for Biscayne Bay: With field surveys having been conducted relatively recently and being quite detailed, these data have a high degree of applicability to the MFL project. However, their usefulness is severely limited by the relatively small spatial extent of the assessment.

Mapping efforts conducted in association with the listing of Johnson’s seagrass (*Halophila johnsonii*) as a threatened species.

As described previously, Johnson’s seagrass was designated as a threatened species in 1998 by the federal government. The listing was made only after substantial field surveys, literature reviews and other analyses that determined the species’ known range with a high level degree of certainty. The documented spatial distribution of this diminutive seagrass is shown in Appendix E. It is notable that Critical Habitat was designated for this species in ten distinct areas and that the largest of these areas encompasses a significant portion of Biscayne Bay, and includes portions of the Snake Creek/Oleta River, Northern Biscayne Bay and Miami River/Government Cut Sub-regions (Figure 5).

Figure 6, attached, which was provided by DERM shows the known distribution of *H. johnsonii* within its range in Biscayne Bay. Light penetration likely limits the deep water extent of the distribution of this species, which is known to occur in extremely shallow waters, often in beds mixed with other seagrass species.

Relevancy of this information to the establishment of MFL for Biscayne Bay: With field surveys having been conducted relatively recently and a portion of the critical habitat being within the Snake Creek/Oleta River, Northern Biscayne Bay and Miami River/Government Cut sub-regions, the presence of this species has an intermediate degree of relevancy to the MFL project. However, this relevancy

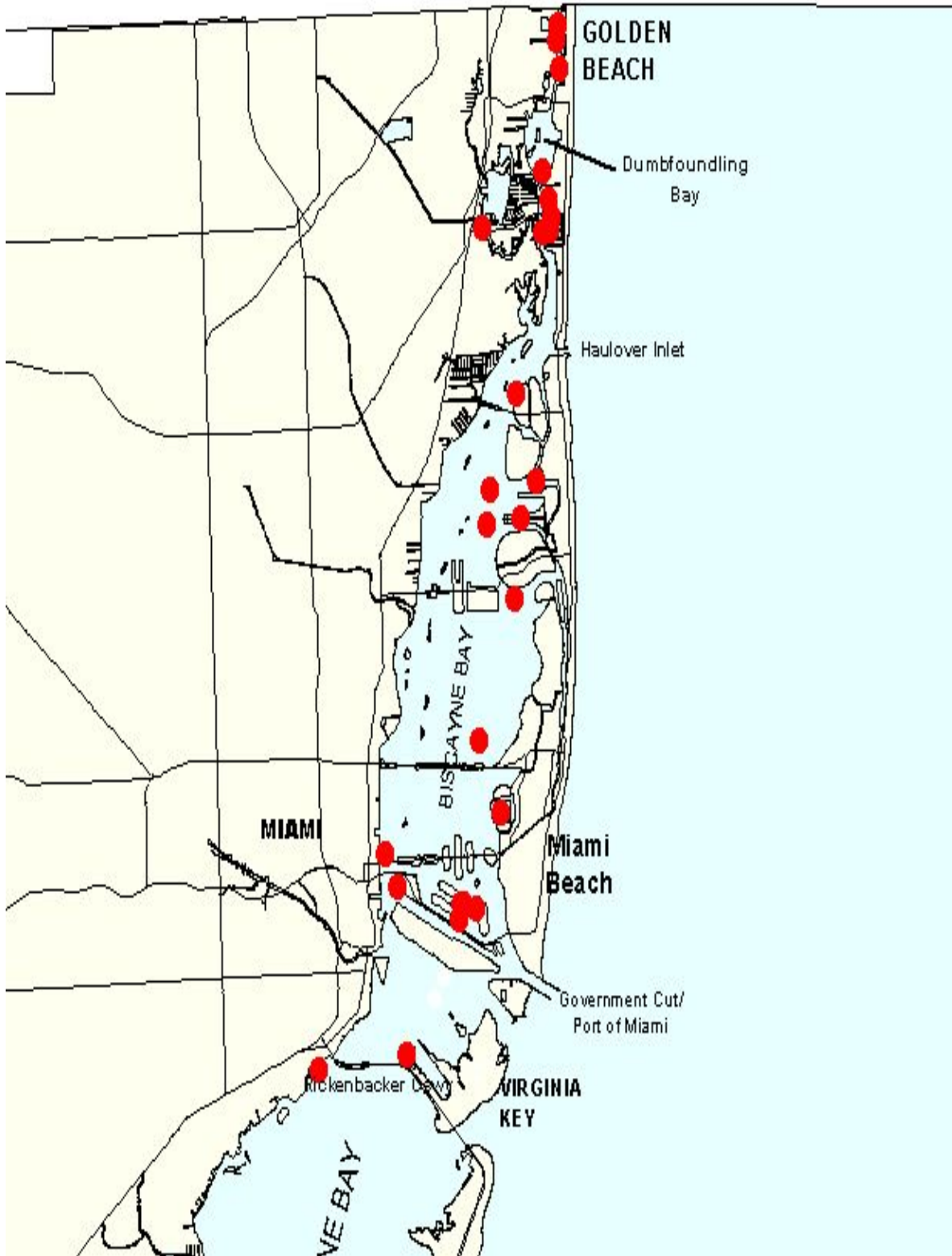


Figure 6
Distribution of Johnson Seagrass Within Biscayne Bay

is further limited due to the species' documented tolerance of high variable salinity conditions (i.e., 15-43 ppt).

Seagrass information contained in the Biscayne Bay Aquatic Preserve Management Plan

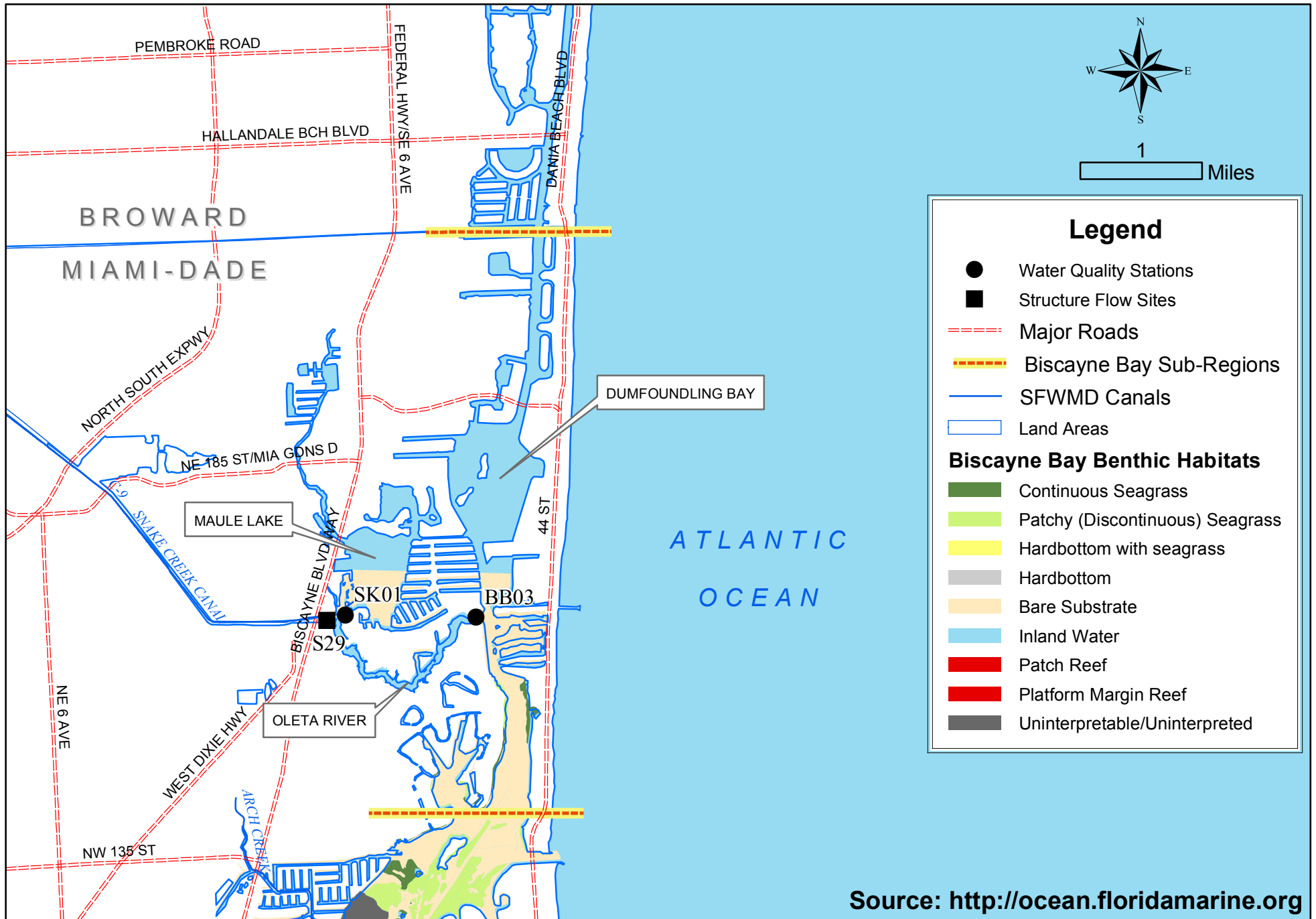
During the mid 1980s, the Metro-Dade Department of Environmental Resources Management (DERM) developed a draft Aquatic Preserve Management Plan for Biscayne Bay. A portion of Part III – Living Resources describes the benthic communities in different areas of the Bay, and includes descriptions and figures that show the spatial distribution of seagrasses (Appendix F). Notable elements of the Plan include:

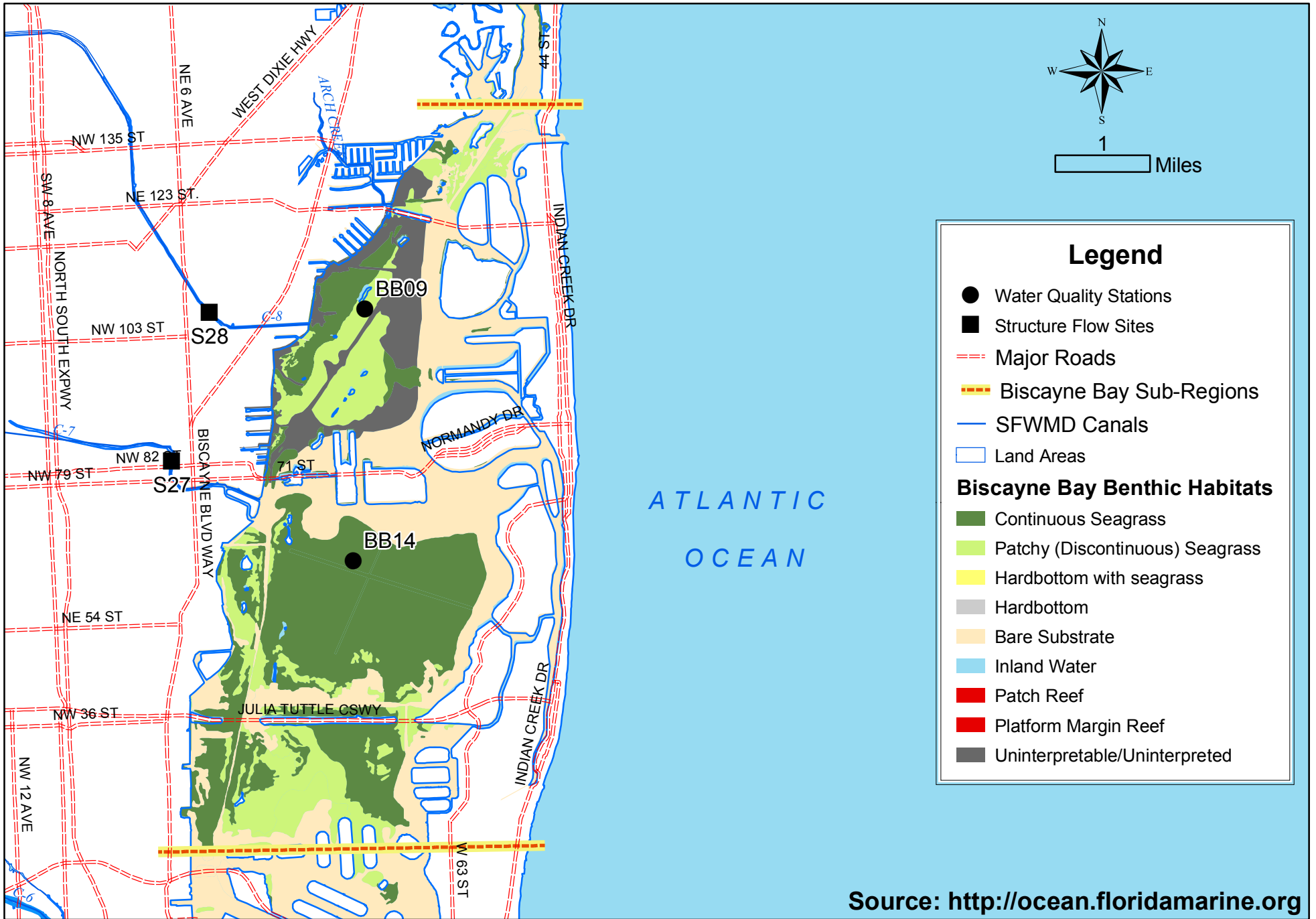
“Turtle grass predominates in central and south Bay,... Turtle grass growth is generally most dense in areas where there is more than six inches of sand, mud, or muddy sand sediment and where light penetration is not a limiting factor. ... the Central Aquatic Preserve Management Area is covered with 16 percent turtle grass, 47 percent mixed grasses, six percent shoal grass, and three percent algae mixed with seagrass. ...In the Northern Aquatic Preserve Management Area manatee and shoal grasses predominate wherever light penetration is sufficient to permit plant growth. ... While manatee and shoal grasses are the dominant benthic plants in the Northern Aquatic Preserve Management Area, they comprise slightly less than 24 percent of the total Bay bottom in that area. ...the most extensive and noteworthy grass-algal beds in north Bay are located in Unit III north of the Julia Tuttle Causeway, and on both sides of the Intracoastal Waterway south of Little River Adjacent to Bay Point.”

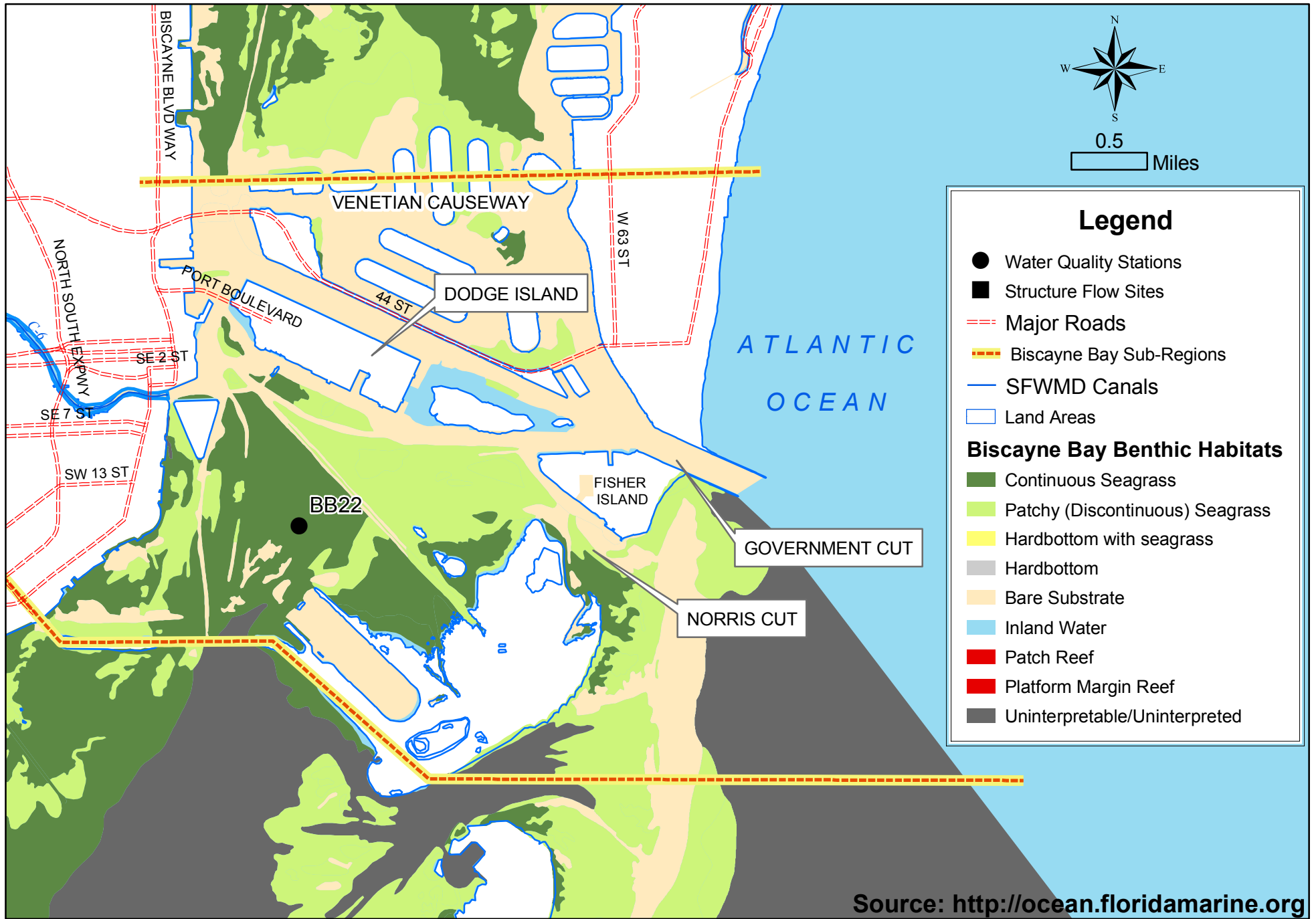
Relevancy of this information to the establishment of MFL for Biscayne Bay: Considering the absence of specificity with regard to the spatial distribution of individual seagrass species coupled with the age of these data (i.e., field surveys conducted approximately 20 years ago), these data have a relatively low degree of relevancy to the MFL project.

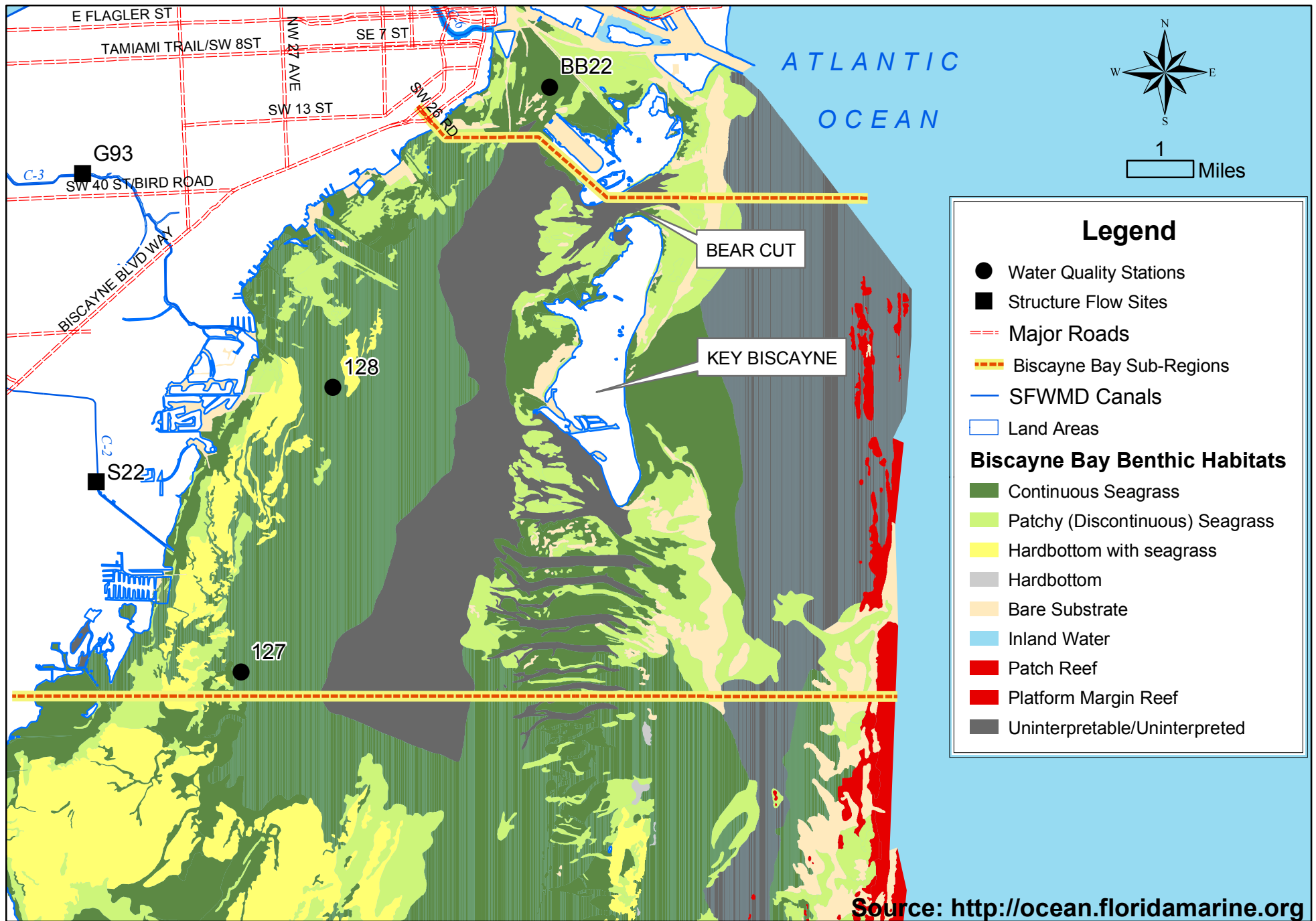
Results of analyses of aerial photography to determine benthic conditions in Biscayne Bay by the Florida Fish and Wildlife Conservation Commission's Marine Research Institute

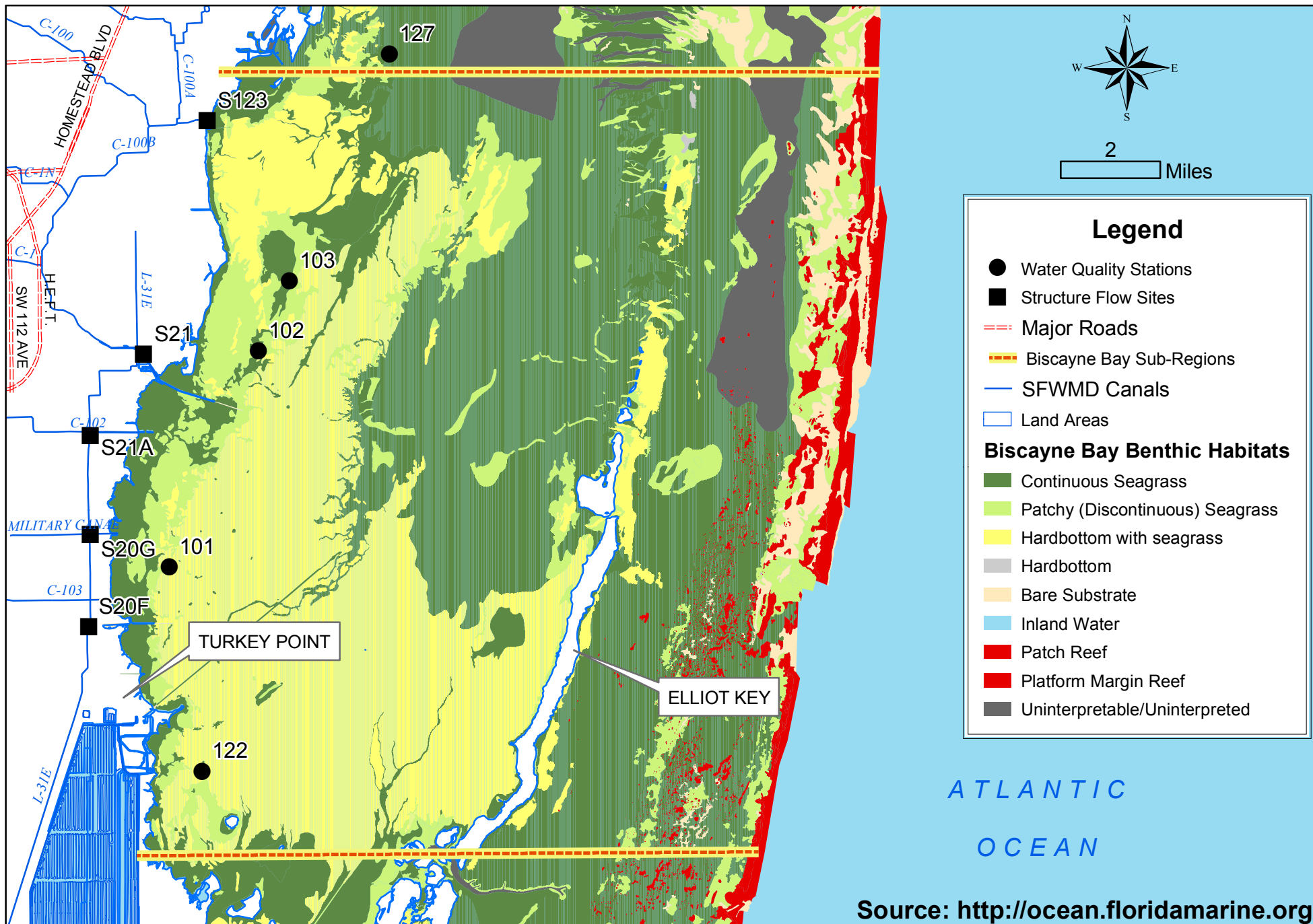
Figures 7 - 12 show the result of benthic community mapping that has been completed for all of Biscayne Bay. These data were obtained from the FWC's Marine Research Institute and are graphic depictions of an extensive GIS-based database. Unfortunately, because this work is primarily the result of analyses of aerial photography (coupled with limited ground-truthing) no distinction can be

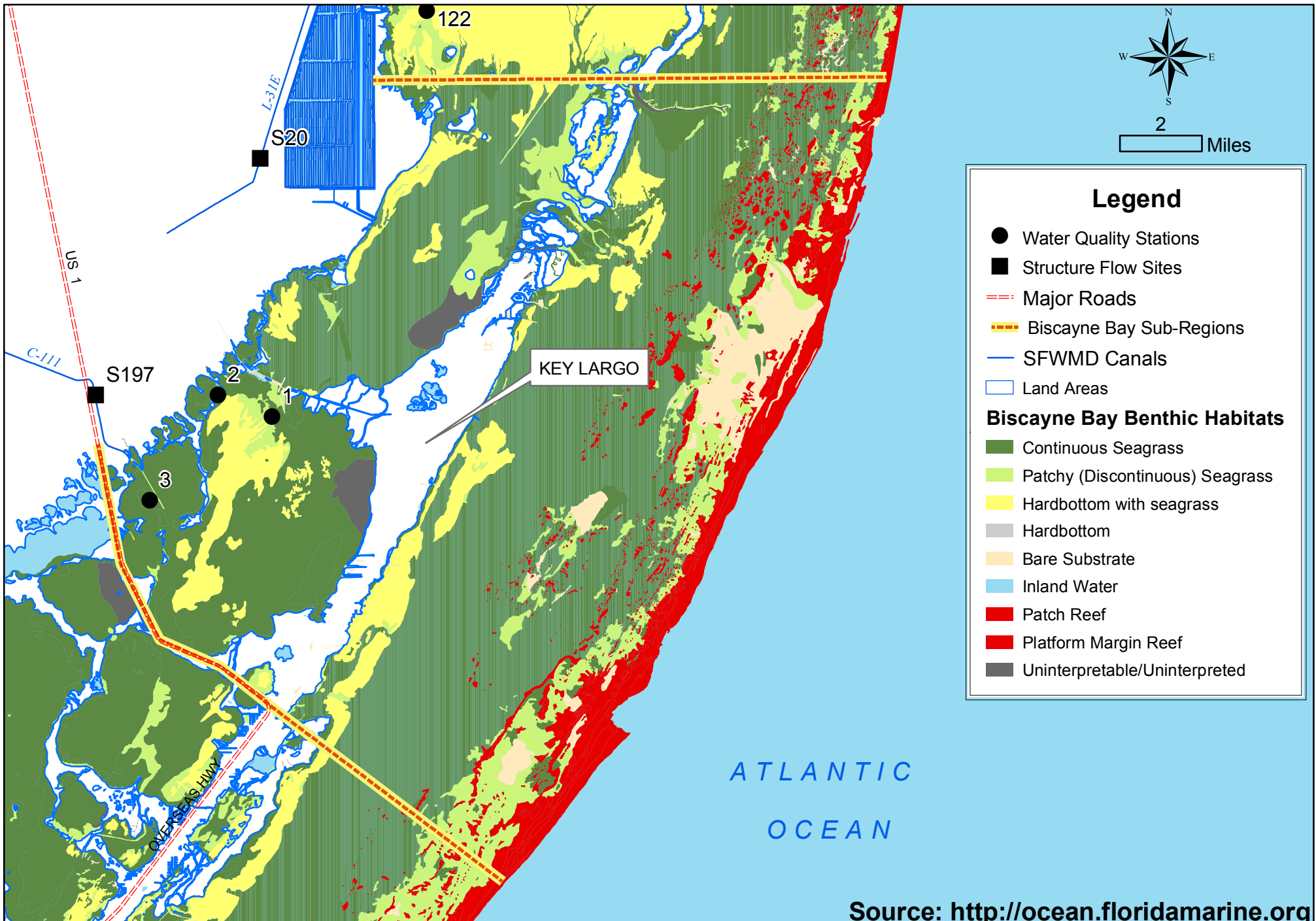












made as to the abundance, density, and/or spatial distribution of any individual seagrass species.

Relevancy of this information to the establishment of MFL for Biscayne Bay: The FWC-FMRI data is relatively recent and covers the entire project area, however its utility in the establishment of an MFL rule for Biscayne Bay is limited due to the lack of species specificity.

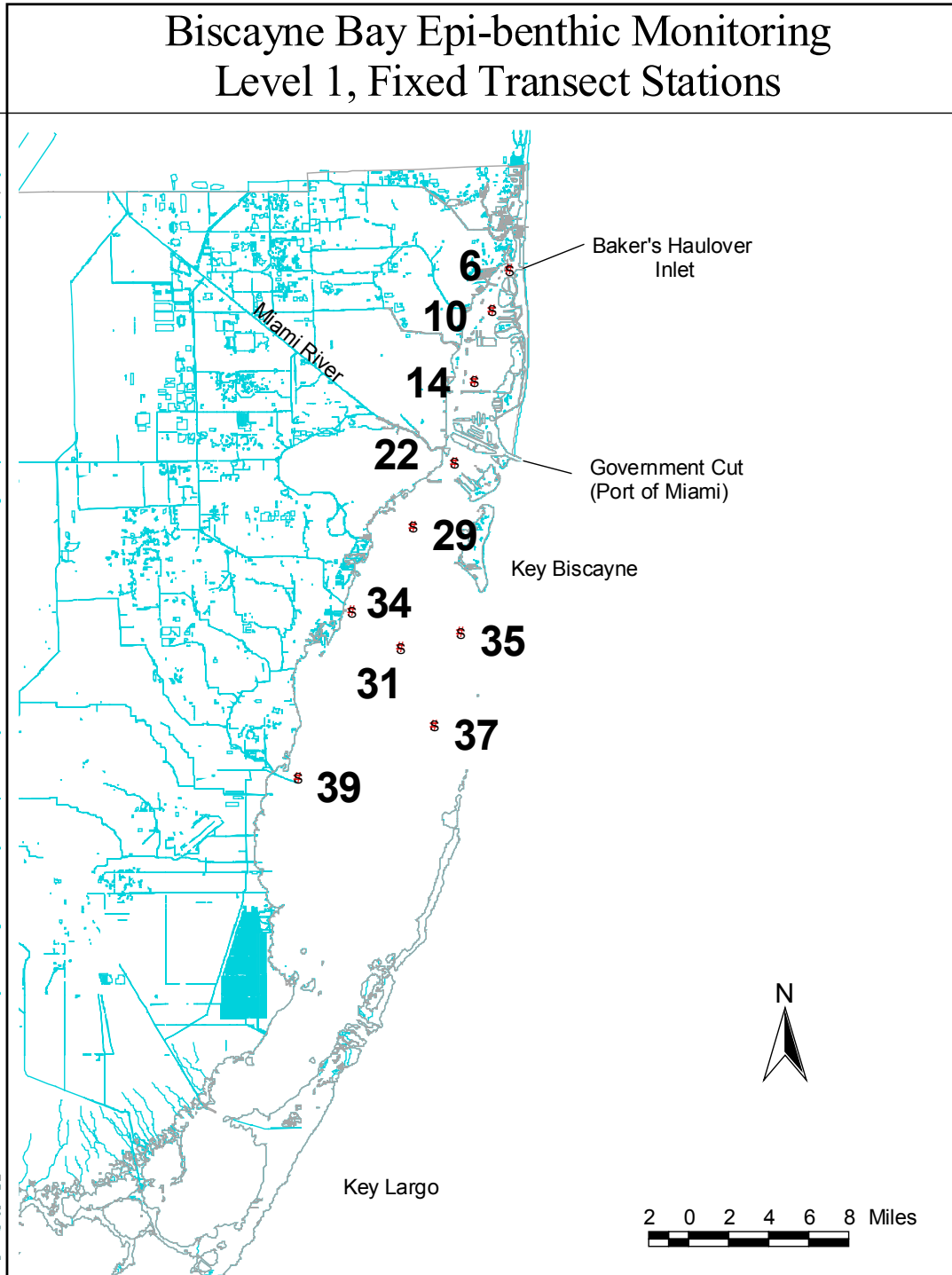
Results of seagrass mapping and/or monitoring conducted by the Miami-Dade County Department of Environmental Resources Management (DERM).

At various times during the last \pm 15 - 20 years, DERM has documented the presence, absence and/or species distribution of seagrasses in Biscayne Bay. Milano (1983) developed a map of bottom communities of Biscayne Bay based on the data that were available at that time. Beginning in 1985 however, DERM obtained information on seagrasses by monitoring conditions along a number of specific transects. As time passed, DERM determined that it would be advantageous to document seagrasses on a broader scale, and a change was made in 1996 to begin documenting conditions at approximately 100 randomly-selected locations throughout the Bay. Each year, a new suite of 100 sites is visited, and within each site, the seagrass and macroalgae species that are present are documented and estimates are made of the abundance of each species. The information through the end of this subsection, with minor editorial and formatting adjustments, was provided by DERM as a description of their seagrass monitoring programs.

“DERM’s SAV monitoring design is comprised of two main elements. The first (“Level 1” sampling) is a sampling of fixed locations throughout the bay, which provides trend-oriented data. The second (“level two” sampling) is a stratified random sampling that provides status, trend, and spatial data of the benthic communities of the southern portion of the bay.

Level 1 Sampling - Established in September 1985, a series of fixed transects were positioned throughout the bay. Initially, sampling was conducted quarterly at 12 sites. Three additional sites were added 1989, two in Manatee Bay and one in Barnes Sound. Currently, sampling is conducted annually during the month of June at 10 of the original 12 sites (Figure 13). Monitoring of stations located near Black Ledge and Turkey Point was discontinued in 1996. The three stations added in 1989 were incorporated into DERM’s SAV monitoring program in northeast Florida Bay, and sampling is currently conducted at these sites on a semiannual basis in May and November.

Figure 13
Level 1 - Fixed transect stations in Biscayne Bay



Parameters collected include, seagrass shoot and blade density, standing crop biomass by species, and seagrass composition along a 45 m transect. Shoot and blade density will be determined at each station by sampling a 0.2 m² section at each of three fixed one meter square grids.

Standing crop biomass is harvested from three 0.04 m² areas at each station. Biomass samples are segregated by species, rinsed in a mild HCl solution, then dried in an oven at 60 degrees C and weighed.

The location of the current Level 1 monitoring transects and a summary of the results are shown graphically on the following charts (Figures 13 and 14 a-n). The raw data from these analyses are provided in Appendix A.

Level 2 Sampling - This is a stratified random sampling similar to the methods currently used in Florida Bay and the Florida Keys National Marine Sanctuary (FKNMS). The monitoring network consists of 101 stratified random sites sampled annually using the modified Braun-Blanquet cover-abundance scale (BBCA) Table. Overall cover for each species of seagrass, and total cover for all species are estimated using the BBCA scale defined below. Frequency, abundance, and density are calculated for each site.

Table 3. The modified BBCA scale.

BRAUN-BLANQUET COVER-ABUNDANCE (MAGNITUDE) SCALE

BBCA VALUE ASSIGNMENT	OBSERVED RANGE	MEAN COVER (%)	ABUNDANCE
5	> 75	87.5	ANY
4	50 to 75	62.5	ANY
3	25 to 50	37.5	ANY
2	5 to 25	15	ANY
1	< 5	2.5*	NUMEROUS
0.5	< 5	2.5*	LOW
0.1	< 5	2.5*	SOLITARY
0	ABSENT	0	ABSENT

* represents an assigned value

Figures 15 and 16 are graphic representations showing the spatial coverage of the Level 2 monitoring and the distribution of *Thalassia testudinum* as documented in this initiative.

Figure 14 a

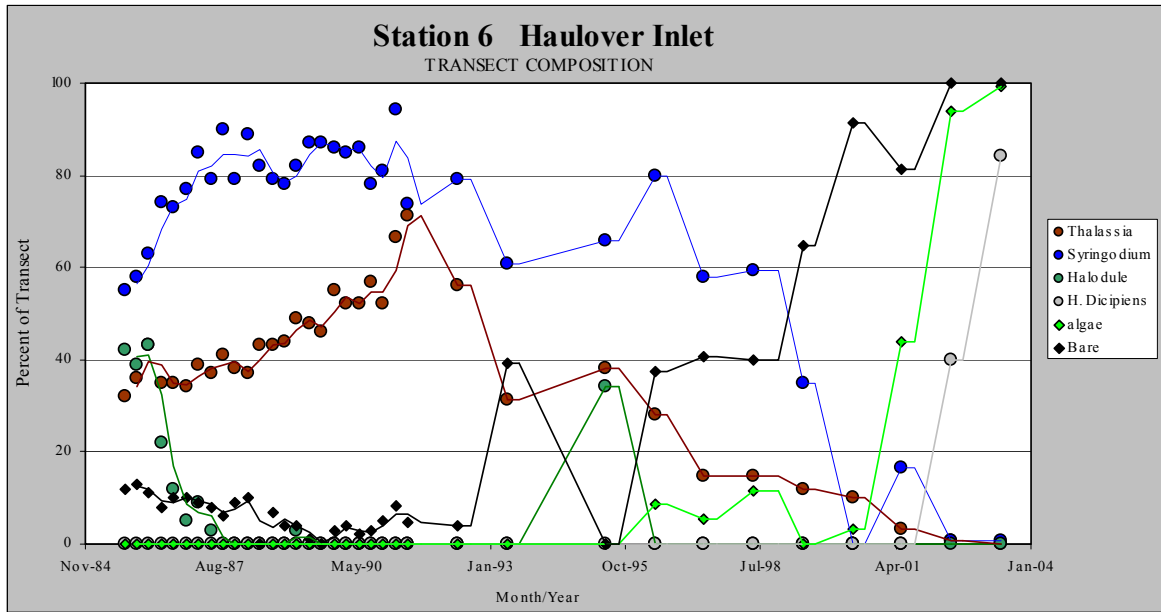
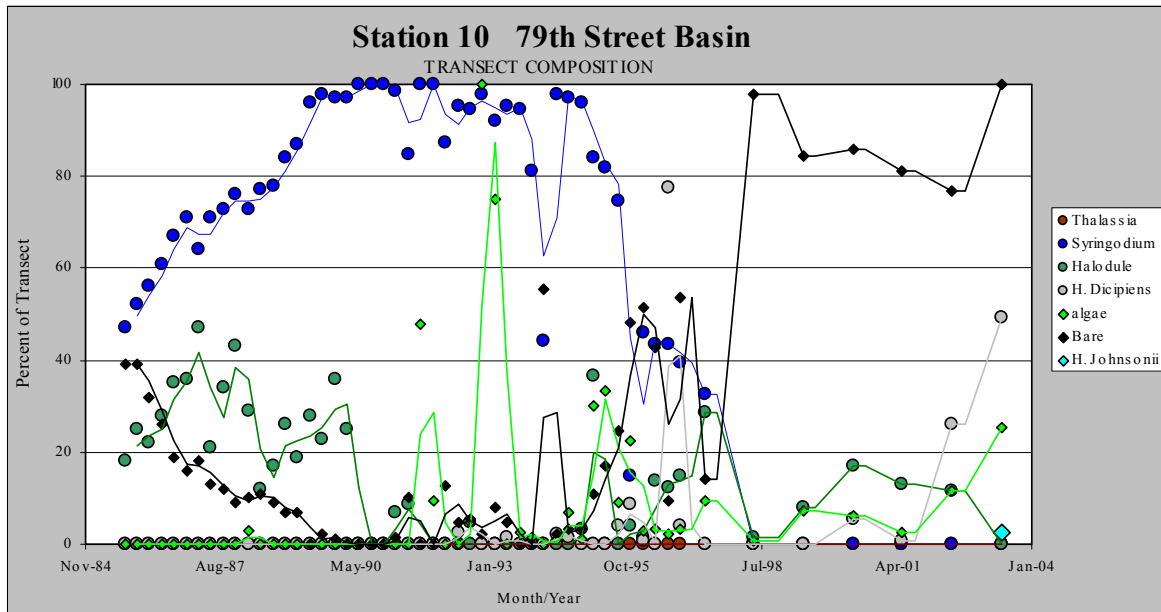


Figure 14 b



Information provided by DERM

Figure 14 c

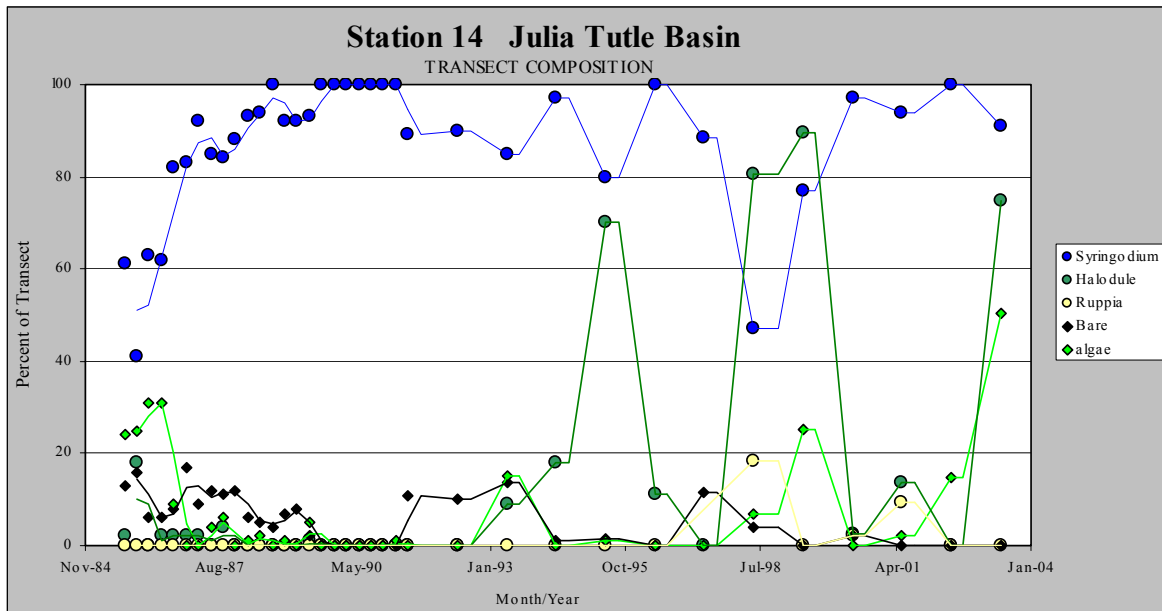
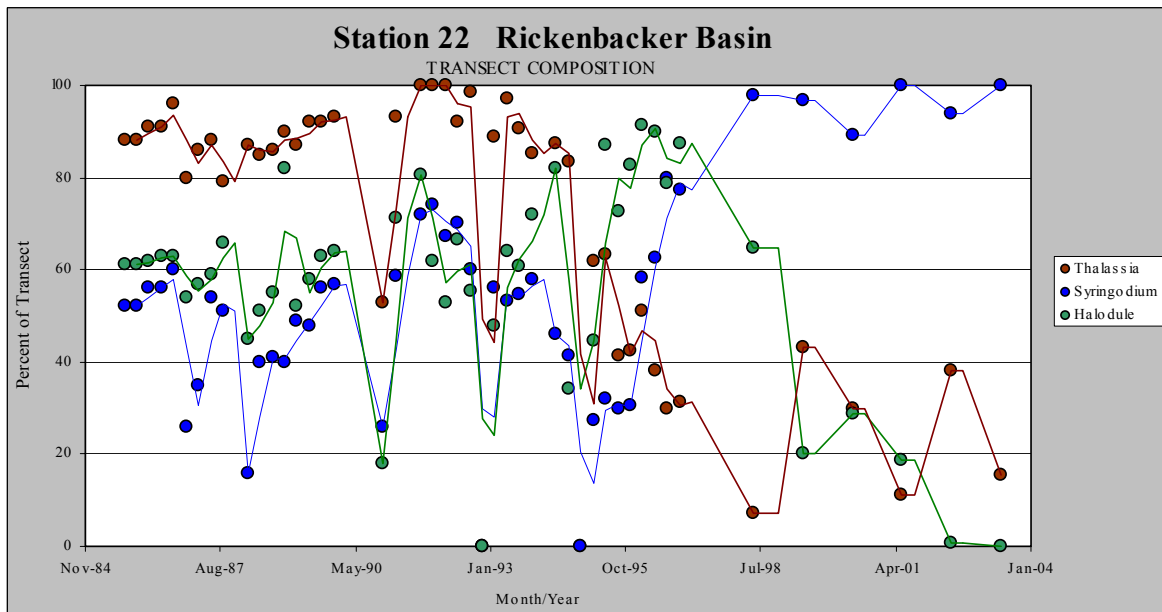


Figure 14 d



Information provided by DERM

Figure 14 e

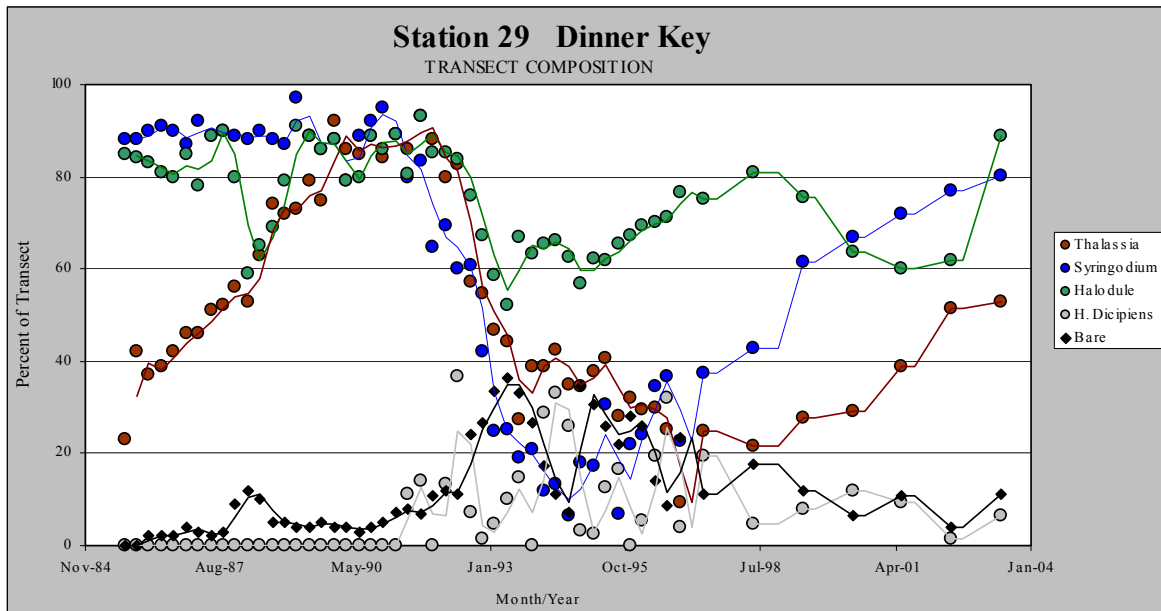
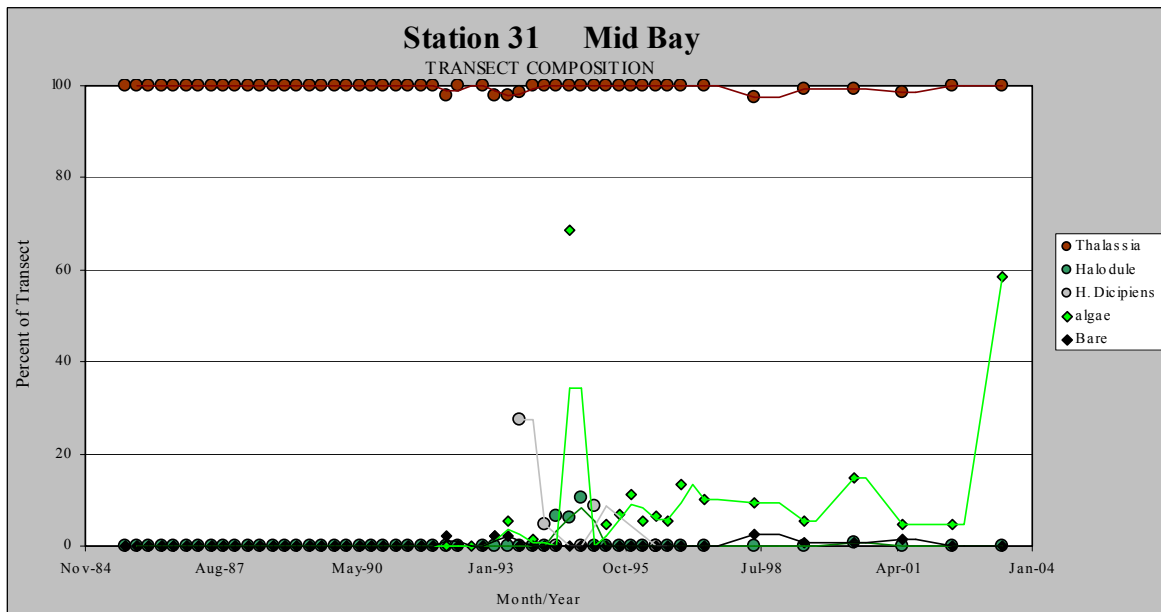


Figure 14 f



Information provided by DERM

Figure 14 g

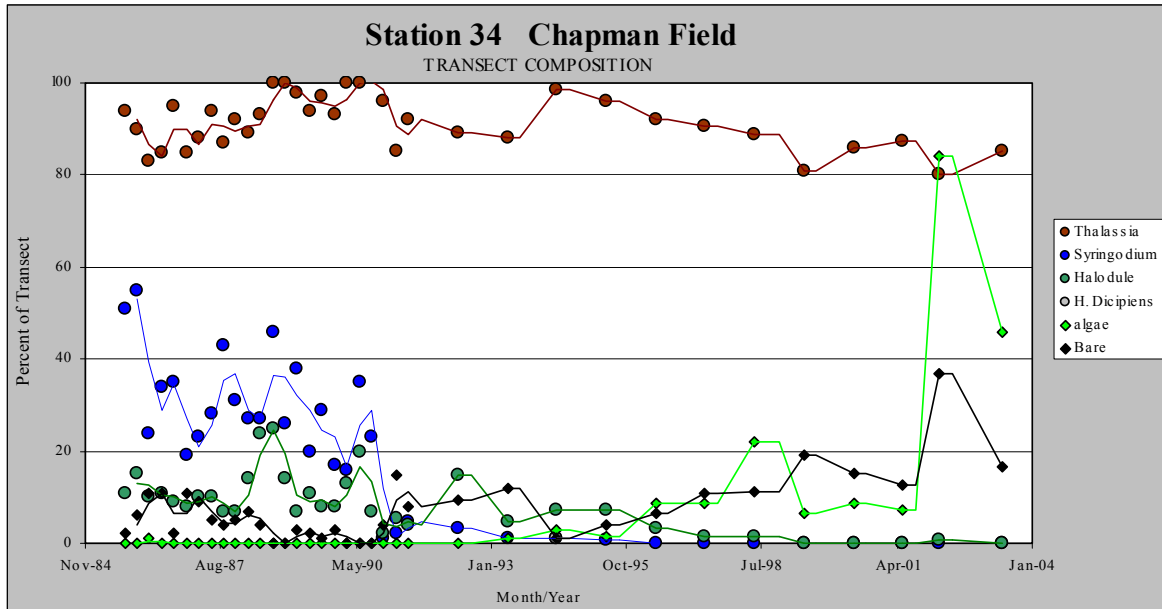
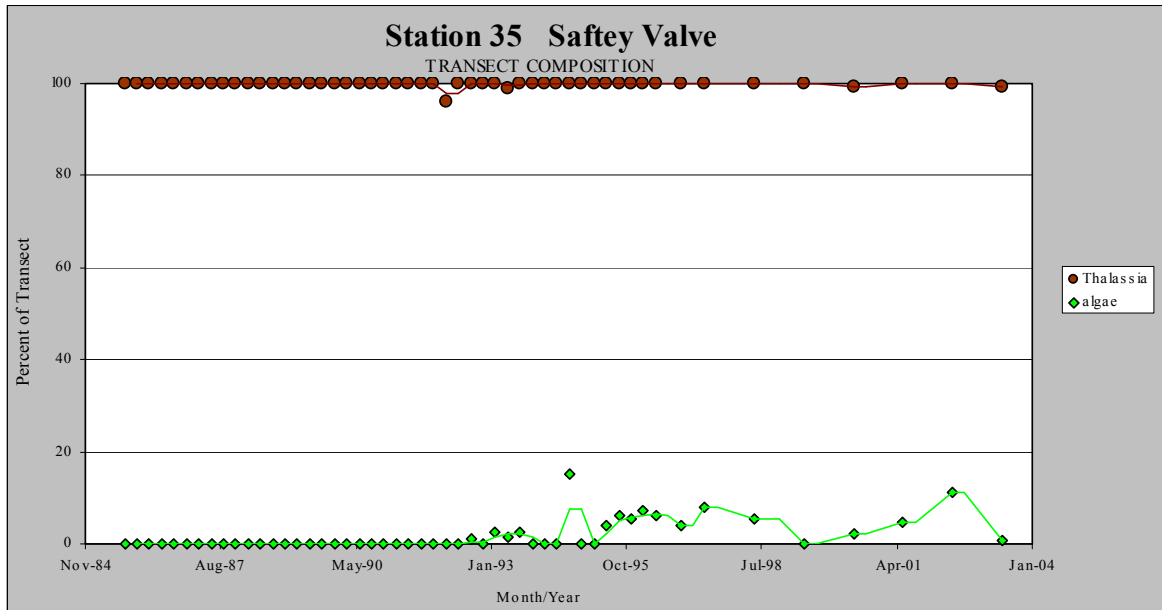


Figure 14 h



Information provided by DERM

Figure 14 i

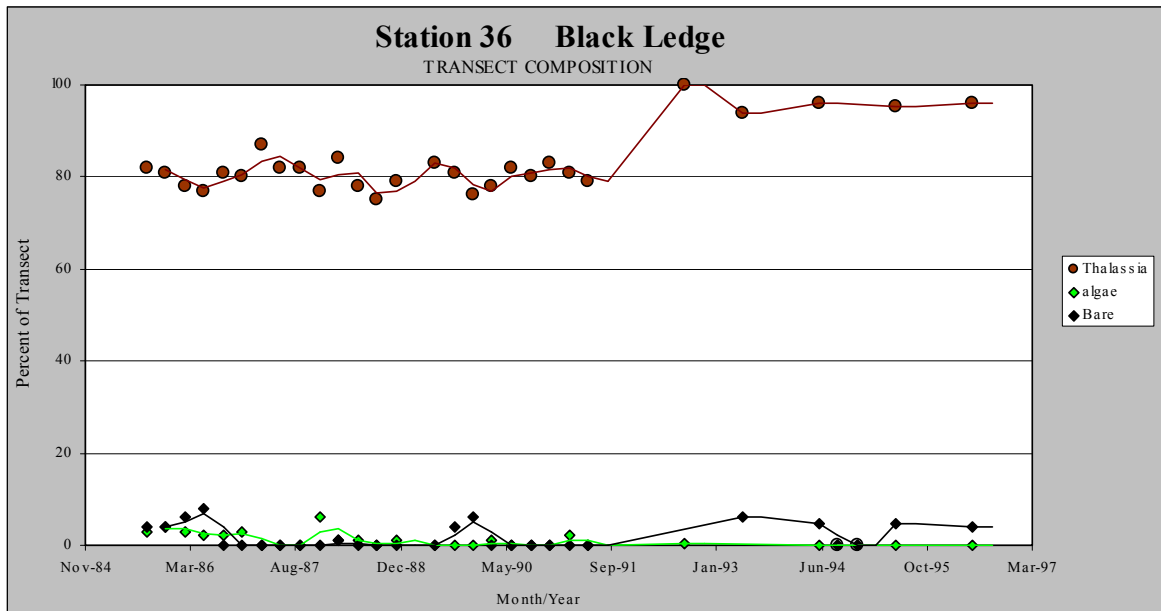
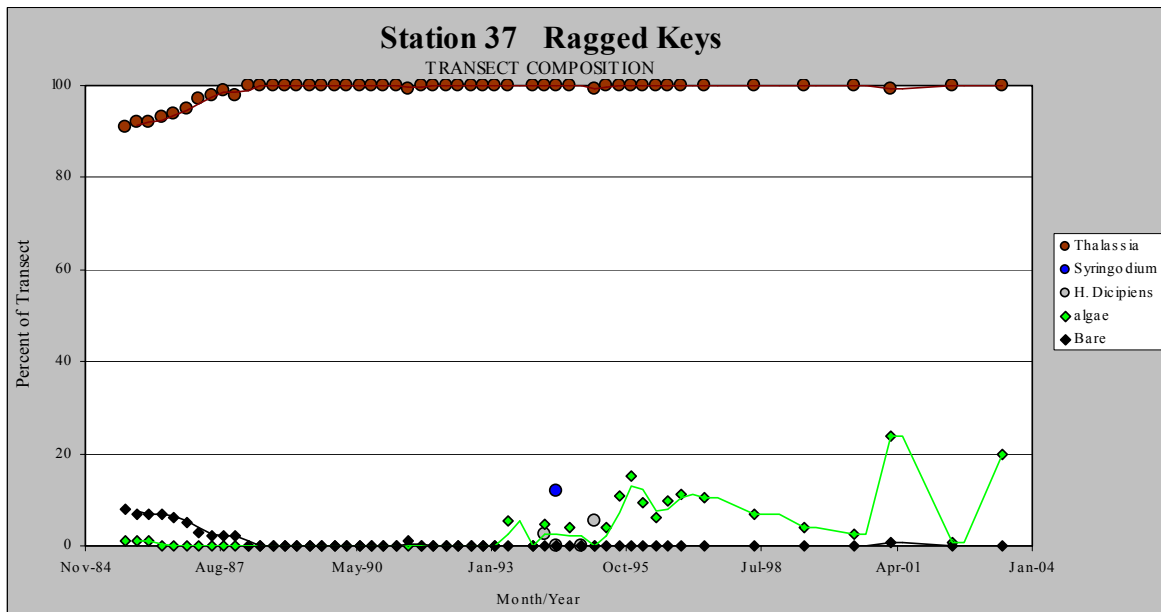


Figure 14 j



Information provided by DERM

Figure 14 k

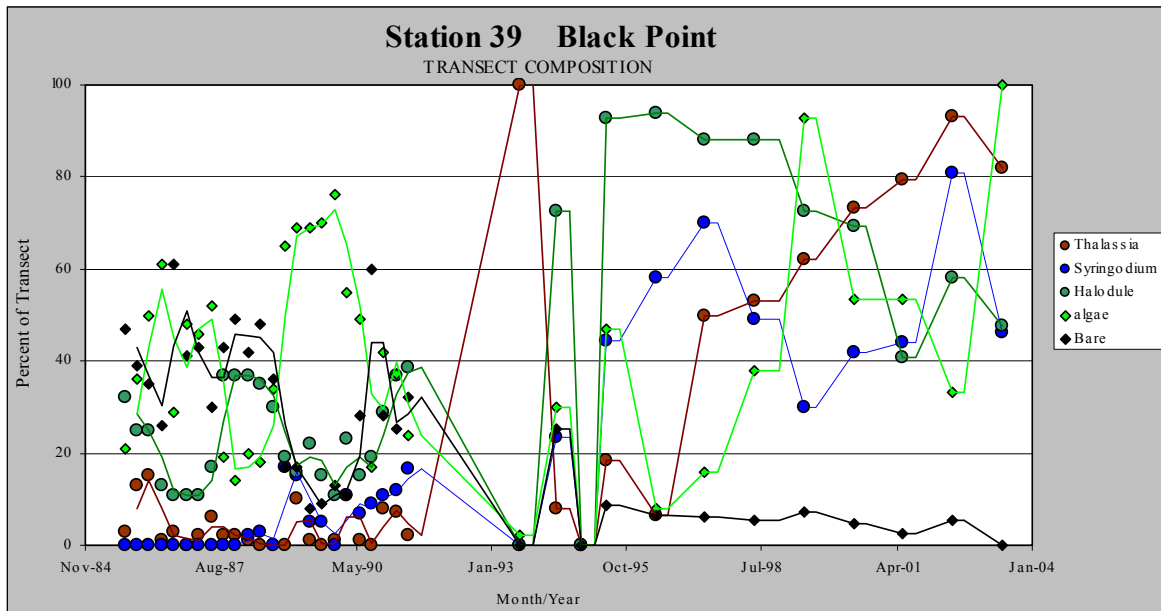
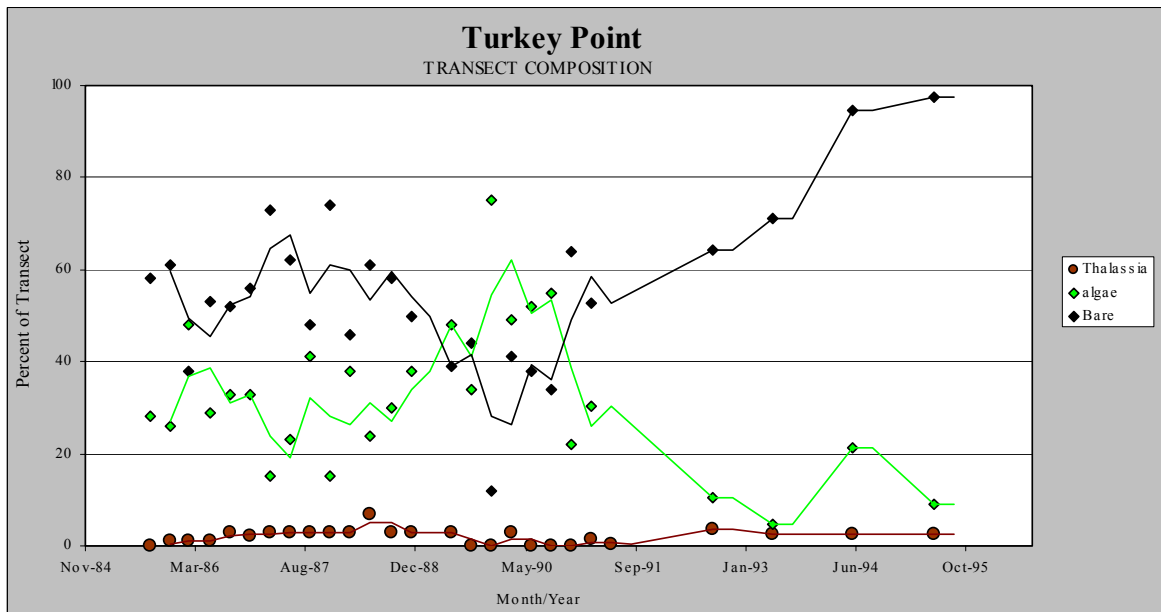


Figure 14 l



Information provided by DERM

Figure 14 m

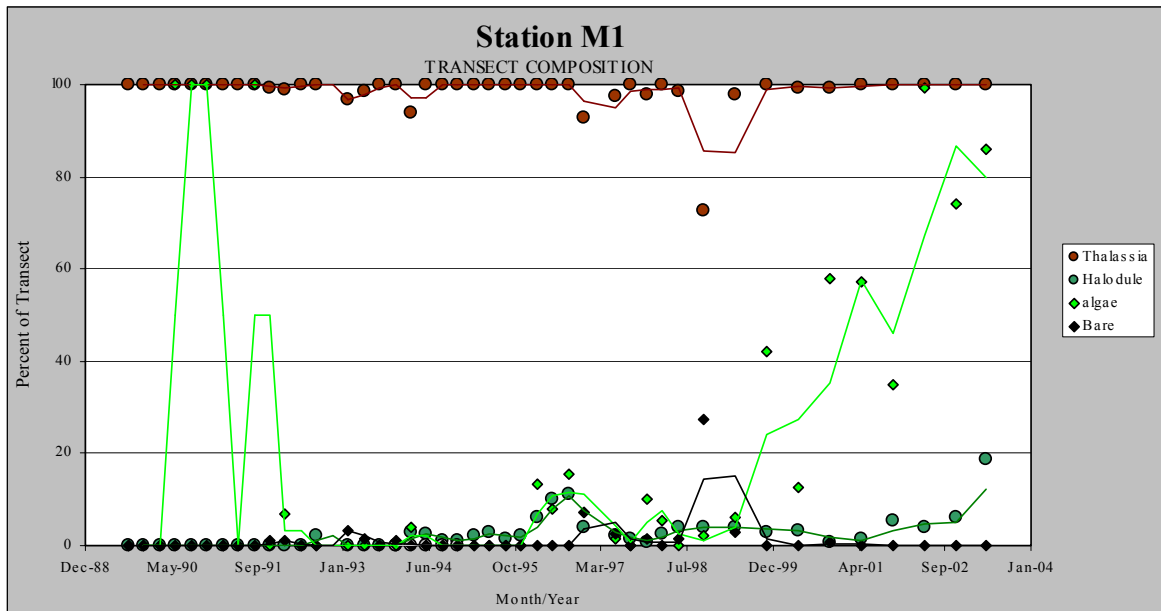
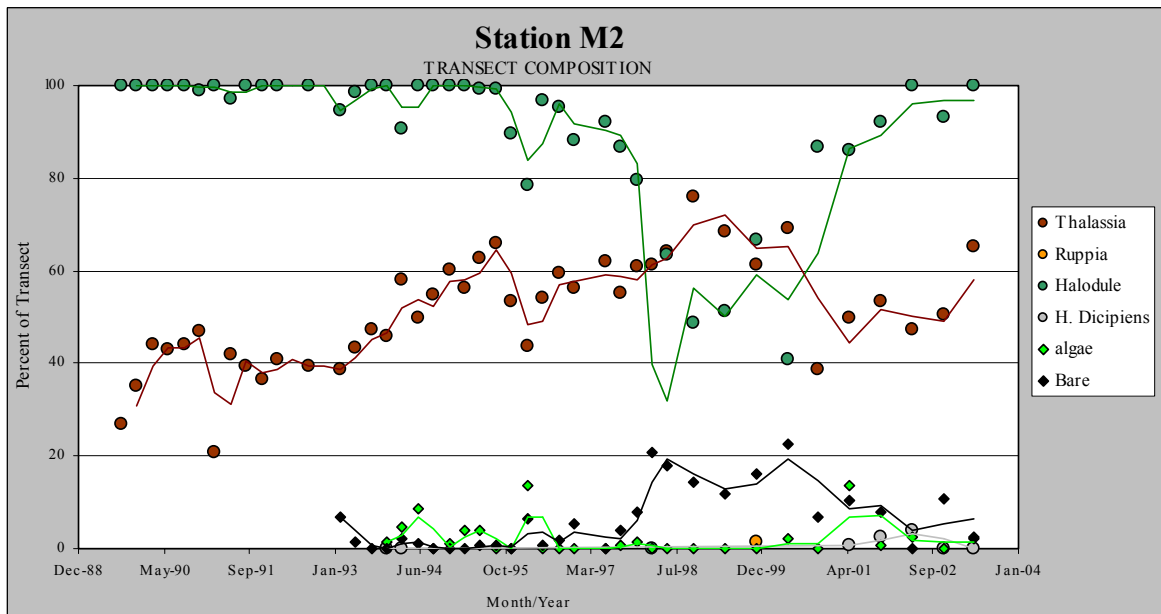


Figure 14 n



Information provided by DERM

Figure 15
Level 2 Sampling polygons for *Thalassia testudinum*. Each polygon contains 12-16 potential sampling locations. (Information from DERM)

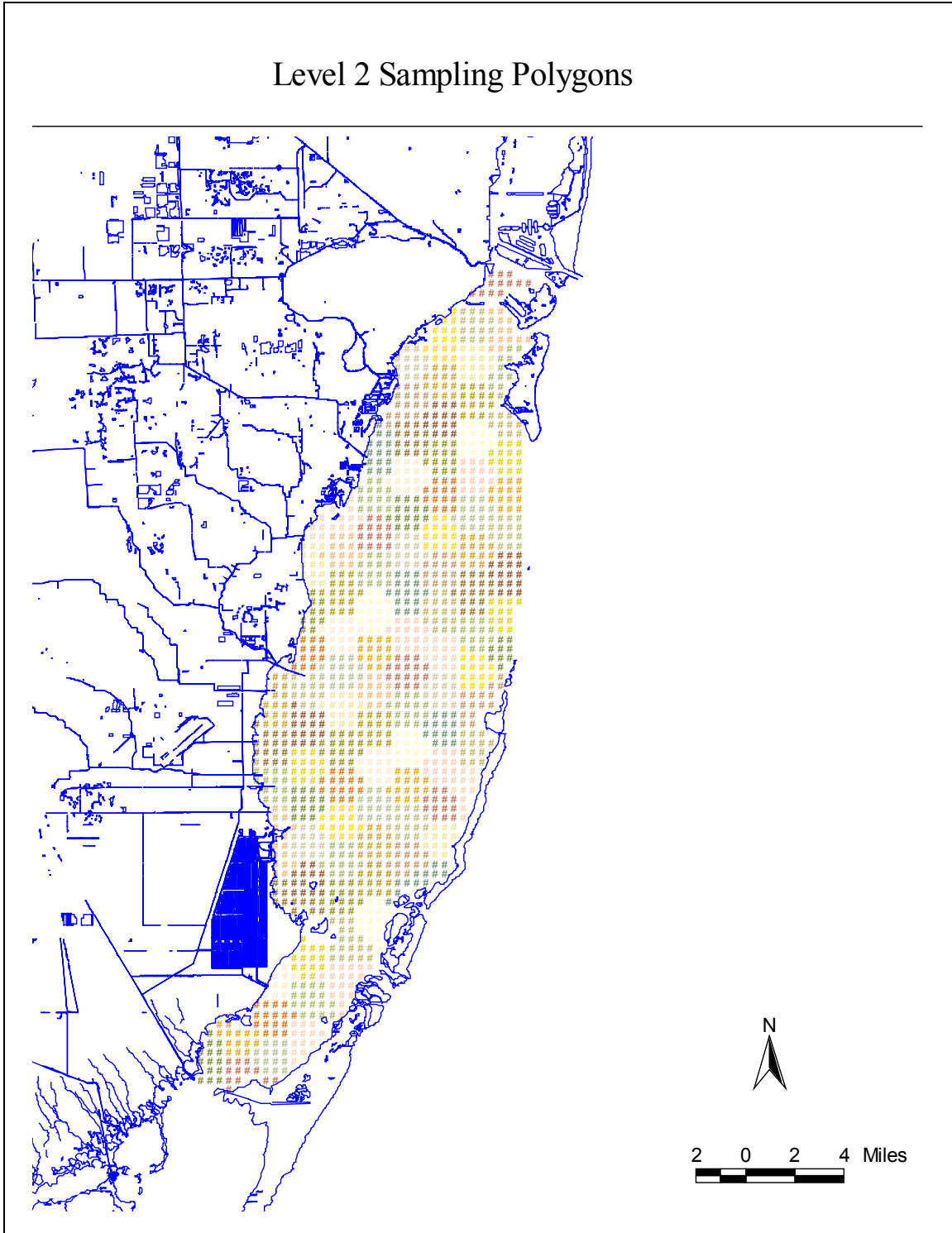
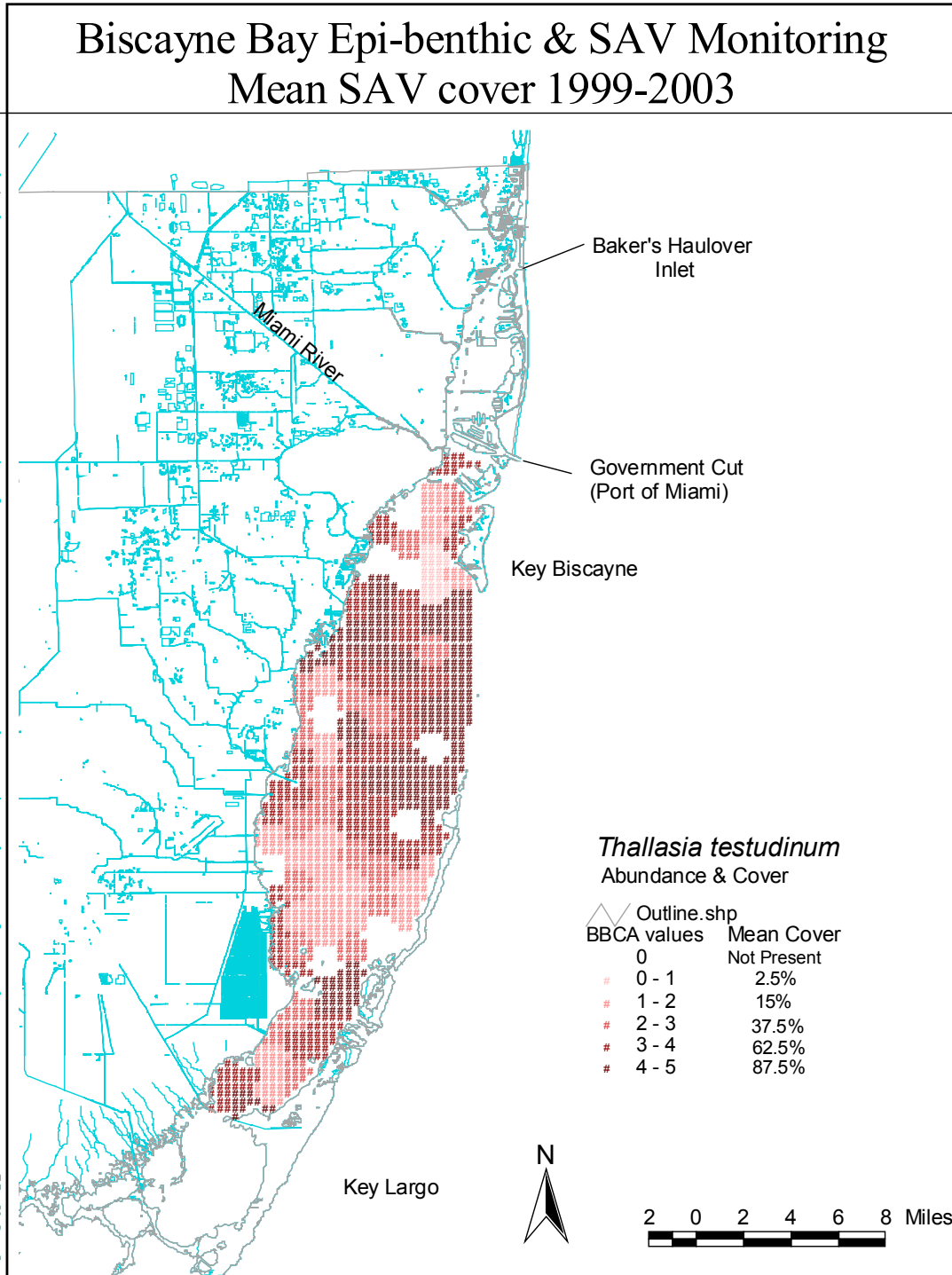


Figure 16
 Mean BBCA Abundance and related cover, of *Thalassia testudinum* between 1999 - 2003. (Information from DERM)



Relevancy of this information to the establishment of MFL for Biscayne Bay: At present, the DERM data is the best available data for seagrasses within the project area. It is current, covers the entire project area and includes the identification of each species of seagrass and macroalgae at each monitoring location.

Seagrass mapping currently being conducted by researchers at Florida International University

As identified previously, graduate students at FIU are currently involved with detailed seagrass mapping in the nearshore areas within the central and South-Central Biscayne Bay sub-regions. Data are presently being taken and compiled regarding the SAV species, spatial distribution, abundance and density of each seagrass species in these nearshore waters. Freshwater seepage wells have been installed in the Bay and water quality data, including salinity are simultaneously being recorded.

Relevancy of this information to the establishment of MFL for Biscayne Bay: It is likely that, when these data are published (i.e., mid to late 2004) they will be the best available data for seagrasses within the nearshore portions of the central project area. They are current; they will cover the area that is most significantly affected by alterations in the flow of freshwater into the Bay and they will include the identification of each species of seagrass and macroalgae at each monitoring location and will have water quality parameters, including salinity, recorded at each sampling site. Although it appears unlikely that these data will be released prior to the April 2004 deadline for this Task 7 report, it is recommended that the District maintain communication with FIU and obtain the information as soon as it is available, and give careful consideration to how the results may affect the development of the MFL rule.

Seagrass Communities as habitat for marine fauna

Numerous studies have documented that submerged aquatic vegetation provides habitat for a variety of marine organisms, and cross-indexed references to many such studies were provided in "Freshwater Flow and Ecological Relationships in Biscayne Bay" (BFA, 2004). Of particular pertinence to developing an understanding of these relationships in Biscayne Bay, De Sylva 1969, Thorhaug 1976, and Ault et. al. 1999, all provide site specific data identifying the value of seagrasses in Biscayne Bay.

Much of the site-specific research has focused on the value of seagrass communities as habitat for fishes. Idyll (1966) identifies 27 species of fish that occur in Biscayne Bay and which are 'of major importance to commercial, sport or bait fisheries either in Biscayne Bay or elsewhere. Fishes listed by Idyll (1966) include well-known commercially valuable species (e.g., mullet, snapper, groupers), highly-sought recreationally valuable species (e.g., tarpon, bonefish, snook) and baitfishes (e.g., herrings). Idyll (1966) identifies an additional 18 species of fish that are "of minor importance" to commercial sport or bait fisheries (e.g., grunts, pinfish, mojarra), and a cumulative list of these species is provided in Table 4, below. The preferred habitat for many of these species in either the juvenile and/or adult stage is the seagrass community. Seagrasses also provide habitat for the prey of these species.

Table 4
Fishes occurring in Biscayne Bay which are of major or minor importance to commercial, sport or bait fisheries in Biscayne Bay

Common Name	Scientific Name	Common Name	Scientific Name
Species that are of major importance		Species that are of minor importance	
Black mullet	<i>Mugil cephalus</i>	French grunt	<i>Haemulon flavineatum</i>
Silver mullet	<i>Mugil trichodon</i>	White grunt	<i>Haemulon plumieri</i>
Common barracuda	<i>Sphyraena barracuda</i>	Sailor choice	<i>Haemulon parra</i>
King mackerel	<i>Scombermorus regalis</i>	Caesar grunt	<i>Haemulon carbonarium</i>
Spanish mackerel	<i>Scombermorus maculates</i>	Broad mojarra	<i>Cerres cinereus</i>
Blue runner	<i>Caranx crysos</i>	Common mojarra	<i>Eucinostomus gala</i>
Bar jack	<i>Caranx rubber</i>	Sandperch	<i>Deplectrum formosum</i>
Crevelle jack	<i>Caranx hippos</i>	Lookdown	<i>Selene vomer</i>
Gray snapper	<i>Lutjanus griseus</i>	Ladyfish	<i>Elops saurus</i>
Lane snapper	<i>Lutjanus synagris</i>	Pinfish	<i>Archosargus rhomboidalis</i>
Schoolmaster	<i>Lutjanus apodus</i>	Chub	<i>Kyphosus sectatrix</i>
Spotted weakfish	<i>Cynoscion nebulosus</i>	Spanish hogfish	<i>Bodianua rufus</i>
Halfbeak	<i>Hemirhamphus brasiliensis</i>	Common hogfish	<i>Lachnolaimus maximus</i>
Thread herring	<i>Opisthonema oglinum</i>	Hardhead silversides	<i>Atherinomorus stipea</i>
Grouper	<i>Epinephalus striatus</i>	Mojarra	<i>Eucinostomus lefroyi</i>
Grouper	<i>Epinephalus morio</i>	Sheepshead	<i>Archosargus probatocephalus</i>
Spotted jewfish	<i>Promicrops itaiar</i>	Drum	<i>Pogonias cromis</i>
Spadefish	<i>Chaetodipterus faber</i>	Moonfish	<i>Vomer setapinnis</i>
Bonefish	<i>Albula vulpes</i>		

Table 4 - continued
 Fishes occurring in Biscayne Bay which are of major or minor importance to commercial, sport or bait fisheries in Biscayne Bay

Pinfish	<i>Lagodon rhomboids</i>			
Bluefish	<i>Pomatomus saltatrix</i>			
Thin snook	<i>Centropomus undecimalis</i>			
Tarpon	<i>Megalops atlanticus</i>			
Hog snapper	<i>Lacnolaimus maximus</i>			
Flat herring	<i>Harenrula pensacolae</i>			
Common pompano	<i>Trachinotus carolinus</i>			
Permit	<i>Trachinotus goodei</i>			

Modified from Idyll, 1966

Idyll identifies an additional ± 50 species (Appendix G) that occur in Biscayne Bay which are valuable as aquarium fishes (e.g., parrotfish, filefish, angelfish, butterflyfish). The preferred habitat for majority of these species, however is the reef ecosystem, rather than seagrass communities and so the potential impact of minimum flows on these species is more remote.

Comparatively less site-specific data are available regarding the value of Biscayne Bay's seagrass communities for biota other than fishes. Research on fauna other than fish that inhabit Biscayne Bay's seagrass communities has largely focused on commercially valuable organisms. The most widely studied individual species is the pink shrimp (*Farfantepenaeus duorarum*), and numerous reports (e.g., Ault et. al. 1999, Browder et. al 1999, Diaz et. al. 2000) describe the value of the seagrass community to this species. On-going research by Browder and Robblee is documenting the value of the shoal grass community for different size and age classes of pink shrimp (J. Browder, pers. comm.).

Fewer data are available concerning the documented presence of other biota in the seagrass communities of Biscayne Bay, however, Idyll (undated) identifies several invertebrate species that inhabit Biscayne Bay and which are of major importance to commercial, sport and/or bait fisheries. Of these, seagrasses are important at one time or another in the life cycle for the species identified in Table 5.

Table 5
Seagrass dependant Invertebrates that occur in Biscayne Bay and which are of major importance to commercial, sport or bait fisheries

Common Name	Scientific Name
Queen conch	<i>Strombus gigas</i>
Blue crab	<i>Callinectes sapidus</i>
Stone crab	<i>Menippe mercenaria</i>
Spiny lobster	<i>Panulirus argus</i>
Pink shrimp	<i>Farfantepenaeus duorarum</i>

Modified from Idyll (1966)

As noted elsewhere in this report, it is the shoal grass community that is present along much of the western portion of the project area that is most susceptible to modifications in the timing, volume and/or quality of the fresh water delivery into Biscayne Bay. On-going monitoring and research is being conducted that, when completed will be helpful in identifying and understanding the relationship between fisheries and seagrasses in the Biscayne National Park area of the Bay. This fish and shrimp sampling is being conducted by J. Browder, M. Robblee and others and will be particularly valuable in that it includes intensive sampling within the nearshore (depths less than one meter) area of the bay. Data are still being collected in this multi-year study, the results of which should be obtained evaluated as soon as they are available for their relevancy to the establishment of MFLs for this sub-region of the Bay.

Although American oysters (*Crassostrea virginica*) are presently largely absent from Biscayne Bay, they are present in some tidal creeks and canals (J. Meeder, pers. comm) along the western shore of portions of Biscayne Bay. There has been no recent attempt to determine or document the presence, absence, abundance and/or vitality of oysters in Biscayne Bay. However, detailed investigations and analyses by (URS Greiner Woodward Clyde 1999) in the St. Lucie Estuary (approximately 100 miles north of Biscayne Bay on Florida's east coast) resulted in that species being selected as a key indicator for minimum flows and levels for that ecosystem. Their investigations identified other mollusks (e.g., brackish water clam (*Rangia cuneata*), coot clam (*Mulinia lateralis*), ribbed mussel (*Modiolus demissus*) and barnacles (*Balanus* sp.) that inhabit the 21-40 ppt salinity zones in that estuary (URS Greiner Woodward Clyde 1999). Their analyses also documented the presence of seagrasses, including *Halodule* in this zone.

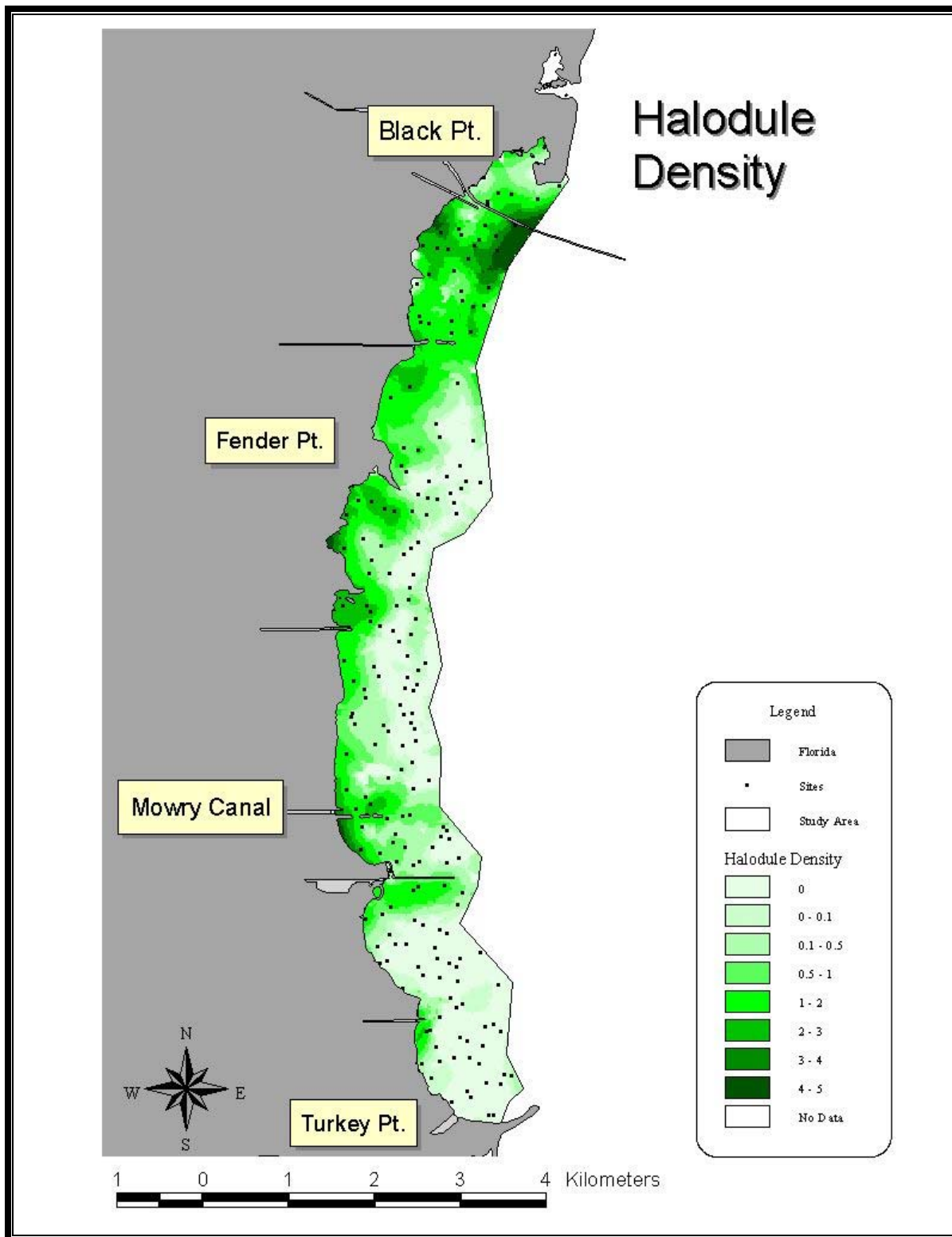
Additional investigations and research would be necessary to document the presence and distribution of these species in Biscayne Bay.

IMPLICATIONS OF THE KNOWN CONTROLS ON SEAGRASS DISTRIBUTION, EXISTING SEAGRASS MAPS OF BISCAYNE BAY AND MFLS

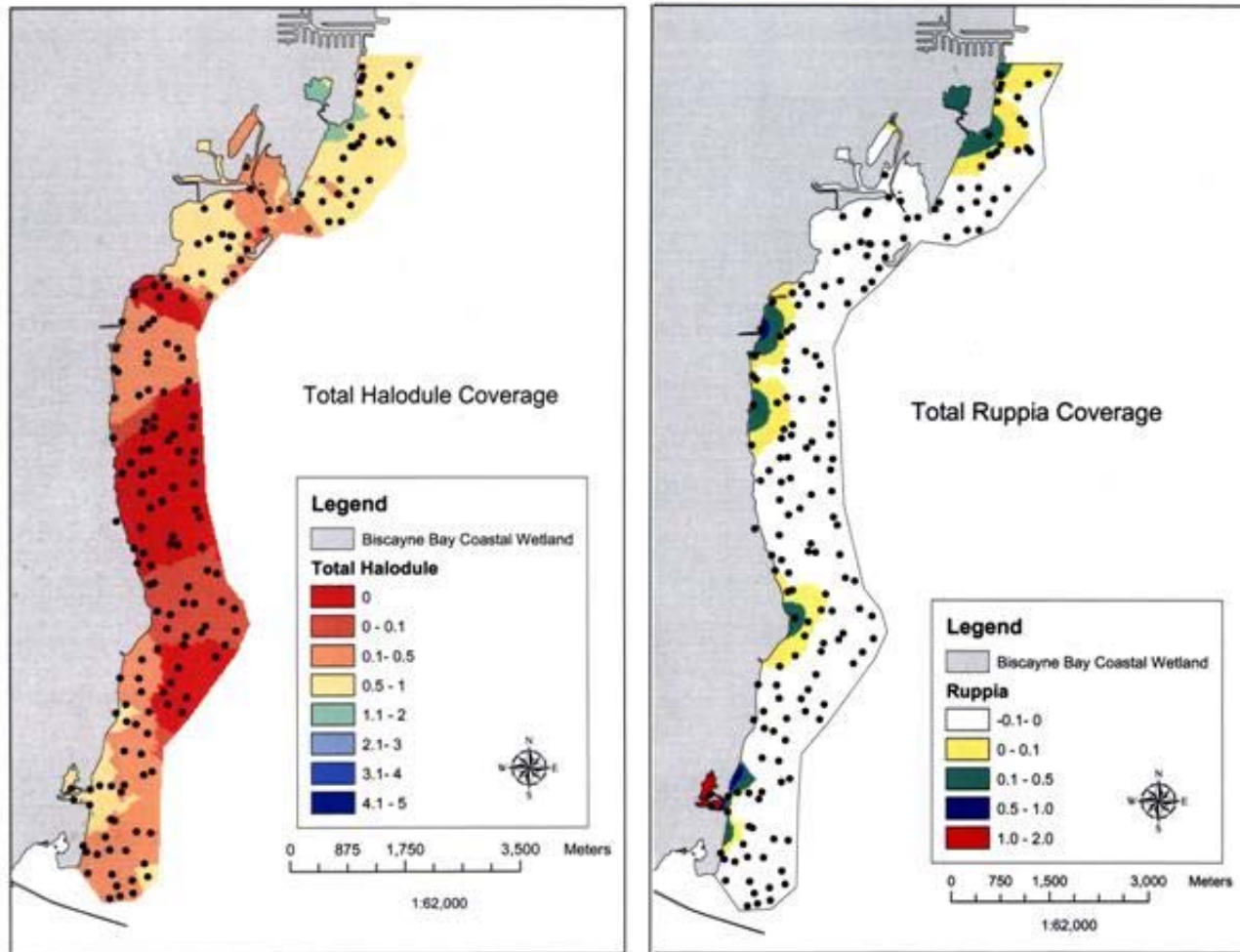
Given that detailed seagrass maps of Biscayne Bay are just now being prepared at a level to discern species distribution patterns and zonation along the western shoreline near the major drainage canals (i.e., graduate student work at FIU by Danielle Mir-Gonzalez and Julie Christian), the preliminary maps shown in Figures 17 and 18, combined with the ongoing work of Joan Browder and Mike Robblee concerning faunal use and preferences for seagrass beds in Biscayne Bay can be used to draw preliminary conclusions and direct further study.

In addition, URS Greiner Woodward Clyde (1999) has performed a similar survey of the literature, existing distribution of submerged aquatic vegetation and potential distribution given improvements to water quality for the St. Lucie Estuary (SLE). They determined that the existing "SAV resources in the SLE are extremely low." Using an SAV suitability analysis they determined that due to the wide range in salinity currently existing in the SLE that "SAV species that are more adapted to lower salinity regimes may offer the greatest potential for establishment of submerged vegetation. It is recommended that additional effort be given to evaluating these species, especially wigeongrass, for suitability in the SLE. Shoal grass has the highest potential for the Lower Estuary areas." We would caution, however, as discussed below for other studies, the topic of nutrient enrichment via freshwater inputs was only mentioned in passing in this study, and that the SAV analyses did not include any algal component. A brief reference to the potential competition for light between phytoplankton and seagrass is mentioned briefly on page 4-9. The exclusion of further discussion or examination of larger macroalgal species and epiphytes is a major limitation of the conclusions of this report, regardless of the extent of its presence/absence in the St. Lucie Estuary.

Fong and Hartwell (1994) initially developed a simulation model to predict changes in biomass of three species of seagrass (shoal grass, turtle grass and manatee grass), epiphytes on the seagrasses and rhizophytic macroalgae as related to temperature, light, salinity and water-column and sediment nutrients (P only) in south Florida. This work was based on published information without direct experimentation. Fong et al. (1997) extended these analyses to



Biscayne Bay—*Halodule* and *Ruppia* Coverages



include comparison of the model predictions with actual values for biomass at three locations in Biscayne Bay: Turkey Point, Fender Point and Black Point. The validation process had a good fit for Turkey Point (i.e., turtle grass dominant, manatee grass absent, and shoal grass at low biomass), somewhat less so for Fender Point (i.e., shoal grass dominant in winter, turtle grass in the summer) and less so for Black Point (shoal grass dominant year round, low biomass for turtle grass). Although Fong et al. (1997) concluded that the model in its form at the time "...could be useful to managers to run what-if scenarios in order to make predictions about up-stream water management practices, including allowable nutrients and freshwater diversion", we would disagree since the role of nitrogen in the water column was not part of the model development nor validation. Fong et al. (1997) do acknowledge that "...the parameters controlling growth and death rates of the algal groups, especially the epiphytes, are the least certain parameters in the model." Since it has been shown that nutrient enrichment, particularly nitrogen increases can fuel rapid biomass increases in epiphytes on seagrasses, and their resulting death (Cambridge and McComb 1984, Cambridge et al. 1986, Silberstein et al. 1986), this is an important issue in Biscayne Bay. In addition, rapid increases in biomass of drift algae, such as *Ulva* spp., *Gracilaria* spp., and *Enteromorpha* spp. have also been linked to nitrogen enrichment in Biscayne Bay (Meeder and Boyer 2001) and nitrogen enrichment and seagrass loss in Florida and other parts of the world (Lewis et al. 1985, Johansson and Lewis 1992, den Hartog 1994, Avery 2000).

The application of the Fong model to predict seagrass coverage thus has several problems. The first is the lack of a parameter for nitrogen or ammonia, enrichment within the model, and thus predictions of the likely increases in micro- and macro-algae that might compete with seagrasses. The second is the known distribution of seagrasses in the general area of the Fong et al. (1997) work (see Figures 17 and 18). The general increase in coverage by shoal grass, as one moves from south to north between Turkey Point and Black Point (Figure 18), for example, is not explained in the Fong et al. (1997) model. Wigeongrass distribution in general, as shown in Figure 17, is not addressed in the Fong et al. (1997) model. As noted in further discussions below, Fourqurean et al. (2003) appears to have a better predictive process for looking at inshore, lower salinity, seagrass species, although the water column concentrations of nutrients and their possible impacts, are still in need of greater attention,

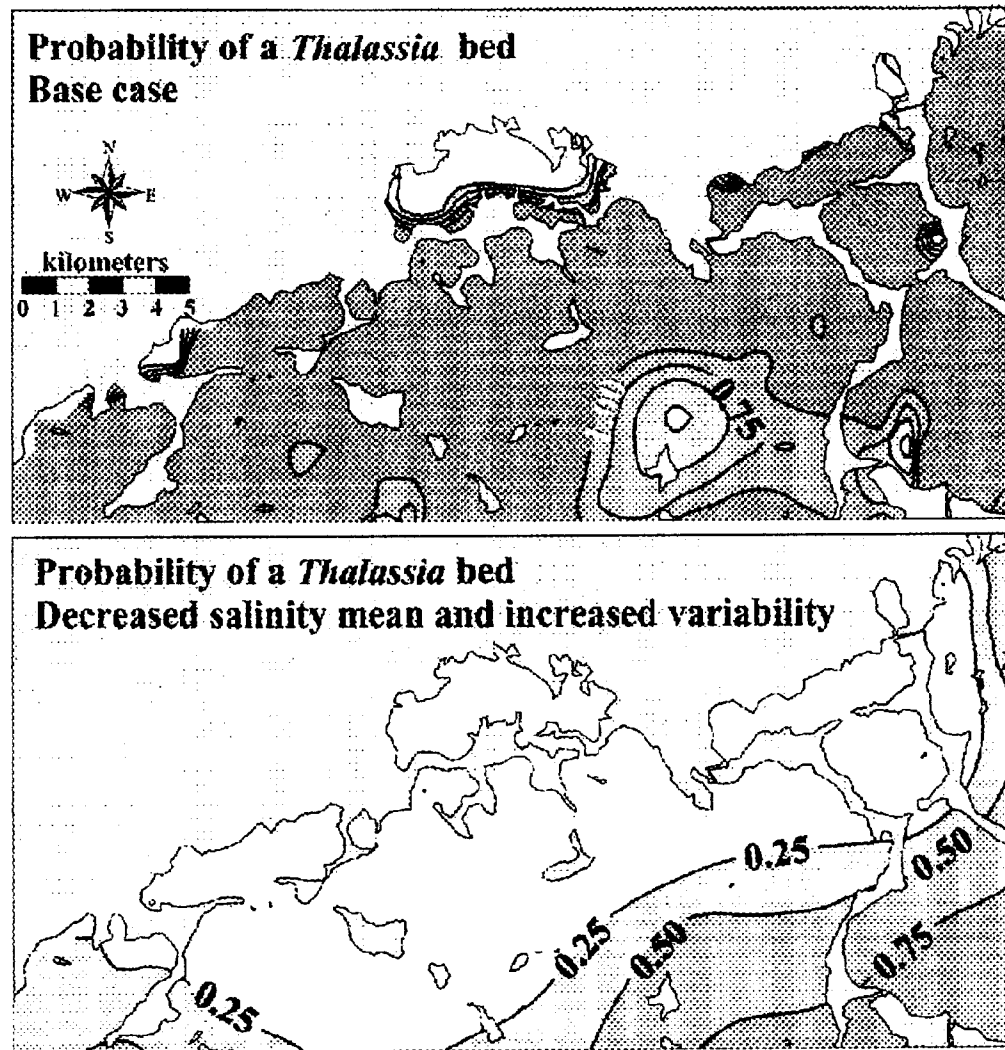
Lirman and Cropper (2003) applied a modified Fong and Hartwell model in a more detailed look at interactions between shoal grass, manatee grass and turtle grass in Biscayne Bay. Their work included field surveys, salinity exposure experiments and a modified seagrass simulation model. Exposure of seagrasses in microcosms to various salinity ranges showed species specific susceptibilities,

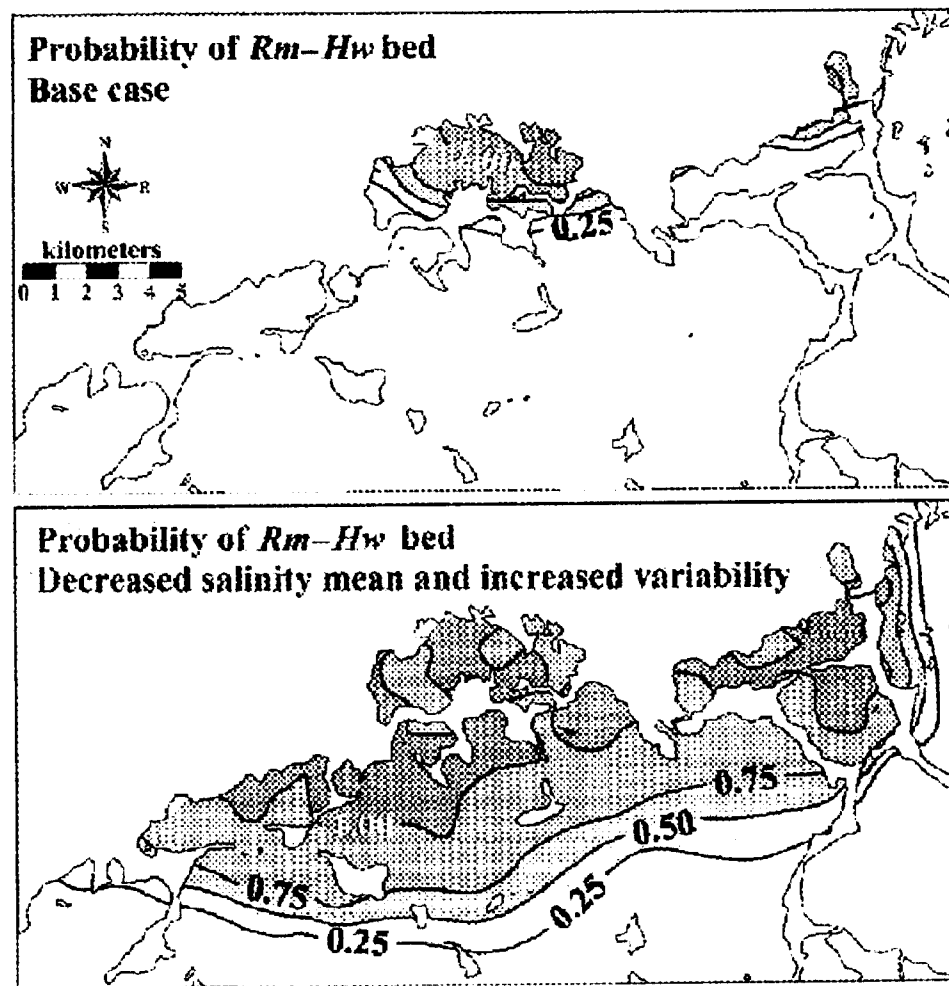
with turtle grass showing maximum growth at oceanic salinities (30-40 psu), and lowest growth rates at the extremes (5 and 45 psu). For manatee grass, maximum growth rates occurred at 25 psu, with major drops in ranges higher or lower than this. Shoal grass was the most tolerant, growing well at all tested salinities. The modified model suggests that only with drastic lowering of salinities would shoal grass become the dominant seagrass in much of the study area. It is significant to note again however that Lirman and Cropper (2003) state that "Even if localized distribution patterns, such as high abundance of *H. wrightii* in canal-influenced areas may be explained on the basis of salinity regimes, salinity tolerance alone can not account for all the observed large-scale patterns in seagrass distribution...Data on other important factors such as sediment nutrient dynamics, light availability, seagrass recruitment and rhizome expansion, competition from seagrasses, epiphytes, and drift and rhizophytic macroalgae, are needed to fully understand and predict the large-scale distribution dynamics of SAV within Biscayne Bay."

In another series of papers by Boyer et al. (1997) and Fourqurean et al. (2003), long term trends in water quality data at 28 stations, and mapped seagrass meadows have been assembled to define eight benthic habitat classes from 677 sampling locations in Florida Bay. This information was used to construct a discriminant function model which assigned probability of a given benthic habitat class occurring for a given combination of water quality variables. Nitrogen species concentrations were one of the nutrients included as opposed to the Fong and Hartwell (1994), Fong et al. (1997), and Lirman and Cropper (2003) modeling efforts.

Fourqurean et al. (2003) report that only 13.9 % of the benthic habitat stations were correctly classified using mean salinity alone. Simple chance would have classified 12.8%. A step wise addition of parameters was tested with a final correct classification of 56.7%. Similar to the work of Lirman and Cropper (2003), Fourqurean et al. (2003) "...suggest that this model will prove a useful tool for resource managers interested in predicting the ecological response of Florida Bay to changes in the amount, timing and quality of freshwater flows."

Specifically Fourqurean et al. (2003) performed model runs to examine both the current and predicted distribution of turtle grass beds and mixed shoal grass-wigeongrass beds, with the predicted conditions based on a reduction in salinity by half, and a doubling of the variation in salinity. Figure 19 shows the current and predicted distribution of turtle grass, and Figure 20, the current and predicted occurrence of a mixed shoal grass - wigeongrass bed. Under such predicted scenario, the shoal grass -wigeongrass community "...would encroach





outwards into Florida Bay by 5-10 km...while there would be a concomitant decrease in the current distribution of turtle grass."

Fourqurean et al (2003) further speculate that "[C]hanges in the structure of the benthic plant communities is also likely to have a large impact on the food web of Florida Bay, since the animal communities in seagrass beds in Florida Bay are affected by the species composition and density of the seagrass (Thayer and Chester 1989, Thayer et al. 1999). In addition, if the anecdotes in Zieman (1982:90-91) about the relative value of these different seagrass communities to hook-and-line fisherman are true, such a change could lead to an increase in production of sought-after game fish in Florida Bay, including seatrout (*Cynoscion nebulosus*), redfish (*Sciaenops ocellata*) and snook (*Centropomus undecimalis*)." In this regard, it may be significant to note that spotted seatrout appear to have expanded their spawning range into central Florida Bay due perhaps to "a change from hypersaline to more normal salinities that have occurred during the decade" (Thayer et al., 1999, p. 530).

The on-going study, "Biscayne Bay Coastal and Nearshore Community Baseline Study to Develop Biological Performance Measures" has produced its first annual report (Browder et al. 2003), but it is too early in the study to draw any major conclusions. Year 1 has been devoted primarily to addressing the first of four objectives related to biological performance measures: characterization of the spatial and temporal patterns of fish and macroinvertebrate densities. As would be expected, "{D}ensities for the groups, all fish, all caridean shrimp, and all crabs, were significantly related to both salinity and habitat..." (Part 1, page 8). However, after only one year of sampling, the authors were not willing to draw any major conclusions from their data.

The questions become: (a) Which combinations of species, habitat and salinity are preferred?; (b) Has this combination been adversely impacted by historical water management practices?; and (c) Can those preferred combinations be maintained, restored and/or enhanced by modifications to the existing water management system? It is likely that the answers to questions (b) and (c) are yes. Regarding the preferred combination of species, habitat and salinity, it appears from the combined work of Fong and Hartwell (1994), Fong et al. (1997), Lirman and Cropper (2003), and Fourqurean et al. (2003) that a predictive model of what kinds of benthic habitats might result from various potential modifications to the existing water management system could be assembled and applied.

We would however caution that the epiphytic and drift algal component of the various models are the weakest portion, and they have the potential, if not accurately predicted, to result in potential negative impacts due to loading of

nitrogen to the nearshore waters of the western side of Central and South Central Biscayne Bay. Joe Boyer and Jack Meeder of FIU have indicated to the authors that they are working on a loading model to quantify the amounts of nutrients, including nitrogen and phosphorous, that might be exported from existing soils subjected to elevated water tables and therefore transfer to adjacent waters. Understanding the impacts of additional nitrogen loadings, and potentially increased ammonia loadings, should be priority research subject in combination with a joint stakeholders decision about what future conditions are desired for Biscayne Bay.

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APPENDIX A

See Enclosed Disk – Excel File

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	09	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN_T	NP	DIN_T	%SAT_T	%SAT_B
31.0	30-Sep-93		101	Convoy Point	25.47833	-80.32083	1993.74	BB	AS	0.74	09	1993	1993-09	0.0283	0.0028	0.0055	0.0352	0.4983	0.4929	0.3695	0.0062	0.0002	0.2808	0.8429	4.6335	28.90	28.90	27.60	27.60	5.60	5.60	1.04	176.22	907.50	2.92	81.07	82.02			
31.0	30-Sep-93		102	Black Point	25.54583	-80.29467	1993.74	BB	AS	0.74	09	1993	1993-09	0.0202	0.0151	0.0051	0.0263	0.4160	0.4466	0.3295	0.0063	0.0008	0.2804	0.9750	3.5173	28.90	28.90	28.10	28.10	4.70	4.90	0.25	146.74	133.00	16.92	87.17	70.88			
31.0	30-Sep-93		103	Near Black Ledge	25.57333	-80.28667	1993.74	BB	IS	0.74	09	1993	1993-09	0.0085	0.0057	0.0028	0.0211	0.3194	0.2926	0.2897	0.0065	0.0004	0.2426	0.9196	2.6750	31.60	31.60	28.10	28.10	5.40	5.50	0.56	108.62	169.20	10.07	79.32	80.79			
31.0	30-Sep-93		104	BNP Marker C	25.60167	-80.22083	1993.74	BB	MAIN	0.74	09	1993	1993-09	0.0063	0.0037	0.0026	0.0202	0.1774	0.2266	0.1508	0.0053	0.0005	0.0674	1.0130	1.2425	32.60	32.60	28.10	28.10	5.00	4.90	0.69	70.62	108.43	11.00	74.22	72.73			
31.0	30-Sep-93		105	Biscayne Channel	25.65417	-80.18667	1993.74	BB	MAIN	0.74	09	1993	1993-09	0.0069	0.0040	0.0029	0.0202	0.1831	0.2272	0.1559	0.0056	0.0012	0.0404	0.9152	1.3100	32.20	32.20	28.10	28.10	5.20	5.20	0.83	72.66	51.73	10.78	76.99	77.10			
31.0	30-Sep-93		106	White Marker	25.63417	-80.13000	1993.74	BB	OCHAN	0.74	09	1993	1993-09	0.0054	0.0025	0.0025	0.0176	0.1536	0.2229	0.1357	0.0078	0.0005	0.0458	0.9853	1.4875	32.60	32.60	28.60	28.60	5.40	5.40	0.42	43.45	93.57	6.49	80.22	80.22			
31.0	30-Sep-93		107	Fowley Rocks	25.59000	-80.10000	1993.74	BB	MAIN	0.74	09	1993	1993-09	0.0037	0.0015	0.0022	0.0137	0.1349	0.1713	0.1175	0.0053	0.0007	0.0458	0.9342	1.0650	32.60	32.60	28.70	28.70	5.30	5.20	0.19	55.94	95.00	7.17	78.74	77.25			
31.0	30-Sep-93		108	Marker G-1B	25.56917	-80.19250	1993.74	BB	OCHAN	0.74	09	1993	1993-09	0.0151	0.0126	0.0025	0.0184	0.2648	0.3035	0.2213	0.0063	0.0012	0.0936	0.9648	1.2825	32.60	32.60	28.10	28.10	4.80	4.80	1.88	93.40	61.81	11.81	86.61	87.56			
31.0	30-Sep-93		109	Midbay North	25.56417	-80.23500	1993.74	BB	MAIN	0.74	09	1993	1993-09	0.0066	0.0034	0.0032	0.0229	0.1700	0.0295	0.1145	0.0061	0.0014	0.0809	0.8568	1.2825	32.40	32.40	28.50	28.50	5.40	5.40	1.95	61.47	46.78	10.66	79.99	79.99			
31.0	30-Sep-93		110	Fender Point	25.50500	-80.28750	1993.74	BB	IS	0.74	09	1993	1993-09	0.0237	0.0175	0.0062	0.0344	0.3179	0.0582	0.2597	0.0055	0.0013	0.1375	0.9458	2.7650	33.50	33.50	27.80	27.80	5.50	5.50	0.68	127.93	97.76	23.41	81.55	81.60			
31.0	30-Sep-93		111	Feathered Bank	25.51583	-80.24000	1993.74	BB	MAIN	0.74	09	1993	1993-09	0.0076	0.0044	0.0034	0.0262	0.1677	0.0338	0.1338	0.0075	0.0006	0.1186	0.9517	1.5875	32.90	32.90	28.30	28.30	4.10	4.10	0.77	49.39	120.88	9.97	60.82	60.82			
31.0	30-Sep-93		112	Sands Cut	25.48833	-80.18833	1993.74	BB	MAIN	0.74	09	1993	1993-09	0.0049	0.0027	0.0022	0.0205	0.1840	0.2255	0.1585	0.0087	0.0009	0.2777	1.0086	1.5075	33.40	33.40	28.40	28.40	4.40	4.30	0.50	61.13	60.67	8.47	65.53	64.10			
31.0	01-Oct-93		113	Elliott Key	25.44167	-80.22333	1993.75	BB	MAIN	0.75	10	1993	1993-10	0.0062	0.0027	0.0035	0.0371	0.2253	0.0433	0.1820	0.0054	0.0012	0.2470	0.9721	1.8300	34.30	34.30	27.50	27.50	5.90	5.90	0.59	91.96	77.31	17.87	87.87	87.98			
31.0	01-Oct-93		114	Caesar Creek	25.51667	-80.19167	1993.75	BB	OCHAN	0.75	10	1993	1993-10	0.0024	0.0019	0.0019	0.0175	0.1310	0.1167	0.0775	0.0128	0.0022	0.1309	0.9619	1.0775	32.80	32.80	27.60	27.60	5.60	5.70	0.68	32.80	32.80	11.81	86.61	87.56			
31.0	01-Oct-93		115	Adams Key	25.40417	-80.24083	1993.75	BB	MAIN	0.75	10	1993	1993-10	0.0063	0.0030	0.0033	0.0261	0.1673	0.0325	0.1348	0.0080	0.0029	0.1495	1.0145	1.3525	32.50	32.40	27.50	27.50	5.40	5.50	1.53	61.27	25.08	11.90	79.35	80.77			
31.0	01-Oct-93		116	Rubicon Keys	25.40000	-80.25500	1993.75	BB	MAIN	0.75	10	1993	1993-10	0.0088	0.0054	0.0054	0.0253	0.1720	0.0341	0.1379	0.0053	0.0035	0.0943	0.9590	1.4050	33.00	33.00	27.40	27.40	5.10	5.10	0.44	71.21	21.62	14.10	85.00	84.08			
31.0	01-Oct-93		117	Totten Key	25.38500	-80.26500	1993.75	BB	MAIN	0.75	10	1993	1993-10	0.0115	0.0077	0.0039	0.0267	0.1918	0.0383	0.1536	0.0050	0.0025	0.1008	1.0013	1.4700	32.70	32.70	27.50	27.50	5.70	5.70	0.20	84.32	34.16	16.82	83.87	83.87			
31.0	01-Oct-93		118	Broad Creek	25.34833	-80.25500	1993.75	BB	MAIN	0.75	10	1993	1993-10	0.0048	0.0017	0.0031	0.0205	0.1658	0.2253	0.1405	0.0046	0.0006	0.1203	0.5240	1.1850	32.10	32.10	27.30	27.30	5.50	5.60	1.15	80.29	90.38	12.25	80.47	81.94			
31.0	01-Oct-93		119	Pumpkin Key	25.31833	-80.30333	1993.75	BB	SCARD	0.75	10	1993	1993-10	0.0105	0.0049	0.0056	0.0565	0.3525	0.0669	0.2856	0.0078	0.0006	0.0646	1.7049	2.8050	32.10	32.10	27.30	27.30	5.70	5.60	2.52	99.72	239.00	18.93	83.77	82.30			
31.0	01-Oct-93		120	Card Sound South	25.31417	-80.34333	1993.75	BB	SCARD	0.75	10	1993	1993-10	0.0099	0.0051	0.0037	0.0385	0.3982	0.0474	0.3518	0.0080	0.0037	0.2449	1.4377	1.1725	32.50	32.50	27.90	27.90	5.80	5.80	0.82	57.61	43.71	6.84	85.53	85.53			
31.0	01-Oct-93		121	Card Sound North	25.35500	-80.29167	1993.75	BB	SCARD	0.75	10	1993	1993-10	0.0099	0.0062	0.0036	0.0327	0.2520	0.0426	0.2094	0.0080	0.0033	0.0780	1.0722	1.9725	32.00	32.00	27.30	27.30	6.00	6.00	1.04	99.20	28.30	15.60	87.85	87.85			
31.0	01-Oct-93		122	West Arsenicker	25.42017	-80.31083	1993.75	BB	IS	0.75	10	1993	1993-10	0.0140	0.0089	0.0051	0.0391	0.3716	0.0531	0.3185	0.0047	0.0032	0.2080	0.9750	3.5925	30.20	30.20	27.40	27.40	6.40	6.50	0.40	116.97	37.02	25.30	92.60	94.17			
31.0	01-Oct-93		123	Pelican Bank	25.44500	-80.28333	1993.75	BB	MAIN	0.75	10	1993	1993-10	0.0154	0.0104	0.0050	0.0330	0.2196	0.0484	0.1712	0.0043	0.0053	0.1365	1.0130	1.6425	32.70	32.70	27.60	27.60	6.50	6.50	0.10	117.06	20.04	25.15	95.73	95.73			
31.0	30-Sep-93		124	Midbay South	25.47250	-80.23333	1993.74	BB	MAIN	0.74	09	1993	1993-09	0.0138	0.0093	0.0045	0.0353	0.1907	0.0491	0.1415	0.0046	0.0022	0.1051	1.1050	1.4700	34.40	34.40	28.30	28.30	5.00	5.00	0.77	92.33	50.14	23.80	74.88	74.88			
31.0	01-Oct-93		125	Turkey Point	25.47000	-80.28333	1993.75	BB	TP	0.75	10	1993	1993-10	0.0138	0.0094	0.0044	0.0317	0.2032	0.0455	0.1577	0.0042	0.0029	0.1430	1.0276	1.3500	34.20	34.20	27.60	27.60	6.40	6.80	0.54	107.49	34.21	24.07	94.25	100.14			
32.0	20-Oct-93		101	Convoy Point	25.47833	-80.32083	1993.80	BB	AS	0.80	10	1993	1993-10	0.0349	0.0221	0.0092	0.0392	1.2252	0.9341	0.2911	0.0173	0.0006	0.2488	0.8758	3.3235	14.70	17.90	28.30	28.30	5.80	6.50	0.94	156.97	3336.13	119.68	76.72	87.49			
32.0	20-Oct-93		102	Black Point	25.54583	-80.29467	1993.80	BB	AS	0.80	10	1993	1993-10	0.0236	0.0140	0.0298	0.0380	0.6084	0.3116	0.2968	0.0086	0.0033	0.3673	0.7429	3.6350	20.20	20.20	28.30	28.30	6.60	6.70	0.40	156.59	207.05	80.21	90.38	91.69			
32.0	20-Oct-93		103	Near Black Ledge	25.57333	-80.28667	1993.80	BB	IS	0.80	10	1993	1993-10	0.1554	0.1486	0.0068	0.0209	0.5050	0.1763	0.3287	0.0057	0.0034	0.2843	0.8086	2.5350	25.80	25.80	28.00	28.00	5.90	6.00	0.64	194.99	114.50	68.08	83.47	84.89			
32.0	20-Oct-93		104	BNP Marker C	25.60167	-80.22083	1993.80	BB	MAIN	0.80	10	1993	1993-10	0.0084	0.0063	0.00																								

SURV	DATE	TIME	STA	SITE	LATDEC	LONGDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	N/P	DIN/TP	%SAT_T	%SAT_B
35.0	26-Jan-94		101	Convoy Point	-80.47833	-80.32083	1994.07	BB	AS	0.07	01	1994	1994-01	0.0046	0.0039	0.0008	0.0083	0.7246	0.0129	0.7117	0.0105	0.0003	0.3650	0.8772	4.3050	16.90	20.60	22.60	22.50	8.00	10.50	0.64			152.22	92.00	2.71	100.71	135.24
35.0	26-Jan-94		102	Black Point	-80.54583	-80.29467	1994.07	BB	AS	0.07	01	1994	1994-01	0.0059	0.0050	0.0009	0.0077	0.2666	0.0132	0.2534	0.0057	0.0006	0.3279	0.7430	2.7800	31.10	31.00	22.00	22.00	7.80	7.80	0.20			102.94	47.25	5.11	106.92	106.85
35.0	26-Jan-94		103	Near Black Ledge	-80.57333	-80.28667	1994.07	BB	IS	0.07	01	1994	1994-01	0.0060	0.0050	0.0009	0.0087	0.1959	0.0147	0.1812	0.0060	0.0002	0.1198	0.7751	1.9200	33.10	33.00	21.00	21.00	7.30	7.30	0.45			72.68	139.67	5.44	100.72	100.72
35.0	26-Jan-94		104	BNP Marker C	-80.60167	-80.22083	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0089	0.0075	0.0013	0.0118	0.2026	0.0207	0.1819	0.0067	0.0002	0.1084	0.7254	1.5225	34.20	34.20	20.00	20.00	7.00	7.00	0.84			66.53	197.00	6.79	95.68	95.68
35.0	26-Jan-94		105	Biscayne Channel	-80.65417	-80.18667	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0060	0.0048	0.0012	0.0112	0.1799	0.0172	0.1627	0.0058	0.0001	0.1141	0.8043	1.4275	34.10	34.10	20.00	20.00	7.00	7.00	0.23			66.54	492.00	6.56	91.71	91.71
35.0	26-Jan-94		106	White Marker	-80.63417	-80.13000	1994.07	BB	OCHAN	0.07	01	1994	1994-01	0.0006	0.0000	0.0006	0.0070	0.1252	0.0076	0.1176	0.0058	0.0004	0.0428	0.9819	0.5175	35.40	35.40	23.00	23.00	6.80	6.80	0.30			47.69	43.60	2.91	97.09	94.35
35.0	26-Jan-94		107	Fowey Rocks	-80.59000	-80.10000	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0018	0.0018	0.0008	0.0081	0.1335	0.0102	0.1233	0.0053	0.0010	0.0428	0.7430	0.7475	35.40	35.40	22.00	22.00	6.60	6.60	0.59			35.70	22.46	4.23	95.35	93.91
35.0	26-Jan-94		108	Marker G-1B	-80.56917	-80.19250	1994.07	BB	OCHAN	0.07	01	1994	1994-01	0.0019	0.0012	0.0008	0.0083	0.1371	0.0103	0.1269	0.0073	0.0002	0.0912	0.7938	0.7938	35.10	35.10	21.00	21.00	6.70	6.80	0.94			41.68	97.67	3.12	93.42	91.90
35.0	26-Jan-94		109	Midbay North	-80.56417	-80.23500	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0058	0.0043	0.0015	0.0155	0.1560	0.0212	0.1348	0.0053	0.0000	0.1055	0.8364	1.1725	34.00	34.00	20.00	20.00	6.80	6.90	2.33			104.70	8.00	93.48	94.79	
35.0	26-Jan-94		110	Fender Point	-80.28750	-80.25000	1994.07	BB	IS	0.07	01	1994	1994-01	0.0074	0.0059	0.0014	0.0140	0.2884	0.0214	0.2670	0.0063	0.0001	0.4705	0.7678	0.8225	29.10	29.10	22.00	22.00	7.60	7.80	0.89			61.73	611.00	7.54	103.09	105.66
35.0	26-Jan-94		111	Fathered Bank	-80.51833	-80.24000	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0009	0.0000	0.0009	0.0111	0.1560	0.0100	0.1440	0.0050	0.0000	0.1312	0.8218	1.1350	34.50	34.50	20.50	20.50	6.80	6.70	1.09			68.57	4.58	92.47	91.90	
35.0	26-Jan-94		112	Sands Cut	-80.19833	-80.19833	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0008	0.0000	0.0008	0.0097	0.1630	0.0104	0.1526	0.0050	0.0002	0.1161	0.5094	1.0475	34.80	34.80	20.00	20.00	6.70	6.70	0.64			71.65	149.00	5.28	92.47	92.34
35.0	26-Jan-94		113	Elliott Key	-80.23333	-80.19833	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0021	0.0014	0.0007	0.0082	0.1570	0.0223	0.1723	0.0050	0.0023	0.0405	0.8405	1.4355	34.70	34.70	21.50	21.50	6.80	6.80	0.35			69.00	423.00	7.58	92.32	91.82
35.0	27-Jan-94		114	Caesar Creek	-80.38500	-80.19167	1994.07	BB	OCHAN	0.07	01	1994	1994-01	0.0018	0.0009	0.0010	0.0101	0.1318	0.0118	0.1230	0.0087	0.0003	0.1002	0.8101	0.9535	35.40	35.40	22.00	22.00	6.70	6.70	0.33			100.84	0.00	3.22	94.53	94.59
35.0	27-Jan-94		115	Adams Key	-80.40417	-80.24083	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0058	0.0045	0.0014	0.0124	0.1867	0.0183	0.1685	0.0080	0.0001	0.1002	0.7619	1.2145	34.70	34.70	21.80	21.80	6.40	6.40	0.73			60.00	592.00	6.69	89.59	89.59
35.0	27-Jan-94		116	Rubicon Keys	-80.40000	-80.25000	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0066	0.0053	0.0013	0.0124	0.1629	0.0189	0.1440	0.0046	0.0001	0.0758	0.8072	1.1720	34.70	34.70	21.00	21.00	6.30	6.40	0.69			78.90	541.00	9.17	88.43	89.83
35.0	27-Jan-94		117	Totten Key	-80.38500	-80.26500	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0044	0.0031	0.0013	0.0142	0.1735	0.0186	0.1550	0.0044	0.0006	0.1100	0.8291	1.3758	34.60	34.70	22.00	22.00	6.80	6.80	0.54			86.99	66.38	9.32	95.26	95.32
35.0	27-Jan-94		118	Broad Creek	-80.34833	-80.25000	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0051	0.0037	0.0014	0.0121	0.1722	0.0172	0.1551	0.0058	0.0009	0.1393	0.9553	1.3663	34.50	34.50	21.40	21.40	6.70	6.80	2.97			65.62	40.83	6.53	93.18	94.69
35.0	27-Jan-94		119	Pumpkin Key	-80.31833	-80.30333	1994.07	BB	SCARD	0.07	01	1994	1994-01	0.0198	0.0175	0.0023	0.0269	0.3037	0.0467	0.2571	0.0055	0.0009	0.2175	0.9531	3.0208	32.30	32.30	21.60	21.60	6.90	7.00	0.99			122.23	121.18	18.77	94.83	96.20
35.0	27-Jan-94		120	Card Sound South	-80.31417	-80.34333	1994.07	BB	SCARD	0.07	01	1994	1994-01	0.0033	0.0029	0.0023	0.0300	0.2674	0.0653	0.2021	0.0044	0.0007	0.0831	0.4729	2.6203	30.50	30.40	22.10	22.10	7.00	7.00	0.50			134.04	207.33	32.74	95.70	95.64
35.0	27-Jan-94		121	Card Sound North	-80.29167	-80.31667	1994.07	BB	SCARD	0.07	01	1994	1994-01	0.0067	0.0051	0.0016	0.0150	0.1894	0.0217	0.1676	0.0058	0.0004	0.1002	0.9517	1.9780	33.80	33.60	22.00	22.00	6.30	6.30	0.94			121.14	124.20	8.28	87.90	87.79
35.0	27-Jan-94		122	West Arsenicker	-80.42017	-80.31083	1994.07	BB	IS	0.07	01	1994	1994-01	0.0074	0.0064	0.0013	0.0250	0.3359	0.1146	0.2213	0.0061	0.0014	0.2126	0.8889	2.5480	33.70	33.70	22.00	22.00	7.00	7.00	0.54			72.48	181.83	41.43	94.44	94.38
35.0	27-Jan-94		123	Pelican Bank	-80.44500	-80.28333	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0356	0.0335	0.0021	0.0278	0.2286	0.0634	0.1652	0.0049	0.0007	0.0929	0.6773	1.9038	31.80	31.70	21.80	21.80	6.80	6.80	0.54			103.69	201.22	28.75	93.40	93.33
35.0	26-Jan-94		124	Midbay South	-80.23333	-80.23333	1994.07	BB	MAIN	0.07	01	1994	1994-01	0.0030	0.0017	0.0013	0.0153	0.1897	0.0183	0.1724	0.0046	0.0008	0.1198	0.6933	0.9575	34.30	34.40	20.30	20.30	7.10	7.10	1.09			103.69	52.40	8.88	97.12	97.18
35.0	26-Jan-94		125	Turkey Point	-80.27000	-80.28333	1994.07	BB	TP	0.07	01	1994	1994-01	0.0582	0.0553	0.0029	0.0278	0.2992	0.0861	0.2132	0.0049	0.0008	0.1283	0.7838	1.5100	29.40	29.40	20.90	20.90	7.00	7.00	0.54			135.70	245.90	39.03	93.48	93.48
36.0	16-Feb-94		101	Convoy Point	-80.47833	-80.32083	1994.13	BB	AS	0.13	02	1994	1994-02	0.0060	0.0042	0.0018	0.0164	0.4092	0.0224	0.3867	0.0064	0.0012	0.5953	1.1088	4.6127	27.40	27.40	22.60	22.60	7.20	7.30	0.28			140.85	40.06	7.72	97.08	98.43
36.0	16-Feb-94		102	Black Point	-80.54583	-80.29467	1994.13	BB	AS	0.13	02	1994	1994-02	0.0014	0.0008	0.0007	0.0086	0.4049	0.0101	0.3948	0.0078	0.0014	0.4499	0.8831	4.9031	29.20	29.60	22.10	22.10	7.10	7.10	0.40			114.53	16.00	2.85	96.43	96.50
36.0	16-Feb-94		103	Near Black Ledge	-80.57333	-80.28667	1994.13	BB	IS	0.13	02	1994	1994-02	0.0021	0.0012	0.0009	0.0111	0.2916	0.0132	0.2785	0.0062	0.0020	0.3102	0.9123	3.3670	33.20	33.20	22.50	22.50	7.10	7.10								

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN:TP	NP	DIN:TP	%SAT	%SAT_B
47.0	19-Jan-95		106	White Marker	25.63417	-80.13000	1995.05	BB	OCHAN	0.05	01	1995	1995-01	0.0094	0.0049	0.0020	0.0034	0.2114	0.2948	0.0118	0.0034	0.0004	0.0202	0.2302	2.8435	35.30	34.50	21.40	21.90	6.90	6.90	1.05	161.53	67.20	7.04	95.20	95.20	96.89	96.89	
47.0	19-Jan-95		107	Fowey Rocks	25.59000	-80.10000	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0023	0.0017	0.0006	0.0033	0.2114	0.0056	0.2056	0.0033	0.0005	0.0348	0.3088	1.4940	33.90	35.50	21.40	20.50	6.90	6.90	1.05	161.53	67.20	7.04	95.20	95.20	96.89	96.89	
47.0	19-Jan-95		108	Marker G-1B	25.56917	-80.19250	1995.05	BB	OCHAN	0.05	01	1995	1995-01	0.0022	0.0014	0.0008	0.0049	0.2438	0.0071	0.2366	0.0035	0.0003	0.0446	0.2593	2.7808	33.90	33.90	20.90	20.70	7.00	7.00	1.40	154.79	51.00	4.53	96.04	96.04	96.04	96.04	
47.0	19-Jan-95		109	Midbay North	25.56417	-80.23500	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0045	0.0033	0.0012	0.0048	0.2533	0.0132	0.2400	0.0037	0.0004	0.0390	0.2406	3.8345	32.50	32.50	20.90	20.50	6.70	6.80	1.70	150.76	75.60	7.88	91.33	91.33	92.17	92.17	
47.0	19-Jan-95		110	Fender Point	25.50500	-80.28750	1995.05	BB	IS	0.05	01	1995	1995-01	0.1495	0.1443	0.0051	0.0284	0.4992	0.1779	0.3214	0.0039	0.0008	0.1337	0.0936	4.3690	21.50	21.80	20.90	20.90	8.20	8.30	0.45	285.28	508.20	101.64	103.92	105.40	105.40		
47.0	19-Jan-95		111	Fatherbed Bank	25.51833	-80.24000	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0032	0.0021	0.0011	0.0062	0.2966	0.0094	0.2862	0.0025	0.0002	0.0613	0.0936	2.4725	21.40	32.40	20.20	20.20	7.00	7.00	1.05	247.23	134.00	8.38	94.41	94.41	94.41	94.41	
47.0	19-Jan-95		112	Sands Cut	25.48833	-80.18833	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0037	0.0023	0.0014	0.0070	0.2150	0.0108	0.2042	0.0036	0.0003	0.0571	0.2807	3.0563	34.50	34.50	20.90	20.70	6.80	6.80	1.10	136.51	77.00	6.84	93.92	93.92	93.92	93.92	
47.0	19-Jan-95		113	Elliott Key	25.61817	-80.22333	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0004	0.0004	0.0011	0.0086	0.2460	0.0170	0.2290	0.0038	0.0006	0.0600	0.2508	2.4393	33.90	33.90	20.90	20.90	7.00	7.00	1.05	144.94	60.75	9.92	93.86	93.86	93.86	93.86	
47.0	19-Jan-95		114	Casars Creek	25.38500	-80.19167	1995.05	BB	OCHAN	0.05	01	1995	1995-01	0.0043	0.0033	0.0011	0.0074	0.2153	0.0117	0.2035	0.0037	0.0004	0.0447	0.2927	2.7615	35.10	35.10	20.90	21.10	6.70	6.70	2.70	128.13	67.00	6.98	92.17	92.17	92.17	92.17	
47.0	18-Jan-95		115	Adams Key	25.40417	-80.24083	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0065	0.0051	0.0014	0.0087	0.2501	0.0153	0.2349	0.0036	0.0005	0.0460	0.1858	2.4695	33.50	33.50	20.40	20.40	6.80	6.80	2.90	155.36	62.29	9.48	92.65	92.65	92.65	92.65	
47.0	18-Jan-95		116	Rubicon Keys	25.40000	-80.25500	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0071	0.0058	0.0013	0.0083	0.2691	0.0154	0.2537	0.0039	0.0007	0.0447	0.2192	2.9253	32.50	32.50	19.90	19.90	6.70	6.60	3.50	153.78	49.00	8.82	90.03	88.69	88.69	88.69	
47.0	18-Jan-95		117	Totten Key	25.38500	-80.26500	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0177	0.0161	0.0016	0.0129	0.2906	0.0306	0.2600	0.0043	0.0010	0.0656	0.1551	3.5850	29.90	29.90	19.90	19.90	7.00	7.00	1.35	148.27	67.31	15.63	92.08	92.26	92.26	92.26	
47.0	18-Jan-95		118	Broad Creek	25.34833	-80.25500	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0055	0.0043	0.0012	0.0085	0.2197	0.0140	0.2057	0.0042	0.0004	0.0419	0.1537	3.1773	33.90	33.90	20.60	20.60	6.90	6.90	2.50	116.25	79.90	7.39	94.53	94.53	94.53	94.53	
47.0	18-Jan-95		119	Pumpkin Key	25.38333	-80.30333	1995.05	BB	SCARD	0.05	01	1995	1995-01	0.0033	0.0028	0.0013	0.0069	0.2740	0.0133	0.2499	0.0048	0.0008	0.0448	0.2291	2.8433	32.70	32.70	20.90	20.90	7.00	7.00	1.40	148.98	62.30	9.41	94.88	94.88	94.88	94.88	
47.0	18-Jan-95		120	Card Sound South	25.31417	-80.34333	1995.05	BB	SCARD	0.05	01	1995	1995-01	0.0411	0.0368	0.0043	0.0338	0.4110	0.0749	0.3360	0.0044	0.0011	0.0572	0.3208	4.5330	25.30	25.60	20.50	20.50	7.20	7.40	1.10	206.00	152.93	37.56	93.04	95.81	95.81	95.81	
47.0	18-Jan-95		121	Card Sound North	25.35500	-80.29167	1995.05	BB	SCARD	0.05	01	1995	1995-01	0.0172	0.0154	0.0018	0.0138	0.2963	0.0310	0.2653	0.0034	0.0004	0.0530	0.1871	3.4938	29.90	29.90	20.90	19.90	6.70	6.90	3.30	192.42	177.20	20.14	88.48	91.12	91.12	91.12	
47.0	18-Jan-95		122	West Arsenicker	25.42017	-80.31083	1995.05	BB	IS	0.05	01	1995	1995-01	0.1449	0.1408	0.0041	0.0187	0.3933	0.1636	0.2297	0.0036	0.0009	0.1172	0.1671	4.0858	23.60	25.20	19.60	19.60	7.50	7.60	0.55	244.28	424.91	101.61	94.54	96.83	96.83	96.83	
47.0	18-Jan-95		123	Pelican Bank	25.44500	-80.28333	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0404	0.0381	0.0022	0.0169	0.2911	0.0573	0.2338	0.0027	0.0004	0.0474	0.1390	3.3178	28.20	28.20	19.60	19.60	7.10	7.10	1.00	231.60	327.40	46.77	92.29	92.29	92.29	92.29	
47.0	18-Jan-95		124	Midbay South	25.47250	-80.23333	1995.05	BB	MAIN	0.05	01	1995	1995-01	0.0099	0.0084	0.0014	0.0222	0.2819	0.0321	0.2298	0.0022	0.0006	0.0891	0.1123	3.4388	31.60	31.60	20.30	20.30	7.00	7.00	0.55	267.25	114.63	32.75	94.04	94.04	94.04	94.04	
47.0	18-Jan-95		125	Turkey Point	25.47000	-80.28333	1995.05	BB	TP	0.05	01	1995	1995-01	0.0099	0.0082	0.0039	0.0211	0.3805	0.1102	0.2706	0.0027	0.0005	0.1559	0.1577	3.8215	28.90	28.60	20.10	20.10	7.40	7.00	0.40	310.57	524.83	89.87	96.98	92.05	92.05	92.05	
48.0	16-Feb-95		101	Convoy Point	25.47833	-80.32083	1995.12	BB	AS	0.12	02	1995	1995-02	0.0584	0.0545	0.0039	0.0128	0.3960	0.0713	0.3247	0.0067	0.0003	0.1973	0.1753	3.7238	24.00	24.00	24.60	24.60	8.10	8.20	0.64	130.04	509.00	23.40	109.45	110.80	110.80	110.80	
48.0	16-Feb-95		102	Black Point	25.54583	-80.29467	1995.12	BB	AS	0.12	02	1995	1995-02	0.0912	0.0855	0.0057	0.0165	0.5327	0.1077	0.4250	0.0068	0.0002	0.2625	0.3575	6.3200	19.10	20.60	24.60	24.60	7.60	8.50	0.60	172.95	1025.67	34.97	99.50	111.97	111.97	111.97	
48.0	16-Feb-95		103	Near Black Ledge	25.57333	-80.28667	1995.12	BB	IS	0.12	02	1995	1995-02	0.0401	0.0371	0.0031	0.0138	0.3924	0.0540	0.3384	0.0043	0.0000	0.2691	0.1741	4.7328	24.50	24.50	24.60	24.60	8.30	8.40	0.86	200.21	27.54	111.73	113.21	113.21	113.21		
48.0	16-Feb-95		104	BNP Marker C	25.60167	-80.22083	1995.12	BB	MAIN	0.12	02	1995	1995-02	0.0057	0.0045	0.0013	0.0143	0.2779	0.0200	0.2579	0.0047	0.0003	0.0443	0.2612	2.8000	32.40	32.40	21.60	21.60	6.90	6.90	1.50	132.35	143.25	9.55	94.79	94.89	94.89	94.89	
48.0	16-Feb-95		105	Biscayne Channel	25.65417	-80.18667	1995.12	BB	MAIN	0.12	02	1995	1995-02	0.0018	0.0018	0.0013	0.0143	0.2318	0.0329	0.2148	0.0045	0.0009	0.0428	0.2228	2.4643	33.90	33.90	22.20	22.20	6.80	6.80	0.68	166.00	101.99	95.19	95.19	95.19	95.19		
48.0	16-Feb-95		106	White Marker	25.63417	-80.13000	1995.12	BB	OCHAN	0.12	02	1995	1995-02	0.0010	0.0008	0.0010	0.0086	0.2102	0.0102	0.2065	0.0041	0.0005	0.0454	0.2010	2.8661	34.80	34.80	22.20	22.20	7.00	7.10	1.20	158.95	48.33	5.4	101.38	100.24	100.24	100.24	
48.0	16-Feb-95		107	Fowey Rocks	25.59000	-80.10000	1995.12	BB	MAIN	0.12	02	1995	1995-02	0.0020	0.0011	0.0009	0.0123	0.2143	0.0143	0.2000	0.0033	0.0005	0.0239	0.2704	2.8013	35.60	35.70	22.50	22.40	7.00	7.00	1.00	148.85	58.29	9.71	96.38	99.49	99.49	99.49	

SURV	DATE	TIME	STA	SITE	LATDEC	LONGDEC	YEAR	BAY	ZSI	MO	ON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN_TP	N_P	DIN_TP	%SAL_T	%SAL_B						
51.0	18-May-95	03	109	Marker G-1B	25.56917	-80.19250	1995.37	BB	OCHAN	0.37	05	1995	1995-05	0.0029	0.0010	0.0072	0.1582	0.0011	0.1591	0.0077	0.0003	0.0597	0.1360	3.3650	35.40	36.30	30.20	30.90	6.50	6.40	0.80	45.66	58.75	2.33	100.00	95.87	95.87									
51.0	18-May-95	03	109	Marker North	25.56417	-80.23500	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0040	0.0029	0.0100	0.0072	0.1703	0.0112	0.1591	0.0058	0.0000	0.0721	0.1935	2.3125	36.30	36.30	30.20	30.90	6.30	6.20	0.80	46.90	58.67	2.27	100.00	95.87									
51.0	18-May-95	10	110	Fender Point	25.50500	-80.28750	1995.37	BB	IS	0.37	05	1995	1995-05	0.0025	0.0012	0.0013	0.0086	0.4056	0.0111	0.3945	0.0082	0.0003	0.0726	0.1965	5.4050	31.70	31.70	30.20	30.70	7.80	7.70	0.12	109.32	79.00	2.98	116.86	115.44									
51.0	18-May-95	11	111	Featherbed Bank	25.51583	-80.24000	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0039	0.0027	0.0012	0.0110	0.2259	0.0149	0.2110	0.0056	0.0000	0.1710	0.1511	2.6675	36.10	36.10	30.20	30.20	5.90	5.80	0.45	109.65	5.90	90.60	89.07										
51.0	18-May-95	12	112	Sands Cut	25.48833	-80.18833	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0028	0.0020	0.0008	0.0061	0.1839	0.0089	0.1750	0.0057	0.0000	0.1442	0.2086	2.2300	36.30	36.30	30.30	30.40	5.40	5.20	0.45	117.02	3.45	83.08	80.06										
51.0	17-May-95	13	113	Elliott Key	25.44167	-80.22333	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0067	0.0057	0.0009	0.0183	0.2579	0.0250	0.2330	0.0065	0.0002	0.2378	0.1511	2.7300	36.20	36.20	30.30	30.30	5.70	5.70	0.65	87.74	357.00	8.50	87.65	87.65									
51.0	17-May-95	14	114	Caesar Creek	25.38500	-80.19167	1995.37	BB	OCHAN	0.37	05	1995	1995-05	0.0012	0.0006	0.0006	0.0078	0.2867	0.0090	0.2777	0.0072	0.0002	0.0655	0.1466	2.3325	35.90	35.90	29.10	29.10	6.60	6.60	0.35	98.09	85.67	2.76	100.42	100.42									
51.0	17-May-95	15	115	Adams Key	25.40417	-80.24083	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0016	0.0011	0.0011	0.0092	0.0056	0.0040	0.0274	0.0056	0.0000	0.1469	0.3325	2.2925	36.20	36.20	30.20	30.70	5.70	5.70	0.80	110.71	623.00	8.65	78.53	78.53									
51.0	17-May-95	16	116	Rubicon Keys	25.40000	-80.25500	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0068	0.0056	0.0012	0.0126	0.2872	0.0194	0.2678	0.0055	0.0000	0.1051	0.1663	2.2575	36.30	36.20	30.60	30.70	5.40	5.60	0.50	126.56	7.80	83.25	86.34										
51.0	17-May-95	17	117	Totten Key	25.38500	-80.28500	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0149	0.0137	0.0012	0.0139	0.3611	0.0288	0.3322	0.0057	0.0000	0.1573	0.1904	3.2350	34.30	34.20	30.20	30.30	5.60	5.60	0.55	141.32	11.29	85.04	85.04										
51.0	17-May-95	18	118	Broad Creek	25.34833	-80.25500	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0087	0.0075	0.0013	0.0067	0.2965	0.0154	0.2811	0.0063	0.0001	0.0955	0.1738	2.5900	35.50	35.50	30.30	30.30	4.90	4.90	0.45	104.58	439.00	5.42	75.02	75.02									
51.0	17-May-95	19	119	Pumpkin Key	25.31833	-80.30333	1995.37	BB	SCARD	0.37	05	1995	1995-05	0.0187	0.0161	0.0026	0.0228	0.4037	0.0415	0.3622	0.0078	0.0002	0.1592	0.2033	4.5225	31.60	31.00	30.50	30.40	6.10	5.60	0.65	114.20	395.31	11.74	91.27	84.64									
51.0	17-May-95	20	120	Card Sound South	25.31417	-80.34333	1995.37	BB	SCARD	0.37	05	1995	1995-05	0.0217	0.0182	0.0035	0.0260	0.4599	0.0477	0.4062	0.0081	0.0005	0.1741	0.2494	4.9750	30.60	33.20	30.50	30.70	6.20	5.90	0.55	124.05	194.71	12.98	92.38	87.59									
51.0	17-May-95	21	121	Card Sound North	25.31417	-80.34333	1995.37	BB	OCHAN	0.37	05	1995	1995-05	0.0014	0.0014	0.0025	0.0140	0.0056	0.0040	0.0254	0.0056	0.0000	0.1469	0.3325	2.4450	35.10	35.10	30.20	30.20	5.70	5.70	0.80	110.71	623.00	8.65	78.53	78.53									
51.0	17-May-95	22	122	West Arsenicker	25.42017	-80.31083	1995.37	BB	IS	0.37	05	1995	1995-05	0.0099	0.0066	0.0012	0.0143	0.3072	0.0242	0.2830	0.0084	0.0001	0.2247	0.2192	3.7550	34.80	34.90	30.20	30.70	5.60	5.40	0.30	91.27	690.00	6.39	85.59	82.59									
51.0	17-May-95	23	123	Pelican Bank	25.44500	-80.28333	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0183	0.0163	0.0026	0.0226	0.3311	0.0409	0.2920	0.0081	0.0000	0.1161	0.1436	3.2425	35.50	35.60	30.30	30.30	5.20	5.20	0.30	80.29	11.12	79.61	79.61										
51.0	18-May-95	24	124	Midbay South	25.47250	-80.23333	1995.37	BB	MAIN	0.37	05	1995	1995-05	0.0014	0.0009	0.0005	0.0127	0.2234	0.0141	0.2093	0.0053	0.0002	0.2101	0.1315	2.7000	36.10	36.10	30.20	30.30	5.90	6.00	0.30	93.86	201.00	5.91	90.66	92.20									
51.0	18-May-95	25	125	Turkey Point	25.47000	-80.28333	1995.37	BB	TP	0.37	05	1995	1995-05	0.0196	0.0174	0.0022	0.0181	0.2627	0.0376	0.2251	0.0052	0.0002	0.1422	0.1466	2.7150	35.40	35.40	30.40	30.40	5.20	5.20	0.20	112.04	537.50	16.04	79.61	79.61									
52.0	15-Jun-95	01	101	Convoy Point	25.47833	-80.32083	1995.45	BB	AS	0.45	06	1995	1995-06	0.0354	0.0320	0.0034	0.0148	0.3793	0.0502	0.3292	0.0052	0.0001	0.3328	0.2785	3.2003	30.60	30.90	29.70	29.70	7.90	8.00	0.80	161.76	1438.00	21.39	116.80	118.29									
52.0	15-Jun-95	02	102	Black Point	25.54583	-80.29467	1995.45	BB	AS	0.45	06	1995	1995-06	0.0325	0.0298	0.0042	0.0088	0.4298	0.0401	0.3844	0.0052	0.0001	0.3508	0.2785	3.2003	25.40	25.12	29.20	29.20	8.30	8.50	0.80	110.71	623.00	12.99	135.24	135.07									
52.0	15-Jun-95	03	103	Near Black Ledge	25.57333	-80.28667	1995.45	BB	IS	0.45	06	1995	1995-06	0.0343	0.0314	0.0029	0.0196	0.3586	0.0539	0.3047	0.0049	0.0002	0.1483	0.1658	2.6403	31.30	31.30	29.80	29.80	6.40	6.50	0.70	162.63	769.50	24.43	94.53	96.01									
52.0	15-Jun-95	04	104	BNP Marker C	25.60167	-80.22083	1995.45	BB	MAIN	0.45	06	1995	1995-06	0.0077	0.0065	0.0015	0.0138	0.1773	0.0216	0.1558	0.0069	0.0006	0.0610	0.2306	1.6185	34.50	32.20	28.00	28.00	6.70	6.80	1.85	56.93	77.00	6.92	100.00	100.85									
52.0	15-Jun-95	05	105	Biscayne Channel	25.65417	-80.18667	1995.45	BB	MAIN	0.45	06	1995	1995-06	0.0106	0.0090	0.0016	0.0095	0.2077	0.0201	0.1876	0.0067	0.0007	0.0577	0.3032	3.4298	34.70	34.70	28.60	28.60	6.50	6.50	1.85	69.01	63.78	6.67	97.77	97.77									
52.0	15-Jun-95	06	106	White Marker	25.63417	-80.13000	1995.45	BB	OCHAN	0.45	06	1995	1995-06	0.0073	0.0060	0.0013	0.0061	0.1804	0.0134	0.1671	0.0071	0.0002	0.0412	0.3731	1.8490	35.00	35.50	29.00	29.00	6.80	6.90	0.95	56.04	127.33	4.15	102.80	104.39									
52.0	15-Jun-95	07	107	Fowey Rocks	25.59000	-80.10000	1995.45	BB	MAIN	0.45	06	1995	1995-06	0.0029	0.0028	0.0002	0.0055	0.1180	0.0084	0.1096	0.0063	0.0005	0.3632	0.2487	1.0903	35.90	35.80	28.50	28.50	7.10	7.10	0.45	41.64	40.00	2.96	107.45	107.45									
52.0	15-Jun-95	08	108	Marker G-1B	25.56917	-80.19250	1995.37	BB	OCHAN	0.37	05	1995	1995-05	0.0029	0.0010	0.0072	0.1582	0.0011	0.1591	0.0077	0.0003	0.0597	0.1360	3.3650	35.40	36.30	30.20	30.90	6.50	6.40	0.80	45.66	58.75	2.33	100.00											

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH4)	SAL S	SAL B	TEMP S	TEMP B	DO S	DO B	TURB	Kd	pH	TN-T	NTP-R	1469	%SAT	%SAT B
55.0	15-Sep-95		111	Fender Point	-26.50500	-80.87500	1995.70	BB	IS	0.70	09	1995	1995-09	0.0221	0.0261	0.0167	0.0198	0.0074	0.0626	0.3336	0.0074	0.0005	0.1278	0.4165	4.7635	15.40	29.00	29.00	30.00	8.562	6.20	1.10	305.27	127.96	146.69	1.10	82.41	125.03		
55.0	15-Sep-95		111	Fatherhead Bank	-26.51583	-80.24000	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0227	0.0211	0.0181	0.0176	0.4383	0.0406	0.3342	0.0036	0.0006	0.0678	0.2357	2.8085	30.20	31.00	29.00	29.00	6.663	6.20	1.10	264.63	144.63	144.63	1.10	82.41	117.79		
55.0	15-Sep-95		112	Sands Cut	-26.48833	-80.18833	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0041	0.0033	0.0008	0.0114	0.3832	0.0155	0.3677	0.0044	0.0004	0.0743	0.2620	3.5950	33.60	34.20	29.00	29.00	5.90	5.50	1.05	192.06	88.60	7.77	88.55	82.98			
55.0	14-Sep-95		113	Elliott Key	-26.44167	-80.22333	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0186	0.0174	0.0012	0.0286	0.4592	0.0472	0.4120	0.0047	0.0002	0.0926	0.0013	2.9393	24.21	30.00	29.00	29.00	6.50	6.90	1.30	210.16	67.50	22.11	95.78	101.82			
55.0	14-Sep-95		114	Casars Creek	-26.38500	-80.19167	1995.70	BB	OCHAN	0.70	09	1995	1995-09	0.0018	0.0011	0.0006	0.0056	0.2881	0.0074	0.2808	0.0047	0.0005	0.0617	0.2058	2.0923	35.00	35.00	29.00	29.00	6.30	6.20	1.35	137.21	35.00	3.50	95.67	94.15			
55.0	14-Sep-95		115	Adams Key	-26.40417	-80.24083	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0139	0.0128	0.0011	0.0091	0.3566	0.0230	0.3336	0.0043	0.0005	0.0730	0.0622	2.6733	31.50	31.50	29.00	29.00	6.10	6.10	1.30	181.95	93.86	11.73	90.63	90.63			
55.0	14-Sep-95		116	Rubicon Keys	-26.40000	-80.25000	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0159	0.0146	0.0010	0.0092	0.3752	0.0248	0.3050	0.0047	0.0005	0.0928	0.2297	3.1483	30.40	30.60	29.00	29.00	6.10	6.30	0.50	178.98	118.00	11.80	90.10	92.93			
55.0	14-Sep-95		117	Totten Key	-26.38500	-80.22083	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0143	0.0130	0.0013	0.0084	0.3737	0.0226	0.3510	0.0051	0.0012	0.1347	0.2285	6.1193	33.60	33.50	29.00	29.00	6.50	6.80	0.90	161.75	84.60	9.40	94.51	94.59			
55.0	14-Sep-95		118	Broad Creek	-26.34833	-80.25000	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0107	0.0097	0.0010	0.0064	0.3042	0.0171	0.2871	0.0045	0.0006	0.0622	0.1278	3.4688	30.40	30.40	29.00	29.00	6.10	6.00	0.75	149.84	61.13	8.43	89.80	88.33			
55.0	14-Sep-95		119	Pumpkin Key	-26.31833	-80.30333	1995.70	BB	SCARD	0.70	09	1995	1995-09	0.0174	0.0158	0.0016	0.0209	0.4373	0.0383	0.3990	0.0055	0.0009	0.0898	0.1436	4.2388	25.20	25.40	29.00	29.00	6.00	6.80	0.50	175.99	99.45	15.41	97.35	93.24			
55.0	14-Sep-95		120	Card Sound South	-26.31417	-80.34333	1995.70	BB	SCARD	0.70	09	1995	1995-09	0.0189	0.0159	0.0031	0.0189	0.5016	0.0378	0.4638	0.0050	0.0008	0.2175	0.2381	5.4650	21.50	23.80	29.00	29.00	6.00	6.80	1.00	123.92	108.10	16.89	92.11	96.20			
55.0	14-Sep-95		121	Card Sound North	-26.35500	-80.29167	1995.70	BB	SCARD	0.70	09	1995	1995-09	0.0088	0.0078	0.0010	0.0101	0.3989	0.0189	0.3860	0.0047	0.0005	0.1234	0.2357	5.8818	29.70	29.70	29.00	29.00	6.50	6.50	0.85	189.95	89.83	8.98	95.63	95.63			
55.0	14-Sep-95		122	West Arsencker	-26.42017	-80.31083	1995.70	BB	IS	0.70	09	1995	1995-09	0.0155	0.0140	0.0010	0.0078	0.4339	0.0233	0.4105	0.0048	0.0018	0.2091	0.1735	4.4700	24.70	24.80	29.00	29.00	6.80	7.00	0.75	199.95	29.00	10.76	96.52	99.29			
55.0	14-Sep-95		123	Pelican Bank	-26.44500	-80.28750	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0118	0.0107	0.0011	0.0130	0.4700	0.0283	0.4518	0.0049	0.0012	0.0927	0.0549	6.1343	24.20	24.20	29.00	29.00	6.50	6.80	1.00	164.26	84.50	10.42	91.54	91.54			
55.0	15-Sep-95		124	Midbay South	-26.47250	-80.23333	1995.70	BB	MAIN	0.70	09	1995	1995-09	0.0092	0.0083	0.0010	0.0273	0.3975	0.0365	0.3610	0.0039	0.0011	0.1024	0.2321	4.1955	29.70	29.70	29.00	29.00	6.20	6.20	1.20	227.16	74.57	20.88	90.77	90.77			
55.0	15-Sep-95		125	Turkey Point	-26.47000	-80.28333	1995.70	BB	TP	0.70	09	1995	1995-09	0.0550	0.0525	0.0026	0.0090	0.3975	0.0365	0.4120	0.0044	0.0013	0.0999	0.1962	5.0188	24.60	24.60	29.00	29.00	6.30	6.10	1.20	218.64	107.65	32.11	89.44	86.60			
56.0	11-Oct-95		101	Convoy Point	-26.47833	-80.32083	1995.77	BB	AS	0.77	10	1995	1995-10	0.0101	0.0079	0.0022	0.0083	0.5498	0.0184	0.5314	0.0059	0.0005	0.2525	0.1962	3.6325	24.40	24.40	28.30	28.30	6.70	6.70	0.75	206.69	75.00	6.91	94.21	94.21			
56.0	11-Oct-95		102	Black Point	-26.54583	-80.29467	1995.77	BB	AS	0.77	10	1995	1995-10	0.2653	0.2527	0.0126	0.0216	0.8992	0.2869	0.6123	0.0063	0.0005	0.8301	0.1603	5.1248	16.00	17.50	28.30	28.30	6.80	7.20	0.55	317.18	117.00	101.20	91.20	96.93			
56.0	11-Oct-95		103	Near Black Ledge	-26.57333	-80.28667	1995.77	BB	IS	0.77	10	1995	1995-10	0.0890	0.0762	0.0038	0.0148	0.5500	0.0947	0.4553	0.0050	0.0002	0.3063	0.2094	3.2270	23.00	23.10	28.40	28.40	6.20	6.30	0.65	245.54	135.50	42.30	86.49	87.86			
56.0	11-Oct-95		104	BNP Marker C	-26.60167	-80.22083	1995.77	BB	MAIN	0.77	10	1995	1995-10	0.0035	0.0027	0.0009	0.0087	0.3336	0.0123	0.3213	0.0050	0.0002	0.0652	0.2165	2.0493	33.60	33.50	28.40	28.40	5.50	5.80	1.25	126.59	201.50	10.61	81.35	79.92			
56.0	11-Oct-95		105	Biscayne Channel	-26.65417	-80.18667	1995.77	BB	MAIN	0.77	10	1995	1995-10	0.0149	0.0126	0.0023	0.0133	0.3367	0.0282	0.3085	0.0059	0.0003	0.0632	0.3804	3.8190	32.30	32.40	28.40	28.40	5.50	5.40	1.25	126.59	201.50	10.61	81.35	79.92			
56.0	11-Oct-95		106	White Marker	-26.63417	-80.13000	1995.77	BB	OCHAN	0.77	10	1995	1995-10	0.0004	0.0001	0.0002	0.0031	0.2493	0.0035	0.2459	0.0060	0.0002	0.0652	0.3122	2.4910	32.80	35.80	28.40	28.40	5.80	5.80	0.80	92.52	49.50	1.29	87.92	87.92			
56.0	11-Oct-95		107	Fowey Rocks	-26.59000	-80.10000	1995.77	BB	MAIN	0.77	10	1995	1995-10	0.0006	0.0004	0.0002	0.0021	0.1844	0.0026	0.1817	0.0030	0.0003	0.0395	0.2823	1.4500	36.10	36.10	28.40	28.40	5.90	6.00	1.10	135.07	18.75	1.92	89.74	91.26			
56.0	11-Oct-95		108	Marker G-1B	-26.56917	-80.19250	1995.77	BB	OCHAN	0.77	10	1995	1995-10	0.0002	0.0000	0.0002	0.0021	0.2222	0.0023	0.2199	0.0050	0.0009	0.0672	0.2225	2.6685	35.30	35.30	28.50	28.50	5.40	5.40	0.55	99.20	5.91	1.02	81.46	81.46			
56.0	11-Oct-95		109	Midbay North	-26.56417	-80.23500	1995.77	BB	MAIN	0.77	10	1995	1995-10	0.0044	0.0035	0.0009	0.0055	0.3176	0.0100	0.3076	0.0028	0.0001	0.1909	0.1643	2.9965	31.70	31.80	28.50	28.50	6.10	6.10	0.90	252.04	285.00	7.92	90.03	89.98			
56.0	11-Oct-95		110	Fender Point	-26.50500	-80.28750	1995.77	BB	IS	0.77	10	1995	1995-10	0.0118	0.0107	0.0011	0.0130	0.4700	0.0283	0.4518	0.0049	0.0012	0.0927	0.0549	6.1343	24.20	24.20	29.00	29.00	6.50	6.80	1.00	164.26	84.50	10.42	91.54	91.54			
56.0	11-Oct-95		111	Fatherhead Bank	-26.51583	-80.24000	1995.77	BB	MAIN	0.77	10	1995	1995-10	0.0107	0.0095	0.0012	0.0099	0.3474	0.0208	0.3269	0.0035	0.0002	0.1024	0.1962	4.0038	29.70	30.00	28.30	28.30	5.70	5.70	0.75	220.63	294.00	13.07	92.97	83.03			
56.0	11-Oct-95		112	Sands Cut	-26.48833	-80.18833	1995.77	BB	MAIN	0.77	10	1995	1995-10	0.0022	0.0019	0.0003	0.0067	0.2628	0.0089	0.2539	0.0041	0.0002	0.1818	0.1634	3.4443	33.70	33.70	28.30	28.30	5.40	5.30	0.65	141.66	84.67	4.79	80.61	79.02			
56.0	11-Oct-95		113	Elliott Key	-26.44167	-80.22333	1995.77	BB	MAIN	0.77	10	1995	1																											

SURV	DATE	TIME	STA	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	SiOH4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	N:P	DIN:TP	%SAT_S	%SAT_B
59.0	26-Jan-96		110 Sands Cut	-25.48833	-80.18833	1996.07	BB	MAIN	0.07	01	1996	1996-01	0.0005	0.0000	0.0005	0.0039	0.1962	0.0043	0.1338	0.0862	0.0002	0.0536	0.1515	3.1630		34.50	35.10	21.60	21.60	6.70	6.80	0.75	58.93	41.33	1.85	30.79	95.19	95.19
59.0	26-Jan-96		113 Elliott Key	-25.44167	-80.22333	1996.07	BB	MAIN	0.07	01	1996	1996-01	0.0027	0.0019	0.0007	0.0076	0.1897	0.1013	0.1594	0.0050	0.0007	0.0536	0.1040	3.1318		34.50	35.10	21.60	21.60	7.00	7.00	0.75	58.93	41.33	1.85	30.79	95.19	95.19
59.0	26-Jan-96		114 Caesar Creek	-25.38500	-80.19167	1996.07	BB	OCHAN	0.07	01	1996	1996-01	0.0001	0.0000	0.0007	0.0039	0.1469	0.0046	0.1423	0.0085	0.0007	0.0666	0.1304	2.8488		35.30	35.30	21.90	21.90	7.10	6.80	25.80	38.16	14.56	1.19	99.66	95.45	95.45
59.0	26-Jan-96		115 Adams Key	-25.40417	-80.24083	1996.07	BB	MAIN	0.07	01	1996	1996-01	0.0047	0.0031	0.0010	0.0081	0.1841	0.0122	0.1723	0.0053	0.0006	0.3783	0.1304	3.2226		34.10	34.10	21.90	21.90	7.30	7.30	1.70	37.36	43.50	5.12	101.92	101.92	101.92
59.0	26-Jan-96		116 Rubicon Keys	-25.40000	-80.25500	1996.07	BB	MAIN	0.07	01	1996	1996-01	0.0040	0.0030	0.0010	0.0060	0.1799	0.0099	0.1700	0.0051	0.0002	0.0499	0.1155	3.1423		34.00	34.00	21.90	21.90	6.80	6.80	2.30	37.89	94.67	4.30	94.88	94.88	94.88
59.0	26-Jan-96		117 Totten Key	-25.39500	-80.26500	1996.07	BB	MAIN	0.07	01	1996	1996-01	0.0032	0.0025	0.0006	0.0034	0.2360	0.0066	0.2294	0.0045	0.0002	0.0590	0.1332	3.1528		32.20	32.20	21.90	21.90	6.90	6.90	1.65	116.24	62.67	3.24	95.14	95.14	95.14
59.0	26-Jan-96		118 Broad Creek	-25.34833	-80.25500	1996.07	BB	MAIN	0.07	01	1996	1996-01	0.0015	0.0009	0.0006	0.0031	0.2267	0.0046	0.2221	0.0064	0.0000	0.0562	0.0876	3.0223		34.50	34.50	22.00	22.00	7.00	7.00	5.40	78.98	1.59	98.12	98.29	98.29	98.29
59.0	26-Jan-96		119 Pumpkin Key	-25.31833	-80.30333	1996.07	BB	SCARD	0.07	01	1996	1996-01	0.0019	0.0013	0.0000	0.0040	0.2720	0.0043	0.2476	0.0047	0.0005	0.0980	0.1316	3.8035		30.50	30.50	22.00	22.00	7.10	7.10	2.45	115.97	69.00	10.37	95.07	102.27	102.27
59.0	26-Jan-96		120 Card Sound South	-25.31417	-80.34333	1996.07	BB	SCARD	0.07	01	1996	1996-01	0.0076	0.0063	0.0014	0.0078	0.2638	0.0155	0.2281	0.0047	0.0005	0.0976	0.0631	3.7230		30.20	30.10	23.00	23.00	7.10	7.10	2.45	133.56	73.67	7.25	97.13	97.13	97.13
59.0	26-Jan-96		121 Card Sound North	-25.35500	-80.29167	1996.07	BB	SCARD	0.07	01	1996	1996-01	0.0017	0.0009	0.0007	0.0045	0.1794	0.0062	0.1732	0.0047	0.0000	0.0721	0.1658	3.2408		32.60	32.60	22.20	22.20	7.20	7.20	0.95	84.03	2.90	99.93	99.93	99.93	
59.0	26-Jan-96		122 West Arsenicker	-25.42017	-80.31083	1996.07	BB	IS	0.07	01	1996	1996-01	0.0043	0.0034	0.0009	0.0051	0.2125	0.0095	0.2030	0.0053	0.0001	0.1765	0.1427	3.3435		31.20	31.20	22.50	22.50	7.20	7.20	1.45	89.27	270.00	3.97	99.40	99.40	99.40
59.0	26-Jan-96		123 Pelican Bank	-25.44500	-80.28333	1996.07	BB	MAIN	0.07	01	1996	1996-01	0.0295	0.0275	0.0020	0.0105	0.2325	0.0400	0.1926	0.0050	0.0005	0.1311	0.1597	3.3453		29.40	29.40	22.30	22.30	7.20	7.20	2.65	103.81	190.33	17.84	97.98	97.98	97.98
59.0	26-Jan-96		124 Midbay South	-25.47250	-80.23333	1996.07	BB	MAIN	0.07	01	1996	1996-01	0.0024	0.0015	0.0009	0.0086	0.1655	0.0111	0.1545	0.0051	0.0000	0.0617	0.1454	3.0175		34.00	34.00	21.50	21.50	7.00	6.90	1.45	106.81	4.79	97.16	95.77	95.77	95.77
59.0	26-Jan-96		125 Turkey Point	-25.47000	-80.28333	1996.07	BB	TP	0.07	01	1996	1996-01	0.0124	0.0106	0.0018	0.0077	0.2107	0.0201	0.1906	0.0040	0.0002	0.2035	0.1067	3.1363		30.10	30.10	21.90	21.90	6.80	6.90	2.50	118.02	287.00	11.25	92.48	93.84	93.84
60.0	21-Feb-96		101 Convoy Point	-25.47833	-80.32083	1996.14	BB	AS	0.14	02	1996	1996-02	0.0052	0.0043	0.0009	0.0073	0.2683	0.0125	0.2558	0.0050	0.0009	0.2641	0.3057	4.5060		29.40	29.40	21.30	21.30	8.50	8.80	0.65	119.79	29.75	5.58	114.14	114.14	114.14
60.0	21-Feb-96		102 Black Point	-25.54583	-80.29467	1996.14	BB	AS	0.14	02	1996	1996-02	0.0028	0.0020	0.0008	0.0046	0.3181	0.0074	0.3107	0.0067	0.0007	0.3982	0.2256	4.7635		26.60	27.50	20.80	20.80	9.00	9.80	0.40	105.67	23.44	2.45	117.81	128.12	128.12
60.0	21-Feb-96		103 Near Black Ledge	-25.57333	-80.28667	1996.14	BB	IS	0.14	02	1996	1996-02	0.0037	0.0026	0.0012	0.0083	0.2789	0.0120	0.2639	0.0051	0.0009	0.1887	0.1576	3.6148		30.30	30.60	20.20	20.20	8.20	8.40	0.50	119.42	31.18	5.20	109.06	111.29	111.29
60.0	21-Feb-96		104 BNP Marker C	-25.60167	-80.22083	1996.14	BB	MAIN	0.14	02	1996	1996-02	0.0021	0.0009	0.0012	0.0086	0.1557	0.0107	0.1449	0.0063	0.0005	0.1256	0.2235	2.9888		35.10	35.10	18.60	18.60	7.20	7.40	1.90	54.91	51.17	3.79	96.53	99.21	99.21
60.0	21-Feb-96		105 Biscayne Channel	-25.65417	-80.18667	1996.14	BB	MAIN	0.14	02	1996	1996-02	0.0019	0.0009	0.0009	0.0046	0.1355	0.0096	0.1259	0.0071	0.0013	0.0945	0.3533	2.8900		35.50	35.50	20.20	20.20	7.20	7.30	1.50	42.54	16.18	3.02	99.13	100.36	100.36
60.0	21-Feb-96		106 White Marker	-25.63417	-80.13000	1996.14	BB	OCHAN	0.14	02	1996	1996-02	0.0016	0.0010	0.0007	0.0050	0.1149	0.0068	0.1083	0.0065	0.0002	0.1259	0.2988	2.4283		20.30	20.30	22.00	22.00	7.20	7.20	0.65	99.08	94.50	2.25	100.90	99.47	99.47
60.0	21-Feb-96		107 Fowey Rocks	-25.59000	-80.10000	1996.14	BB	MAIN	0.14	02	1996	1996-02	0.0033	0.0027	0.0006	0.0060	0.1094	0.0093	0.1001	0.0067	0.0007	0.0876	0.4899	2.3035		36.10	36.20	22.40	22.40	6.80	7.00	0.45	35.94	29.44	3.05	96.82	99.22	99.22
60.0	21-Feb-96		108 Marker G-1B	-25.56917	-80.19250	1996.14	BB	OCHAN	0.14	02	1996	1996-02	0.0012	0.0006	0.0017	0.0035	0.1237	0.0047	0.1190	0.0064	0.0000	0.1195	0.3417	2.8818		35.60	36.00	21.10	21.10	6.90	7.20	1.35	42.59	16.81	96.27	100.44	100.44	
60.0	21-Feb-96		109 Midbay North	-25.56417	-80.23500	1996.14	BB	MAIN	0.14	02	1996	1996-02	0.0019	0.0012	0.0008	0.0043	0.1567	0.0062	0.1505	0.0060	0.0002	0.2400	0.2392	3.0925		35.30	35.60	19.10	18.60	7.40	7.00	1.60	57.39	88.50	2.27	100.31	103.58	103.58
60.0	21-Feb-96		110 Fender Point	-25.50500	-80.28750	1996.14	BB	IS	0.14	02	1996	1996-02	0.0108	0.0096	0.0012	0.0075	0.2513	0.0182	0.2350	0.0057	0.0009	0.2009	0.2599	4.0345		30.30	30.40	21.20	21.20	8.00	8.90	1.10	118.98	47.36	3.14	116.01	119.47	119.47
60.0	21-Feb-96		111 Featherbed Bank	-25.51583	-80.24000	1996.14	BB	MAIN	0.14	02	1996	1996-02	0.0015	0.0008	0.0009	0.0027	0.1516	0.0061	0.1431	0.0062	0.0003	0.2458	0.3043	3.0143		36.00	36.00	21.75	21.75	7.40	7.80	0.97	54.14	58.33	2.19	104.97	104.97	104.97
60.0	21-Feb-96		112 Sands Cut	-25.48833	-80.18833	1996.14	BB	MAIN	0.14	02	1996	1996-02	0.0015	0.0008	0.0009	0.0054	0.0772	0.0003	0.0730	0.0072	0.0003	0.1338	0.2968	2.9428		35.50	35.50	20.50	20.50	7.40	7.40	0.40	50.25	10.26	103.00	103.00	103.00	
60.0	22-Feb-96		113 Elliott Key	-25.44167	-80.22333	1996.14	BB	MAIN	0.14	02	1996	1996-02	0.0075	0.0068	0.0007	0.0109	0.2158	0.0183	0.1928	0.0064	0.0001	0.1864	0.3798	4.0545		35.10	35.10	21.50	21.50	7.00	6.80	0.80	74.21	524.00	6.31	97.86	95.19	95.19
60.0	22-Feb-96		114 Caesar Creek	-25.38500	-80.19167	1996.14	BB	OCHAN	0.14	02	1996	1996-02	0.0059	0.0051	0.0008	0.0058	0.1517	0.0118	0.1400	0.0073	0.0001	0.0716	0.3268	3.3580		35.50	36.20	22.50	22.50	6.80	7.40	1.15	46.12					

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZGHN	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL S	SAL B	TEMP S	TEMP B	DO S	DO B	TURB	Kd	pH	TN:TP	TP:DO	%SAT T	%SAT B
63.0	15-May-96		101	Caesar Creek	-25.38500	-80.91667	1996.37	BB	AS	0.37	05	1996	1996-05	0.0024	0.0010	0.0010	0.0010	0.2185	0.0010	0.0028	0.0048	0.0001	0.0083	0.2675	2.4115	37.30	30.00	27.90	27.90	7.20	7.20	3.70	121.03	300.00	4.06	105.67	106.45		
63.0	15-May-96		115	Adams	-25.40417	-80.24083	1996.37	BB	MAIN	0.37	05	1996	1996-05	0.0040	0.0031	0.0008	0.0060	0.3346	0.0099	0.3247	0.0064	0.0001	0.0981	0.2675	2.7753	38.30	30.00	27.90	27.90	6.90	6.90	3.70	136.57	284.00	4.06	105.67	105.66		
63.0	15-May-96		116	Rubicon Keys	-25.40000	-80.25500	1996.37	BB	MAIN	0.37	05	1996	1996-05	0.0036	0.0028	0.0009	0.0068	0.2583	0.0104	0.2479	0.0057	0.0004	0.0790	0.2166	2.6188	37.70	37.70	28.20	28.20	7.10	7.10	1.10	99.73	59.40	4.01	105.57	105.57		
63.0	15-May-96		117	Totton Key	-25.38500	-80.25500	1996.37	BB	MAIN	0.37	05	1996	1996-05	0.0029	0.0005	0.0037	0.0028	0.2125	0.0057	0.2069	0.0060	0.0007	0.1052	0.1937	2.6485	37.70	37.70	28.20	28.20	6.90	6.80	1.10	77.85	18.11	2.09	105.57	104.57		
63.0	15-May-96		118	Broad Creek	-25.34833	-80.25500	1996.37	BB	MAIN	0.37	05	1996	1996-05	0.0021	0.0015	0.0006	0.0033	0.2116	0.0054	0.2062	0.0054	0.0005	0.1247	0.2024	2.9115	37.50	37.50	27.60	27.60	6.60	6.80	1.65	86.36	21.56	2.19	100.20	103.24		
63.0	15-May-96		119	Pumpkin Key	-25.30333	-80.30333	1996.37	BB	SCARD	0.37	05	1996	1996-05	0.0016	0.0009	0.0007	0.0071	0.2817	0.0087	0.2730	0.0083	0.0009	0.1412	0.2024	3.7435	36.60	36.50	27.60	27.90	6.30	6.30	1.10	75.22	22.85	2.32	100.20	95.29		
63.0	15-May-96		120	Card Sound South	-25.31417	-80.34333	1996.37	BB	SCARD	0.37	05	1996	1996-05	0.0029	0.0022	0.0007	0.0030	0.2627	0.0059	0.2568	0.0057	0.0002	0.1859	0.2077	3.5568	37.00	37.00	27.50	27.50	6.10	6.10	2.50	101.42	96.33	2.28	92.24	92.24		
63.0	15-May-96		121	Card Sound North	-25.29167	-80.34333	1996.37	BB	SCARD	0.37	05	1996	1996-05	0.0023	0.0016	0.0006	0.0055	0.2749	0.0077	0.2572	0.0012	0.0003	0.1352	0.2083	3.8195	37.70	37.70	27.80	27.80	6.80	6.80	0.90	54.17	15.1	106.07	103.55			
63.0	15-May-96		122	West Arsencker	-25.42017	-80.31083	1996.37	BB	IS	0.37	05	1996	1996-05	0.0008	0.0001	0.0007	0.0051	0.2420	0.0059	0.2361	0.0088	0.0000	0.2953	0.1917	3.6830	38.10	38.10	28.00	28.00	7.60	7.80	0.85	61.19	1.49	116.20	119.57			
63.0	15-May-96		123	Pelican Bank	-25.44500	-80.28333	1996.37	BB	MAIN	0.37	05	1996	1996-05	0.0080	0.0072	0.0008	0.0063	0.1942	0.0144	0.1799	0.0063	0.0003	0.1103	0.2074	2.7345	38.30	38.20	28.00	28.00	6.60	6.60	2.05	68.50	102.50	5.06	101.05	100.99		
63.0	14-May-96		124	Midbay South	-25.47250	-80.23333	1996.36	BB	MAIN	0.36	05	1996	1996-05	0.0007	0.0004	0.0007	0.0054	0.1987	0.0061	0.1926	0.0040	0.0001	0.1711	0.1877	1.9690	37.60	37.60	28.00	28.00	6.50	6.70	0.70	111.29	174.00	3.41	93.33	102.34		
63.0	14-May-96		125	Turkey Point	-25.47000	-80.28333	1996.36	BB	TP	0.36	05	1996	1996-05	0.0053	0.0044	0.0008	0.0079	0.2270	0.0131	0.2139	0.0040	0.0002	0.1620	0.3475	1.9763	38.10	38.00	28.00	28.00	5.50	6.00	0.75	127.18	187.50	7.35	84.10	91.69		
64.0	24-Jun-96		101	Convoy Point	-25.47833	-80.32083	1996.48	BB	AS	0.48	06	1996	1996-06	0.0789	0.7694	0.0125	0.0251	1.2301	0.8041	0.4261	0.0073	0.0007	0.2857	0.6339	3.8705	37.90	37.90	30.00	32.00	6.70	10.30	1.85	373.89	2552.56	244.39	95.05	151.96		
64.0	24-Jun-96		102	Black Point	-25.54583	-80.29467	1996.48	BB	AS	0.48	06	1996	1996-06	0.0565	0.1485	0.0123	0.0120	0.8030	0.1728	0.4432	0.0072	0.0013	0.1740	0.3311	3.7038	21.40	21.00	30.00	30.00	10.10	10.10	0.30	112.47	150.00	53.64	144.59	99.33		
64.0	24-Jun-96		103	Near Black Ledge	-25.57333	-80.28667	1996.48	BB	IS	0.48	06	1996	1996-06	0.0569	0.0485	0.0080	0.0095	0.4976	0.0660	0.4316	0.0051	0.0009	0.9115	0.3349	5.2928	21.80	18.60	30.80	30.80	11.30	11.20	0.35	253.39	171.45	28.58	156.58	155.10		
64.0	24-Jun-96		104	BNP Marker C	-25.60167	-80.22083	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0363	0.0333	0.0030	0.0160	0.2907	0.0523	0.2383	0.0057	0.0000	0.1813	0.2259	2.6128	32.00	32.00	29.40	29.40	6.00	6.00	0.95	110.76	102.60	20.48	89.29	89.29		
64.0	24-Jun-96		108	Marker G-1B	-25.56917	-80.19250	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0042	0.0028	0.0013	0.0059	0.2261	0.0101	0.2161	0.0049	0.0005	0.1197	0.2515	2.0778	34.40	34.40	29.40	29.40	5.60	5.60	1.05	113.56	114.14	4.57	84.60	84.60		
64.0	24-Jun-96		109	Midbay North	-25.56417	-80.23500	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0278	0.0250	0.0028	0.0121	0.2834	0.0399	0.2435	0.0044	0.0000	0.1829	0.1951	2.2568	32.30	32.30	29.30	29.30	6.20	6.20	0.80	143.07	200.00	92.37	92.37			
64.0	24-Jun-96		110	Fender Point	-25.50500	-80.28750	1996.48	BB	IS	0.48	06	1996	1996-06	0.0644	0.6459	0.0185	0.0370	0.9810	0.7013	0.2797	0.0045	0.0002	0.1874	0.1976	4.0193	18.40	25.50	31.50	30.60	6.60	6.00	0.50	463.27	6679.33	345.48	91.61	115.33		
64.0	24-Jun-96		111	Featherbed Bank	-25.51583	-80.24000	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0023	0.0013	0.0005	0.0219	0.3850	0.1617	0.3233	0.0040	0.0002	0.1920	0.1771	2.8180	30.30	31.30	29.30	29.30	6.30	6.30	0.60	214.03	340.00	89.90	92.69	93.34		
64.0	24-Jun-96		112	Sands Cut	-25.48833	-80.18833	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0105	0.0089	0.0016	0.0149	0.2572	0.0254	0.2318	0.0050	0.0001	0.2002	0.1912	2.5265	33.70	33.70	29.80	29.80	5.70	5.60	0.60	114.81	125.00	11.33	85.98	84.48		
64.0	24-Jun-96		113	Elliott Key	-25.44167	-80.22333	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0193	0.0102	0.0072	0.0104	0.2557	0.0697	0.2618	0.0046	0.0007	0.2226	0.1926	2.7518	33.50	34.20	29.80	29.80	5.90	5.90	0.00	123.85	221.22	33.75	88.96	90.41		
64.0	24-Jun-96		116	Rubicon Keys	-25.40000	-80.25500	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0169	0.0154	0.0015	0.0138	0.2861	0.0307	0.2554	0.0045	0.0002	0.1638	0.1732	2.8418	30.30	33.10	30.30	30.30	5.80	5.90	1.05	140.95	292.67	15.14	87.42	88.99		
64.0	24-Jun-96		121	Card Sound North	-25.35500	-80.29167	1996.48	BB	SCARD	0.48	06	1996	1996-06	0.0242	0.0218	0.0024	0.0228	0.4245	0.0469	0.3776	0.0049	0.0007	0.1584	0.2030	4.1273	33.00	33.10	30.30	29.70	6.10	6.20	0.35	192.51	148.89	21.27	90.30	91.72		
64.0	24-Jun-96		122	West Arsencker	-25.42017	-80.31083	1996.48	BB	IS	0.48	06	1996	1996-06	0.0109	0.0097	0.0012	0.0115	0.4176	0.0005	0.3952	0.0074	0.0005	0.8161	0.3426	4.1260	31.40	31.40	30.00	30.00	7.30	7.50	0.25	124.30	91.57	6.88	108.94	111.93		
64.0	24-Jun-96		123	Pelican Bank	-25.44500	-80.28333	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0099	0.0098	0.0008	0.0098	0.3067	0.0061	0.3098	0.0049	0.0003	0.0821	0.0968	3.4198	30.90	30.90	29.70	29.70	6.00	6.00	0.70	171.43	373.00	48.63	94.07	94.07		
64.0	24-Jun-96		124	Midbay South	-25.47250	-80.23333	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0781	0.0752	0.0028	0.0292	0.3780	0.1072	0.2708	0.0049	0.0003	0.2260	0.2810	4.2531	32.30	32.30	29.60	29.60	6.30	6.30	0.50	171.43	766.00	48.63	94.07	94.07		
64.0	24-Jun-96		126	BNP Marker B	-25.67167	-80.20500	1996.48	BB	MAIN	0.48	06	1996	1996-06	0.0186	0.0160	0.0026	0.0152	0.3501	0.0338	0.3163	0.0057	0.0000	0.1929	0.2977	2.7025	31.30	32.00	30.30	29.00	6.30	6.70	0.80	137.03	103.00	13.23	93.62	99.40		
64.0	24-Jun-96		127	Shoal Point	-25.63000	-80.25000	1996.48	BB	IS	0.48	06	1996	1996-06	0.0230	0.0197																								

SURV	DATE	TIME	STA	SITE	LATDEC	YEAR	BAY	ZSI	MO	ON	YEAR	YR-MO	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	LN-TP	DIN-TP	%SAT_T	%SAT_B	
67.0	07-Sep-96		102	BNP Marker B	-25.67167	-80.25000	1996.68	BB	IS	0.68	09	1996	1996-09	0.0051	0.0011	0.0177		0.02745	0.02623	0.2483	0.0020	0.0003	0.0551	0.2346	5.6723	34.40	32.40	31.00	31.00	4.80	4.90	0.10	0.85	233.05	187.00	20.77	91.61	97.18	73.93	
67.0	07-Sep-96		127	Shoal Point	-25.63000	-80.25000	1996.68	BB	IS	0.68	09	1996	1996-09	0.0099	0.0072	0.0027	0.0188	0.32683	0.02627	0.2975	0.0030	0.0003	0.0653	0.5743	5.9743	31.80	32.40	31.00	31.00	4.30	4.40	0.10	0.85	233.05	187.00	20.77	91.61	97.18	73.93	
67.0	07-Sep-96		128	Matheron Beach	-25.68833	-80.23333	1996.68	BB	IS	0.68	09	1996	1996-09	0.0116	0.0098	0.0018	0.0152	0.3594	0.0267	0.3326	0.0043	0.0000	0.0637	0.4723	5.7858	31.70	32.70	31.00	31.00	4.30	5.00	0.40	1.00	183.34	13.63	64.68	75.68	68.84	76.68	
67.0	07-Sep-96		129	Marker G-71	-25.73667	-80.18500	1996.68	BB	MAIN	0.68	09	1996	1996-09	0.0096	0.0062	0.0014	0.0158	0.2748	0.0253	0.2495	0.0052	0.0000	0.0581	0.5780	4.9980	33.40	34.00	30.20	30.20	5.80	5.80	1.05	0.40	117.20	10.81	87.94	87.94	87.94	87.94	
67.0	07-Sep-96		130	South Dodge Island	-25.76333	-80.17167	1996.68	BB	NBAY	0.68	09	1996	1996-09	0.0173	0.0156	0.0018	0.0148	0.2425	0.0321	0.2103	0.0055	0.0002	0.0418	0.5832	4.3290	32.30	32.90	31.00	31.00	5.80	5.80	1.45	0.40	97.58	306.00	12.93	87.45	87.45	87.61	
67.0	07-Sep-96		131	North Venetian Basin	-25.80000	-80.16667	1996.68	BB	NBAY	0.68	09	1996	1996-09	0.0246	0.0222	0.0024	0.0203	0.3394	0.0449	0.2945	0.0057	0.0009	0.0422	0.4897	5.3150	31.70	32.10	30.00	30.00	5.70	5.30	5.00	0.65	131.05	116.64	17.34	57.57	75.15	75.15	
67.0	07-Sep-96		132	North I-195 Basin	-25.81667	-80.16667	1996.68	BB	NBAY	0.68	09	1996	1996-09	0.0129	0.0105	0.0025	0.0110	0.3851	0.0239	0.3612	0.0061	0.0002	0.1087	0.5657	6.2143	29.70	31.50	31.00	31.00	4.90	5.00	0.25	1.00	139.26	341.00	8.63	72.80	75.16	75.16	
67.0	07-Sep-96		133	North Normandy Isle	-25.86667	-80.20833	1996.68	BB	NBAY	0.68	09	1996	1996-09	0.0075	0.0074	0.0020	0.0074	0.3007	0.0212	0.2807	0.0099	0.0011	0.0736	0.5885	5.1008	31.20	31.20	31.00	31.00	6.00	5.00	0.85	0.60	66.03	267.50	4.25	91.49	87.24	87.24	
67.0	07-Sep-96		134	Oleta River Park	-25.90500	-80.13333	1996.68	BB	NBAY	0.68	09	1996	1996-09	0.0121	0.0097	0.0025	0.0135	0.3143	0.0257	0.2886	0.0099	0.0011	0.0736	0.5657	5.9873	29.70	31.20	31.00	31.00	5.70	5.50	0.95	1.00	139.26	341.00	8.63	72.80	75.16	75.16	
67.0	07-Sep-96		135	South Card Sound	-25.31667	-80.31667	1996.68	BB	SCARD	0.68	09	1996	1996-09	0.0179	0.0161	0.0018	0.0175	0.3781	0.0354	0.3428	0.0034	0.0010	0.0859	0.1016	4.4728	32.50	33.70	31.60	31.60	6.20	6.30	0.20	0.20	245.55	77.69	22.95	93.95	96.35	96.35	
68.0	10-Oct-96		101	Convoy Point	-25.47833	-80.32083	1996.77	BB	AS	0.77	10	1996	1996-10	0.1269	0.1220	0.0049	0.0426	0.6848	0.0598	0.5153	0.0058	0.0004	0.3206	0.3221	6.4863	0.5698	29.60	29.00	27.80	27.80	5.90	10.50	0.80	0.80	260.89	968.80	64.59	85.35	151.32	151.32
68.0	10-Oct-96		102	Black Point	-25.54583	-80.29467	1996.77	BB	AS	0.77	10	1996	1996-10	0.1000	0.0927	0.0073	0.0342	0.6129	0.1342	0.4787	0.0060	0.0004	0.2466	0.1825	6.0360	0.5668	29.60	24.60	27.80	27.80	7.10	7.20	0.45	0.45	227.42	767.00	49.81	99.06	100.45	100.45
68.0	10-Oct-96		103	Near Black Ledge	-25.57333	-80.28667	1996.77	BB	IS	0.78	10	1996	1996-10	0.0058	0.0052	0.0014	0.0078	0.0067	0.0465	0.0464	0.0067	0.0000	0.0109	0.1854	5.1723	0.1181	28.20	29.20	25.40	25.40	5.70	6.20	0.55	0.55	147.21	431.25	19.63	88.26	87.64	87.64
68.0	10-Oct-96		104	BNP Marker C	-25.60167	-80.22083	1996.77	BB	MAIN	0.78	10	1996	1996-10	0.0058	0.0075	0.0024	0.0074	0.2217	0.0187	0.2725	0.0071	0.0000	0.0524	0.5681	3.2600	0.0537	34.90	34.90	26.90	26.90	6.00	5.90	1.05	0.60	117.20	10.81	87.94	87.94	87.94	87.94
68.0	10-Oct-96		108	Marker G-1B	-25.56917	-80.19250	1996.77	BB	MAIN	0.77	10	1996	1996-10	0.0100	0.0079	0.0021	0.0079	0.1946	0.0179	0.1675	0.0074	0.0000	0.0524	0.5681	2.7638	0.0829	35.60	35.60	27.30	27.30	5.80	6.20	1.70	1.00	121.06	6.53	92.75	92.75	92.75	92.75
68.0	10-Oct-96		109	Midbay North	-25.56417	-80.23500	1996.77	BB	MAIN	0.77	10	1996	1996-10	0.0048	0.0031	0.0018	0.0056	0.1778	0.0105	0.1673	0.0060	0.0004	0.0617	0.2677	2.8753	0.0234	36.20	36.20	27.30	27.30	6.50	6.60	0.70	0.70	65.97	59.80	3.88	97.61	99.11	99.11
68.0	10-Oct-96		110	Fender Point	-25.50500	-80.28750	1996.77	BB	IS	0.77	10	1996	1996-10	0.0797	0.0740	0.0058	0.0136	0.4964	0.1113	0.3881	0.0064	0.0001	0.2776	0.3541	5.7338	0.3102	28.50	28.50	27.30	27.30	6.00	5.90	1.05	0.60	171.92	3181.00	38.33	94.39	107.26	107.26
68.0	10-Oct-96		111	Feathered Bank	-25.51583	-80.24000	1996.77	BB	MAIN	0.77	10	1996	1996-10	0.0068	0.0049	0.0019	0.0082	0.2270	0.0150	0.2121	0.0053	0.0000	0.0539	0.2921	3.1100	0.0341	36.20	36.20	27.30	27.30	6.20	6.20	1.10	1.10	94.01	6.20	93.11	93.11	93.11	93.11
68.0	10-Oct-96		112	Sands Cut	-25.48533	-80.19833	1996.77	BB	MAIN	0.77	10	1996	1996-10	0.0063	0.0052	0.0011	0.0067	0.2408	0.0130	0.2278	0.0070	0.0004	0.0697	0.2559	3.3335	0.0176	35.50	34.80	27.30	27.30	6.00	6.10	1.10	1.10	76.43	74.00	4.11	89.46	90.55	90.55
68.0	10-Oct-96		113	Elliott Key	-25.44167	-80.22333	1996.77	BB	MAIN	0.77	10	1996	1996-10	0.0077	0.0066	0.0011	0.0154	0.1646	0.0231	0.1415	0.0060	0.0003	0.0789	0.2645	2.5433	0.0195	36.20	36.10	27.30	27.30	6.00	5.90	1.05	0.60	165.00	165.00	89.78	89.78	89.78	89.78
68.0	10-Oct-96		116	Rubicon Keys	-25.40000	-80.25500	1996.77	BB	MAIN	0.77	10	1996	1996-10	0.0056	0.0045	0.0011	0.0069	0.1875	0.0125	0.1750	0.0057	0.0002	0.0688	0.3890	2.8465	0.0234	36.00	35.90	27.30	27.30	5.90	5.70	1.30	1.30	72.39	119.00	4.82	88.49	85.44	85.44
68.0	10-Oct-96		121	Card Sound North	-25.35500	-80.29167	1996.77	BB	SCARD	0.77	10	1996	1996-10	0.0112	0.0098	0.0014	0.0145	0.2730	0.0258	0.2450	0.0067	0.0002	0.0599	0.3152	3.7263	0.0429	33.40	33.40	27.30	27.30	5.80	5.90	1.25	1.25	90.11	368.00	8.86	85.87	76.71	76.71
68.0	10-Oct-96		122	West Arsenicker	-25.42017	-80.31083	1996.77	BB	IS	0.77	10	1996	1996-10	0.0249	0.0229	0.0021	0.0220	0.3482	0.0469	0.3013	0.0071	0.0000	0.1494	0.2580	3.7400	0.0810	34.10	33.60	26.90	26.90	5.70	5.20	0.85	0.85	108.12	14.57	84.08	76.46	76.46	76.46
68.0	10-Oct-96		123	Pelican Bank	-25.44500	-80.28333	1996.77	BB	MAIN	0.77	10	1996	1996-10	0.0245	0.0229	0.0016	0.0279	0.2894	0.0524	0.2371	0.0072	0.0000	0.1494	0.2580	3.7400	0.0810	34.10	34.10	26.90	26.90	5.70	5.60	0.95	0.88	98.92	16.09	84.32	82.68	82.68	
68.0	10-Oct-96		124	Midbay South	-25.47250	-80.23333	1996.77	BB	MAIN	0.77	10	1996	1996-10	0.0088	0.0077	0.0009	0.0270	0.2796	0.0356	0.2420	0.0051	0.0000	0.1083	0.3612	3.1953	0.0400	35.40	35.30	27.30	27.30	6.00	6.00	1.35	1.35	121.06	15.42	89.40	89.43	89.43	
68.0	10-Oct-96		125	BNP Marker B	-25.67167	-80.25000	1996.77	BB	MAIN	0.78	10	1996	1996-10	0.0191	0.0181	0.0043	0.0191	0.3207	0.0260	0.2497	0.0099	0.0002	0.0831	0.3083	3.7745	0.2945	34.90	34.90	26.90	26.90	6.10	6.10	3.35	3.35	107.06	16.13	89.26	89.26	89.26	
68.0	10-Oct-96		127	Shoal Point	-25.63000	-80.25000	1996.77	BB	IS	0.78	10	1996	1996-10	0.0100	0.0182	0.0029	0.0140	0.3176	0.0351	0.2846	0.0099	0.0002	0.0831	0.3083	3.7745															

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN-TP	N:P	DIN:TP	%SAT_T	%SAT_B
71.0	22-Jan-97		129	Matheron Beach	25.68833	-80.23333	1997.06	BB	AS	0.10	02	1997	1997-01	0.0199	0.0099	0.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	31.40	31.40	19.00	17.00	11.50	11.50	41.70	11.50	41.70	4.95	119.95	122.45		
71.0	22-Jan-97		129	Marker G-71	25.73667	-80.18500	1997.06	BB	MAIN	0.06	01	1997	1997-01	0.0089	0.0089	0.0009	0.0036	0.2109	0.0117	0.1436	0.0064	0.0111	0.4437	1.1806	3.0443	34.50	34.50	19.00	19.00	19.80	8.70	8.70	0.85	74.40	8.70	55.50	118.89	117.07		
71.0	22-Jan-97		130	South Dodge Island	25.76333	-80.17167	1997.06	BB	NBAY	0.06	01	1997	1997-01	0.0081	0.0073	0.0008	0.0058	0.1897	0.0139	0.1758	0.0071	0.0004	0.0351	1.1007	2.8483	35.00	35.00	19.80	19.80	8.60	8.60	1.00	59.57	79.60	4.37	117.33	117.33			
71.0	22-Jan-97		131	North Venetian Basin	25.80000	-80.16667	1997.06	BB	NBAY	0.06	01	1997	1997-01	0.0139	0.0129	0.0026	0.0069	0.2650	0.0207	0.2442	0.0067	0.0001	0.0398	1.0267	3.4393	32.60	32.60	17.70	17.70	9.20	5.55	80.71	592.00	6.80	118.24	119.34				
71.0	22-Jan-97		132	North 1-195 Basin	25.81667	-80.16667	1997.06	BB	NBAY	0.06	01	1997	1997-01	0.0043	0.0041	0.0002	0.0034	0.2777	0.0078	0.2700	0.0061	0.0001	0.0602	0.6479	3.9715	31.00	31.00	16.50	16.50	10.20	10.40	0.15	100.44	222.00	2.81	128.46	130.98			
71.0	22-Jan-97		133	North Normandy Isle	25.86667	-80.15000	1997.06	BB	NBAY	0.06	01	1997	1997-01	0.0176	0.0151	0.0026	0.0100	0.2728	0.0277	0.2451	0.0071	0.0000	0.0654	0.8842	3.2335	33.40	33.40	17.00	17.00	8.70	8.80	1.00	84.72	8.60	113.66	114.78				
71.0	22-Jan-97		134	Oleta River Park	25.90500	-80.13333	1997.06	BB	NBAY	0.06	01	1997	1997-01	0.0270	0.0245	0.0025	0.0115	0.2644	0.0385	0.2259	0.0071	0.0003	0.0233	1.2893	3.0600	34.50	34.70	20.00	20.00	8.40	8.30	0.35	82.11	274.75	11.95	115.10	116.84			
71.0	22-Jan-97		135	South Card Sound	25.91667	-80.13667	1997.06	BB	SCARD	0.06	01	1997	1997-01	0.0110	0.0097	0.0013	0.0049	0.3101	0.0159	0.2259	0.0042	0.0002	0.0468	0.2865	4.1095	33.00	33.00	18.70	18.70	8.60	8.20	0.30	160.06	151.00	8.39	102.12	106.31			
72.0	05-Feb-97		101	Convoy Point	25.47833	-80.32083	1997.10	BB	AS	0.10	02	1997	1997-02	0.0227	0.0195	0.0032	0.0083	0.3844	0.0310	0.3534	0.0032	0.0011	0.3320	0.1769	4.9160	26.70	26.70	24.20	24.20	9.10	9.20	0.65	267.88	63.29	21.61	124.98	126.50			
72.0	05-Feb-97		102	Black Point	25.54583	-80.29467	1997.10	BB	AS	0.10	02	1997	1997-02	0.0223	0.0195	0.0007	0.0042	0.4414	0.0655	0.4354	0.0060	0.0009	0.3303	0.2316	5.6555	26.60	26.60	24.20	24.20	8.60	8.90	0.40	161.69	15.42	2.37	117.63	121.74			
72.0	05-Feb-97		103	Near Black Ledge	25.57333	-80.28667	1997.10	BB	IS	0.10	02	1997	1997-02	0.0017	0.0009	0.0007	0.0036	0.3714	0.0053	0.3621	0.0053	0.0005	0.3381	0.1479	5.1647	28.00	28.00	24.40	24.40	8.90	9.10	0.40	156.07	21.43	2.21	123.27	126.04			
72.0	05-Feb-97		104	BNP Marker C	25.60167	-80.22083	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0017	0.0010	0.0007	0.0034	0.2142	0.0051	0.2069	0.0063	0.0002	0.4477	0.2010	3.3020	35.10	35.10	22.40	22.40	6.60	6.80	1.30	75.55	72.50	1.79	93.36	96.06			
72.0	05-Feb-97		105	Marker G-1B	25.62917	-80.19250	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0027	0.0015	0.0011	0.0041	0.2547	0.0058	0.2500	0.0074	0.0000	0.0651	0.1029	3.6218	35.00	35.00	23.30	23.30	7.00	7.70	0.10	105.28	104.00	0.74	109.98	110.14			
72.0	05-Feb-97		109	Midbay North	25.56417	-80.23500	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0009	0.0004	0.0005	0.0008	0.1801	0.0017	0.1784	0.0062	0.0000	0.0781	0.1126	2.2630	35.90	35.90	22.70	22.70	7.60	7.70	0.90	94.33	90.00	0.61	108.47	109.90			
72.0	05-Feb-97		110	Fender Point	25.50500	-80.28750	1997.10	BB	IS	0.10	02	1997	1997-02	0.0220	0.0202	0.0014	0.0030	0.2828	0.0250	0.2578	0.0050	0.0006	0.1916	0.2734	3.6348	29.10	29.10	24.10	24.10	8.00	8.30	0.65	63.48	89.38	11.00	111.08	115.25			
72.0	05-Feb-97		111	Feathered Bank	25.51583	-80.24000	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0009	0.0005	0.0004	0.0023	0.2040	0.0032	0.2008	0.0050	0.0012	0.2720	0.1142	3.6870	35.20	35.20	23.00	23.00	7.20	7.50	1.10	89.65	5.69	1.40	102.67	106.95			
72.0	05-Feb-97		112	Sands Cut	25.48833	-80.18833	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0009	0.0005	0.0004	0.0021	0.2034	0.0030	0.2004	0.0053	0.0000	0.0794	0.1110	3.4260	35.20	35.20	23.00	23.00	7.40	7.60	0.55	84.24	1.25	1.05	103.17	107.98			
72.0	05-Feb-97		113	Elliott Key	25.44167	-80.22333	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0061	0.0055	0.0006	0.0062	0.2018	0.0124	0.1894	0.0096	0.0000	0.0846	0.1479	3.3788	35.00	34.90	22.60	22.60	7.30	7.40	0.45	80.07	4.90	103.45	104.80				
72.0	05-Feb-97		116	Rubicon Keys	25.40000	-80.25500	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0026	0.0020	0.0007	0.0020	0.1885	0.0048	0.1839	0.0047	0.0000	0.0699	0.1286	3.4460	34.50	34.50	22.70	22.70	7.80	7.90	0.55	86.32	2.16	110.17	111.59				
72.0	05-Feb-97		121	Card Sound North	25.35500	-80.29167	1997.10	BB	SCARD	0.10	02	1997	1997-02	0.0021	0.0015	0.0005	0.0017	0.2035	0.0038	0.1997	0.0049	0.0001	0.0911	0.1238	3.7460	33.60	33.70	22.80	22.80	7.30	7.50	0.85	85.44	109.00	1.71	102.51	105.38			
72.0	05-Feb-97		122	West Arsenicker	25.42017	-80.31083	1997.10	BB	IS	0.10	02	1997	1997-02	0.0412	0.0391	0.0021	0.0075	0.3533	0.0487	0.3046	0.0047	0.0010	0.1895	0.2348	4.5785	27.30	27.30	22.90	22.90	7.50	7.60	0.65	168.28	107.08	23.20	101.45	102.80			
72.0	05-Feb-97		123	Pelican Bank	25.44500	-80.28333	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0358	0.0343	0.0015	0.0077	0.3050	0.0435	0.2616	0.0044	0.0005	0.0993	0.2283	3.9955	30.60	30.60	22.60	22.60	7.40	7.50	0.65	152.86	207.33	21.82	101.89	103.40			
72.0	05-Feb-97		124	Midbay South	25.47250	-80.23333	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0131	0.0121	0.0010	0.0076	0.2267	0.0207	0.2061	0.0042	0.0000	0.0799	0.1576	3.2748	34.10	34.10	22.50	22.50	7.60	7.70	0.40	119.97	10.94	106.93	108.34				
72.0	05-Feb-97		126	BNP Marker B	25.67167	-80.20500	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0053	0.0047	0.0007	0.0045	0.1981	0.0098	0.1883	0.0053	0.0006	0.0417	0.2798	3.9879	34.50	34.80	22.40	22.40	6.50	6.80	1.70	82.05	35.13	4.07	91.58	96.00			
72.0	05-Feb-97		127	Shoal Point	25.63000	-80.25000	1997.10	BB	IS	0.10	02	1997	1997-02	0.0027	0.0015	0.0007	0.0030	0.2221	0.0022	0.2082	0.0060	0.0004	0.0722	0.1930	4.0888	32.00	31.40	22.80	22.80	6.40	6.90	0.20	116.53	32.20	2.99	92.29	95.62			
72.0	05-Feb-97		128	Matheron Beach	25.68833	-80.23333	1997.10	BB	IS	0.10	02	1997	1997-02	0.0027	0.0015	0.0003	0.0034	0.2636	0.0061	0.2475	0.0053	0.0008	0.0541	0.2839	3.8015	35.00	35.00	22.80	22.80	6.20	6.80	0.80	105.28	117.40	0.45	102.20	119.88	82.11		
72.0	05-Feb-97		129	Marker G-71	25.73667	-80.18500	1997.10	BB	MAIN	0.10	02	1997	1997-02	0.0022	0.0015	0.0007	0.0039	0.2269	0.0061	0.2208	0.0060	0.0007	0.0456	0.4872	2.8128	32.80	33.70	22.80	22.80	6.80	6.70	2.70	92.00	2.27	95.85	98.34				
72.0	05-Feb-97		130	South Dodge Island	25.76333	-80.17167	1997.10	BB	NBAY	0.10	02	1997	1997-02	0.0039	0.0029	0.0010	0.0071	0.2310	0.0111	0.2199	0.0087	0.0002	0.0349	0.5098	3.6675	33.70														

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	ON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN:TP	N:P	DIN:TP	%SAT	%SAT_B
75.0	15-May-97		130	North Dodge Island	25.76333	-80.17167	1997.37	BB	NBAY	0.37	05	1997	1997-05	0.0276	0.0042	0.0034	0.0135	0.2212	0.0401	0.1811	0.0070	0.0001	0.0662	0.6977	4.2950	32.70	33.10	27.60	27.60	6.00	5.90	1.05	70.22	1145.00	4.72	86.36	87.11			
75.0	15-May-97		131	North Venetian Basin	25.80000	-80.16667	1997.37	BB	NBAY	0.37	05	1997	1997-05	0.0203	0.0186	0.0017	0.0098	0.2544	0.0301	0.2243	0.0090	0.0001	0.0572	0.4173	4.1495	32.70	33.10	27.60	27.60	6.00	6.20	0.95	62.66	961.00	7.42	85.23	91.37			
75.0	15-May-97		132	North I-195 Basin	25.81667	-80.16667	1997.37	BB	NBAY	0.37	05	1997	1997-05	0.0096	0.0089	0.0007	0.0043	0.2666	0.0139	0.2526	0.0083	0.0001	0.1078	0.3035	5.2638	29.70	31.30	28.10	28.10	7.20	7.30	0.25	71.18	398.00	3.72	104.50	106.54			
75.0	15-May-97		133	North Normandy Isle	25.86667	-80.15000	1997.37	BB	NBAY	0.37	05	1997	1997-05	0.0309	0.0277	0.0032	0.0041	0.3436	0.0770	0.2666	0.0121	0.0005	0.3289	1.2307	5.4648	27.40	33.00	28.10	28.10	6.00	6.00	0.25	62.94	366.83	14.11	86.34	90.87			
75.0	15-May-97		134	Oleta River Park	25.90500	-80.13333	1997.37	BB	NBAY	0.37	05	1997	1997-05	0.0353	0.0317	0.0035	0.0101	0.2606	0.0454	0.2153	0.0103	0.0005	0.1235	1.7545	5.2195	29.10	35.40	28.30	28.30	5.40	6.00	1.40	55.99	185.14	9.74	78.21	89.49			
75.0	16-May-97		135	South Card Sound	25.31667	-80.31667	1997.37	BB	SCARD	0.37	05	1997	1997-05	0.0061	0.0053	0.0007	0.0044	0.2246	0.0104	0.2142	0.0043	0.0002	0.1335	0.3199	4.3113	36.40	36.40	28.70	28.70	6.50	6.10	0.35	114.60	149.00	5.32	98.20	92.81			
76.0	11-Jun-97		101	Convoy Point	25.47833	-80.32083	1997.44	BB	AS	0.44	06	1997	1997-06	1.1027	1.0823	0.0204	0.0620	1.2553	1.1647	0.9096	0.0142	0.0066	0.1359	0.4553	4.9903	0.0001	12.30	31.30	27.60	27.60	5.00	4.70	3.52	195.99	391.49	181.84	64.71	68.54		
76.0	11-Jun-97		102	Black Point	25.54583	-80.29467	1997.44	BB	AS	0.44	06	1997	1997-06	0.2302	0.2225	0.0077	0.0603	0.5383	0.2905	0.2478	0.0074	0.0003	0.1745	0.2559	4.9518	0.0016	25.00	26.20	27.60	27.60	5.60	6.80	1.11	161.90	2075.00	87.37	68.72	95.84		
76.0	11-Jun-97		103	Near Black Ledge	25.57333	-80.28667	1997.44	BB	IS	0.44	06	1997	1997-06	0.0561	0.0504	0.0057	0.0354	0.4455	0.0915	0.3540	0.0047	0.0005	0.3291	0.1972	5.3643	0.0008	26.30	26.30	27.30	27.30	6.70	6.80	0.55	208.65	435.67	42.85	94.49	95.90		
76.0	09-Jun-97		104	BNP Marker C	25.60167	-80.22083	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.0024	0.0012	0.0012	0.0081	0.2212	0.0104	0.2107	0.0046	0.0000	0.0843	0.3560	3.3555	0.0000	35.40	35.40	28.30	28.30	5.70	5.50	0.70	107.10	5.05	85.90	82.89			
76.0	09-Jun-97		108	Marker G-1B	25.56917	-80.19250	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.0033	0.0019	0.0015	0.0076	0.2025	0.0109	0.1916	0.0045	0.0000	0.0450	0.3324	3.3440	0.0025	35.10	35.10	27.60	27.60	4.50	4.50	0.55	99.74	5.36	75.35	67.40			
76.0	11-Jun-97		109	Midbay North	25.59500	-80.23500	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.1587	0.1533	0.0054	0.0362	0.4262	0.1950	0.2313	0.0053	0.0005	0.1088	0.2051	5.5063	0.0000	29.30	32.40	27.30	27.30	6.10	6.30	0.92	176.50	795.71	8.02	67.68	92.27		
76.0	11-Jun-97		110	Fender Point	25.56417	-80.28750	1997.44	BB	IS	0.50	07	1997	1997-07	0.0071	0.0061	0.0029	0.0128	0.3360	0.0141	0.2004	0.0051	0.0002	0.2212	0.2669	3.9209	0.0000	34.00	34.00	31.50	31.50	5.80	6.20	0.21	148.90	29.20	1.80	64.80	78.03		
76.0	11-Jun-97		111	Feathered Bank	25.51583	-80.24000	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.1340	0.1286	0.0055	0.0480	0.4527	0.1820	0.2707	0.0054	0.0001	0.1588	0.2579	4.5173	0.0010	29.00	32.40	27.30	27.30	6.60	6.50	0.96	184.77	5200.00	74.29	94.69	95.29		
76.0	11-Jun-97		112	Sands Cut	25.48833	-80.18833	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.2060	0.2000	0.0495	0.0331	0.4619	0.2391	0.2207	0.0054	0.0006	0.1416	0.3785	4.3273	0.0028	29.00	29.30	27.20	27.20	7.10	6.70	1.30	188.52	854.00	97.60	96.03	96.13		
76.0	11-Jun-97		113	Elliott Key	25.44167	-80.22333	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.2118	0.2054	0.0064	0.0333	0.4652	0.2451	0.2201	0.0054	0.0012	0.2032	0.4894	4.1918	0.0050	28.10	28.00	27.00	27.00	7.00	7.00	1.50	189.88	466.80	100.03	95.97	95.51		
76.0	11-Jun-97		116	Rubicon Keys	25.40000	-80.25500	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.0111	0.0098	0.0013	0.0157	0.2686	0.0268	0.2418	0.0040	0.0003	0.1703	0.2212	5.0618	0.0032	34.20	34.10	27.20	27.20	5.80	5.80	0.47	150.48	191.25	15.00	85.92	85.87		
76.0	11-Jun-97		121	Card Sound North	25.35500	-80.29167	1997.44	BB	SCARD	0.44	06	1997	1997-06	0.0149	0.0134	0.0015	0.0270	0.3633	0.0419	0.3214	0.0040	0.0002	0.1617	0.2579	6.2195	0.0089	31.90	32.50	27.40	27.40	6.20	5.90	0.31	203.53	598.50	23.47	90.68	86.55		
76.0	11-Jun-97		122	West Arsenicker	25.42017	-80.31083	1997.44	BB	IS	0.44	06	1997	1997-06	0.0259	0.0250	0.0019	0.0424	0.3360	0.0693	0.2557	0.0052	0.0002	0.3033	0.4067	5.2793	0.0121	31.90	31.90	26.70	26.70	5.90	6.00	0.49	142.86	660.00	29.55	85.74	87.19		
76.0	11-Jun-97		123	Pelican Bank	25.44500	-80.28333	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.1166	0.1122	0.0044	0.0449	0.3639	0.1615	0.2024	0.0047	0.0003	0.1903	0.2731	5.0023	0.0000	31.00	31.00	27.30	27.30	5.50	5.40	0.67	173.29	1153.50	76.90	80.02	79.30		
76.0	11-Jun-97		124	Midbay South	25.47250	-80.23333	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.1259	0.1225	0.0034	0.0359	0.4048	0.1618	0.2430	0.0052	0.0002	0.1631	0.2879	4.9808	0.0020	31.60	35.50	27.20	27.20	6.60	6.00	0.95	172.63	2312.00	69.01	96.17	89.86		
76.0	09-Jun-97		126	BNP Marker B	25.67167	-80.20500	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.0062	0.0051	0.0011	0.0167	0.2069	0.0229	0.1840	0.0038	0.0000	0.0711	0.5384	4.6575	0.0103	34.90	35.00	28.10	28.10	5.70	5.50	1.25	126.66	13.37	85.49	82.68			
76.0	09-Jun-97		127	Shoal Point	25.63000	-80.25000	1997.44	BB	IS	0.44	06	1997	1997-06	0.0149	0.0120	0.0030	0.0176	0.2970	0.0325	0.2645	0.0041	0.0002	0.1022	0.4177	5.5740	0.0057	34.20	32.60	28.10	28.10	5.00	4.70	0.25	160.09	465.50	17.53	73.82	69.65		
76.0	09-Jun-97		128	Matheson Beach	25.68833	-80.23333	1997.44	BB	IS	0.44	06	1997	1997-06	0.0415	0.0372	0.0043	0.0265	0.3280	0.0680	0.2600	0.0057	0.0003	0.0869	0.9178	5.7010	0.0013	31.50	33.00	28.10	28.10	4.60	4.50	0.20	128.37	484.50	26.60	80.73	66.85		
76.0	09-Jun-97		129	Marker G-7	25.73667	-80.18500	1997.44	BB	MAIN	0.44	06	1997	1997-06	0.0219	0.0204	0.0019	0.0149	0.3080	0.0267	0.2341	0.0057	0.0001	0.1044	0.2687	5.0000	0.0031	34.00	34.00	28.10	28.10	5.00	5.00	0.43	102.73	217.20	14.40	80.30	78.03		
76.0	09-Jun-97		130	South Dodge Island	25.76333	-80.17167	1997.44	BB	NBAY	0.44	06	1997	1997-06	0.0208	0.0184	0.0024	0.0235	0.2178	0.0442	0.1735	0.0053	0.0001	0.0487	0.6205	4.5783	0.0008	34.40	34.50	28.10	28.10	5.20	5.40	0.85	91.50	1264.00	18.59	77.74	80.85		
76.0	09-Jun-97		131	North Venetian Basin	25.80000	-80.16667	1997.44	BB	NBAY	0.44	06	1997	1997-06	0.0375	0.0338	0.0037	0.0315	0.2560	0.0690	0.1870	0.0070	0.0001	0.0501	1.0476	4.8128	0.0033	32.60	32.80	28.10	28.10	5.20	5.00	0.80	127.97	1971.00	21.90	96.77	74.07		
76.0	09-Jun-97		132	North I-195 Basin	25.81667	-80.16667	1997.44	BB	NBAY	0.44	06	1997	1997-06	0.0256	0.0226	0.0030	0.0306	0.2682	0.0562	0.2120	0.0071	0.0000	0.0738	0.9307	5.1698	0.0033	32.40	32.												

SURV	DATE	TIME	STA	SITE	LATDEC	YEAR	BAY	ZSY	MO	ON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TSS	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	DIN/TP	%SAT	%SAT_B												
79.0	04-Sep-97		133	North I-195 Basin	-80.86667	1997.67	BB	NBAY	0.67	09	1997	1997-09	0.0439	0.0036	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	30.10	30.00	30.00	30.00	4.70	4.70	0.55	14.00	165.00	1.14	0.0343	69.98												
79.0	04-Sep-97		133	North Normandy Isale	-80.86667	1997.67	BB	NBAY	0.67	09	1997	1997-09	0.0489	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	26.60	30.40	30.10	30.00	5.90	4.70	0.55	15.33	159.00	1.61	0.0343	69.98												
79.0	04-Sep-97		134	Oleta River Park	-80.13333	1997.67	BB	NBAY	0.67	09	1997	1997-09	0.0580	0.0517	0.0064	0.0475	0.4120	0.1055	0.3065	0.0098	0.0000	0.2668	1.5828	5.1253	31.40	34.60	29.80	29.90	5.10	5.10	0.50	9.43	23.93	75.84	77.42	94.30	23.93	75.84	77.42										
79.0	04-Sep-97		135	South Card Sound	-80.31667	1997.67	BB	SCARD	0.67	09	1997	1997-09	0.0119	0.0098	0.0021	0.0201	0.4769	0.0320	0.4369	0.0040	0.0000	0.1821	0.2688	6.1948	28.10	34.10	28.10	29.80	5.80	5.80	0.50	12.60	17.60	83.54	84.91	29.80	5.80	5.80	0.50	12.60	17.60	83.54	84.91						
80.0	01-Oct-97		101	Convoy Point	-80.24733	1997.75	BB	AS	0.75	10	1997	1997-10	0.2526	0.2485	0.0041	0.0332	0.5993	0.2858	0.3135	0.0062	0.0010	0.6619	0.4028	5.0625	4.4597	26.50	26.60	29.30	29.20	6.30	6.20	0.55	214.05	628.15	102.08	90.51	89.06	29.20	6.30	6.20	0.55	214.05	628.15	102.08	90.51	89.06			
80.0	01-Oct-97		102	Black Point	-80.29467	1997.75	BB	AS	0.75	10	1997	1997-10	0.2190	0.2035	0.0155	0.0438	0.7212	0.2628	0.4585	0.0087	0.0012	0.3082	0.2491	5.2358	6.8848	19.30	20.00	28.90	28.80	5.40	5.70	0.25	183.99	500.53	67.04	73.91	78.36	19.30	20.00	28.90	28.80	5.40	5.70	0.25	183.99	500.53	67.04	73.91	78.36
80.0	01-Oct-97		103	Near Black Ledge	-80.28667	1997.75	BB	IS	0.75	10	1997	1997-10	0.0176	0.0167	0.0029	0.0280	0.2649	0.0363	0.3495	0.0049	0.0003	0.0975	0.3195	3.4665	0.0771	33.00	33.00	28.70	28.70	5.80	5.80	0.50	120.16	231.00	14.67	83.40	83.40	33.00	33.00	28.70	28.70	5.80	5.80	0.50	120.16	231.00	14.67	83.40	83.40
80.0	01-Oct-97		104	BNP Marker C	-80.26000	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0168	0.0140	0.0028	0.0155	0.2649	0.0363	0.3495	0.0049	0.0003	0.0975	0.3195	3.4665	0.0771	33.00	33.00	28.70	28.70	5.80	5.80	0.50	120.16	231.00	14.67	83.40	83.40	33.00	33.00	28.70	28.70	5.80	5.80	0.50	120.16	231.00	14.67	83.40	83.40
80.0	01-Oct-97		108	Marker G-1B	-80.19250	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0034	0.0027	0.0007	0.0036	0.1889	0.0070	0.1819	0.0040	0.0002	0.0597	0.1563	3.2783	0.0432	33.80	33.90	28.60	28.60	4.80	5.00	0.20	105.82	66.33	3.90	71.61	74.71	33.80	33.90	28.60	28.60	4.80	5.00	0.20	105.82	66.33	3.90	71.61	74.71
80.0	01-Oct-97		109	Midbay North	-80.23500	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0063	0.0044	0.0022	0.0082	0.2229	0.0144	0.2084	0.0040	0.0004	0.0443	0.0142	3.2628	0.0513	33.30	33.30	28.60	28.60	5.00	5.00	0.20	162.25	82.40	7.92	82.00	84.98	33.30	33.30	28.60	28.60	5.00	5.00	0.20	162.25	82.40	7.92	82.00	84.98
80.0	01-Oct-97		110	Fender Point	-80.28750	1997.75	BB	IS	0.75	10	1997	1997-10	0.1052	0.1004	0.0048	0.0251	0.4404	0.1303	0.3101	0.0059	0.0005	0.1384	0.2937	3.4930	0.1960	26.60	26.70	29.10	29.00	6.30	6.00	0.35	165.55	531.71	48.97	90.42	86.10	26.60	26.70	29.10	29.00	6.30	6.00	0.35	165.55	531.71	48.97	90.42	86.10
80.0	01-Oct-97		111	Feathered Bank	-80.24000	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0095	0.0077	0.0018	0.0101	0.2419	0.0196	0.2223	0.0049	0.0000	0.1211	0.3186	3.3653	0.0799	32.80	32.70	28.30	28.30	4.90	4.80	0.50	109.72	61.89	7.26	75.65	71.12	32.80	32.70	28.30	28.30	4.90	4.80	0.50	109.72	61.89	7.26	75.65	71.12
80.0	01-Oct-97		112	Sands Cut	-80.18833	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0068	0.0051	0.0012	0.0058	0.0053	0.0040	0.1882	0.0053	0.0001	0.0966	0.2594	3.0338	0.0184	33.80	34.00	28.30	28.30	5.50	5.80	0.40	132.70	448.38	80.96	80.96	125.58	33.80	34.00	28.30	28.30	5.50	5.80	0.40	132.70	448.38	80.96	80.96	125.58
80.0	01-Oct-97		113	Elliott Key	-80.44167	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0107	0.0095	0.0012	0.0149	0.2784	0.0256	0.2498	0.0050	0.0001	0.2170	0.2697	3.7290	0.0230	31.90	31.90	28.20	28.20	6.30	6.30	0.40	82.63	331.00	11.23	92.79	92.79	31.90	31.90	28.20	28.20	6.30	6.30	0.40	82.63	331.00	11.23	92.79	92.79
80.0	01-Oct-97		116	Rubicon Keys	-80.25500	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0151	0.0134	0.0018	0.0151	0.3320	0.0302	0.3017	0.0055	0.0002	0.1910	0.2327	4.1285	0.0638	28.90	32.60	28.10	28.70	7.70	4.20	0.45	136.70	288.00	12.17	111.19	62.39	28.90	32.60	28.10	28.70	7.70	4.20	0.45	136.70	288.00	12.17	111.19	62.39
80.0	01-Oct-97		121	Card Sound North	-80.29167	1997.75	BB	SCARD	0.75	10	1997	1997-10	0.0246	0.0219	0.0027	0.0279	0.5346	0.0625	0.4822	0.0054	0.0005	0.1604	0.2164	6.3318	0.1762	24.30	32.60	28.30	29.30	6.40	5.70	0.40	218.22	249.83	21.41	89.93	85.08	24.30	32.60	28.30	29.30	6.40	5.70	0.40	218.22	249.83	21.41	89.93	85.08
80.0	01-Oct-97		122	West Arsenicker	-80.31083	1997.75	BB	IS	0.75	10	1997	1997-10	0.0258	0.0245	0.0013	0.0167	0.4208	0.0425	0.3783	0.0044	0.0005	0.2453	0.2525	5.0503	0.0737	27.60	27.60	28.30	28.30	7.70	8.10	0.25	210.92	202.50	21.32	110.47	116.21	27.60	27.60	28.30	28.30	7.70	8.10	0.25	210.92	202.50	21.32	110.47	116.21
80.0	01-Oct-97		123	Pelican Bank	-80.28333	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0284	0.0265	0.0019	0.0265	0.4252	0.0549	0.3703	0.0057	0.0005	0.1604	0.2516	4.4698	0.0810	29.70	29.70	28.40	28.40	5.20	5.20	0.75	164.16	224.00	21.19	75.66	75.66	29.70	29.70	28.40	28.40	5.20	5.20	0.75	164.16	224.00	21.19	75.66	75.66
80.0	01-Oct-97		124	Midbay South	-80.23333	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0125	0.0112	0.0013	0.0310	0.3348	0.0435	0.2913	0.0050	0.0003	0.2327	0.2731	3.9098	0.0699	31.90	31.90	28.40	28.40	5.70	5.70	0.65	147.16	310.75	19.12	74.10	84.10	31.90	31.90	28.40	28.40	5.70	5.70	0.65	147.16	310.75	19.12	74.10	84.10
80.0	02-Oct-97		126	BNP Marker B	-80.20500	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0045	0.0035	0.0004	0.0175	0.3529	0.0590	0.2939	0.0059	0.0007	0.0825	0.4011	3.6086	0.1732	29.90	31.00	28.20	28.20	5.60	5.40	0.50	132.67	187.44	10.41	81.38	79.15	29.90	31.00	28.20	28.20	5.60	5.40	0.50	132.67	187.44	10.41	81.38	79.15
80.0	02-Oct-97		127	Shoal Point	-80.25000	1997.75	BB	IS	0.75	10	1997	1997-10	0.0335	0.0301	0.0034	0.0146	0.3810	0.0482	0.3328	0.0062	0.0011	0.1438	0.3770	4.3745	0.3365	26.20	26.30	29.00	29.00	5.90	6.20	0.10	136.06	98.29	17.20	84.59	88.89	26.20	26.30	29.00	29.00	5.90	6.20	0.10	136.06	98.29	17.20	84.59	88.89
80.0	02-Oct-97		128	Matheson Beach	-80.23333	1997.75	BB	IS	0.75	10	1997	1997-10	0.0055	0.0043	0.0015	0.0158	0.3556	0.0754	0.2802	0.0062	0.0012	0.0825	0.5136	4.1020	0.2165	27.20	27.60	30.00	29.50	5.90	7.20	0.20	102.00	143.53	26.91	76.89	104.31	27.20	27.60	30.00	29.50	5.90	7.20	0.20	102.00	143.53	26.91	76.89	104.31
80.0	02-Oct-97		129	Marker G-71	-80.18500	1997.75	BB	MAIN	0.75	10	1997	1997-10	0.0490	0.0443	0.0047	0.0422	0.3519	0.0912	0.2606	0.0088	0.0003	0.0513	0.5179	4.1598	0.3132	29.00	29.40	28.40	28.20																				

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN-TP	N:P	DIN:TP	%SAT_T	%SAT_B
83.0	08-Jan-98		134	Oleta River Park	25.90500	-80.13333	1998.02	BB	NBAY	0.02	01	1998	1998-01	0.0656	0.0608	0.0049	0.0321	0.3016	0.0977	0.2039	0.0085	0.0002	0.0000	0.134	3.4278	0.3627	30.40	30.90	24.60	24.60	6.70	6.80	1.35			78.41	931.12	25.39	84.35	96.07
83.0	07-Jan-98		135	South Card Sound	25.31667	-80.31667	1998.02	BB	SCARD	0.02	01	1998	1998-01	0.0025	0.0015	0.0009	0.0070	0.2208	0.0095	0.2113	0.0060	0.0003	0.0490	0.2877	3.4308	0.0040	28.90	29.90	22.90	22.80	6.90	7.00	0.10			81.98	67.81	3.52	94.31	95.96
84.0	12-Feb-98		101	Convoy Point	25.47833	-80.32083	1998.11	BB	AS	0.11	02	1998	1998-02	0.3206	0.0349	0.0058	0.0201	0.6449	0.3407	0.3042	0.0051	0.0005	0.1560	0.2948	2.2143	24.00	36.00	20.00	20.00	9.20	9.60	0.50			219.43	1391.89	147.62	116.99	132.23	
84.0	12-Feb-98		102	Black Point	25.54583	-80.29467	1998.11	BB	AS	0.11	02	1998	1998-02	0.2832	0.2751	0.0081	0.0296	0.6916	0.3128	0.3788	0.0064	0.0002	0.2523	2.4203	2.2203	19.90	36.00	19.20	19.00	8.70	8.70	0.40			238.28	2981.52	107.77	107.16	119.31	
84.0	12-Feb-98		103	Near Black Ledge	25.57333	-80.28667	1998.11	BB	IS	0.11	02	1998	1998-02	0.1367	0.1323	0.0044	0.0164	0.4924	0.1531	0.3393	0.0050	0.0006	0.2442	2.1650	2.1650	22.30	36.00	19.20	19.00	9.20	9.50	0.35			230.21	547.21	68.40	114.26	128.93	
84.0	13-Feb-98		104	BNP Marker C	25.60167	-80.22083	1998.12	BB	MAIN	0.12	02	1998	1998-02	0.0095	0.0079	0.0016	0.0061	0.2399	0.0155	0.2243	0.0045	0.0001	0.0759	2.1970	2.1970	30.60	36.00	18.50	18.40	7.70	8.00	0.85			118.25	443.37	7.64	99.99	107.57	
84.0	13-Feb-98		109	Marker G-1B	25.56917	-80.19250	1998.12	BB	MAIN	0.12	02	1998	1998-02	0.0051	0.0043	0.0008	0.0044	0.1957	0.0095	0.1862	0.0049	0.0001	0.0684	1.9150	1.9150	32.30	36.00	19.10	19.00	8.30	8.60	0.80			86.83	272.23	4.32	91.77	92.43	
84.0	13-Feb-98		109	Midbay North	25.56417	-80.23500	1998.12	BB	MAIN	0.12	02	1998	1998-02	0.0090	0.0076	0.0014	0.0061	0.1858	0.0152	0.1707	0.0047	0.0000	0.1070	2.0288	2.0288	30.60	36.00	18.50	18.40	9.00	9.10	1.05			87.16	7.10	118.22	123.50		
84.0	12-Feb-98		110	Fender Point	25.50500	-80.28750	1998.11	BB	IS	0.11	02	1998	1998-02	0.1909	0.1866	0.0043	0.0239	0.4323	0.2147	0.2176	0.0043	0.0000	0.1899	2.6645	2.6645	26.60	36.00	19.10	19.00	8.30	8.40	0.60			224.76	111.64	106.91	115.03		
84.0	13-Feb-98		111	Feathered Bank	25.51583	-80.24000	1998.12	BB	MAIN	0.12	02	1998	1998-02	0.0089	0.0078	0.0011	0.0089	0.2157	0.0177	0.1979	0.0041	0.0002	0.0778	2.0565	2.0565	32.60	36.00	19.10	19.00	6.70	7.10	0.50			216.36	253.21	9.56	89.91	96.50	
84.0	12-Feb-98		112	Sands Cut	25.48833	-80.18833	1998.11	BB	MAIN	0.11	02	1998	1998-02	0.0009	0.0007	0.0002	0.0044	0.1339	0.0053	0.1286	0.0050	0.0000	0.0778	1.8850	1.8850	33.30	36.00	18.70	18.60	7.60	8.00	0.60			58.91	2.34	100.72	105.95		
84.0	12-Feb-98		113	Elliott Key	25.44167	-80.23333	1998.11	BB	MAIN	0.11	02	1998	1998-02	0.0079	0.0072	0.0007	0.0171	0.1935	0.0250	0.1265	0.0043	0.0000	0.0968	1.9440	1.9440	32.30	36.00	18.70	18.60	7.90	7.90	1.25			100.60	12.97	103.79	105.55		
84.0	13-Feb-98		116	Rubicon Keys	25.40000	-80.19250	1998.12	BB	MAIN	0.12	02	1998	1998-02	0.0051	0.0043	0.0010	0.0044	0.1908	0.0165	0.1602	0.0049	0.0000	0.1002	2.4408	2.4408	26.00	36.00	19.50	19.40	8.30	8.60	0.45			108.26	235.20	6.80	104.26	109.29	
84.0	12-Feb-98		121	Card Sound North	25.35500	-80.29167	1998.11	BB	SCARD	0.11	02	1998	1998-02	0.0344	0.0313	0.0031	0.0309	0.3351	0.0653	0.2699	0.0049	0.0007	0.0868	3.8603	3.8603	25.80	36.00	18.20	18.10	7.90	7.90	0.85			152.12	207.40	29.63	98.85	106.55	
84.0	12-Feb-98		122	West Arsenicker	25.42017	-80.31083	1998.11	BB	IS	0.11	02	1998	1998-02	0.0207	0.0212	0.0034	0.0249	0.4464	0.2456	0.2008	0.0046	0.0010	0.1080	2.6835	2.6835	26.10	36.00	18.20	18.10	7.50	7.60	0.40			212.75	540.15	117.03	104.74	102.51	
84.0	12-Feb-98		123	Pelican Bank	25.44500	-80.28333	1998.11	BB	MAIN	0.11	02	1998	1998-02	0.2404	0.2368	0.0036	0.0225	0.4616	0.2629	0.1987	0.0047	0.0009	0.0990	2.6930	2.6930	32.40	36.00	18.20	18.20	7.90	7.70	0.50			216.38	683.49	123.25	100.60	103.21	
84.0	12-Feb-98		124	Midbay South	25.47250	-80.23333	1998.11	BB	MAIN	0.11	02	1998	1998-02	0.0139	0.0129	0.0011	0.0091	0.1547	0.0230	0.1316	0.0040	0.0000	0.0746	1.9750	1.9750	28.60	36.00	18.20	18.20	8.00	8.10	0.60			85.06	12.66	104.80	108.05		
84.0	13-Feb-98		126	BNP Marker B	25.67167	-80.20500	1998.12	BB	MAIN	0.12	02	1998	1998-02	0.0165	0.0147	0.0018	0.0097	0.2817	0.0262	0.2555	0.0044	0.0002	0.0813	3.0980	3.0980	27.90	36.00	19.20	19.10	7.10	6.90	0.25			141.30	249.54	13.13	91.55	94.21	
84.0	13-Feb-98		127	Shoal Point	25.63000	-80.25000	1998.12	BB	IS	0.12	02	1998	1998-02	0.0179	0.0162	0.0017	0.0094	0.2812	0.0278	0.2334	0.0042	0.0002	0.0976	3.1730	3.1730	26.00	36.00	20.30	20.30	7.00	7.00	0.30			138.30	254.56	14.70	102.26	115.71	
84.0	13-Feb-98		128	Matheson Beach	25.68833	-80.23333	1998.12	BB	IS	0.12	02	1998	1998-02	0.0152	0.0135	0.0016	0.0073	0.2219	0.0225	0.1994	0.0051	0.0002	0.0827	2.0978	2.0978	27.90	36.00	19.60	19.50	7.90	8.80	0.25			95.30	321.27	9.74	101.87	119.97	
84.0	13-Feb-98		129	Marker G-71	25.73667	-80.18500	1998.12	BB	MAIN	0.12	02	1998	1998-02	0.0182	0.0152	0.0029	0.0123	0.2176	0.0304	0.1872	0.0067	0.0002	0.1626	3.0563	3.0563	30.00	36.00	20.10	20.00	5.70	5.70	1.25			71.52	434.87	10.00	75.95	78.51	
84.0	13-Feb-98		130	South Dodge Island	25.76333	-80.17167	1998.12	BB	NBAY	0.12	02	1998	1998-02	0.0233	0.0199	0.0034	0.0173	0.2198	0.0406	0.1793	0.0069	0.0002	0.0989	2.9618	2.9618	32.40	36.00	21.20	21.10	7.00	7.00	0.95			70.63	579.99	13.03	77.97	78.12	
84.0	13-Feb-98		131	North Venetian Basin	25.80000	-80.16667	1998.12	BB	NBAY	0.12	02	1998	1998-02	0.0240	0.0208	0.0032	0.0147	0.2124	0.0406	0.1737	0.0076	0.0001	0.0840	3.2124	3.2124	31.00	36.00	21.00	21.00	4.80	4.70	1.15			61.99	1106.94	11.30	65.00	65.48	
84.0	13-Feb-98		132	North L-195 Basin	25.81667	-80.16667	1998.12	BB	NBAY	0.12	02	1998	1998-02	0.0120	0.0102	0.0018	0.0100	0.1939	0.0219	0.1719	0.0060	0.0000	0.0596	3.4573	3.4573	29.70	36.00	20.00	20.00	8.00	8.50	0.45			72.00	9.80	106.74	117.42		
84.0	13-Feb-98		133	North Normandy Isle	25.86667	-80.15000	1998.12	BB	NBAY	0.12	02	1998	1998-02	0.0053	0.0053	0.0000	0.0000	0.2707	0.0207	0.2045	0.0049	0.0000	0.0510	3.9140	3.9140	21.00	7.00	6.40	6.40	6.00	6.00	0.60			66.74	1149.97	8.20	92.10	89.65	
84.0	13-Feb-98		134	Oleta River Park	25.90500	-80.13333	1998.12	BB	NBAY	0.12	02	1998	1998-02	0.0774	0.0657	0.0072	0.0177	0.6076	0.0899	0.4582	0.0076	0.0000	0.2738	4.0640	4.0640	29.00	36.00	19.70	19.60	6.30	6.30	0.50			21.82	26.97	53.73	61.72		
84.0	12-Feb-98		135	South Card Sound	25.31667	-80.31667	1998.11	BB	SCARD	0.11	02	1998	1998-02	0.0396	0.0357	0.0039	0.0280	0.3385	0.0676	0.2710	0.0037	0.0003	0.1128	4.6325	4.6325	27.10	36.00	19.00	18.80	8.20	8.00	0.65			202.68	483.16	40.26	102.91	107.57	
85.0	04-Mar-98		101	Convoy Point	25.47833	-80.32083	1998.11	BB	AS	0.17	03	1998	1998-03	0.2096	0.2035	0.0062	0.0101	0.5078	0.2197	0.2881	0.0036	0.0005	0.1725	0.1530	3.3715	24.00	25.00	21												

SURV	DATE	TIME	STA	SITE	LATDEC	LONGDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN:TP	N:P	DIN:TP	%SAT_T	%SAT_B
88.0	02-Jun-98		101	Convoy Point	-80.47833	-80.32083	1998.42	BB	AS	0.42	06	1998	1998-06	0.1079	0.1029	0.0050	0.0276	0.4909	0.1355	0.3553	0.0115	0.0024	0.3604	0.2993	4.3573	31.60	31.60	29.00	29.30	5.00	4.60	0.25	94.76	124.90	26.16	73.99	88.23			
88.0	01-Jun-98		102	Black Point	-25.54583	-80.29467	1998.41	BB	AS	0.41	06	1998	1998-06	0.0573	0.0534	0.0039	0.0359	0.4619	0.0932	0.4757	0.0052	0.0013	0.3198	0.4147	4.6040	33.30	33.30	30.10	30.70	7.20	7.30	0.21	196.99	156.65	39.75	108.26	109.77			
88.0	01-Jun-98		103	Near Black Ledge	-25.57333	-80.28667	1998.41	BB	IS	0.41	06	1998	1998-06	0.0106	0.0084	0.0027	0.0170	0.5030	0.0276	0.4854	0.0050	0.0003	0.3656	0.2797	5.9115	33.90	33.90	29.70	30.10	7.20	7.10	0.44	211.10	197.00	12.12	107.47	107.47			
88.0	02-Jun-98		104	BNP Marker C	-25.60167	-80.22083	1998.42	BB	MAIN	0.42	06	1998	1998-06	0.0031	0.0022	0.0009	0.0103	0.1906	0.0134	0.1772	0.0040	0.0002	0.1967	0.2016	2.4700	36.90	36.90	28.80	28.80	5.60	5.60	0.83	106.77	191.00	7.49	85.54	85.54			
88.0	01-Jun-98		108	Marker G-1B	-25.56917	-80.19250	1998.41	BB	MAIN	0.41	06	1998	1998-06	0.0019	0.0012	0.0006	0.0116	0.1488	0.0134	0.1354	0.0046	0.0001	0.0876	0.1128	2.2540	36.20	36.20	29.70	29.70	7.70	7.70	0.63	126.05	383.00	6.49	117.90	117.90			
88.0	01-Jun-98		109	Midbay North	-25.56417	-80.23500	1998.41	BB	MAIN	0.41	06	1998	1998-06	0.0027	0.0016	0.0011	0.0070	0.1479	0.0097	0.1382	0.0032	0.0001	0.1357	0.1492	4.2783	36.70	36.70	29.50	29.00	5.80	6.10	0.32	103.07	278.00	6.78	88.62	93.21			
88.0	01-Jun-98		110	Fender Point	-25.50500	-80.28750	1998.41	BB	IS	0.41	06	1998	1998-06	0.0311	0.0288	0.0023	0.0216	0.2787	0.0527	0.2260	0.0036	0.0003	0.1471	0.1838	3.2235	35.50	35.50	29.70	29.00	6.50	6.50	0.11	173.10	376.50	32.74	99.09	99.16			
88.0	01-Jun-98		111	Featherbed Bank	-25.51583	-80.24000	1998.41	BB	MAIN	0.41	06	1998	1998-06	0.0046	0.0034	0.0014	0.0132	0.1920	0.0189	0.1731	0.0032	0.0000	0.1184	0.1563	2.5105	36.70	36.70	29.50	29.00	5.90	6.03	0.43	133.77	317.00	13.15	90.49	90.49			
88.0	01-Jun-98		112	Sands Cut	-25.48833	-80.18833	1998.41	BB	MAIN	0.41	06	1998	1998-06	0.0029	0.0021	0.0008	0.0132	0.1670	0.0161	0.1509	0.0025	0.0000	0.1112	0.1652	2.4068	36.00	36.00	29.00	29.00	5.80	6.20	0.09	149.09	34.00	14.38	88.30	94.39			
88.0	01-Jun-98		113	Elliott Key	-25.44167	-80.22333	1998.41	BB	MAIN	0.41	06	1998	1998-06	0.0074	0.0065	0.0029	0.0203	0.2246	0.0277	0.1969	0.0032	0.0003	0.2448	0.3588	2.8055	37.50	37.50	29.00	29.00	6.20	6.20	1.18	186.54	198.00	19.32	95.21	95.21			
88.0	01-Jun-98		116	Rubicon Keys	-25.40000	-80.25000	1998.41	BB	MAIN	0.41	06	1998	1998-06	0.0102	0.0089	0.0013	0.0152	0.2176	0.0253	0.1922	0.0039	0.0009	0.1003	0.2034	2.8240	35.70	35.70	29.00	29.00	5.10	5.10	0.37	124.34	60.33	14.48	77.44	77.44			
88.0	01-Jun-98		121	Card Sound North	-25.35500	-80.29167	1998.41	BB	SCARD	0.41	06	1998	1998-06	0.0092	0.0082	0.0011	0.0156	0.2940	0.0249	0.2622	0.0036	0.0006	0.1472	0.2629	3.3838	34.20	34.20	29.10	29.00	5.40	5.20	0.03	178.74	88.75	15.11	81.29	78.34			
88.0	01-Jun-98		122	West Arsenicker	-25.42017	-80.31083	1998.41	BB	IS	0.41	06	1998	1998-06	0.0217	0.0200	0.0017	0.0289	0.4388	0.0505	0.2883	0.0057	0.0003	0.2461	0.2424	3.8113	36.70	36.70	28.60	28.60	5.20	5.20	0.69	171.74	361.00	19.78	79.21	79.21			
88.0	01-Jun-98		123	Pelican Bank	-25.44500	-80.28333	1998.41	BB	MAIN	0.41	06	1998	1998-06	0.0163	0.0143	0.0020	0.0169	0.2882	0.0305	0.2549	0.0038	0.0005	0.1744	0.1969	3.2133	34.70	34.70	28.40	28.40	4.50	4.50	0.11	168.03	158.33	13.77	87.57	87.57			
88.0	01-Jun-98		124	Midbay South	-25.47250	-80.23333	1998.41	BB	MAIN	0.41	06	1998	1998-06	0.0047	0.0040	0.0007	0.0238	0.2549	0.0285	0.2263	0.0031	0.0006	0.1972	0.2105	3.4558	36.70	36.70	29.50	29.00	5.80	6.00	0.28	182.04	101.88	20.38	88.55	91.54			
88.0	02-Jun-98		126	BNP Marker B	-25.67167	-80.20500	1998.42	BB	MAIN	0.42	06	1998	1998-06	0.0049	0.0033	0.0016	0.0145	0.2106	0.0194	0.1912	0.0033	0.0006	0.1836	0.3126	3.0358	36.90	36.90	28.80	28.80	5.40	5.40	1.05	143.26	69.13	13.17	82.49	82.55			
88.0	02-Jun-98		127	Shoal Point	-25.63000	-80.25000	1998.42	BB	IS	0.42	06	1998	1998-06	0.0058	0.0043	0.0015	0.0099	0.2760	0.0158	0.2602	0.0032	0.0005	0.2846	0.2868	3.8410	35.60	35.60	29.70	29.00	5.70	5.70	1.11	166.01	206.33	12.14	76.01	75.80			
88.0	02-Jun-98		128	Matheson Beach	-25.68833	-80.23333	1998.42	BB	IS	0.42	06	1998	1998-06	0.0095	0.0078	0.0017	0.0121	0.2963	0.0217	0.2747	0.0040	0.0002	0.1507	0.3535	4.1740	34.60	34.60	30.10	30.10	5.00	5.00	0.15	166.01	206.33	12.14	76.01	75.80			
88.0	02-Jun-98		129	Marker G-7	-25.73667	-80.18500	1998.42	BB	MAIN	0.42	06	1998	1998-06	0.0105	0.0094	0.0020	0.0216	0.2433	0.0320	0.2112	0.0073	0.0008	0.2959	0.7034	3.4575	36.20	36.20	28.90	28.90	5.30	5.30	0.99	73.94	91.50	9.73	80.16	80.16			
88.0	02-Jun-98		130	South Dodge Island	-25.76333	-80.17167	1998.42	BB	NSAY	0.42	06	1998	1998-06	0.0253	0.0227	0.0026	0.0238	0.2537	0.0491	0.2046	0.0084	0.0012	0.1592	0.8668	3.5498	33.60	33.60	29.00	29.00	5.50	5.50	1.11	67.13	93.53	12.99	82.29	82.35			
88.0	02-Jun-98		131	North Venetian Basin	-25.80000	-80.16667	1998.42	BB	NSAY	0.42	06	1998	1998-06	0.0349	0.0316	0.0033	0.0251	0.2748	0.0600	0.2149	0.0099	0.0010	0.0920	0.9529	3.7800	32.90	32.90	29.00	29.00	5.10	5.20	2.09	61.35	131.85	13.39	76.09	77.58			
88.0	02-Jun-98		132	North I-195 Basin	-25.81667	-80.16667	1998.42	BB	NSAY	0.42	06	1998	1998-06	0.0197	0.0165	0.0032	0.0246	0.3127	0.0442	0.2685	0.0112	0.0005	0.1437	0.8552	4.5345	31.40	31.40	29.10	29.00	5.00	5.00	0.32	62.05	210.67	8.78	82.83	82.90			
88.0	02-Jun-98		133	North Normandy Isle	-25.86667	-80.15000	1998.42	BB	NSAY	0.42	06	1998	1998-06	0.0264	0.0235	0.0029	0.0397	0.2940	0.0661	0.2279	0.0118	0.0009	0.2670	1.5337	4.5405	29.10	29.10	29.00	29.00	5.40	5.00	0.60	55.26	157.42	12.43	79.03	80.37			
88.0	02-Jun-98		134	Oleta River Park	-25.90500	-80.13333	1998.42	BB	NSAY	0.42	06	1998	1998-06	0.0153	0.0118	0.0028	0.0082	0.2367	0.0235	0.2132	0.0121	0.0006	0.3511	2.5426	4.4818	31.40	31.40	29.00	29.00	5.60	5.90	1.13	43.35	84.00	4.31	82.77	86.48			
88.0	01-Jun-98		135	South Card Sound	-25.31667	-80.31667	1998.41	BB	SCARD	0.41	06	1998	1998-06	0.0135	0.0132	0.0003	0.0084	0.3316	0.0219	0.3097	0.0065	0.0003	0.1256	0.2682	4.6465	32.90	32.90	29.00	29.00	5.80	5.30	0.03	112.78	156.50	7.45	86.24	79.14			
89.0	16-Jul-98		101	Convoy Point	-25.47833	-80.32083	1998.54	BB	AS	0.54	07	1998	1998-07	0.0017	0.0000	0.0000	0.0111	0.0499	0.0128	0.3371	0.0030	0.0003	0.3616	0.4112	4.7763	31.30	31.30	31.20	31.20	7.80	8.00	0.35	276.33	91.50	9.38	120.34	123.43			
89.0	16-Jul-98		102	Black Point	-25.54583	-80.29467	1998.54	BB	AS	0.54	07	1998	1998-07	0.0462	0.0417	0.0045	0.0186	0.5398	0.0648	0.4750	0.0042	0.0000	0.4713	0.4272	5.7270	30.90	30.90	31.00	31.00	9.20	9.20	0.40	285.58	34.26	132.77	137.52	137.52			
89.0	16-Jul-98		103	Near Black Ledge	-25.57333	-80.28667	1998.54	BB	IS	0.54	07	1998	1998-07	0.0023	0.0000	0.0023	0.0187	0.4900	0.0210	0.4690	0.0038	0.0000	0.4293	0.3162	5.9770	32.60	32.70	30.00	30.00	8.00	8.00	0.45	297.75	12.24	120.17	120.85				
89.0	16-Jul-98		104	BNP Marker C	-25.60167	-80.22083	1998.54	BB	MAIN	0.54	07	1998																												

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	CHLA	TOC	Si(OH)4	SAL S	SAL B	TEMP S	TEMP B	DO S	DO B	TURB	Kd	pH	TN-T	N-P	DIN-TP	%SAT T	%SAT B			
92.0	30-Oct-98		102	Black Point	-25.54833	-80.29467	1998.93	BB	AS	0.83	10	1998	1998-10	0.0067	0.0057	0.0030	0.0146	0.3066	0.0233	0.2073	0.0041	0.0021	0.2441	0.2580	3.8078	0.0311	28.80	28.80	26.30	26.30	9.50	9.70	148.00	16.45	148.00	136.20	127.00	167.18	24.63	12.69	63.30	94.73		
92.0	30-Oct-98		104	BNP Marker C	-25.60167	-80.22083	1998.93	BB	MAIN	0.83	10	1998	1998-10	0.0035	0.0021	0.0014	0.0082	0.2155	0.0117	0.2038	0.0046	0.0018	0.0726	0.2392	2.3668	0.0180	33.80	33.70	24.40	24.40	6.80	6.70	0.41	103.64	14.52	5.62	97.67	96.17	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		108	Marker G-1B	-25.56917	-80.19250	1998.93	BB	MAIN	0.83	10	1998	1998-10	0.0008	0.0000	0.0008	0.0086	0.1751	0.0094	0.1657	0.0045	0.0016	0.0707	0.1738	2.1985	0.0013	33.90	33.90	24.30	24.30	6.80	6.70	0.29	105.87	12.76	4.59	97.67	96.17	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		109	Midbay North	-25.56417	-80.23500	1998.93	BB	MAIN	0.83	10	1998	1998-10	0.0031	0.0024	0.0007	0.0096	0.1751	0.0127	0.1624	0.0040	0.0021	0.0602	0.2024	2.3390	0.0109	33.80	33.80	24.40	24.40	6.70	6.80	0.13	92.72	13.44	7.06	96.23	97.67	106.64	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		110	Fender Point	-25.50400	-80.28750	1998.93	BB	IS	0.82	10	1998	1998-10	0.0049	0.0044	0.0005	0.0074	0.4548	0.0122	0.4426	0.0052	0.0026	0.2032	0.2325	0.2320	4.8130	0.3406	37.40	30.20	24.90	24.90	7.40	8.00	0.36	192.78	10.26	5.18	102.56	121.62	148.00	16.45	148.00	136.20	127.00
92.0	30-Oct-98		111	Featherbed Bank	-25.51583	-80.24000	1998.93	BB	MAIN	0.83	10	1998	1998-10	0.0016	0.0009	0.0007	0.0074	0.1693	0.0090	0.1603	0.0041	0.0016	0.0950	0.1424	2.4593	0.0011	33.70	33.70	24.30	24.30	6.70	6.70	0.16	109.59	12.85	4.81	96.06	96.06	106.64	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		112	Sands Cut	-25.48833	-80.18833	1998.92	BB	MAIN	0.82	10	1998	1998-10	0.0007	0.0000	0.0007	0.0100	0.1760	0.0107	0.1653	0.0038	0.0005	0.0790	0.1836	2.3865	0.0054	34.30	34.30	24.60	24.60	5.80	5.90	0.35	103.90	14.37	5.00	93.30	94.73	106.64	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		113	Elliott Key	-25.44167	-80.22333	1998.92	BB	MAIN	0.82	10	1998	1998-10	0.0042	0.0032	0.0010	0.0131	0.2012	0.0173	0.1839	0.0040	0.0002	0.0629	0.1223	2.2803	0.0000	34.10	34.10	24.20	24.20	5.70	5.70	0.31	91.14	164.33	9.59	81.85	81.85	96.06	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		116	Rubicon Keys	-25.40000	-80.25500	1998.92	BB	MAIN	0.82	10	1998	1998-10	0.0095	0.0083	0.0012	0.0069	0.1836	0.0163	0.1673	0.0040	0.0006	0.0639	0.2616	2.3933	0.0131	34.70	34.70	24.30	24.30	6.70	6.80	0.50	102.04	58.25	9.07	96.69	98.13	106.64	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		121	Card Sound North	-25.35500	-80.29167	1998.92	BB	SCARD	0.82	10	1998	1998-10	0.0067	0.0061	0.0011	0.0093	0.2807	0.0160	0.2647	0.0044	0.0013	0.0991	0.2992	3.8875	0.0115	31.40	31.40	24.40	24.40	6.60	6.60	0.20	104.69	26.88	8.02	93.34	93.34	106.64	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		122	West Arsenicker	-25.42017	-80.31083	1998.92	BB	IS	0.82	10	1998	1998-10	0.2311	0.2227	0.0084	0.0951	0.5616	0.3261	0.2355	0.0069	0.0026	0.2032	0.3305	5.2048	0.0178	21.10	21.10	24.10	24.10	7.00	7.00	0.62	180.30	274.06	104.70	92.51	92.51	106.64	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		123	Pelican Bank	-25.44500	-80.28333	1998.92	BB	MAIN	0.82	10	1998	1998-10	0.0354	0.0359	0.0035	0.0253	0.5480	0.1086	0.4374	0.0066	0.0014	0.1040	0.2123	4.0318	0.0589	27.70	29.60	24.10	24.10	6.60	6.60	0.37	216.67	172.44	43.11	92.19	92.38	106.64	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		124	Midbay South	-25.56417	-80.23500	1998.92	BB	MAIN	0.82	10	1998	1998-10	0.0031	0.0024	0.0007	0.0096	0.1751	0.0127	0.1624	0.0040	0.0021	0.0602	0.2024	2.3390	0.0109	33.80	33.80	24.40	24.40	6.70	6.80	0.13	92.72	13.44	7.06	96.23	97.67	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		126	BNP Marker B	-25.67167	-80.20500	1998.93	BB	MAIN	0.83	10	1998	1998-10	0.0062	0.0059	0.0026	0.0121	0.2465	0.0202	0.2262	0.0057	0.0019	0.0798	0.2454	3.0620	0.0472	31.10	31.30	25.20	25.20	6.80	7.10	0.05	95.17	24.08	7.81	96.09	100.23	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		127	Shoal Point	-25.63000	-80.25000	1998.93	BB	IS	0.83	10	1998	1998-10	0.0095	0.0098	0.0018	0.0078	0.2709	0.0105	0.2604	0.0055	0.0016	0.1097	0.2983	3.5073	0.0226	29.00	29.10	24.50	24.50	7.80	7.80	0.13	109.10	14.95	4.21	95.19	105.69	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		128	Matheron Beach	-25.68833	-80.23333	1998.93	BB	IS	0.83	10	1998	1998-10	0.0183	0.0153	0.0030	0.0115	0.2895	0.0298	0.2597	0.0075	0.0026	0.1086	0.7426	3.6873	0.0793	28.60	30.70	25.70	25.70	7.00	9.30	0.11	85.28	25.06	8.78	98.61	132.37	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		129	Marker G-71	-25.73667	-80.18500	1998.93	BB	MAIN	0.83	10	1998	1998-10	0.0278	0.0259	0.0049	0.0254	0.2483	0.0531	0.1952	0.0081	0.0026	0.0881	0.5742	3.3068	0.3287	30.90	33.90	24.40	24.40	6.70	6.90	0.24	67.57	44.65	14.46	94.45	99.39	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		130	South Dodge Island	-25.76333	-80.17167	1998.93	BB	NBAY	0.83	10	1998	1998-10	0.0175	0.0140	0.0035	0.0116	0.2454	0.0290	0.2164	0.0085	0.0030	0.1211	0.6160	3.1438	0.2069	31.20	31.70	24.60	24.60	6.80	6.40	0.62	63.75	21.26	7.54	96.47	91.09	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		131	North Venetian Basin	-25.80000	-80.16667	1998.93	BB	NBAY	0.83	10	1998	1998-10	0.0219	0.0188	0.0029	0.0158	0.2695	0.0378	0.2384	0.0094	0.0018	0.0906	0.6154	4.2273	0.4332	27.90	30.50	24.80	24.80	7.30	7.40	0.21	63.75	78.22	14.87	101.16	104.04	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		133	North Normandy Isle	-25.86667	-80.15000	1998.93	BB	NBAY	0.83	10	1998	1998-10	0.0598	0.0029	0.0029	0.0186	0.2062	0.0244	0.1818	0.0110	0.0010	0.0891	0.7560	2.7505	0.2130	33.40	33.40	25.20	25.20	7.10	7.80	0.62	41.48	53.54	4.90	102.61	112.60	106.64	12.56	6.22	97.67	96.17	
92.0	30-Oct-98		134	Oleta River Park	-25.90500	-80.13333	1998.93	BB	NBAY	0.83	10	1998	1998-10	0.0249	0.0203	0.0046	0.0139	0.2289	0.0388	0.1901	0.0131	0.0012	0.1171	1.2328	3.1285	0.2582	32.20	34.90	25.60	25.60	6.80	6.40	0.80	41.70	73.87	6.56	96.56	96.56	106.64	12.56	6.22	97.67	96.17	
92.0	29-Oct-98		135	South Card Sound	-25.31667	-80.31667	1998.92	BB	SCARD	0.82	10	1998	1998-10	0.0887	0.0834	0.0053	0.0291	0.3661	0.1178	0.2483	0.0068	0.0015	0.0779	0.3198	3.4200	0.0008	28.30	28.30	24.30	24.30	7.00	7.00	0.27	118.17	177.16	38.25	92.92	96.92	106.64	12.56	6.22	97.67	96.17	
93.0	18-Nov-98		101	Convoy Point	-25.47833	-80.32083	1998.98	BB	AS	0.88	11	1998	1998-11	0.4284	0.4152	0.0132	0.0379	0.7421	0.5264	0.2158	0.0126	0.0001	0.1918	0.4506	3.5150	0.0000	19.20	24.30	27.40	27.40	6.10	8.20	0.49	110.17	15398.70	92.32	86.32	114.40	148.00	16.45	148.00	136.20	127.00	
93.0	18-Nov-98		102	Black Point	-25.54833	-80.29467	1998.98	BB	AS	0.88	11	1998	1998-11	0.0067	0.0057	0.0030	0.0146	0.3066	0.0233	0.2073	0.0041	0.0021	0.2441	0.2580	3.8078	0.0311	28.80	28.80	26.30	26.30	9.50	9.70	148.00	16.45	148.00	136.20	127.00	167.18	24.63	12.69	63.30	94.73		
93.0	18-Nov-98		103	Near Black Ledge	-25.57333	-80.28667	1998.98	BB	IS	0.88	11	1998	1998-11	0.0025	0.0172	0.0080	0.0340	0.4205	0.0591																									

SURV	DATE	TIME	STA	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN-TP	N:P	DIN:TP	%AT_T	%AT_B
96.0	22-Feb-99	1241	104 BNP Marker C	-80.260167	-80.22083	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0072	0.0009	0.0007	0.0000	0.03140	0.0148	0.0000	0.0002	0.0002	0.0002	0.1644	2.8000	35.50	35.40	20.30	20.30	7.90	7.90	1.65	184.62	21.00	6.88	100.65	100.77	100.77		
96.0	22-Feb-99	1121	108 Marker G-1B	-80.19250	-80.19250	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0018	0.0016	0.0002	0.0044	0.2783	0.0061	0.2692	0.0037	0.0005	0.0005	0.5481	2.6123	35.20	35.20	20.30	20.30	7.90	7.90	1.65	164.41	25.00	3.66	107.77	100.77	100.77		
96.0	22-Feb-99	1128	109 Midway North	-80.23500	-80.23500	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0028	0.0026	0.0002	0.0079	0.2475	0.0106	0.2369	0.0033	0.0001	0.0001	0.6708	0.1221	36.20	36.20	20.30	20.30	8.00	8.20	1.85	168.19	304.00	7.23	110.96	113.59	113.59		
96.0	23-Feb-99	916	110 Fender Point	-80.28750	-80.28750	1999.14	BB	IS	0.14	02	1999	1999-02	0.0044	0.0036	0.0002	0.0081	0.3047	0.0125	0.2922	0.0029	0.0011	0.0029	0.1324	3.0893	35.20	35.20	18.00	18.00	7.30	7.30	1.30	168.19	304.00	7.23	110.96	113.59	113.59		
96.0	22-Feb-99	1058	111 Feathered Bank	-80.24000	-80.24000	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0036	0.0033	0.0002	0.0039	0.2623	0.0075	0.2548	0.0029	0.0004	0.0004	0.7676	0.1014	36.30	36.30	20.10	20.10	7.70	7.70	1.80	197.30	42.80	5.63	106.00	106.07			
96.0	23-Feb-99	1034	112 Sands Cut	-80.18833	-80.18833	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0007	0.0000	0.0007	0.0064	0.1218	0.0071	0.2057	0.0037	0.0005	0.0005	0.5414	0.0986	35.70	35.70	20.10	20.10	7.20	7.20	0.85	126.26	28.86	4.20	96.26	96.42			
96.0	23-Feb-99	1112	113 Elliott Key	-80.22333	-80.22333	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0032	0.0023	0.0009	0.0063	0.2077	0.0158	0.1962	0.0032	0.0003	0.0003	0.8033	0.1653	37.00	37.00	18.00	18.00	7.00	7.20	1.50	142.98	82.00	7.90	95.20	97.92			
96.0	23-Feb-99	1133	116 Rubicon Keys	-80.23500	-80.23500	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0008	0.0008	0.0002	0.0035	0.1691	0.0096	0.1595	0.0039	0.0002	0.0002	0.8093	0.1832	36.30	36.30	20.10	20.10	7.10	7.20	1.60	165.15	91.33	6.05	96.11	97.46			
96.0	23-Feb-99	1150	121 North Card Sound	-80.29167	-80.29167	1999.14	BB	SCARD	0.14	02	1999	1999-02	0.0008	0.0002	0.0006	0.0048	0.1730	0.0056	0.1673	0.0032	0.0001	0.0001	0.9416	0.1587	35.00	35.00	19.40	19.40	6.90	7.10	0.50	121.12	161.00	3.95	93.89	96.47			
96.0	23-Feb-99	1242	122 West Arsenicker	-80.31083	-80.31083	1999.14	BB	IS	0.14	02	1999	1999-02	0.0037	0.0032	0.0011	0.0084	0.3468	0.0121	0.3347	0.0031	0.0003	0.0003	1.5379	0.1268	33.30	33.30	18.70	18.70	7.30	7.50	0.60	247.31	86.50	8.64	96.84	99.56			
96.0	23-Feb-99	1315	123 Pelican Bank	-80.28333	-80.28333	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0042	0.0036	0.0011	0.0071	0.2788	0.0114	0.2674	0.0025	0.0002	0.0002	0.5333	0.1146	35.20	35.20	20.10	20.10	7.00	7.10	0.85	249.69	106.33	10.19	94.16	96.40			
96.0	23-Feb-99	1028	124 Midway South	-80.24750	-80.24750	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0043	0.0037	0.0006	0.0079	0.2273	0.0121	0.2151	0.0021	0.0005	0.0005	0.7846	0.1343	36.80	36.80	18.50	18.50	7.30	7.20	1.25	237.94	57.83	12.72	96.58	98.09			
96.0	23-Feb-99	1058	126 BNP Marker B	-80.20500	-80.20500	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0047	0.0042	0.0005	0.0079	0.2429	0.0111	0.2318	0.0041	0.0001	0.0001	0.8943	0.1480	33.90	33.70	20.00	20.00	7.00	7.30	1.05	132.43	318.00	6.07	99.80	99.74			
96.0	23-Feb-99	1058	126 BNP Marker B	-80.20500	-80.20500	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0047	0.0042	0.0005	0.0079	0.2429	0.0111	0.2318	0.0041	0.0001	0.0001	0.8943	0.1480	33.90	33.70	20.00	20.00	7.00	7.30	1.05	132.43	318.00	6.07	99.80	99.74			
96.0	22-Feb-99	1645	128 Matheson Beach	-80.23333	-80.23333	1999.14	BB	IS	0.14	02	1999	1999-02	0.0036	0.0029	0.0007	0.0078	0.2049	0.0114	0.1935	0.0033	0.0001	0.0001	0.8049	0.2621	31.60	31.60	20.40	20.40	7.60	7.60	0.75	137.49	326.00	7.66	102.25	102.25			
96.0	22-Feb-99	1258	129 Marker G-71	-80.18500	-80.18500	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0100	0.0098	0.0012	0.0088	0.1681	0.0188	0.1493	0.0048	0.0008	0.0008	0.6416	0.2520	33.70	33.70	20.20	20.20	7.00	7.20	2.80	177.22	53.70	8.63	101.12	91.80			
96.0	22-Feb-99	1317	130 South Doge Island	-80.17167	-80.17167	1999.14	BB	NBAY	0.14	02	1999	1999-02	0.0060	0.0053	0.0007	0.0052	0.1351	0.0111	0.1239	0.0055	0.0010	0.0010	0.2907	0.4396	35.30	35.30	22.30	22.30	6.40	6.80	4.20	52.14	24.46	4.46	94.77	96.31			
96.0	22-Feb-99	1354	131 North Venetian Basin	-80.16667	-80.16667	1999.14	BB	NBAY	0.14	02	1999	1999-02	0.0080	0.0072	0.0008	0.0061	0.1605	0.0141	0.1465	0.0088	0.0004	0.0004	0.3801	0.7383	34.50	34.40	22.00	22.00	6.90	6.90	3.75	54.08	80.40	4.57	96.72	96.66			
96.0	22-Feb-99	1421	132 North I-195 Basin	-80.16667	-80.16667	1999.14	BB	NBAY	0.14	02	1999	1999-02	0.0100	0.0096	0.0005	0.0092	0.2048	0.0193	0.1855	0.0062	0.0002	0.0011	0.5326	0.3935	32.80	32.90	20.10	20.10	7.80	7.70	1.75	73.61	275.00	6.92	105.33	104.05			
96.0	22-Feb-99	1515	133 North Normandy Isle	-80.15000	-80.15000	1999.14	BB	NBAY	0.14	02	1999	1999-02	0.0057	0.0052	0.0007	0.0063	0.1622	0.0122	0.1297	0.0086	0.0005	0.0005	0.9018	1.0022	34.90	35.00	20.90	20.90	7.10	7.00	4.55	45.23	58.00	3.15	96.38	97.01			
96.0	22-Feb-99	1537	134 Oleta River Park	-80.13333	-80.13333	1999.14	BB	MAIN	0.14	02	1999	1999-02	0.0028	0.0023	0.0005	0.0062	0.1305	0.0090	0.1215	0.0092	0.0005	0.0005	0.5515	0.9863	35.80	35.50	22.10	22.10	6.50	6.80	2.00	31.30	42.83	2.16	91.33	96.07			
96.0	23-Feb-99	1203	135 South Card Sound	-80.31667	-80.31667	1999.14	BB	SCARD	0.14	02	1999	1999-02	0.0009	0.0001	0.0007	0.0070	0.2109	0.0079	0.2031	0.0041	0.0008	0.0008	0.8003	0.1738	33.98	34.00	20.00	19.80	6.00	7.40	0.51	113.43	22.50	4.23	92.92	101.03			
97.0	12-Mar-99	1345	101 Convoy Point	-80.24783	-80.24783	1999.19	BB	AS	0.19	03	1999	1999-03	0.0095	0.0082	0.0013	0.0126	0.2984	0.0231	0.2763	0.0034	0.0003	0.0003	0.2182	0.1550	34.20	34.20	22.90	22.90	8.00	8.60	0.34	193.76	18.00	14.32	121.50	122.90			
97.0	11-Mar-99	1437	102 Black Point	-80.29487	-80.29487	1999.19	BB	AS	0.19	03	1999	1999-03	0.0083	0.0078	0.0004	0.0053	0.3855	0.0159	0.3720	0.0033	0.0004	0.0004	0.2180	0.1606	32.00	30.70	22.40	22.40	11.60	11.70	0.32	254.95	8.39	8.94	159.52	160.79			
97.0	11-Mar-99	1439	103 Near Black Ledge	-80.28667	-80.28667	1999.19	BB	IS	0.19	03	1999	1999-03	0.0059	0.0058	0.0002	0.0068	0.0925	0.0102	0.2488	0.0025	0.0002	0.0002	0.2689	0.1038	34.10	34.10	20.00	20.00	9.90	9.90	0.39	232.38	13.81	9.11	135.96	140.17			
97.0	11-Mar-99	1440	104 BNP Marker C	-80.26017	-80.26017	1999.19	BB	MAIN	0.19	03	1999	1999-03	0.0008	0.0008	0.0001	0.0037	0.1569	0.0017	0.1508	0.0038	0.0018	0.0018	0.7786	0.1651	35.90	35.90	20.20	20.20	7.70	7.70	1.60	166.19	37.74	10.87	96.18	97.46			
97.0	11-Mar-99	949	108 Marker G-1B	-80.19250	-80.19250	1999.19	BB	MAIN	0.19	03	1999	1999-03	0.0024	0.0015	0.0008	0.0044	0.1594	0.0068	0.1526	0.0036	0.0011	0.0011	0.7074	0.2059	35.90	35.90	20.60	20.60	7.70	7.60	0.89	97.14	13.93	4.16	106.00	104.51			
97.0	11-Mar-99	942	109 Midway North	-80.23500	-80.23500	1999.19	BB	MAIN	0.19	03	1999	1999-03	0.0016	0.0000	0.0016	0.0062	0.1495	0.0077	0.1418	0.0029	0.0016	0.0016	0.0970	0.1259	36.50	36.50	21.40	21.40	7.80	7.70	0.62	113.47	10.52	5.87	109.32	107.92			
97.0	12-Mar-99	1327	110 Fender Point	-80.28750	-80.28750	1999.19	BB	IS	0.19	03</																													

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TCON	TP	SRP	ORP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN-TP	N:P	DIN:TP	%SAT	%SAT_B	
100.0	24-Jun-99	850	109	Midbay South	-25.56417	-80.23500	1999.48	BB	MAIN	0.48	06	1999	1999-06	0.0083	0.0063	0.0021	0.0158	0.0089	0.0041	0.1858	0.0047	0.0004	0.1954	0.1621	0.3788	0.1864	36.10	36.10	29.20	29.20	6.20	6.10	0.43			137.80	137.80	13.00	13.00	52.30	52.30	
100.0	24-Jun-99	1441	110	Feder Point	-25.50500	-80.23500	1999.47	BB	IS	0.47	06	1999	1999-06	0.0534	0.0499	0.0035	0.0241	0.3784	0.0775	0.3039	0.0049	0.0002	0.1956	0.1954	3.7493	0.1864	35.20	35.10	29.20	29.20	9.30	9.30	0.31			177.61	738.00	35.14	150.42	160.96	160.96	
100.0	21-Jun-99	1351	111	Featherbed Bank	-25.51833	-80.24000	1999.47	BB	MAIN	0.47	06	1999	1999-06	0.0090	0.0064	0.0026	0.0116	0.2920	0.0206	0.2714	0.0059	0.0002	0.1936	0.1081	3.4663	0.1864	37.30	37.50	29.30	29.30	10.20	10.20	0.60			108.78	196.00	37.74	142.96	144.57	144.57	
100.0	21-Jun-99	1332	112	Sands Cut	-25.48833	-80.18833	1999.47	BB	MAIN	0.47	06	1999	1999-06	0.0048	0.0025	0.0023	0.0152	0.2433	0.0200	0.2234	0.0052	0.0000	0.1443	0.1075	3.3630	0.1864	35.70	35.90	30.40	30.40	9.30	9.30	0.60			103.76	#DIV/0!	85.1	156.46	162.46	162.46	
100.0	21-Jun-99	1151	113	Elliott Key	-25.44167	-80.22333	1999.47	BB	MAIN	0.47	06	1999	1999-06	0.0156	0.0120	0.0030	0.0225	0.2970	0.0380	0.2589	0.0047	0.0003	0.1441	0.1441	3.5830	0.1864	36.00	37.10	29.10	29.10	28.80	7.00	7.00	0.23			139.11	271.75	178.2	106.57	107.06	107.06
100.0	21-Jun-99	1137	116	Rubicon Keys	-25.40000	-80.25000	1999.47	BB	MAIN	0.47	06	1999	1999-06	0.0139	0.0120	0.0019	0.0163	0.2612	0.0303	0.2310	0.0052	0.0017	0.1261	0.1044	3.5460	0.1864	35.00	35.40	29.00	29.00	29.10	7.00	7.20	0.20			111.41	39.32	12.91	106.15	109.20	109.20
100.0	21-Jun-99	1102	121	North Card Sound	-25.35500	-80.29167	1999.47	BB	SCARD	0.47	06	1999	1999-06	0.0051	0.0039	0.0012	0.0129	0.2962	0.0180	0.2681	0.0046	0.0013	0.2692	0.2316	3.9038	0.1864	35.90	35.70	29.20	29.20	29.20	6.50	6.90	0.15			138.58	30.29	8.73	98.91	104.93	104.93
100.0	21-Jun-99	1045	122	West Arsenicker	-25.42017	-80.31083	1999.47	BB	MAIN	0.47	06	1999	1999-06	0.0128	0.0091	0.0027	0.0170	0.2512	0.0192	0.2270	0.0052	0.0012	0.1093	0.0925	3.8228	0.1864	35.80	37.00	29.30	29.30	29.80	6.40	6.00	0.18			111.92	212.50	132.07	104.67	104.67	
100.0	21-Jun-99	1017	123	Pelican Bank	-25.44500	-80.28333	1999.47	BB	MAIN	0.47	06	1999	1999-06	0.0131	0.0109	0.0028	0.0245	0.3304	0.0382	0.2922	0.0052	0.0019	0.2693	0.0485	3.2693	0.1864	36.40	36.30	29.20	29.20	28.90	7.10	7.10	0.31			140.91	40.29	16.30	108.11	108.11	108.11
100.0	21-Jun-99	1309	124	Midbay South	-25.47250	-80.23333	1999.47	BB	MAIN	0.47	06	1999	1999-06	0.0057	0.0042	0.0015	0.0200	0.2778	0.0257	0.2521	0.0065	0.0013	0.1701	0.0895	3.2138	0.1864	37.50	37.60	29.30	29.30	29.10	8.10	8.60	0.37			94.49	43.18	8.74	124.67	132.25	132.25
100.0	24-Jun-99	946	126	BNP Marker B	-25.67167	-80.20500	1999.48	BB	MAIN	0.48	06	1999	1999-06	0.0196	0.0160	0.0036	0.0258	0.2801	0.0454	0.2346	0.0054	0.0009	0.1687	0.1324	3.6103	0.1864	33.90	34.70	29.60	29.60	29.00	6.70	6.60	1.24			114.31	108.17	18.54	100.27	99.59	99.59
100.0	24-Jun-99	1259	127	Shoal Point	-25.63000	-80.25000	1999.48	BB	IS	0.48	06	1999	1999-06	0.0226	0.0185	0.0041	0.0315	0.3664	0.0541	0.3174	0.0063	0.0002	0.2089	0.2311	4.1493	0.1864	31.50	31.40	29.50	29.50	29.30	7.90	8.10	0.42			129.25	51.00	19.07	117.28	120.00	120.00
100.0	24-Jun-99	1229	128	Mathon Beach	-25.68833	-80.23333	1999.48	BB	IS	0.48	06	1999	1999-06	0.0241	0.0200	0.0041	0.0211	0.4188	0.0452	0.3726	0.0064	0.0001	0.1350	0.2518	4.5218	0.1864	35.90	33.00	29.90	29.90	29.50	6.70	7.10	0.47			143.47	1291.00	15.55	99.17	114.33	115.39
100.0	24-Jun-99	1025	129	West Arsenicker	-25.42017	-80.31083	1999.47	BB	MAIN	0.47	06	1999	1999-06	0.0128	0.0091	0.0027	0.0170	0.2512	0.0192	0.2270	0.0052	0.0012	0.1093	0.0925	3.8228	0.1864	35.80	37.00	29.30	29.30	29.80	6.40	6.00	0.18			111.92	212.50	132.07	104.67	104.67	
100.0	24-Jun-99	1016	130	South Doge Island	-25.76333	-80.17167	1999.48	BB	NSAY	0.48	06	1999	1999-06	0.0407	0.0363	0.0044	0.0409	0.2869	0.0818	0.2053	0.0067	0.0002	0.0921	0.04510	3.5288	0.1864	31.30	33.20	29.00	29.00	28.80	6.20	7.00	1.34			94.23	777.33	26.80	91.58	104.47	104.47
100.0	24-Jun-99	1038	131	North Venetian Basin	-25.80000	-80.16667	1999.48	BB	NSAY	0.48	06	1999	1999-06	0.0468	0.0431	0.0037	0.0243	0.3418	0.0711	0.2707	0.0105	0.0008	0.0958	0.3665	4.1185	0.1864	28.60	31.00	29.30	29.30	29.10	6.20	6.40	1.35			72.69	203.00	15.04	90.25	90.49	90.49
100.0	24-Jun-99	1057	132	North I-195 Basin	-25.81667	-80.16667	1999.48	BB	NSAY	0.48	06	1999	1999-06	0.0124	0.0105	0.0019	0.0131	0.3570	0.0255	0.3315	0.0103	0.0005	0.2128	0.1758	5.5245	0.1864	25.30	27.10	29.30	29.30	29.60	5.60	6.80	0.23			76.69	104.00	5.47	92.68	98.21	98.21
100.0	24-Jun-99	1122	133	North Normandy Isle	-25.86667	-80.15000	1999.48	BB	NSAY	0.48	06	1999	1999-06	0.0164	0.0169	0.0095	0.0154	0.4177	0.1278	0.2899	0.0124	0.0005	0.2522	0.7082	5.4738	0.1864	27.30	31.60	29.40	29.40	29.00	6.90	5.90	0.55			74.60	521.71	22.83	97.48	87.91	87.91
100.0	24-Jun-99	1116	134	Oleta River Park	-25.90500	-80.13333	1999.48	BB	NSAY	0.48	06	1999	1999-06	0.0399	0.0335	0.0064	0.0326	0.5121	0.0725	0.4396	0.0123	0.0005	0.2579	0.8094	4.3380	0.1864	28.90	34.60	29.20	29.20	29.00	7.40	7.50	0.80			92.02	295.86	13.03	108.09	113.10	113.10
100.0	21-Jun-99	1136	135	South Card Sound	-25.31667	-80.31667	1999.47	BB	SCARD	0.47	06	1999	1999-06	0.0153	0.0125	0.0029	0.0308	0.4133	0.0462	0.3672	0.0068	0.0003	0.1270	0.1193	4.8038	0.1864	35.90	36.70	29.20	29.20	29.00	6.50	7.10	0.05			106.39	329.75	11.88	98.97	108.49	108.49
101.0	21-Jul-99	350	101	Convoy Point	-25.47833	-80.32083	1999.55	BB	AS	0.55	07	1999	1999-07	0.0009	0.0000	0.0009	0.0082	0.5913	0.0091	0.5822	0.0093	0.0012	0.5586	0.3353	6.4580	0.1016	33.30	33.30	31.50	31.50	31.70	7.50	7.50	0.66			140.64	16.19	2.16	114.15	114.15	114.15
101.0	21-Jul-99	1445	102	Black Point	-25.54833	-80.29467	1999.55	BB	AS	0.55	07	1999	1999-07	0.0073	0.0057	0.0016	0.0090	0.5260	0.0162	0.5097	0.0083	0.0022	0.5254	0.1995	6.3763	0.2197	27.30	27.40	31.70	31.70	31.80	8.20	8.20	0.38			141.14	16.57	4.36	121.88	120.48	120.48
101.0	21-Jul-99	1435	103	Near Black Ledge	-25.57333	-80.28667	1999.55	BB	IS	0.55	07	1999	1999-07	0.0062	0.0046	0.0016	0.0131	0.4185	0.0193	0.3992	0.0072	0.0022	0.2142	0.1751	4.7578	0.1336	31.30	31.30	31.50	31.50	31.60	6.00	6.00	0.54			142.48	19.71	5.98	100.27	97.71	97.71
101.0	21-Jul-99	1345	104	BNP Marker C	-25.60167	-80.22083	1999.55	BB	MAIN	0.55	07	1999	1999-07	0.0035	0.0019	0.0016	0.0115	0.4049	0.0150	0.3899	0.0080	0.0026	0.1361	0.2080	4.8388	0.1606	29.60	29.60	30.10	30.10	30.70	6.10	6.00	0.38			112.06	12.62	4.16	90.27	88.79	88.79
101.0	21-Jul-99	1420	105	Marker G-1B	-25.56917	-80.19250	1999.55	BB	MAIN	0.55	07	1999	1999-07	0.0068	0.0050	0.0028	0.0063	0.3608	0.0108	0.3517	0.0095	0.0009	0.1904	0.1930	5.1316	0.0816	35.90	35.90	30.90	30.90	30.90	6.90	6.00	0.23			85.61	13.16	2.44	106.32	92.45	92.45
101.0	21-Jul-99	1415	109	Midbay North	-25.56417	-80.23500	1999.55	BB	MAIN	0.55	07	1999	1999-07	0.0000	0																											

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN_TP	NP	DIN_TP	%SAT_T	%SAT_B
104.0	28-Oct-99	1005	111	Featherbed Bank	25.4583	-80.14000	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.0037	0.0032	0.0006	0.0107	0.2007	0.0127	0.2193	0.0063	0.0064	0.0958	0.6003	2.8390	31.60	31.60	22.90	22.90	6.10	6.10	0.82	38.77	6.00	2.75	0.0086	87.64	96.46		
104.0	28-Oct-99	1045	112	Featherbed Bank	25.4883	-80.13833	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.0020	0.0020	0.0000	0.0107	0.2324	0.0144	0.2193	0.0039	0.0012	0.0958	0.6003	2.8350	31.60	31.60	23.30	23.30	6.90	6.90	0.95	69.51	29.85	20.67	95.22	95.22			
104.0	29-Oct-99	1047	113	Elliott Key	25.44167	-80.22333	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.0349	0.0338	0.0011	0.0416	0.2569	0.0764	0.1805	0.0037	0.0010	0.0676	0.6753	3.1113	31.30	31.30	23.60	23.60	6.80	6.80	1.53	69.51	29.85	20.67	95.22	95.22			
104.0	29-Oct-99	0945	116	Rubicon Keys	25.40000	-80.25500	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.2909	0.2859	0.0051	0.0686	0.4868	0.3595	0.1262	0.0051	0.0001	0.2859	1.4642	3.7390	25.60	25.60	23.30	23.30	6.70	6.70	1.056	66.00	105.34	71.08	90.07	88.73			
104.0	29-Oct-99	1000	121	North Card Sound	25.35500	-80.29167	1999.82	BB	SCARD	0.82	10	1999	1999-10	0.1333	0.1288	0.0045	0.0422	0.3970	0.1755	0.2215	0.0040	0.0000	0.0971	1.2137	4.4245	26.30	26.30	23.60	23.60	7.00	7.00	1.39	96.08	58.00	43.79	94.88	94.88			
104.0	29-Oct-99	0927	122	West Arsenicker	25.42017	-80.31083	1999.82	BB	IS	0.82	10	1999	1999-10	0.6924	0.6717	0.0207	0.0948	0.9377	0.7872	0.1504	0.0096	0.0003	0.6717	3.4823	5.1890	15.30	15.30	23.30	23.30	7.00	7.20	2.41	99.78	109.18	141.67	98.38	90.64			
104.0	29-Oct-99	0914	123	Pelican Bank	25.44500	-80.28333	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.3009	0.2953	0.0056	0.0477	0.4688	0.3485	0.1203	0.0073	0.0006	0.1282	3.1147	3.9740	22.90	25.10	23.30	23.40	6.80	6.50	2.46	64.21	84.79	47.74	89.59	87.21			
104.0	29-Oct-99	1145	124	Midbay South	25.41500	-80.23333	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.0537	0.0394	0.0002	0.0306	0.2582	0.1062	0.1203	0.0041	0.0020	0.0537	0.7912	2.8025	31.60	31.60	23.30	23.30	6.80	6.80	1.22	94.27	24.94	24.94	92.71	92.71			
104.0	28-Oct-99	1115	126	BNP Marker B	25.67167	-80.20500	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.0886	0.0856	0.0030	0.0266	0.4402	0.1152	0.3250	0.0041	0.0020	0.2826	1.8566	6.9563	26.80	30.40	23.30	24.00	6.50	6.40	1.16	106.98	40.14	28.00	88.50	87.22			
104.0	28-Oct-99	1613	127	Shoal Point	25.63000	-80.25000	1999.82	BB	IS	0.82	10	1999	1999-10	0.1053	0.1008	0.0045	0.0586	0.4715	0.1639	0.3076	0.0055	0.0036	0.2981	5.9711	4.9560	22.40	22.40	24.00	24.00	6.90	6.80	1.19	80.21	42.26	29.62	91.63	90.30			
104.0	28-Oct-99	1543	128	Matheson Beach	25.68833	-80.23333	1999.82	BB	IS	0.82	10	1999	1999-10	0.0510	0.0488	0.0022	0.0140	0.6624	0.0650	0.5973	0.0083	0.0019	0.3149	6.2499	5.0100	28.90	28.90	24.00	24.00	7.60	7.60	1.49	85.25	32.22	7.88	105.76	105.64			
104.0	28-Oct-99	1136	129	Marker G-71	25.79667	-80.18500	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.0428	0.0418	0.0010	0.0318	0.2366	0.0746	0.1610	0.0070	0.0019	0.1954	8.8933	3.6923	29.90	32.00	24.00	24.00	5.90	6.00	2.18	33.74	27.49	10.69	82.73	85.56			
104.0	28-Oct-99	0914	130	South Dodge Island	25.76333	-80.17167	1999.82	BB	NBAY	0.82	10	1999	1999-10	0.0329	0.0328	0.0001	0.0114	0.1947	0.0443	0.1504	0.0062	0.0023	0.0589	5.7723	2.9910	32.90	32.90	24.00	24.00	5.90	5.90	1.63	31.49	17.28	7.16	84.73	84.63			
104.0	28-Oct-99	1145	131	North Venetian Basin	25.80000	-80.16667	1999.82	BB	MAIN	0.82	10	1999	1999-10	0.0537	0.0394	0.0002	0.0306	0.2582	0.1062	0.1203	0.0041	0.0020	0.0537	0.7912	2.8025	31.60	31.60	23.30	23.30	6.80	6.80	1.22	94.27	24.94	24.94	92.71	92.71			
104.0	28-Oct-99	1244	132	North I-195 Basin	25.81667	-80.16667	1999.82	BB	NBAY	0.82	10	1999	1999-10	0.1063	0.1022	0.0041	0.0760	0.3257	0.1823	0.1434	0.0092	0.0010	0.1902	9.1781	4.4903	25.50	25.50	23.30	23.30	6.30	6.30	1.32	35.29	63.49	19.75	85.26	85.53			
104.0	28-Oct-99	1305	133	North Normandy Isle	25.86667	-80.15000	1999.82	BB	NBAY	0.82	10	1999	1999-10	0.0778	0.0688	0.0089	0.0344	0.3002	0.1121	0.1880	0.0170	0.0019	0.0988	8.5317	4.4393	27.80	29.90	24.00	24.00	6.50	6.40	1.41	17.63	42.51	6.59	89.81	89.81			
104.0	28-Oct-99	1408	134	Oleta River Park	25.90500	-80.13333	1999.82	BB	NBAY	0.82	10	1999	1999-10	0.0499	0.0465	0.0035	0.0152	0.2055	0.0651	0.1405	0.0088	0.0033	0.0863	6.4620	3.7558	29.80	33.40	24.00	25.20	6.00	6.20	1.68	23.41	15.26	7.41	84.82	89.60			
104.0	28-Oct-99	1015	135	South Card Sound	25.31667	-80.31667	1999.82	BB	SCARD	0.82	10	1999	1999-10	0.0450	0.0430	0.0020	0.0706	0.2979	0.1156	0.1405	0.0034	0.0033	0.0875	5.5258	5.4675	25.30	25.20	23.30	23.30	6.00	6.70	1.40	86.76	33.11	33.67	91.80	90.39			
105.0	22-Nov-99	852	101	Convoy Point	25.47833	-80.32083	1999.89	BB	AS	0.89	11	1999	1999-11	0.1051	0.0991	0.0060	0.0222	0.3547	0.1274	0.2274	0.0067	0.0006	0.3745	0.5712	5.2530	0.1891	22.30	22.90	23.30	23.20	6.90	7.00	0.55	52.61	586.88	18.89	90.79	92.11		
105.0	22-Nov-99	1025	102	Black Point	25.54583	-80.29467	1999.89	BB	AS	0.89	11	1999	1999-11	0.0037	0.0015	0.0023	0.0175	0.2941	0.0213	0.2728	0.0066	0.0006	0.3623	0.7207	5.5725	0.6973	24.60	24.70	22.90	22.70	6.50	6.90	0.54	52.71	98.01	3.11	86.38	91.59		
105.0	22-Nov-99	1040	103	Near Black Ledge	25.57333	-80.28667	1999.89	BB	IS	0.89	11	1999	1999-11	0.0095	0.0071	0.0024	0.0147	0.3410	0.0241	0.3169	0.0053	0.0012	0.2178	0.7349	4.9695	0.3032	25.90	25.90	22.70	22.70	7.30	7.50	0.54	63.77	28.84	4.51	97.59	100.27		
105.0	22-Nov-99	1115	104	BNP Marker C	25.60167	-80.22083	1999.89	BB	MAIN	0.89	11	1999	1999-11	0.0089	0.0069	0.0020	0.0110	0.2592	0.0199	0.2394	0.0038	0.0009	0.0691	0.4783	3.6998	0.0330	29.60	30.20	22.90	22.90	7.00	7.20	0.95	68.27	37.70	5.23	97.49	98.88		
105.0	22-Nov-99	1130	108	Marker G-1B	25.56917	-80.19250	1999.89	BB	MAIN	0.89	11	1999	1999-11	0.0029	0.0000	0.0029	0.0076	0.2471	0.0105	0.2366	0.0041	0.0012	0.0961	0.3308	3.5180	0.0554	32.70	32.70	22.70	22.70	6.30	6.50	0.70	60.15	13.83	2.56	88.05	90.85		
105.0	22-Nov-99	1145	109	Midbay North	25.56417	-80.23500	1999.89	BB	MAIN	0.89	11	1999	1999-11	0.0112	0.0085	0.0027	0.0093	0.2372	0.0206	0.2167	0.0038	0.0012	0.0776	0.4904	3.8545	0.0125	30.70	30.30	22.70	22.70	7.30	7.40	0.69	62.47	27.08	5.42	100.44	101.82		
105.0	22-Nov-99	1010	110	Fender Point	25.50500	-80.28750	1999.89	BB	IS	0.89	11	1999	1999-11	0.0108	0.0074	0.0034	0.0116	0.2585	0.0224	0.2361	0.0040	0.0018	0.0744	0.3763	3.9888	0.0185	29.90	29.90	22.30	22.30	7.20	7.30	0.38	65.40	16.26	5.67	98.48	99.84		
105.0	22-Nov-99	1204	111	Featherbed Bank	25.51583	-80.24000	1999.89	BB	MAIN	0.89	11	1999	1999-11	0.0089	0.0069	0.0020	0.0110	0.2592	0.0199	0.2394	0.0038	0.0012	0.0691	0.4783	3.6998	0.0330	30.70	30.70	22.90	22.90	6.80	6.90	0.95	68.27	37.70	5.23	97.49	98.88		
105.0	22-Nov-99	1210	112	Sanders Cut	25.48833	-80.18833	1999.89	BB	MAIN	0.89	11	1999	1999-11	0.0064	0.0050	0.0014	0.0064	0.1815	0.0128	0.1687	0.0042	0.0005	0.0592	0.4705	4.0700	0.0035	33.90	33.90	23.30	23.30	6.80	6.80	0.57	43.36	205.87	3.05	96.00	96.38		
105.0	22-Nov-99	1200	113	Elliott Key	25.44167	-80.22333	1999.89	BB	MAIN	0.89	11	1999	1999-11	0.0070	0.0027	0.0043	0.0209	0.2057	0.0278	0.1739	0.0033	0.0009	0.0688	0.3521	4.2475	0.0000	31													

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN-TP	NP	DIN-TP	%SAT	%SAT_B
108.0	21-Feb-00	1200	110	Elliott Key	25.444167	-80.23333	2000	BB	MAIN	0.14	02	2000	2000-02	0.0015	0.0000	0.0015	0.0000	0.0087	0.0009	0.1443	1.0516	3.8368	35.90	35.40	23.90	23.90	8.28	8.20	0.97	74.83	12.51	4.01	118.28	118.28	113.93	113.93	
108.0	21-Feb-00	1045	111	Rubicon Keys	25.40000	-80.25500	2000	BB	MAIN	0.14	02	2000	2000-02	0.0065	0.0004	0.0005	0.0030	0.0069	0.0009	0.1843	1.5047	3.1380	35.90	35.40	23.90	23.90	7.90	7.90	1.92	71.54	11.23	3.03	113.93	113.93	113.93	113.93	
108.0	21-Feb-00	1045	121	North Card Sound	25.35500	-80.29167	2000	BB	SCARD	0.14	02	2000	2000-02	0.0065	0.0005	0.0000	0.0042	0.2159	0.0108	0.2052	1.1782	1.5661	4.1338	33.90	33.90	23.90	23.90	8.90	8.10	1.08	74.88	9.89	3.74	112.90	115.89	115.89	115.89
108.0	21-Feb-00	0950	122	West Arsenicker	25.42017	-80.31083	2000	BB	IS	0.14	02	2000	2000-02	0.0057	0.0000	0.0007	0.0062	0.1871	0.0118	0.1753	1.0356	1.1697	4.9458	32.00	32.00	23.90	23.90	7.40	7.40	0.88	72.54	10.20	4.59	118.30	116.89	116.89	116.89
108.0	21-Feb-00	0950	123	Pelican Bank	25.44500	-80.28333	2000	BB	MAIN	0.14	02	2000	2000-02	0.0105	0.0002	0.0013	0.0110	0.2537	0.0215	0.2322	1.0568	1.1569	3.4658	32.60	32.60	23.90	23.90	8.10	8.00	0.74	96.39	25.42	8.17	114.65	113.24	113.24	113.24
108.0	21-Feb-00	1225	124	Midway South	25.47250	-80.23333	2000	BB	MAIN	0.14	02	2000	2000-02	0.0006	0.0000	0.0006	0.0099	0.2105	0.0105	0.2000	1.0462	1.0452	2.8818	35.00	35.00	23.90	23.90	6.00	6.00	0.91	93.25	6.50	4.65	97.88	97.88	97.88	97.88
108.0	22-Feb-00	0950	126	BNP Marker B	25.67167	-80.20500	2000	BB	MAIN	0.14	02	2000	2000-02	0.0021	0.0019	0.0003	0.0041	0.2203	0.0025	0.2141	1.3611	1.3418	2.9788	34.90	34.80	22.60	22.60	6.80	6.80	1.40	72.96	3.92	2.05	96.24	96.24	96.24	96.24
108.0	22-Feb-00	0932	127	Shoal Point	25.63000	-80.25000	2000	BB	IS	0.14	02	2000	2000-02	0.0029	0.0011	0.0009	0.0067	0.0065	0.0020	0.2387	1.0717	2.8993	34.90	34.80	22.60	22.60	6.80	6.80	0.44	96.39	6.34	3.47	97.27	96.38	96.38	96.38	
108.0	22-Feb-00	1010	128	Matheson Beach	25.68833	-80.23333	2000	BB	IS	0.14	02	2000	2000-02	0.0007	0.0000	0.0007	0.0069	0.2848	0.0029	0.2772	1.0342	1.4205	3.5208	32.40	32.40	22.60	22.60	6.80	6.80	0.69	92.60	5.36	2.69	94.74	96.13	96.13	96.13
108.0	22-Feb-00	1030	129	Marker G-71	25.73667	-80.18500	2000	BB	MAIN	0.14	02	2000	2000-02	0.0075	0.0058	0.0007	0.0082	0.2476	0.0157	0.2319	1.0690	1.2950	3.2200	33.50	33.40	23.10	23.10	6.60	6.60	1.32	69.48	14.39	4.40	93.19	93.13	93.13	93.13
108.0	22-Feb-00	1050	130	South Dodge Island	25.76333	-80.17167	2000	BB	NBAY	0.14	02	2000	2000-02	0.0035	0.0008	0.0027	0.0089	0.1113	0.0135	0.0978	1.0402	1.8892	2.2568	35.30	35.30	23.10	23.10	6.60	6.60	0.69	60.52	13.68	4.91	94.29	94.40	94.40	94.40
108.0	22-Feb-00	1310	131	North Venetian Basin	25.80000	-80.16667	2000	BB	NBAY	0.14	02	2000	2000-02	0.0078	0.0056	0.0022	0.0123	0.3261	0.0201	0.3059	1.0767	3.2597	4.8028	32.60	32.60	23.90	23.90	6.70	6.70	1.54	59.95	22.86	3.70	93.94	93.94	93.94	93.94
108.0	22-Feb-00	1320	132	North I-195 Basin	25.81667	-80.16667	2000	BB	NBAY	0.14	02	2000	2000-02	0.0048	0.0029	0.0016	0.0088	0.2991	0.0133	0.2979	1.0648	1.0629	1.7825	32.20	32.20	23.90	23.90	6.90	6.90	0.97	46.03	20.99	96.48	96.48	96.48	96.48	
108.0	22-Feb-00	1330	133	North Venetian Basin	25.83333	-80.16667	2000	BB	NBAY	0.14	02	2000	2000-02	0.0029	0.0016	0.0011	0.0089	0.2500	0.0150	0.2453	1.0619	1.0619	1.4353	34.10	34.10	23.90	23.90	6.90	6.90	0.44	96.39	6.40	3.47	97.27	96.38	96.38	96.38
108.0	22-Feb-00	1410	134	Oleta River Park	25.90500	-80.13333	2000	BB	NBAY	0.14	02	2000	2000-02	0.0024	0.0000	0.0024	0.0095	0.2073	0.0119	0.1954	1.0552	2.2405	2.4805	35.70	35.70	23.10	23.10	6.50	6.60	1.58	176.27	16.08	10.13	93.10	94.54	94.54	94.54
108.0	21-Feb-00	1100	135	South Card Sound	25.31667	-80.31667	2000	BB	SCARD	0.14	02	2000	2000-02	0.0015	0.0000	0.0015	0.0090	0.3463	0.0105	0.3357	1.1510	1.8258	4.0963	31.20	31.20	24.10	24.10	9.00	9.10	0.54	136.09	13.01	4.14	123.68	134.20	134.20	134.20
109.0	14-Mar-00	1435	101	Convoy Point	25.47833	-80.32083	2000	BB	AS	0.20	03	2000	2000-03	0.0075	0.0067	0.0008	0.0094	0.2846	0.0168	0.2678	1.2008	1.4523	4.4523	28.80	28.80	22.90	22.90	7.30	7.40	0.86	210.13	12.87	12.44	99.71	101.08	101.08	101.08
109.0	14-Mar-00	1403	102	Black Point	25.54583	-80.29467	2000	BB	AS	0.20	03	2000	2000-03	0.0094	0.0092	0.0011	0.0013	0.2357	0.0106	0.2251	1.1138	1.3680	3.6890	32.60	32.50	22.80	22.80	8.20	8.20	0.68	182.99	8.11	8.24	114.68	114.75	114.75	114.75
109.0	14-Mar-00	1353	103	Near Black Ledge	25.57333	-80.28667	2000	BB	IS	0.20	03	2000	2000-03	0.0092	0.0094	0.0008	0.0022	0.2086	0.0114	0.1942	1.1843	1.2810	3.2610	34.10	34.00	23.00	23.00	7.50	7.50	0.75	162.74	11.45	9.01	106.18	106.11	106.11	106.11
109.0	14-Mar-00	1241	104	BNP Marker C	25.60167	-80.22083	2000	BB	MAIN	0.20	03	2000	2000-03	0.0048	0.0034	0.0014	0.0000	0.1457	0.0044	0.1425	1.1485	1.2485	2.1485	36.70	36.70	23.90	23.90	6.70	6.80	1.59	96.48	3.21	3.75	96.48	97.92	97.92	97.92
109.0	14-Mar-00	1208	108	Marker G-1B	25.56917	-80.19250	2000	BB	MAIN	0.20	03	2000	2000-03	0.0053	0.0036	0.0017	0.0000	0.1296	0.0043	0.1244	1.0544	0.9747	1.9515	37.00	36.90	22.70	22.70	7.00	7.00	0.88	100.64	3.72	4.08	100.63	100.56	100.56	100.56
109.0	14-Mar-00	1144	109	Midway North	25.56417	-80.23500	2000	BB	MAIN	0.20	03	2000	2000-03	0.0042	0.0040	0.0020	0.0000	0.1182	0.0052	0.1140	1.0943	0.9728	1.9745	37.00	37.00	23.10	23.10	6.90	6.90	1.09	105.58	5.90	3.76	99.68	99.68	99.68	99.68
109.0	14-Mar-00	1415	110	Feathered Bank	25.50500	-80.28750	2000	BB	IS	0.20	03	2000	2000-03	0.0049	0.0047	0.0073	0.0013	0.1711	0.0062	0.1649	1.0846	1.0733	2.5180	35.20	35.20	23.00	23.00	6.80	6.80	0.95	153.77	9.69	5.61	96.97	96.97	96.97	96.97
109.0	14-Mar-00	1129	111	Feathered Bank	25.51583	-80.24000	2000	BB	MAIN	0.20	03	2000	2000-03	0.0038	0.0038	0.0002	0.0000	0.1073	0.0051	0.1022	1.0769	1.0131	2.1195	37.10	37.10	22.70	22.70	6.90	7.00	1.04	89.64	3.42	3.14	99.26	100.70	100.70	100.70
109.0	14-Mar-00	1114	112	Sands Cut	25.48333	-80.18833	2000	BB	MAIN	0.20	03	2000	2000-03	0.0020	0.0019	0.0001	0.0026	0.1194	0.0020	0.1167	1.0871	1.0871	1.9398	36.70	36.90	22.40	22.40	6.80	6.80	0.78	96.58	2.58	2.98	97.39	97.39	97.39	97.39
109.0	14-Mar-00	1132	113	Elliott Key	25.44167	-80.23333	2000	BB	MAIN	0.20	03	2000	2000-03	0.0043	0.0040	0.0000	0.0050	0.1000	0.0060	0.0894	1.0807	1.0807	1.8450	36.80	36.80	22.90	22.90	6.80	6.80	0.92	100.22	8.68	8.97	93.33	93.33	93.33	93.33
109.0	14-Mar-00	0945	116	Rubicon Keys	25.40000	-80.25500	2000	BB	MAIN	0.20	03	2000	2000-03	0.0029	0.0029	0.0001	0.0036	0.1891	0.0065	0.1828	1.0733	1.9599	2.9599	36.50	36.50	22.70	22.70	6.60	6.70	1.57	152.27	10.12	5.25	94.57	96.12	96.12	96.12
109.0	14-Mar-00	0958	121	North Card Sound	25.35500	-80.29167	2000	BB	SCARD	0.20	03	2000	2000-03	0.0013	0.0011	0.0002	0.0023	0.3197	0.0036	0.3160	1.1553	1.0754	3.0100	35.20	35.20	22.90	22.90	6.50	6.40	1.07	264.72	5.32	2.99	92.58	91.15	91.15	91.15
109.0	14-Mar-00	0930	122	West Arsenicker	25.42017	-80.31083	2000	BB	IS	0.20	03	2000	2000-03	0.0054	0.0049	0.0004	0.																				

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	(SiOH4)	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN:TP	DIN:TP	%SAT	%SAT_B
112.0	14-Jun-00	0966	121	North Card Sound	25.35500	-80.29167	2000.45	BB	SCARD	0.48	06	2000	2000-06	0.0039	0.0027	0.0012	0.0000	0.0010	0.0013	0.0089	0.0103	0.0020	0.1504	0.1595	2.7230	36.00	36.00	28.50	28.50	6.0	6.0	0.47	21.31	14.66	2.77	24.27	92.73		
112.0	14-Jun-00	0920	122	West Arsenick	25.42017	-80.31083	2000.45	BB	IS	0.45	06	2000	2000-06	0.0021	0.0020	0.0002	0.0067	0.0888	0.0088	0.0799	0.0111	0.0014	0.1974	0.2705	2.8923	36.90	36.90	28.30	28.30	6.10	6.10	0.54	17.66	14.28	2.76	94.27	92.73		
112.0	14-Jun-00	0803	123	Pelican Bank	25.44500	-80.28333	2000.45	BB	MAIN	0.45	06	2000	2000-06	0.0162	0.0149	0.0013	0.0132	0.1061	0.0294	0.0767	0.0113	0.0018	0.2549	0.1994	2.5418	37.70	37.60	28.00	28.00	6.10	6.10	0.71	20.86	35.53	5.78	93.04	93.06		
112.0	14-Jun-00	1100	124	South Midbay	25.47250	-80.23333	2000.45	BB	MAIN	0.45	06	2000	2000-06	0.0050	0.0038	0.0001	0.0106	0.1108	0.0155	0.0953	0.0104	0.0028	0.3230	0.0119	2.6198	37.90	37.90	28.30	28.30	6.00	6.00	0.54	23.68	32.45	3.32	104.11	105.73		
112.0	13-Jun-00	1553	126	BNP Marker B	25.67167	-80.20500	2000.45	BB	MAIN	0.45	06	2000	2000-06	0.0026	0.0016	0.0010	0.0027	0.1219	0.0053	0.1166	0.0110	0.0031	0.1515	0.1670	2.4980	37.60	37.70	28.60	28.60	6.90	7.00	1.01	24.62	3.74	1.07	105.70	107.30		
112.0	13-Jun-00	1138	127	Shoal Point	25.63000	-80.25000	2000.45	BB	IS	0.45	06	2000	2000-06	0.0037	0.0024	0.0014	0.0166	0.1567	0.0203	0.1364	0.0117	0.0019	0.2012	0.1681	2.2975	38.20	38.10	28.00	28.00	6.40	6.50	0.41	29.71	23.53	3.85	97.73	99.40		
112.0	13-Jun-00	1159	128	Matheson Beach	25.68833	-80.23333	2000.45	BB	IS	0.45	06	2000	2000-06	0.0035	0.0010	0.0025	0.0071	0.1343	0.0108	0.1235	0.0200	0.0020	0.0759	0.3926	3.3605	34.40	34.40	28.30	28.30	6.50	6.60	0.45	14.99	11.85	1.18	97.59	99.69		
112.0	13-Jun-00	1217	129	Marker G-1B	25.72867	-80.18500	2000.45	BB	MAIN	0.45	06	2000	2000-06	0.0063	0.0042	0.0018	0.0046	0.1522	0.0157	0.1436	0.0157	0.0018	0.3501	0.1722	3.2990	36.90	36.90	28.30	28.30	6.40	6.60	1.15	29.62	13.50	1.50	96.30	96.22		
112.0	13-Jun-00	1232	130	South Dodge Island	25.71167	-80.20000	2000.45	BB	NBAY	0.45	06	2000	2000-06	0.0148	0.0125	0.0022	0.0072	0.1535	0.0219	0.1315	0.0140	0.0022	0.3008	0.1304	2.5618	32.40	32.80	28.60	28.60	6.40	6.50	1.81	24.88	13.99	3.47	94.88	96.91		
112.0	13-Jun-00	1511	131	North Venetian Basin	25.80000	-80.16667	2000.45	BB	NBAY	0.45	06	2000	2000-06	0.0071	0.0053	0.0018	0.0037	0.2017	0.0108	0.1909	0.0186	0.0008	0.3922	2.7027	4.6613	28.80	28.90	29.00	29.00	7.20	7.10	1.78	24.06	29.03	1.29	104.69	103.30		
112.0	13-Jun-00	1330	132	North I-195 Basin	25.81667	-80.16667	2000.45	BB	NBAY	0.45	06	2000	2000-06	0.0046	0.0030	0.0010	0.0091	0.1763	0.0137	0.1627	0.0162	0.0021	0.2481	0.1625	4.5960	29.10	29.10	29.00	29.00	8.80	8.70	0.83	24.18	14.67	1.88	128.20	126.74		
112.0	13-Jun-00	1359	133	North Normandy Isle	25.86667	-80.15000	2000.45	BB	NBAY	0.45	06	2000	2000-06	0.0069	0.0048	0.0021	0.0077	0.1734	0.0146	0.1588	0.0149	0.0019	0.5552	1.7490	4.7693	28.30	28.60	29.10	29.00	7.50	7.50	1.66	25.79	16.88	2.16	108.71	107.69		
112.0	13-Jun-00	1418	134	Oleta River Park	25.90500	-80.13333	2000.45	BB	NBAY	0.45	06	2000	2000-06	0.0070	0.0052	0.0018	0.0060	0.1515	0.0129	0.1386	0.0159	0.0022	0.6592	2.2856	4.5128	27.70	33.40	29.10	29.10	7.50	6.90	1.70	21.12	12.91	1.80	104.75	102.85		
112.0	14-Jun-00	1011	135	South Card Sound	25.31667	-80.31667	2000.45	BB	SCARD	0.45	06	2000	2000-06	0.0044	0.0022	0.0022	0.0281	0.1780	0.0305	0.1475	0.0115	0.0026	0.2387	0.2877	3.7765	36.70	36.70	28.30	28.30	6.40	6.70	0.24	34.21	25.92	5.87	101.80	101.80		
113.0	11-Jul-00	1712	101	Convoy Point	25.47833	-80.32083	2000.45	BB	AS	0.52	07	2000	2000-07	0.0320	0.0313	0.0008	0.0050	0.2465	0.0370	0.2095	0.0106	0.0039	0.3385	0.3459	3.6023	2.2771	35.30	34.90	32.70	32.70	6.40	6.40	0.32	51.24	21.15	7.74	99.29	99.09	
113.0	12-Jul-00	1613	102	Black Point	25.54583	-80.29467	2000.53	BB	AS	0.53	07	2000	2000-07	0.0797	0.0766	0.0032	0.0161	0.3198	0.0958	0.2240	0.0101	0.0065	0.5635	0.2888	5.0975	0.7963	29.50	29.80	32.90	33.20	6.10	6.20	0.49	70.01	32.59	20.97	91.42	93.24	
113.0	12-Jul-00	1604	103	Near Black Ledge	25.57333	-80.28667	2000.53	BB	IS	0.53	07	2000	2000-07	0.0175	0.0170	0.0006	0.0000	0.2640	0.0175	0.2465	0.0102	0.0060	0.8809	0.2856	5.5006	0.6112	30.20	30.20	33.30	33.20	7.80	7.80	0.49	57.36	6.50	3.81	117.64	117.70	
113.0	12-Jul-00	1129	104	BNP Marker C	25.60167	-80.22083	2000.53	BB	MAIN	0.53	07	2000	2000-07	0.0134	0.0120	0.0014	0.0000	0.1045	0.0134	0.0911	0.0098	0.0060	0.2211	0.1972	2.3320	0.0738	36.70	36.70	31.30	31.30	5.60	5.70	0.51	23.63	4.98	3.03	86.94	88.60	
113.0	12-Jul-00	1119	108	Marker G-1B	25.56917	-80.19250	2000.53	BB	MAIN	0.53	07	2000	2000-07	0.0119	0.0110	0.0000	0.0000	0.1110	0.0110	0.1178	0.0096	0.0051	0.2049	0.1412	2.2885	0.0834	36.90	36.90	31.70	31.70	5.60	5.60	0.44	27.83	4.87	2.59	86.93	85.93	
113.0	12-Jul-00	1109	109	North Midbay	25.56417	-80.23500	2000.53	BB	MAIN	0.53	07	2000	2000-07	0.0099	0.0099	0.0000	0.0000	0.1292	0.0099	0.1193	0.0096	0.0068	0.2531	0.1940	2.3353	0.1159	37.20	37.20	31.30	31.30	5.50	5.50	0.51	29.66	3.22	2.28	85.85	85.85	
113.0	11-Jul-00	1700	110	Fender Point	25.50500	-80.28750	2000.52	BB	IS	0.52	07	2000	2000-07	0.0255	0.0248	0.0007	0.0004	0.2277	0.0258	0.2018	0.0097	0.0029	0.1639	0.2338	2.6950	0.1345	37.20	37.20	32.20	32.20	6.10	6.20	0.24	51.91	19.43	5.89	95.49	97.05	
113.0	12-Jul-00	1057	111	Feathered Bank	25.51583	-80.24000	2000.53	BB	MAIN	0.53	07	2000	2000-07	0.0110	0.0107	0.0000	0.0000	0.1439	0.0137	0.1302	0.0084	0.0043	0.2100	0.1940	2.5028	0.0622	37.50	37.40	31.30	31.30	5.50	5.60	0.57	37.92	7.01	3.62	85.81	87.37	
113.0	12-Jul-00	1045	112	Sands Cut	25.48833	-80.18833	2000.53	BB	MAIN	0.53	07	2000	2000-07	0.0109	0.0094	0.0015	0.0005	0.0974	0.0144	0.0860	0.0099	0.0044	0.2864	0.2080	2.9425	0.0585	37.00	37.00	31.60	31.60	5.90	5.80	0.53	21.83	5.72	2.56	91.33	90.37	
113.0	12-Jul-00	1055	113	Elliott Key	25.44167	-80.22333	2000.53	BB	MAIN	0.53	07	2000	2000-07	0.0136	0.0129	0.0007	0.0105	0.1642	0.0241	0.1401	0.0095	0.0044	0.2366	0.2286	3.0043	0.0900	38.20	38.40	31.30	31.30	5.70	5.80	0.59	38.19	12.08	5.60	89.31	90.99	
113.0	11-Jul-00	1560	116	Rubicon Keys	25.45000	-80.25000	2000.52	BB	MAIN	0.52	07	2000	2000-07	0.0142	0.0128	0.0000	0.0132	0.1454	0.0142	0.1312	0.0092	0.0052	0.4458	0.1275	36.60	36.60	32.20	32.20	6.30	6.30	0.48	31.72	3.42	3.62	98.25	98.31			
113.0	11-Jul-00	1605	121	North Card Sound	25.35500	-80.29167	2000.60	BB	SCARD	0.52	07	2000	2000-07	0.0058	0.0033	0.0000	0.0000	0.1209	0.0163	0.0900	0.0081	0.0020	0.2183	0.1602	2.8838	0.0628	36.70	36.70	32.90	32.90	6.80	6.80	0.20	29.68	6.38	4.41	105.88	105.81	
113.0	11-Jul-00	1640	122	West Arsenick	25.42017	-80.31083	2000.62	BB	IS	0.52	07	2000	2000-07	0.0076	0.0071	0.0005	0.0000	0.2358	0.0076	0.2282	0.0111	0.0036	0.5006	0.4092	4.9878	0.2258	37.20	37.20	32.90	32.90	8.20	8.10	0.60	46.90	4.63	1.51	122.91	127.39	
113.0	11-Jul-00	1650	123	Pelican Bank	25.44500	-80.28333	2000.62	BB	MAIN	0.52	07	2000	2000-07	0.0188	0.0175	0.0013	0.0025	0.1562	0.0213	0.1349	0.0094	0.0029	0.1864	0.2565	3.2248	0.1175	37.20	37.00</											

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN:TP	N:P	DIN:TP	%SAT	%SAT_B
116.0	25-Oct-00	1137	123	Pelican Bank	25.44500	-80.28333	2000.81	BB	MAIN	0.81	10	2000	2000-10	0.0277	0.0080	0.0017	0.0080	0.2679	0.0357	0.2222	0.0068	0.0116	0.2128	0.2128	3.4110	0.0179	30.10	30.00	24.30	24.00	6.90	6.90	1.46	37.73	21.95	5.23	96.85	97.71		
116.0	25-Oct-00	1130	124	South Midbay	25.47250	-80.23333	2000.81	BB	MAIN	0.81	10	2000	2000-10	0.0044	0.0038	0.0016	0.0044	0.2111	0.0119	0.1991	0.0076	0.0012	0.2102	0.1396	2.8030	0.0105	30.30	33.30	24.30	24.00	5.20	5.20	1.42	34.70	15.77	74.11	94.11	94.11		
116.0	24-Oct-00	0925	126	BNP Marker B	25.67167	-80.20500	2000.81	BB	MAIN	0.81	10	2000	2000-10	0.0081	0.0068	0.0013	0.0051	0.2096	0.0132	0.1964	0.0084	0.0016	0.6764	1.3566	3.2068	0.0433	30.90	30.90	24.30	24.30	7.10	7.00	2.87	34.93	8.34	1.57	99.97	98.45		
116.0	24-Oct-00	1045	127	Shoal Point	25.63000	-80.25000	2000.81	BB	IS	0.81	10	2000	2000-10	0.0244	0.0213	0.0031	0.0046	0.2587	0.0290	0.2294	0.0075	0.0016	0.2267	0.5705	3.4493	0.0865	30.40	28.40	24.30	24.00	7.10	7.00	1.13	24.62	17.89	3.88	98.37	96.87		
116.0	24-Oct-00	1015	128	Matheron Beach	25.68833	-80.23333	2000.81	BB	IS	0.81	10	2000	2000-10	0.0071	0.0057	0.0013	0.0045	0.2950	0.0115	0.2835	0.0099	0.0013	0.9439	1.8065	3.3575	0.0620	31.90	32.00	24.30	24.00	7.00	6.90	2.78	29.76	8.75	1.16	99.20	97.96		
116.0	24-Oct-00	1040	129	Marker G-71	25.73667	-80.18500	2000.81	BB	MAIN	0.81	10	2000	2000-10	0.0237	0.0197	0.0040	0.0148	0.2504	0.0385	0.2119	0.0075	0.0011	0.3625	2.0857	2.9725	0.1471	31.90	32.70	24.30	24.00	7.00	7.00	1.96	33.21	36.45	5.10	95.38	100.27		
116.0	24-Oct-00	1300	130	South Dodge Island	25.76333	-80.17167	2000.81	BB	NBAY	0.81	10	2000	2000-10	0.0062	0.0050	0.0012	0.0034	0.1858	0.0094	0.1762	0.0065	0.0014	0.2118	1.9651	2.1163	0.0422	34.40	34.40	25.20	25.20	7.40	7.40	2.15	21.73	6.76	1.12	107.63	107.63		
116.0	24-Oct-00	1130	131	North Venetian Basin	25.80000	-80.16667	2000.81	BB	NBAY	0.81	10	2000	2000-10	0.0111	0.0163	0.0018	0.0088	0.3065	0.0269	0.2786	0.0095	0.0018	0.5992	1.7266	4.2270	0.1988	34.50	32.10	24.20	24.00	7.20	7.10	2.85	34.34	14.96	2.84	98.06	98.40		
116.0	24-Oct-00	1140	132	North I-195 Basin	25.81667	-80.16667	2000.81	BB	NBAY	0.81	10	2000	2000-10	0.0139	0.0123	0.0015	0.0056	0.2906	0.0194	0.2711	0.0100	0.0012	0.6819	3.9880	4.4963	0.1969	26.90	27.60	24.10	24.00	7.10	7.00	2.85	29.00	15.98	1.94	97.19	95.82		
116.0	24-Oct-00	1205	133	North Normandy Isle	25.86667	-80.15000	2000.81	BB	NBAY	0.81	10	2000	2000-10	0.0058	0.0044	0.0015	0.0022	0.2093	0.0080	0.2013	0.0075	0.0008	0.2887	2.5397	2.7520	0.1275	33.40	33.20	24.90	24.90	6.80	7.50	4.23	28.08	9.51	1.07	97.96	107.90		
116.0	24-Oct-00	1245	134	Oleta River Park	25.90500	-80.13333	2000.81	BB	NBAY	0.81	10	2000	2000-10	0.0261	0.0226	0.0034	0.0030	0.2325	0.0291	0.2034	0.0096	0.0009	0.1110	2.7348	2.8875	0.2436	32.90	33.90	25.40	25.40	7.00	7.00	3.59	24.29	31.01	3.04	101.05	101.70		
116.0	25-Oct-00	1250	135	South Card Sound	25.31667	-80.31667	2000.81	BB	SCARD	0.81	10	2000	2000-10	0.1181	0.1108	0.0073	0.0125	0.4200	0.1306	0.2993	0.0034	0.0020	0.2535	0.7156	4.1393	0.0000	26.30	26.30	24.50	24.50	6.70	6.70	0.94	127.13	64.33	38.62	91.78	91.78		
117.0	22-Nov-00	0835	101	Convoy Point	25.47833	-80.32083	2000.89	BB	AS	0.89	11	2000	2000-11	0.1180	0.1106	0.0053	0.0133	0.6357	0.1293	0.4964	0.0058	0.0013	0.2488	0.3648	3.8680	25.60	25.20	22.70	22.80	6.80	6.50	1.05	102.63	98.11	22.24	90.73	86.61			
117.0	22-Nov-00	1025	102	Black Point	25.54583	-80.29467	2000.89	BB	AS	0.89	11	2000	2000-11	0.1856	0.1804	0.0052	0.0238	0.5756	0.2094	0.3662	0.0061	0.0025	0.6282	0.3524	5.2220	25.80	25.80	25.70	25.80	5.60	5.60	0.55	94.01	84.42	34.20	77.48	77.56			
117.0	22-Nov-00	1035	103	Near Black Ledge	25.57333	-80.28667	2000.89	BB	IS	0.89	11	2000	2000-11	0.0537	0.0490	0.0048	0.0179	0.5328	0.0716	0.4612	0.0074	0.0029	0.6162	0.3320	5.0078	25.00	25.00	25.80	25.80	6.20	6.10	0.51	92.37	24.32	9.73	85.44	84.06			
117.0	22-Nov-00	0950	104	BNP Marker C	25.60167	-80.22083	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0081	0.0054	0.0007	0.0038	0.3038	0.0099	0.2939	0.0070	0.0022	0.1054	0.1762	2.9885	34.90	34.90	25.20	25.20	6.20	6.20	0.66	43.55	4.56	1.42	90.28	90.28			
117.0	22-Nov-00	1000	108	Marker G-1B	25.69177	-80.19250	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0051	0.0043	0.0008	0.0036	0.3060	0.0086	0.2973	0.0069	0.0023	0.0964	0.1708	2.9555	34.50	34.50	25.00	25.00	6.20	6.20	0.59	44.36	3.72	1.25	90.24	90.24			
117.0	22-Nov-00	1010	109	North Midbay	25.56417	-80.23500	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0056	0.0045	0.0011	0.0049	0.2846	0.0105	0.2740	0.0067	0.0020	0.1066	0.2616	3.1633	34.90	34.90	25.10	25.10	5.90	5.90	0.60	42.70	5.23	1.58	86.00	86.00			
117.0	22-Nov-00	0855	110	Fender Point	25.50500	-80.28750	2000.89	BB	IS	0.89	11	2000	2000-11	0.0023	0.0029	0.0005	0.0086	0.3413	0.0409	0.2704	0.0058	0.0019	0.1234	0.2968	3.3945	31.00	31.20	23.20	23.20	6.60	6.50	0.85	53.55	22.00	7.04	91.79	90.52			
117.0	22-Nov-00	0910	111	Featherbed Bank	25.51583	-80.24000	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0039	0.0031	0.0008	0.0030	0.2141	0.0069	0.2071	0.0068	0.0019	0.0973	0.2439	2.6750	35.70	35.60	23.60	23.60	6.20	6.10	0.36	31.29	3.58	1.02	89.34	87.84			
117.0	22-Nov-00	0945	112	Sands Cut	25.48833	-80.18833	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0039	0.0033	0.0006	0.0028	0.2394	0.0066	0.2328	0.0096	0.0014	0.1026	0.6193	2.6595	36.20	36.10	22.90	22.90	6.20	6.20	0.59	24.91	4.74	0.69	88.88	88.82			
117.0	22-Nov-00	1020	113	Elliott Key	25.44167	-80.22333	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0071	0.0059	0.0010	0.0025	0.3013	0.0321	0.2692	0.0094	0.0012	0.1950	0.6085	3.1608	35.10	35.10	23.90	23.90	6.30	6.40	0.36	35.67	25.91	3.80	90.21	91.64			
117.0	22-Nov-00	1035	116	Rubicon Keys	25.40000	-80.25500	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0099	0.0090	0.0009	0.0148	0.3148	0.0427	0.2901	0.0081	0.0019	0.2396	0.4364	3.4230	33.50	33.50	23.50	23.50	6.40	6.30	0.42	38.68	13.28	3.04	90.80	89.49			
117.0	22-Nov-00	1055	121	North Card Sound	25.35500	-80.29167	2000.89	BB	SCARD	0.89	11	2000	2000-11	0.0073	0.0062	0.0011	0.0079	0.3231	0.0152	0.3079	0.0071	0.0026	0.3459	0.6735	4.8658	30.30	30.30	23.10	23.10	6.30	6.10	1.31	45.82	5.78	2.16	87.12	84.45			
117.0	22-Nov-00	1240	123	West Arsenicker	25.42017	-80.31083	2000.89	BB	IS	0.89	11	2000	2000-11	0.0254	0.0265	0.0010	0.0055	0.0074	0.0359	0.3110	0.0074	0.0016	0.2378	0.4465	4.4658	28.20	28.20	22.40	22.40	7.10	7.10	0.85	49.63	19.79	4.52	96.99	96.99			
117.0	22-Nov-00	1225	124	Pelican Bank	25.44500	-80.28333	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0244	0.0236	0.0010	0.0068	0.0064	0.0223	0.2610	0.0064	0.0023	0.3419	0.2777	3.4118	35.20	35.20	22.70	22.70	6.80	6.80	1.16	43.22	14.36	1.51	98.85	94.87			
117.0	22-Nov-00	0925	124	South Midbay	25.47250	-80.23333	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0044	0.0036	0.0008	0.0084	0.2734	0.0128	0.2600	0.0065	0.0008	0.1018	0.4377	2.9060	35.50	35.50	23.70	23.70	6.00	5.90	0.95	41.51	16.53	1.94	93.65	90.29			
117.0	22-Nov-00	0930	126	BNP Marker B	25.67167	-80.20500	2000.89	BB	MAIN	0.89	11	2000	2000-11	0.0053	0.0043	0.0010	0.0059	0.3348	0.0112	0.3237	0.0064	0.0013	0.0981	0.2710	3.5460	33.50														

SURV	DATE	TIME	STA	BNP MARKER	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TSS	DN1	DN2	DN3	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN-TP	N:P	DIN:TP	%SAT	%SAT_B
120.0	01-Mar-01	1400	126	BNP Marker B		25.67167	-80.20500	2001.16	BB	MAIN	0.16	03	2001	2001-03	0.0036	0.0027	0.0008	0.004	0.1943	0.0011	0.1888	0.1988	0.0086	0.0010	0.1781	0.0072	2.0665	36.60	36.40	25.10	26.70	6.30	6.30	0.67	86.79	18.13	3.01	92.78	94.92			
120.0	01-Mar-01	1200	127	Shoal Point		25.63000	-80.25000	2001.16	BB	IS	0.16	03	2001	2001-03	0.0043	0.0039	0.0005	0.0074	0.1247	0.0117	0.1130	0.0088	0.0008	0.1701	0.0072	1.9758	37.00	36.80	25.10	25.60	6.20	6.40	0.08	86.79	18.13	3.01	92.08	94.92				
120.0	01-Mar-01	1300	128	Matheron Beach		25.68833	-80.23333	2001.16	BB	IS	0.16	03	2001	2001-03	0.0184	0.0171	0.0013	0.0073	0.3256	0.0257	0.2999	0.0089	0.0013	0.1009	0.3610	2.6728	33.10	35.00	26.20	25.40	6.00	7.00	0.04	80.91	43.24	6.39	87.43	102.42				
120.0	01-Mar-01	1200	129	Marker G-71		25.73667	-80.18500	2001.16	BB	MAIN	0.16	03	2001	2001-03	0.0106	0.0092	0.0011	0.0093	0.3231	0.0198	0.3033	0.0101	0.0011	0.1213	0.4506	2.3850	34.60	34.00	25.80	25.70	6.00	6.30	0.11	71.02	40.46	4.36	90.86	92.29				
120.0	01-Mar-01	1330	130	South Doge Island		25.76333	-80.17167	2001.16	BB	NBAY	0.16	03	2001	2001-03	0.0102	0.0086	0.0015	0.0090	0.2050	0.0191	0.1859	0.0100	0.0016	0.1891	0.5429	1.9485	35.20	35.30	25.90	25.60	6.10	6.30	0.09	45.41	27.35	4.24	89.82	92.55				
120.0	01-Mar-01	1345	131	North Venetian Basin		25.80000	-80.16667	2001.16	BB	NBAY	0.16	03	2001	2001-03	0.0125	0.0116	0.0009	0.0071	0.1401	0.0197	0.1205	0.0100	0.0010	0.1630	0.6311	1.1250	34.60	34.60	26.50	25.80	6.30	6.80	0.10	31.04	43.22	4.36	92.96	99.65				
120.0	01-Mar-01	1400	132	North I-195 Basin		25.81667	-80.16667	2001.16	BB	NBAY	0.16	03	2001	2001-03	0.0079	0.0065	0.0014	0.0140	0.3101	0.0219	0.2882	0.0096	0.0007	0.1456	0.7620	2.4150	34.50	34.50	25.90	25.90	6.80	6.90	0.09	72.62	65.73	5.12	99.68	101.15				
120.0	01-Mar-01	1420	133	North Normandy Isle		25.86667	-80.15000	2001.16	BB	NBAY	0.16	03	2001	2001-03	0.0081	0.0079	0.0015	0.0116	0.2690	0.0232	0.2458	0.0130	0.0008	0.2193	0.8019	2.9853	34.40	35.00	26.50	25.40	5.90	5.90	0.12	27.51	34.00	3.50	92.80	96.08				
120.0	01-Mar-01	1442	134	Oleta River Park		25.90500	-80.13333	2001.16	BB	NBAY	0.16	03	2001	2001-03	0.0068	0.0057	0.0011	0.0097	0.1017	0.0165	0.0862	0.0099	0.0009	0.1028	0.7498	1.9960	35.60	35.90	26.10	25.80	6.00	6.00	0.06	22.71	40.00	3.69	96.15	97.13				
120.0	02-Mar-01	1049	135	South Card Sound		25.31667	-80.31667	2001.16	BB	SCARD	0.16	03	2001	2001-03	0.0055	0.0048	0.0007	0.0106	0.2729	0.0162	0.2567	0.0095	0.0012	0.2171	0.1075	3.0773	34.50	34.80	25.80	25.40	6.50	6.80	0.21	63.92	28.88	3.79	95.19	99.37				
121.0	23-Mar-01	1102	101	Convoy Point		25.47833	-80.32083	2001.22	BB	AS	0.22	03	2001	2001-03	0.0014	0.0009	0.0006	0.0022	0.3352	0.0037	0.3316	0.0043	0.0004	0.1432	0.0441	3.3083	37.00	37.10	20.40	20.70	6.60	6.60	0.67	174.11	21.88	1.91	92.56	92.49				
121.0	23-Mar-01	1120	102	Black Point		25.54583	-80.29467	2001.22	BB	AS	0.22	03	2001	2001-03	0.0008	0.0005	0.0003	0.0016	0.4779	0.0024	0.4754	0.0057	0.0010	0.3421	0.0978	6.1403	32.90	32.90	20.80	20.40	6.50	6.70	0.47	187.03	5.31	0.95	88.21	90.93				
121.0	23-Mar-01	1135	103	Near Black Ledge		25.57333	-80.28667	2001.22	BB	IS	0.22	03	2001	2001-03	0.0021	0.0019	0.0004	0.0021	0.2500	0.0060	0.2470	0.0010	0.0008	0.1719	0.0050	2.9050	36.00	36.00	21.50	21.60	6.00	6.00	0.41	152.96	2.76	1.88	91.20	91.41				
121.0	22-Mar-01	0805	104	BNP Marker C		25.60167	-80.22083	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0019	0.0014	0.0005	0.0023	0.2620	0.0043	0.2577	0.0049	0.0003	0.0989	0.1102	2.2708	36.90	36.80	23.10	23.10	7.80	9.00	4.62	118.80	30.50	1.94	112.80	129.84				
121.0	22-Mar-01	0840	108	Marker G-1B		25.56917	-80.19250	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0019	0.0009	0.0004	0.0010	0.1703	0.0023	0.1650	0.0042	0.0009	0.1077	0.1192	1.8950	37.00	37.00	20.80	20.10	7.00	0.74	86.00	14.60	1.22	107.98	121.01					
121.0	22-Mar-01	0909	109	North Midbay		25.56417	-80.23500	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0012	0.0009	0.0003	0.0006	0.1738	0.0018	0.1720	0.0043	0.0009	0.1041	0.1185	2.4220	37.00	37.00	21.10	23.10	6.30	4.90	3.95	90.30	4.48	0.95	87.20	72.00				
121.0	23-Mar-01	1050	110	Fender Point		25.50000	-80.28750	2001.22	BB	IS	0.22	03	2001	2001-03	0.0025	0.0023	0.0002	0.0016	0.2582	0.0041	0.2540	0.0046	0.0007	0.0797	0.0592	3.1235	37.20	37.20	21.20	21.10	6.20	6.40	0.45	125.05	13.03	1.97	87.75	90.24				
121.0	23-Mar-01	1655	111	Featherbed Bank		25.51583	-80.24000	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0014	0.0012	0.0002	0.0025	0.2138	0.0039	0.2099	0.0042	0.0003	0.0896	0.0413	2.8060	37.00	37.00	22.50	22.50	8.30	8.40	0.92	113.11	27.75	2.06	119.57	121.01				
121.0	23-Mar-01	1600	112	Sands Cut		25.48333	-80.18833	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0025	0.0023	0.0002	0.0033	0.2289	0.0058	0.2211	0.0040	0.0008	0.0696	0.0000	2.3590	37.10	37.10	21.30	21.20	8.40	8.70	0.74	124.67	16.70	3.21	116.88	122.75				
121.0	23-Mar-01	1050	113	Elliott Key		25.44167	-80.22333	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0027	0.0026	0.0001	0.0028	0.2371	0.0055	0.2316	0.0041	0.0009	0.0937	0.0719	2.3983	37.00	36.90	21.80	21.70	8.30	8.40	1.71	127.84	14.36	2.06	117.97	119.15				
121.0	23-Mar-01	1155	116	Rubicon Keys		25.40000	-80.25500	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0032	0.0029	0.0003	0.0016	0.2366	0.0048	0.2319	0.0040	0.0004	0.0871	0.1116	2.7518	36.30	36.60	22.00	21.80	6.50	6.50	1.28	132.56	27.20	2.67	92.20	91.78				
121.0	23-Mar-01	1211	121	North Card Sound		25.35500	-80.29167	2001.22	BB	SCARD	0.22	03	2001	2001-03	0.0026	0.0023	0.0002	0.0028	0.2861	0.0053	0.2808	0.0037	0.0008	0.1209	0.0827	4.0283	34.60	36.00	21.90	22.00	6.10	6.10	0.45	170.29	14.07	3.17	85.45	86.57				
121.0	23-Mar-01	1133	122	West Arsenicker		25.42017	-80.31083	2001.22	BB	IS	0.22	03	2001	2001-03	0.0018	0.0014	0.0004	0.0029	0.2948	0.0047	0.2900	0.0040	0.0010	0.1756	0.0703	3.8120	36.60	36.00	21.20	21.10	6.70	6.90	0.88	161.96	10.00	2.60	93.85	96.52				
121.0	23-Mar-01	1117	123	Pelican Bank		25.44500	-80.28333	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0061	0.0057	0.0005	0.0037	0.2329	0.0099	0.2291	0.0046	0.0009	0.1018	0.0551	2.9455	37.20	37.20	21.50	21.60	6.60	6.60	0.95	112.80	25.60	4.77	93.95	93.56				
121.0	23-Mar-01	1045	124	Pelican Bank		25.47250	-80.27000	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0025	0.0025	0.0001	0.0021	0.3038	0.0017	0.0964	0.0038	0.0017	0.0460	0.0400	2.5370	37.60	37.70	22.50	21.80	8.00	8.50	0.98	128.68	7.36	3.31	114.08	121.37				
121.0	23-Mar-01	0940	125	BNP Marker B		25.47167	-80.25000	2001.22	BB	MAIN	0.22	03	2001	2001-03	0.0048	0.0048	0.0001	0.0051	0.2726	0.0011	0.2737	0.0040	0.0011	0.1544	0.3298	2.5845	36.90	37.10	22.50	22.40	7.50	7.50	0.42	121.50	14.28	4.21	94.88	95.82				
121.0	23-Mar-01	0949	127	Shoal Point		25.63000	-80.25000	2001.22	BB	IS	0.22	03	2001	2001-03	0.0022	0.0020	0.0002	0.0021	0.2207	0.0043	0.2283	0.0087	0.0012	0.0849	0.0929	2.8665	36.20	36.20	22.00	22.00	6.50	6.40	0.82	69.53	8.13	1.09	92.72	91.18				
121.0	23-Mar-01	0937	128	Matheron Beach		25.68833	-80.23333	2001.22	BB	IS	0.22	03	2001	2001-03	0.0036	0.0029	0.0007	0.0045	0.2931	0.0048	0.2849	0.0088	0.0015	0.0689																		

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	ON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN-TP	N-TP	DIN-TP	%SAT_S	%SAT_B
124.0	28-Jun-01	1435	129	Matheson Beach	25.68833	-80.3333	2001.49	BB	AS	0.49	08	2001	2001-06	0.0164	0.0199	0.0025	0.006	0.1242	0.0215	0.1027	0.0949	0.001	0.1536	0.5470	3.7003	32.10	32.10	28.10	28.90	6.86	6.86	1.46	25.45	27.28	4.40	100.86	96.59	108.59	108.59	
124.0	30-Jun-01	1417	129	Marker G-7	25.73667	-80.18500	2001.49	BB	MAIN	0.49	06	2001	2001-06	0.0192	0.0207	0.0024	0.0111	0.1382	0.0303	0.1089	0.0057	0.0001	0.2007	0.6421	3.0250	32.50	33.60	28.10	28.90	6.10	6.80	1.46	24.50	39.10	5.36	90.85	96.59	108.59	108.59	
124.0	30-Jun-01	0836	130	South Dodge Island	25.76333	-80.17167	2001.49	BB	NBAY	0.49	06	2001	2001-06	0.0219	0.0189	0.0030	0.0128	0.1347	0.0347	0.1000	0.0071	0.0005	0.2563	1.1643	2.8720	32.30	32.30	28.50	28.50	6.50	6.40	1.53	18.89	74.58	4.86	96.22	94.74	108.59	108.59	
124.0	30-Jun-01	0910	131	North Venetian Basin	25.80000	-80.16667	2001.49	BB	NBAY	0.49	06	2001	2001-06	0.0307	0.0276	0.0031	0.0139	0.1306	0.0446	0.0860	0.0078	0.0008	0.2729	0.9094	3.3820	32.90	29.20	28.50	28.50	5.60	5.60	1.22	16.89	57.50	5.69	81.66	81.30	108.59	108.59	
124.0	30-Jun-01	0924	132	North I-195 Basin	25.81667	-80.16667	2001.49	BB	NBAY	0.49	06	2001	2001-06	0.0123	0.0099	0.0023	0.0089	0.1395	0.0211	0.1184	0.0074	0.0005	0.2096	0.5608	3.8973	32.80	29.10	28.60	28.60	6.10	6.00	0.58	18.95	38.90	2.87	88.41	87.05	108.59	108.59	
124.0	30-Jun-01	0944	133	North Normandy Isle	25.86667	-80.15000	2001.49	BB	NBAY	0.49	06	2001	2001-06	0.0279	0.0232	0.0047	0.0053	0.1539	0.0331	0.1207	0.0206	0.0007	1.4753	4.1654	4.1440	37.10	28.30	28.70	28.70	6.40	6.50	1.50	7.46	47.50	1.61	91.79	94.44	108.59	108.59	
124.0	30-Jun-01	1002	134	Oleta River Park	25.90500	-80.13333	2001.49	BB	NBAY	0.49	06	2001	2001-06	0.0338	0.0288	0.0050	0.0078	0.1145	0.0416	0.0730	0.0211	0.0009	1.1565	4.3932	3.6250	31.20	34.20	28.50	28.50	5.80	5.80	1.57	5.43	48.77	1.97	85.27	87.03	108.59	108.59	
124.0	29-Jun-01	1148	135	South Card Sound	25.31667	-80.31667	2001.49	BB	SCARD	0.49	06	2001	2001-06	0.0020	0.0007	0.0013	0.0071	0.1790	0.0090	0.1659	0.0147	0.0008	0.1910	0.3817	4.3068	37.70	37.80	29.00	29.00	5.40	5.60	1.10	12.15	11.65	0.61	83.03	86.03	108.59	108.59	
125.0	11-Jul-01	1053	101	Convoy Point	25.47833	-80.32083	2001.52	BB	AS	0.52	07	2001	2001-07	0.0613	0.0585	0.0028	0.0177	0.3540	0.0790	0.2751	0.0142	0.0008	0.2310	0.2494	2.9738	0.1826	34.70	34.70	29.60	29.60	4.80	4.70	0.69	24.66	97.03	5.57	72.76	71.24	108.59	108.59
125.0	11-Jul-01	1029	102	Black Point	25.54583	-80.29467	2001.52	BB	AS	0.52	07	2001	2001-07	0.0756	0.0699	0.0057	0.0301	0.3858	0.1057	0.2801	0.0102	0.0016	0.4448	0.3514	3.8498	0.3108	27.30	27.40	28.70	28.70	4.70	5.00	0.57	37.77	68.19	10.35	67.53	72.01	108.59	108.59
125.0	11-Jul-01	1016	103	Near Black Ledge	25.57333	-80.28667	2001.52	BB	IS	0.52	07	2001	2001-07	0.0575	0.0504	0.0070	0.0217	0.3535	0.0792	0.2743	0.0112	0.0009	0.4566	0.3293	3.8093	0.2284	29.20	29.20	28.70	28.70	4.10	4.10	0.75	31.68	92.91	7.10	59.32	59.32	108.59	108.59
125.0	10-Jul-01	0925	104	BNP Marker C	25.60167	-80.22083	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0028	0.0015	0.0011	0.0070	0.1676	0.0096	0.1580	0.0168	0.0012	0.1458	0.1656	2.0038	0.0360	37.10	37.00	29.60	29.60	4.60	4.60	0.70	9.97	7.88	0.57	70.78	70.74	108.59	108.59
125.0	10-Jul-01	0915	105	BNP Marker B	25.60167	-80.22083	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0028	0.0015	0.0011	0.0070	0.1676	0.0096	0.1580	0.0168	0.0012	0.1458	0.1656	2.0038	0.0360	37.10	37.00	29.60	29.60	4.60	4.60	0.70	9.97	7.88	0.57	70.78	70.74	108.59	108.59
125.0	11-Jul-01	1001	109	North Midbay	25.56417	-80.23500	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0028	0.0015	0.0013	0.0047	0.1366	0.0075	0.1292	0.0185	0.0005	0.2045	0.1764	2.0883	0.0351	37.30	37.30	29.00	29.00	5.20	5.10	0.52	7.38	13.74	0.40	79.75	78.22	108.59	108.59
125.0	11-Jul-01	1041	110	Fender Point	25.50500	-80.28750	2001.52	BB	IS	0.52	07	2001	2001-07	0.0029	0.0029	0.0019	0.0186	0.2145	0.0414	0.1731	0.0179	0.0012	0.1929	0.2039	2.7628	0.0939	35.50	35.50	28.50	28.50	5.00	5.90	0.60	11.98	33.39	2.31	87.61	89.12	108.59	108.59
125.0	11-Jul-01	0946	111	Featherbank Bank	25.51583	-80.24000	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0022	0.0011	0.0011	0.0057	0.1568	0.0079	0.1490	0.0129	0.0007	0.1662	0.1777	2.6348	0.0282	37.10	37.10	28.80	28.80	5.10	5.10	0.53	12.12	11.29	0.61	78.00	78.00	108.59	108.59
125.0	11-Jul-01	1338	112	Sands Cut	25.48833	-80.18833	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0026	0.0014	0.0012	0.0041	0.1429	0.0067	0.1362	0.0198	0.0009	0.1032	0.2508	2.1353	0.0233	37.20	37.20	29.10	29.10	4.50	4.70	1.20	7.20	7.80	0.34	69.03	72.10	108.59	108.59
125.0	11-Jul-01	1310	113	Elliott Key	25.44167	-80.22333	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0118	0.0103	0.0013	0.0189	0.1925	0.0315	0.1610	0.0131	0.0015	0.1607	0.2921	2.7893	0.0283	37.80	37.90	29.20	29.20	6.20	6.20	1.70	10.44	21.37	2.39	95.54	95.60	108.59	108.59
125.0	11-Jul-01	1211	116	Rubicon Keys	25.40000	-80.25500	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0046	0.0032	0.0014	0.0107	0.1568	0.0153	0.1424	0.0119	0.0009	0.1540	0.1543	2.5895	0.0757	37.10	37.10	28.90	28.90	5.30	5.40	0.74	13.14	17.94	1.28	81.17	82.05	108.59	108.59
125.0	11-Jul-01	1303	121	North Card Sound	25.35500	-80.29167	2001.52	BB	SCARD	0.52	07	2001	2001-07	0.0037	0.0016	0.0021	0.0096	0.1596	0.0133	0.1462	0.0155	0.0010	0.1656	0.2924	2.9985	0.0447	37.30	37.20	29.60	29.60	5.80	6.00	0.47	14.28	13.24	0.86	89.36	92.38	108.59	108.59
125.0	11-Jul-01	1124	122	West Arsenicker	25.42017	-80.31083	2001.52	BB	IS	0.52	07	2001	2001-07	0.0027	0.0016	0.0011	0.0124	0.1378	0.0151	0.1228	0.0109	0.0013	0.4837	0.2081	3.4658	0.1251	37.60	37.60	29.00	29.00	5.70	5.90	0.80	12.70	11.42	1.39	87.59	90.66	108.59	108.59
125.0	11-Jul-01	1111	123	Pelican Bank	25.44500	-80.28333	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0238	0.0219	0.0019	0.0180	0.1661	0.0418	0.1243	0.0102	0.0010	0.4405	0.1571	2.7128	0.0777	37.00	37.00	29.00	29.00	5.00	5.50	0.49	16.36	42.85	4.12	84.13	84.20	108.59	108.59
125.0	11-Jul-01	1349	124	South Midbay	25.47250	-80.23333	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0041	0.0029	0.0012	0.0136	0.1462	0.0177	0.1285	0.0122	0.0008	0.2116	0.1598	3.0718	0.0328	37.00	37.00	29.00	29.00	5.30	5.40	0.70	12.00	22.89	1.46	99.50	61.49	108.59	108.59
125.0	10-Jul-01	1000	126	BNP Marker B	25.67167	-80.20500	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0040	0.0019	0.0021	0.0124	0.1403	0.0163	0.1240	0.0128	0.0006	0.0068	0.3789	3.0225	0.0927	35.70	35.80	29.30	29.30	4.00	4.00	0.97	10.94	26.31	1.27	71.53	73.15	108.59	108.59
125.0	10-Jul-01	0915	126	BNP Marker B	25.67167	-80.20500	2001.52	BB	MAIN	0.52	07	2001	2001-07	0.0040	0.0019	0.0021	0.0124	0.1403	0.0163	0.1240	0.0128	0.0006	0.0068	0.3789	3.0225	0.0927	35.70	34.70	29.30	29.30	4.00	4.00	0.27	9.60	9.60	2.22	96.64	60.49	108.59	108.59
125.0	10-Jul-01	0920	128	Matheson Beach	25.68833	-80.23333	2001.52	BB	IS	0.52	07	2001	2001-07	0.0042	0.0021	0.0021	0.0173	0.1406	0.0173	0.1270	0.0146	0.0012	0.2165	0.8113	1.5119	33.90	33.90	29.50	29.50	5.90	5.20	0.99	5.98	23.02	0.71	79.21	78.29	108.59	108.59	
125.0	10-Jul-01	0815	129	Marker G-7	25.73667																																			

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSY	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN-TP	N:P	DIN:TP	%SAT_T	%SAT_B
128.0	16-Oct-01	1144	103	North Venetian Basin	25.80000	-80.16667	2001.79	BB	NBY	0.79	10	2001	2001-10	0.0299	0.0046	0.0046	0.0173	0.0068	0.0173	0.0068	0.0068	0.0117	0.3756	1.4071	3.4988	28.50	36.10	27.30	27.20	7.50	7.40	3.55	26.27	26.27	6.80	104.68	106.81			
128.0	16-Oct-01	1209	133	North Normandy Isle	25.86667	-80.15000	2001.79	BB	NBY	0.79	10	2001	2001-10	0.0501	0.0444	0.0057	0.0337	0.2120	0.0838	0.1282	0.0077	0.0015	0.5748	3.2467	4.1325	24.90	29.80	28.00	27.80	8.30	7.80	1.65	27.63	56.30	10.92	116.76	112.68			
128.0	16-Oct-01	1229	134	Oleta River Park	25.90500	-80.13333	2001.79	BB	NBY	0.79	10	2001	2001-10	0.0320	0.0267	0.0053	0.0156	0.1375	0.0476	0.0899	0.0053	0.0015	0.3821	0.8117	3.1175	26.00	34.10	27.20	27.00	8.20	8.50	2.00	26.03	31.47	9.02	119.27	125.96			
128.0	16-Oct-01	1255	135	South Card Sound	25.31667	-80.13667	2001.79	BB	SCARD	0.79	10	2001	2001-10	0.0570	0.0506	0.0064	0.0299	0.1962	0.0669	0.1093	0.0026	0.0021	0.1443	0.4972	4.3175	26.70	30.29	27.46	27.56	6.81	6.00	0.45	47.70	41.84	33.98	96.43	86.99			
129.0	15-Nov-01	1625	101	Convoy Point	25.47833	-80.32083	2001.87	BB	AS	0.87	11	2001	2001-11	0.1051	0.1014	0.0037	0.0503	0.3913	0.1554	0.2359	0.0082	0.0010	0.1171	0.3985	3.3230	3.1394	24.90	25.10	23.30	23.40	7.60	7.00	0.16	76.50	148.04	18.86	101.10	93.92		
129.0	15-Nov-01	1120	102	Black Point	25.54583	-80.29467	2001.88	BB	AS	0.88	11	2001	2001-11	0.0209	0.0178	0.0032	0.0361	0.2300	0.0371	0.1729	0.0077	0.0009	0.1477	0.1901	3.9335	0.1786	24.00	24.80	23.10	23.10	6.30	6.80	0.43	29.85	66.28	7.41	84.05	90.72		
129.0	15-Nov-01	1133	103	Near Black Ledge	25.57333	-80.28667	2001.88	BB	IS	0.88	11	2001	2001-11	0.0083	0.0064	0.0019	0.0308	0.1684	0.0391	0.1294	0.0070	0.0006	0.2112	0.1956	3.2625	0.0439	27.00	27.10	23.10	23.10	5.70	5.60	0.49	23.96	60.49	5.56	77.14	75.84		
129.0	15-Nov-01	1145	104	BNP Marker C-1B	25.60167	-80.22083	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.0151	0.0123	0.0029	0.0100	0.2993	0.0251	0.2702	0.0050	0.0002	0.1587	0.5923	2.8028	0.0296	30.00	30.10	22.90	22.90	6.70	6.70	0.51	50.63	126.40	5.07	92.12	92.30		
129.0	15-Nov-01	1205	105	Marker G-1B	25.58917	-80.19250	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.0085	0.0066	0.0016	0.0297	0.2520	0.0200	0.2397	0.0049	0.0003	0.1029	0.3455	3.2520	0.0252	31.00	30.00	22.90	22.90	6.60	6.60	0.51	59.66	6.00	6.00	2.48	90.60	92.96	
129.0	15-Nov-01	1212	109	North Midbay	25.56417	-80.23500	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.0038	0.0023	0.0003	0.0140	0.0056	0.0040	0.0112	0.0056	0.0000	0.0749	0.0000	0.0000	0.0000	31.90	31.90	22.80	22.80	6.50	6.50	0.38	97.87	97.87	0.00	96.12	96.12		
129.0	15-Nov-01	1640	110	Fender Point	25.50500	-80.28750	2001.87	BB	IS	0.87	11	2001	2001-11	0.0068	0.0046	0.0022	0.0111	0.3266	0.0579	0.2687	0.0052	0.0003	0.0945	0.2632	2.7573	0.0315	28.80	28.80	22.90	22.90	6.70	7.00	0.19	62.61	169.63	11.10	91.52	95.61		
129.0	15-Nov-01	1245	111	Feathered Bank	25.51583	-80.24000	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.0409	0.0001	0.0002	0.0444	0.4303	0.0053	0.4249	0.0059	0.0005	0.0758	0.2249	2.4383	0.0091	32.70	32.60	22.90	23.20	6.40	6.40	0.39	73.24	10.74	0.91	89.56	89.62		
129.0	15-Nov-01	1306	112	Sands Cut	25.48833	-80.18833	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.0008	0.0000	0.0008	0.0036	0.3681	0.0444	0.3777	0.0052	0.0003	0.0815	0.3437	2.2793	0.0005	33.40	33.30	22.70	23.00	6.80	6.20	0.43	73.91	13.84	0.85	95.83	87.43		
129.0	15-Nov-01	1345	113	Elliott Key	25.44167	-80.23333	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.0085	0.0053	0.0032	0.0283	0.3021	0.0248	0.4833	0.0046	0.0018	0.0812	0.4259	3.2533	0.0913	37.50	35.00	28.70	22.70	22.90	7.00	8.20	0.43	115.22	364.42	23.64	94.57	112.84	
129.0	15-Nov-01	1410	116	Rubicon Keys	25.40000	-80.25500	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.0117	0.1085	0.0032	0.0323	0.2042	0.0141	0.3492	0.0046	0.0018	0.1847	0.4259	3.2533	0.0659	25.40	29.10	22.80	23.00	6.80	8.20	0.33	105.93	81.23	31.61	90.73	112.84		
129.0	15-Nov-01	1430	121	North Card Sound	25.35000	-80.29167	2001.87	BB	SCARD	0.87	11	2001	2001-11	0.0901	0.0853	0.0049	0.0292	0.3884	0.1193	0.2691	0.0051	0.0020	0.1544	0.3345	3.6305	0.0258	24.60	30.20	23.00	23.00	6.80	8.50	0.25	75.94	59.37	23.33	90.48	117.75		
129.0	15-Nov-01	1505	122	West Arsenicker	25.42017	-80.31083	2001.87	BB	IS	0.87	11	2001	2001-11	0.0257	0.0203	0.0054	0.0361	0.4967	0.2418	0.2549	0.0050	0.0015	0.1897	0.3126	3.9125	0.0663	24.00	21.50	23.10	23.10	6.50	7.20	0.10	99.36	164.63	48.36	84.81	94.01		
129.0	15-Nov-01	1610	123	Pelican Bank	25.44500	-80.28333	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.1858	0.1816	0.0043	0.0263	0.3439	0.2121	0.1318	0.0048	0.0007	0.0974	0.4643	3.1523	0.1672	25.60	31.80	22.90	24.00	6.60	6.40	0.27	50.94	307.24	43.75	88.29	90.33		
129.0	15-Nov-01	1330	124	South Midbay	25.47250	-80.23333	2001.87	BB	MAIN	0.87	11	2001	2001-11	0.0012	0.0002	0.0010	0.0047	0.0049	0.0059	0.2399	0.0066	0.0004	0.2661	0.2295	2.2043	0.0000	33.30	33.30	22.70	23.10	5.90	6.30	0.25	70.04	14.48	1.20	83.20	88.84		
129.0	15-Nov-01	1125	126	BNP Marker B	25.67167	-80.20500	2001.87	BB	MAIN	0.87	11	2001	2001-12	0.0129	0.0100	0.0024	0.0096	0.2685	0.0219	0.2476	0.0066	0.0004	0.2876	0.1876	2.9085	0.0312	30.00	33.50	23.30	24.00	7.00	7.10	0.86	51.10	54.81	3.86	95.35	101.44		
129.0	15-Nov-01	1106	127	Shoal Point	25.63000	-80.25000	2001.88	BB	IS	0.88	11	2001	2001-11	0.0111	0.0086	0.0024	0.0079	0.3298	0.0190	0.3109	0.0055	0.0006	0.0638	0.3711	3.0388	0.0556	28.20	28.20	22.90	22.90	5.80	6.60	0.39	59.52	31.60	3.42	78.91	89.80		
129.0	15-Nov-01	1250	128	Matheson Beach	25.68833	-80.23333	2001.88	BB	IS	0.88	11	2001	2001-11	0.0124	0.0099	0.0024	0.0053	0.3525	0.0176	0.3349	0.0051	0.0009	0.1176	0.5173	3.0405	0.1845	28.50	31.30	23.30	23.00	6.70	6.60	0.58	69.44	18.56	3.47	91.79	91.97		
129.0	15-Nov-01	1230	129	Marker G-7	25.73667	-80.18500	2001.88	BB	MAIN	0.88	11	2001	2001-11	0.0243	0.0211	0.0033	0.0186	0.3283	0.0428	0.2854	0.0074	0.0011	0.1087	1.1247	2.8633	0.2753	31.30	33.60	24.10	24.00	5.60	6.00	0.33	44.27	39.63	5.79	78.87	85.58		
129.0	15-Nov-01	1245	130	North Dodge Island	25.73667	-80.17167	2001.88	BB	NBY	0.88	11	2001	2001-11	0.0105	0.0105	0.0053	0.0165	0.2920	0.0029	0.2725	0.0075	0.0010	0.1087	1.5424	2.1307	0.0273	33.70	34.40	24.60	23.60	6.10	5.80	0.20	49.20	23.81	3.01	87.75	83.82		
129.0	15-Nov-01	1150	131	North Venetian Basin	25.80000	-80.18889	2001.88	BB	NBY	0.88	11	2001	2001-11	0.0102	0.0028	0.0028	0.0247	0.0037	0.0110	0.0247	0.0037	0.0010	0.1434	0.2768	2.8428	0.0981	31.10	32.00	24.00	24.00	6.40	6.20	1.68	47.87	3.00	1.68	88.00	91.00		
129.0	15-Nov-01	1336	132	North I-195 Basin	25.81667	-80.16667	2001.88	BB	NBY	0.88	11	2001	2001-11	0.0071	0.0055	0.0017	0.0113	0.2185	0.0185	0.1980	0.0071	0.0011	0.1005	1.1407	3.3508	0.0995	29.70	29.70	23.60	23.60	6.20	7.40	1.00	49.49	17.44	2.60	99.78	102.55		
129.0	15-Nov-01	1356	133	North Normandy Isle	25.86667	-80.15000	2001.88	BB	NBY	0.88	11	2001	2001-11	0.0323	0.0277	0.0046	0.0158	0.1888	0.0480	0.1480	0.0071	0.0014	0.0277	0.1667	3.2790	0.1730	29.80	33.80	23.70	23.00	6.30	6.40	1.38	26.66	34.48	6.78	93.02	91.82		
129.0	15-Nov-01	1425	134	Oleta River Park	25.90500	-80.13333	2001.88	BB	NBY	0.88	11	2001</																												

SURV	DATE	TIME	STA	SITE	LATDEC	LONGDEC	YEAR	BAY	ZSII	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL_S	SAL_B	TEMP_S	TEMP_B	DO_S	DO_B	TURB	Kd	pH	TN:TP	N:P	DIN:TP	%SAT	%SAT_B
133.0	07-Mar-02	1140	101	Convoy Point	-25.47833	-80.32083	2002	18	BB	AS	0.18	03	2002	2002-03	0.0612	0.0575	0.0037	0.0197	0.4980	0.0810	0.4171	0.0010	0.0001	0.4507	0.2095	5.0723	24.49	30.18	18.99	19.49	6.62	7.48	0.78	1092.72	2317.65	177.62	83.16	98.36		
133.0	06-Mar-02	0944	102	Black Point	-25.54583	-80.29467	2002	17	BB	AS	0.17	03	2002	2002-03	0.0028	0.0022	0.0006	0.0054	0.4917	0.0082	0.4835	0.0011	0.0007	0.3532	0.2607	3.8375	30.15	30.11	18.60	18.82	6.67	6.87	0.43	991.86	27.82	16.62	86.49	89.37		
133.0	06-Mar-02	1003	103	Near Black Ledge	-25.57333	-80.28667	2002	18	BB	IS	0.17	03	2002	2002-03	0.0028	0.0022	0.0006	0.0054	0.4728	0.0074	0.4654	0.0021	0.0009	0.2668	0.3192	3.3373	32.25	32.23	19.11	19.11	6.33	6.47	0.56	508.66	17.35	7.92	83.91	85.76		
133.0	07-Mar-02	0910	104	BNP Marker C	-25.60167	-80.22083	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0015	0.0010	0.0005	0.0019	0.3777	0.0033	0.3744	0.0017	0.0010	0.0712	0.2973	2.8610	36.32	36.61	18.10	19.02	7.01	6.83	1.50	480.77	7.07	4.22	95.06	93.10		
133.0	07-Mar-02	0920	108	Marker G-1B	-25.56917	-80.19250	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0016	0.0012	0.0004	0.0061	0.3527	0.0077	0.3450	0.0019	0.0015	0.0751	0.2217	2.8388	36.29	36.30	19.10	19.10	6.93	6.60	1.77	421.66	11.04	9.22	94.36	89.89		
133.0	07-Mar-02	0901	109	North Midbay	-25.56417	-80.23500	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0013	0.0009	0.0005	0.0039	0.4527	0.0053	0.4474	0.0016	0.0000	0.0938	0.2607	2.7438	37.82	37.98	17.39	18.44	7.86	7.30	1.42	652.96	7.57	105.27	99.53	99.53		
133.0	07-Mar-02	1150	110	Fender Point	-25.60167	-80.28750	2002	18	BB	IS	0.18	03	2002	2002-03	0.0024	0.0019	0.0009	0.0092	0.3780	0.0036	0.3644	0.0023	0.0008	0.1253	0.2607	3.0260	35.56	35.61	19.11	19.47	6.86	6.77	0.71	212.72	36.43	13.15	92.31	86.77		
133.0	07-Mar-02	0934	111	Featherbed Bank	-25.51583	-80.24000	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0024	0.0018	0.0006	0.0053	0.3412	0.0077	0.3335	0.0024	0.0002	0.0890	0.2988	2.6430	37.00	37.04	19.45	19.44	6.92	6.60	0.69	321.03	113.23	7.27	95.10	95.80		
133.0	07-Mar-02	0958	112	Sands Cut	-25.48833	-80.18833	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0011	0.0006	0.0005	0.0054	0.3013	0.0065	0.2949	0.0027	0.0010	0.0718	0.1949	2.5860	37.06	37.08	19.26	19.25	7.50	6.95	1.07	244.40	13.98	5.25	102.91	95.37		
133.0	07-Mar-02	1010	113	Elliott Key	-25.44167	-80.22333	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0015	0.0012	0.0004	0.0059	0.3164	0.0074	0.3090	0.0020	0.0002	0.1002	0.2022	2.7738	37.83	37.85	19.55	19.55	6.99	6.72	1.06	356.26	96.39	8.33	96.33	93.10		
133.0	07-Mar-02	1028	116	Rubicon Keys	-25.40000	-80.25000	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0020	0.0015	0.0005	0.0017	0.3485	0.0037	0.3457	0.0027	0.0010	0.1057	0.3484	3.0143	36.38	36.94	19.44	19.47	6.93	6.62	0.99	288.38	8.20	3.13	94.92	93.80		
133.0	07-Mar-02	1045	121	North Card Sound	-25.35500	-80.29167	2002	18	BB	SCARD	0.18	03	2002	2002-03	0.0015	0.0009	0.0008	0.0041	0.3807	0.0058	0.3511	0.0027	0.0006	0.1045	0.2485	2.9788	36.36	36.35	19.22	19.21	6.75	6.63	0.68	292.52	20.73	4.53	92.13	90.48		
133.0	07-Mar-02	1110	122	West Arsenicker	-25.42017	-80.21833	2002	18	BB	IS	0.18	03	2002	2002-03	0.0024	0.0019	0.0009	0.0054	0.3780	0.0036	0.3644	0.0023	0.0008	0.1253	0.2607	3.0260	35.56	35.61	19.11	19.47	6.86	6.77	0.71	212.72	36.43	13.15	92.31	86.77		
133.0	07-Mar-02	1127	123	Pelican Bank	-25.44500	-80.28333	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0052	0.0043	0.0009	0.0089	0.3814	0.0141	0.3473	0.0020	0.0001	0.1490	0.2631	3.2918	33.01	35.21	19.32	19.44	6.86	6.49	1.38	403.69	237.72	15.73	91.70	88.20		
133.0	07-Mar-02	0946	124	South Midbay	-25.47250	-80.23333	2002	18	BB	MAIN	0.18	03	2002	2002-03	0.0013	0.0010	0.0004	0.0042	0.2745	0.0054	0.2691	0.0018	0.0008	0.0875	0.1925	2.6215	37.86	37.71	19.38	19.19	7.51	6.85	0.72	339.02	15.49	6.68	103.33	94.34		
133.0	06-Mar-02	1016	126	BNP Marker B	-25.67167	-80.20500	2002	17	BB	MAIN	0.17	03	2002	2002-03	0.0035	0.0031	0.0004	0.0091	0.3409	0.0126	0.3283	0.0021	0.0011	0.0702	0.5092	2.9998	34.46	34.48	19.74	19.77	5.93	6.16	2.80	364.68	24.64	13.44	80.54	83.71		
133.0	06-Mar-02	1232	127	Shoal Point	-25.63000	-80.25000	2002	17	BB	IS	0.17	03	2002	2002-03	0.0020	0.0015	0.0005	0.0035	0.3168	0.0054	0.3113	0.0018	0.0008	0.1145	0.2583	2.8890	34.84	34.83	19.78	19.78	6.18	6.43	0.81	251.45	15.20	6.56	84.20	87.60		
133.0	06-Mar-02	1045	128	Mathon Beach	-25.68833	-80.23333	2002	17	BB	IS	0.17	03	2002	2002-03	0.0034	0.0028	0.0006	0.0055	0.2580	0.0090	0.2490	0.0023	0.0010	0.1218	0.8211	3.4128	32.72	32.75	19.66	19.66	6.50	6.74	1.74	252.14	19.17	8.76	87.16	90.40		
133.0	06-Mar-02	1110	129	Marker G-7	-25.73667	-80.18500	2002	17	BB	MAIN	0.17	03	2002	2002-03	0.0004	0.0003	0.0001	0.0072	0.4145	0.0112	0.2303	0.0023	0.0013	0.0626	0.1329	2.7798	34.31	34.48	19.52	20.30	5.82	5.81	1.56	232.57	19.31	10.78	79.52	79.57		
133.0	06-Mar-02	1025	130	South Dodge Island	-25.76333	-80.17167	2002	17	BB	NSAY	0.17	03	2002	2002-03	0.0079	0.0064	0.0015	0.0143	0.2381	0.0222	0.2159	0.0023	0.0002	0.0467	0.3206	2.6745	33.80	34.51	19.55	20.00	6.57	6.79	1.44	227.28	209.38	21.22	87.77	93.40		
133.0	06-Mar-02	1145	131	North Venetian Basin	-25.80000	-80.16667	2002	17	BB	NSAY	0.17	03	2002	2002-03	0.0052	0.0046	0.0006	0.0084	0.1862	0.0136	0.1725	0.0030	0.0007	0.0516	0.9283	3.1385	31.96	32.04	20.06	20.05	6.36	6.62	1.73	137.24	41.17	10.06	85.35	88.88		
133.0	06-Mar-02	1210	132	North I-195 Basin	-25.81667	-80.16667	2002	17	BB	NSAY	0.17	03	2002	2002-03	0.0030	0.0026	0.0004	0.0069	0.2247	0.0099	0.2148	0.0023	0.0007	0.0691	0.5482	3.6710	30.94	30.99	19.19	19.19	6.31	6.20	1.20	220.12	30.29	9.71	83.02	81.59		
133.0	06-Mar-02	1237	133	North Normandy Isle	-25.86667	-80.15000	2002	17	BB	NSAY	0.17	03	2002	2002-03	0.0093	0.0072	0.0021	0.0138	0.1814	0.0232	0.1583	0.0021	0.0006	0.0410	1.3620	2.5248	34.04	34.07	19.90	19.91	7.68	7.82	1.87	194.66	90.56	24.85	104.26	106.20		
133.0	06-Mar-02	1255	134	Oleta River Park	-25.90500	-80.13333	2002	17	BB	NSAY	0.17	03	2002	2002-03	0.0023	0.0015	0.0008	0.0076	0.2083	0.0099	0.1984	0.0024	0.0012	0.0275	1.2499	1.9088	34.00	35.34	20.54	20.62	6.22	6.26	1.47	193.81	17.57	9.21	85.20	86.61		
133.0	07-Mar-02	1057	135	South Card Sound	-25.31667	-80.31667	2002	18	BB	SCARD	0.18	03	2002	2002-03	0.0018	0.0015	0.0003	0.0058	0.1855	0.0076	0.1739	0.0018	0.0011	0.1176	0.3241	2.9873	35.23	35.36	19.89	19.84	6.75	6.55	0.72	224.92	14.80	9.21	92.35	89.63		
134.0	04-Apr-02	1515	101	Convoy Point	-25.47833	-80.32083	2002	25	BB	AS	0.25	04	2002	2002-04	0.0513	0.0493	0.0019	0.0499	0.2544	0.1012	0.1532	0.0037	0.0018	0.3101	0.2071	3.2323	0.0105	31.24	31.26	28.32	28.33	7.97	8.12	0.52	153.94	126.22	61.23	112.07	119.25	
134.0	04-Apr-02	1025	102	Black Point	-25.54583	-80.29467	2002	25	BB	AS	0.25	04	2002	2002-04	0.0291	0.0283	0.0038	0.0755	0.2956	0.1046	0.1910	0.0061	0.0014	0.4308	0.0292	5.2638	0.0543	29.63	29.85	27.26	27.26	6.67	6.63	0.44	108.10	170.77	38.25	96.04	95.60	
134.0	04-Apr-02	1045	103	Near Black Ledge	-25.57333	-80.28667	2002	25	BB	IS	0.25	04	2002	2002-04	0.0196	0.0147	0.0049	0.0150	0.2590	0.0706	0.1885	0.0046</																		

SURV	DATE	TIME	STA	SITE	LATDEC	YEAR	BAY	ZSI	M0	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	T	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH) ₄	SAL S	SAL B	TEMP S	TEMP B	DO S	DO B	TURB	Kd	pH	TP	NO3-P	NO2-P	DIN/P	%SAT B	%SAT B
137.0	16-Jul-02	1013	102	Black Point	-25.45733	2002.54	BB	IS	0.54	07	2002	2002-07	0.0849	0.0288	0.1467	1.1807	0.0086	0.0066	0.0920	0.0086	0.0066	0.0920	0.0086	0.0066	0.0920	6.5110	6.21	11.55	31.23	30.29	6.17	6.71	1.78	###	303.83	405.67	11.32	83.02	83.00	
137.0	17-Jul-02	0941	103	Near Black Ledge	-25.57333	-20.28667	2002.54	BB	IS	0.54	07	2002	2002-07	0.0784	0.7323	0.0341	1.0174	1.0036	0.0679	0.1357	0.0097	0.0050	0.6190	1.0226	5.4643	11.46	11.52	31.29	31.25	6.43	6.32	1.10	###	27.66	229.02	385.64	198.05	83.62	83.33	
137.0	16-Jul-02	1034	104	BNP Marker C	25.60167	-20.22083	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0304	0.0273	0.0031	0.0145	0.1428	0.0449	0.0979	0.0080	0.0024	0.0747	0.2997	7.0973	31.90	32.10	30.50	30.40	5.30	5.54	0.63	###	52.98	41.77	16.65	79.45	83.10		
137.0	16-Jul-02	1047	108	Marker G-1B	25.56917	-20.19250	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0036	0.0023	0.0013	0.0046	0.0628	0.0082	0.0545	0.0039	0.0005	0.0945	1.0352	2.1948	35.83	34.96	30.86	30.85	4.90	4.89	0.50	###	35.86	37.29	4.70	75.08	79.38		
137.0	16-Jul-02	1058	109	North Midbay	25.56417	-20.23500	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0985	0.0919	0.0066	0.0158	0.2000	0.1143	0.0858	0.0056	0.0011	0.1177	0.1675	2.9330	29.97	30.77	30.80	30.80	4.90	4.89	0.50	###	79.38	223.65	45.35	92.73	72.94		
137.0	16-Jul-02	1422	110	Fender Point	25.50500	-20.28750	2002.54	BB	IS	0.54	07	2002	2002-07	0.4076	0.3970	0.0106	0.0268	0.7001	0.4344	0.2657	0.0068	0.0009	0.1606	0.4173	6.4410	21.38	24.91	32.07	31.65	6.63	6.94	0.69	###	227.31	1128.24	141.03	74.08	100.38		
137.0	16-Jul-02	1122	111	Feathered Bank	25.51563	-20.24000	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0219	0.0196	0.0022	0.0167	0.1325	0.0386	0.0939	0.0106	0.0006	0.1911	0.3703	4.7140	30.51	30.50	30.65	30.66	5.28	5.28	0.76	###	27.82	132.86	8.10	78.56	78.55		
137.0	16-Jul-02	1139	112	Sands Cut	25.53117	-20.18833	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0083	0.0068	0.0016	0.0159	0.1051	0.0242	0.1469	0.0112	0.0004	0.1469	0.3614	2.7743	35.31	33.30	30.84	31.81	5.01	4.91	0.66	###	20.78	92.13	4.79	76.40	74.87		
137.0	16-Jul-02	1154	113	Elliott Key	25.44167	-20.22333	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0082	0.0069	0.0013	0.0169	0.0885	0.0251	0.0634	0.0121	0.0004	0.2999	0.3705	3.1123	32.34	32.30	30.84	30.87	4.96	4.86	0.80	###	26.22	130.60	4.61	74.31	73.22		
137.0	16-Jul-02	1220	116	Rubicon Keys	25.40000	-20.25500	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0071	0.0057	0.0014	0.0130	0.0871	0.0201	0.0670	0.0113	0.0000	0.1129	0.1646	3.8718	31.28	33.23	31.33	31.02	3.94	4.01	0.54	###	17.04	3.93	59.16	60.82			
137.0	16-Jul-02	1250	121	North Card Sound	25.35500	-20.29167	2002.54	BB	SCARD	0.54	07	2002	2002-07	0.0223	0.0192	0.0031	0.0128	0.1347	0.0351	0.0996	0.0132	0.0000	0.1298	0.1440	5.2375	27.25	31.80	31.40	31.37	6.27	6.67	0.28	###	22.54	5.87	91.87	100.50			
137.0	16-Jul-02	1342	122	West Arsenicker	25.42017	-20.31083	2002.54	BB	IS	0.54	07	2002	2002-07	0.0141	0.0111	0.0030	0.0288	0.1108	0.0428	0.0680	0.0109	0.0001	0.3342	0.1352	9.4150	28.88	27.87	32.33	32.33	6.41	6.30	0.72	###	22.52	87.43	8.71	94.82	93.19		
137.0	16-Jul-02	1354	123	Pelican Bank	25.44500	-20.28333	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0261	0.0232	0.0028	0.0205	0.0897	0.0468	0.0432	0.0147	0.0000	0.1753	0.2392	10.5263	27.51	28.52	31.51	31.84	6.20	6.11	0.60	###	13.50	7.01	91.81	90.48			
137.0	16-Jul-02	1250	124	North Midbay	25.50500	-20.28750	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0018	0.0013	0.0009	0.0073	0.1091	0.0129	0.0339	0.0109	0.0000	0.1469	0.2018	3.1123	31.90	31.90	30.84	31.81	5.01	5.01	0.66	###	20.78	92.13	4.79	76.40	74.87		
137.0	17-Jul-02	1301	126	BNP Marker B	25.67167	-20.20500	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.1910	0.1810	0.0100	0.0289	0.2928	0.2199	0.0729	0.0157	0.0027	0.1818	0.1969	8.0593	21.85	28.70	32.18	31.06	5.81	6.76	0.55	###	41.34	181.57	31.04	82.74	99.72		
137.0	17-Jul-02	0957	127	Shoal Point	25.63000	-20.25000	2002.54	BB	IS	0.54	07	2002	2002-07	0.2582	0.2473	0.0109	0.0468	0.3329	0.3050	0.0279	0.0190	0.0038	0.3721	0.1100	6.8598	26.11	27.99	31.40	31.44	5.62	5.47	0.54	###	38.83	177.11	35.57	81.77	80.53		
137.0	17-Jul-02	1011	128	Matheson Beach	25.68833	-20.23333	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0804	0.0734	0.0070	0.0166	0.1778	0.0970	0.0808	0.0126	0.0031	0.2184	0.2733	5.6130	22.84	24.24	31.56	31.27	5.83	6.02	0.68	###	31.36	68.93	17.11	83.21	86.50		
137.0	17-Jul-02	1026	129	Marker G-71	25.73667	-20.18500	2002.54	BB	MAIN	0.54	07	2002	2002-07	0.0525	0.0497	0.0027	0.0082	0.1305	0.0606	0.0699	0.0099	0.0026	0.1959	0.2939	5.1608	25.38	29.91	31.23	31.04	6.27	6.16	0.84	###	29.14	52.31	13.53	90.71	91.54		
137.0	17-Jul-02	1036	130	South Dodge Island	25.76333	-20.17167	2002.54	BB	NBAY	0.54	07	2002	2002-07	0.0519	0.0482	0.0037	0.0133	0.1478	0.0652	0.0826	0.0091	0.0018	0.1019	0.3761	10.6900	21.83	26.75	31.36	31.37	6.28	6.09	1.04	###	36.06	81.05	15.92	91.41	88.94		
137.0	17-Jul-02	1102	131	North Venetian Basin	25.80000	-20.16667	2002.54	BB	NBAY	0.54	07	2002	2002-07	0.0518	0.0486	0.0032	0.0167	0.1478	0.0652	0.0826	0.0091	0.0018	0.1019	0.3761	10.6900	21.83	26.75	31.36	31.37	6.28	6.09	1.04	###	36.06	81.05	15.92	91.41	88.94		
137.0	17-Jul-02	1113	132	North I-195 Basin	25.81667	-20.16667	2002.54	BB	NBAY	0.54	07	2002	2002-07	0.0161	0.0142	0.0018	0.0112	0.0914	0.0273	0.0643	0.0144	0.0014	0.1736	0.3673	6.8728	26.29	24.91	31.13	31.17	5.39	5.39	0.58	###	14.07	43.35	4.20	76.21	77.72		
137.0	17-Jul-02	1132	133	North Normandy Isle	25.86667	-20.15000	2002.54	BB	NBAY	0.54	07	2002	2002-07	0.0979	0.0902	0.0077	0.0547	0.2191	0.1526	0.0664	0.0110	0.0028	0.3615	1.2548	6.5298	21.95	25.92	31.26	31.48	6.21	6.03	1.43	###	44.26	119.46	30.84	87.48	87.67		
137.0	17-Jul-02	1150	134	Oleta River Park	25.90500	-20.13333	2002.54	BB	NBAY	0.54	07	2002	2002-07	0.1527	0.1217	0.0310	0.0477	0.2589	0.2105	0.0484	0.0134	0.0023	0.3553	1.7514	10.5260	23.00	32.29	30.66	29.75	6.04	5.73	1.37	###	42.87	200.43	34.86	86.25	85.65		
137.0	16-Jul-02	1303	135	South Card Sound	25.31667	-20.31667	2002.54	BB	SCARD	0.54	07	2002	2002-07	0.0170	0.0139	0.0031	0.0124	0.1242	0.0294	0.0948	0.0061	0.0022	0.1326	0.1528	7.3835	26.04	31.41	31.97	31.28	6.19	7.23	0.27	###	45.03	29.48	10.66	90.34	108.61		
138.0	06-Aug-02	1003	101	Convoy Point	24.88718	-20.09715	2002.59	BB	AS	0.59	08	2002	2002-08	0.0689	0.0623	0.0046	0.0307	0.2781	0.0975	0.1806	0.0069	0.0018	0.2170	0.2762	6.8905	0.1741	27.36	27.42	31.35	31.30	3.72	3.89	0.41	###	89.08	117.10	31.24	54.52	57.02	
138.0	06-Aug-02	1332	102	Black Point	25.55453	-21.18367	2002.59	BB	AS	0.59	08	2002	2002-08	0.0352	0.0315	0.0037	0.0385	0.2628	0.0738	0.1892	0.0099	0.0028	0.6313	0.6435	5.5528	1.3932	23.99	24.48	32.15	31.94	5.60	5.88	0.39	###	58.57	58.28	16.41	80.49	84.98	
138.0	06-Aug-02	1322	103	Near Black Ledge	25.58017	-21.12093	2002.59	BB	IS	0.59	08	2002	2002-08	0.0709	0.0665	0.0014	0.0148	0.2559	0.0227	0.2332	0.0072	0.0043	0.8843	1.1019	5.8380	0.2466	24.24	24.28	32.10	32.13	6.41	6.03	0.44	###	78.79	11.77	6.99	92.59	87.13	
138.0	06-Aug-02	1308	104	BNP Marker C	25.56758	-21.07147	2002.59	BB	MAIN	0.59	08	2002	2002-08	0.0042	0.0019	0.0023	0.0113</																							

SURV	DATE	TIME	STA	SITE	LATDEC	LONDEC	YEAR	BAY	ZSI	MO	MON	YEAR	YR-MO	NOX	NO3	NO2	NH4	TN	DIN	TON	TP	SRP	APA	CHLA	TOC	Si(OH)4	SAL S	SAL B	TEMP S	TEMP B	DO S	DO B	TURB	Kd	pH	TN:TP	N:P	DIN:TP	%SAT T	%SAT B
141.0	20-Nov-02	0914	104	BNP Marker C	25.60167	-80.22083	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0077	0.0064	0.0014	0.0151	0.1482	0.0228	0.1264	0.0033	0.0004	0.1643	0.4202	2.0425	34.99	35.96	21.54	21.51	6.11	6.16	1.18	####	99.73	120.61	15.24	85.40	86.31		
141.0	20-Nov-02	0927	108	Marker G-1B	25.56917	-80.19250	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0046	0.0039	0.0007	0.0084	0.1913	0.0130	0.1783	0.0036	0.0007	0.1071	0.4643	1.9705	34.43	34.41	21.51	21.50	6.13	6.05	1.09	####	117.06	40.48	7.97	85.33	84.20		
141.0	20-Nov-02	0901	109	North Midbay	25.56417	-80.23500	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0025	0.0018	0.0007	0.0071	0.1212	0.0096	0.1115	0.0023	0.0008	0.0849	0.2850	1.8703	36.02	36.03	21.36	21.37	6.33	6.27	0.76	####	114.70	26.64	9.09	88.87	88.04		
141.0	20-Nov-02	1236	110	Fender Point	25.50500	-80.28750	2002.88	BB	IS	0.88	11	2002	2002-11	0.0382	0.0359	0.0024	0.0157	0.1880	0.0539	0.1341	0.0025	0.0002	0.0958	0.3467	2.3745	33.56	34.00	21.33	21.33	7.20	6.52	0.76	####	165.44	592.85	47.47	99.42	90.29		
141.0	20-Nov-02	0952	111	Featherbed Bank	25.51583	-80.24000	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0025	0.0016	0.0009	0.0096	0.0991	0.0121	0.0870	0.0041	0.0006	0.0853	0.2263	1.9095	36.09	36.10	20.97	20.95	6.34	6.34	0.89	####	54.17	42.05	6.60	88.58	88.56		
141.0	20-Nov-02	1017	112	Sands Cut	25.48833	-80.18833	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0021	0.0016	0.0005	0.0066	0.0993	0.0087	0.0906	0.0047	0.0001	0.0648	0.2410	2.0383	35.26	35.26	21.11	21.09	6.31	6.12	0.81	####	47.17	226.74	4.15	87.85	85.18		
141.0	20-Nov-02	1052	113	Elliott Key	25.44167	-80.22333	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0213	0.0200	0.0013	0.0542	0.1766	0.0755	0.1011	0.0032	0.0015	0.0944	0.2939	2.3953	36.33	36.31	21.28	21.27	6.41	6.44	1.27	####	122.90	110.74	52.57	90.08	90.49		
141.0	20-Nov-02	1106	116	Rubicon Keys	25.40000	-80.25000	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0558	0.0535	0.0023	0.0194	0.1924	0.0752	0.1072	0.0070	0.0007	0.1003	0.3262	2.7358	33.91	35.84	21.08	21.00	6.75	6.36	0.81	####	57.58	226.13	23.74	93.10	88.63		
141.0	20-Nov-02	1136	121	North Card Sound	25.35500	-80.29167	2002.88	BB	SCARD	0.88	11	2002	2002-11	0.0090	0.0075	0.0016	0.0137	0.1387	0.0228	0.1159	0.0045	0.0005	0.1217	0.4026	3.2038	35.14	35.16	20.99	21.00	6.19	6.32	0.51	####	68.39	106.64	11.23	85.97	87.80		
141.0	20-Nov-02	1157	122	West Arsenicker	25.42017	-80.31083	2002.88	BB	IS	0.88	11	2002	2002-11	0.3617	0.3544	0.0073	0.0619	0.4588	0.4236	0.0352	0.0043	0.0012	0.2165	0.2439	3.6208	24.23	27.54	20.99	21.10	7.26	6.97	0.62	####	237.10	770.85	218.89	93.81	92.20		
141.0	20-Nov-02	1209	123	Pelican Bank	25.44500	-80.28333	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0554	0.0535	0.0019	0.0201	0.1624	0.0754	0.0870	0.0036	0.0015	0.1219	0.3497	2.5278	34.57	34.59	21.04	21.03	6.84	6.79	0.59	####	98.61	110.49	45.78	90.74	94.01		
141.0	20-Nov-02	1004	124	South Midbay	25.47250	-80.23333	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0100	0.0089	0.0011	0.0486	0.2202	0.0586	0.1616	0.0037	0.0015	0.1096	0.7787	2.4590	36.25	36.15	21.38	21.37	6.40	6.27	0.48	####	130.86	85.00	34.83	90.01	88.11		
141.0	20-Nov-02	1215	126	BNP Marker B	25.67167	-80.20500	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0117	0.0101	0.0015	0.0244	0.1154	0.0360	0.0794	0.0042	0.0018	0.0947	0.5671	2.4330	33.08	32.98	21.78	21.75	7.59	7.01	1.80	####	61.00	43.42	19.04	105.10	96.97		
141.0	20-Nov-02	0910	127	Shoal Point	25.63000	-80.25000	2002.88	BB	IS	0.88	11	2002	2002-11	0.0129	0.0117	0.0012	0.0209	0.1031	0.0338	0.0693	0.0031	0.0035	0.0953	0.5348	2.7875	31.15	30.80	21.42	21.41	7.93	6.66	0.30	####	74.17	21.47	24.32	107.90	90.46		
141.0	20-Nov-02	0922	128	Matheson Beach	25.68833	-80.23333	2002.88	BB	IS	0.88	11	2002	2002-11	0.0110	0.0098	0.0012	0.0176	0.0918	0.0286	0.0632	0.0028	0.0010	0.0912	1.1695	2.7403	31.18	31.02	21.19	21.18	8.26	6.89	0.65	####	73.66	62.92	22.97	112.06	93.36		
141.0	20-Nov-02	0936	129	Marker G-71	25.73667	-80.18500	2002.88	BB	MAIN	0.88	11	2002	2002-11	0.0348	0.0332	0.0016	0.0227	0.0917	0.0576	0.0341	0.0047	0.0020	0.0568	0.7934	2.5673	31.98	33.15	23.12	23.27	6.52	6.21	1.32	####	42.78	63.02	26.87	91.17	87.66		
141.0	20-Nov-02	0949	130	South Dodge Island	25.76333	-80.17167	2002.88	BB	NBAY	0.88	11	2002	2002-11	0.0131	0.0120	0.0011	0.0108	0.1212	0.0239	0.0973	0.0050	0.0020	0.0382	0.9109	1.4160	35.53	35.28	23.22	24.66	6.66	6.18	1.18	####	54.07	26.39	10.67	96.60	89.88		
141.0	20-Nov-02	1013	131	North Venetian Basin	25.80000	-80.16667	2002.88	BB	NBAY	0.88	11	2002	2002-11	0.0236	0.0248	0.0018	0.0178	0.0991	0.0444	0.0547	0.0077	0.0016	0.0430	0.8052	1.9140	33.61	35.03	23.25	23.84	6.89	6.32	1.26	####	28.55	62.84	12.80	97.53	90.92		
141.0	20-Nov-02	1028	132	North L-195 Basin	25.81667	-80.16667	2002.88	BB	NBAY	0.88	11	2002	2002-11	0.0225	0.0205	0.0020	0.0204	0.0791	0.0429	0.0362	0.0059	0.0026	0.0570	1.4957	2.7320	31.55	31.89	21.98	21.94	7.28	6.51	1.07	####	29.56	36.88	16.03	100.06	89.63		
141.0	20-Nov-02	1050	133	North Normandy Isle	25.86667	-80.15000	2002.88	BB	NBAY	0.88	11	2002	2002-11	0.0214	0.0194	0.0020	0.0240	0.0912	0.0454	0.0458	0.0069	0.0026	0.1276	1.3370	2.0695	33.18	32.98	22.58	22.57	7.12	6.66	2.31	####	29.41	38.37	14.64	99.68	93.10		
141.0	20-Nov-02	1110	134	Oleta River Park	25.90500	-80.13333	2002.88	BB	NBAY	0.88	11	2002	2002-11	0.0115	0.0103	0.0012	0.0120	0.1182	0.0235	0.0947	0.0062	0.0014	0.0555	0.4555	1.5000	35.30	35.58	24.04	24.07	7.03	6.35	1.42	####	42.43	36.53	8.45	101.55	91.92		
141.0	20-Nov-02	1124	135	South Card Sound	25.31667	-80.31667	2002.88	BB	SCARD	0.88	11	2002	2002-11	0.0082	0.0067	0.0015	0.0150	0.0775	0.0232	0.0543	0.0030	0.0012	0.1034	0.5436	3.1380	35.15	35.14	21.72	21.73	6.39	6.34	0.35	####	56.61	43.38	16.97	89.63	88.93		
142.0	20-Dec-02	0918	101	Convoy Point	25.47833	-80.32083	2002.97	BB	AS	0.97	12	2002	2002-12	0.2452	0.2380	0.0072	0.0259	0.4271	0.2711	0.1560	0.0077	0.0037	0.2646	0.3115	3.0323	24.61	24.58	21.39	21.39	7.47	7.05	0.15	####	122.14	164.10	77.53	97.31	91.82		
142.0	20-Dec-02	1210	102	Black Point	25.54583	-80.29467	2002.97	BB	AS	0.97	12	2002	2002-12	0.1073	0.0995	0.0077	0.0149	0.2915	0.1222	0.1694	0.0058	0.0045	0.3866	0.2586	3.9963	23.08	23.09	21.89	21.87	8.09	8.03	0.15	####	110.51	59.58	46.31	105.05	104.25		
142.0	20-Dec-02	1158	103	Near Black Ledge	25.57333	-80.28667	2002.97	BB	IS	0.97	12	2002	2002-12	0.0990	0.0951	0.0039	0.0169	0.2795	0.1160	0.1636	0.0062	0.0033	0.1921	0.2351	3.2208	28.82	28.88	21.69	21.69	7.87	7.49	0.22	####	99.21	78.04	41.15	105.84	100.77		
142.0	18-Dec-02	1158	104	BNP Marker C	25.60167	-80.22083	2002.96	BB	MAIN	0.96	12	2002	2002-12	0.0082	0.0070	0.0012	0.0067	0.2102	0.0149	0.1954	0.0077	0.0023	0.0741	0.1910	2.0740	33.62	33.50	20.08	20.05	7.22	6.95	0.70	####	60.46	14.24	4.27	98.00	94.22		
142.0	18-Dec-02	1201	108	Marker G-1B	25.56917	-80.19250	2002.96	BB	MAIN	0.96	12	2002	2002-12	0.0019	0.0011	0.0008	0.0068	0.1761	0.0086	0.1675	0.0061	0.0025	0.0623	0.2116	1.8238	34.50	34.54	19.92	19.92	7.23	6.83	0.60	####	64.06	7.64	3.14	98.48	93.06		
142.0	18-Dec-02	1211	109	North Midbay	25.56417	-80.23500	2002.96	BB	MAIN	0.96	12	2002	2002-12	0.0066	0.0052	0.0014	0.0083	0.1874	0.0149																					

APPENDIX B

Final Report to the National Park Service in response to Project Statement BISC-N-011.000
under NPS/FIU Cooperative Agreement No. CA5280-8-9038

TOTAL AMMONIA CONCENTRATIONS IN SOIL, SEDIMENTS, SURFACE WATER ,
AND GROUNDWATER ALONG THE WESTERN SHORELINE OF BISCAYNE BAY WITH
THE FOCUS ON BLACK POINT AND A REFERENCE MANGROVE SITE

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12 February 2001

EXECUTIVE SUMMARY

This study focused on ammonia as a potential stressor of marine benthic communities in Biscayne Bay but also included other nutrients as well. The specific tasks included in this project were: 1) Black Point Monitoring Program, 2) Black Point Monitoring Comparison, 3) Shoreline Nutrient Survey, 4) Shoreline Benthic Community Survey, and 5) Mangrove Transect Comparison.

The Black Point Monitoring Program showed that nutrient concentrations (especially ammonium) were elevated in the canals adjacent to the landfill. The median value of unionized ammonia at Station 12 was 122 ppb which may be toxic to some marine fish. However, the very low dissolved oxygen at the same site would also preclude much marine life from thriving in this area.

The Black Point Monitoring Comparison was performed by statistical comparison of data from 1993 surveys with this study. No differences in water quality in the canals or nearshore area were found. We can clearly say that there has been no measurable improvement in water quality between surveys.

The Shoreline Nutrient Survey showed that ammonium concentrations were highest in the nearshore waters off Black Point, the Cutler Channel, and the Mowry Canal area. A very different distribution was observed for nitrate where highest concentrations were found off the Cutler Channel and very low levels found in the nearshore waters between Cutler Channel and Goulds Canal. A hot spot in total phosphorus was observed off Mangrove Key in extreme south Biscayne Bay. Another interesting aspect was the correspondence between sediment and water column nutrient levels. Levels of ammonium in the sediments are approximately an order of magnitude higher than the water column and generally follow each other. This was also true for total phosphorus although the concentrations in sediment and water were different by only a factor of 3.

Shoreline Benthic Community Survey resulted in the classification of 5 angiosperms and 22 algal species. Among the angiosperms, *Thalassia testudinum* and *Halodule wrightii*, were the most common. *Thalassia* and *Halodule* did not share the same distribution or abundance patterns from north to south - small amounts of *Halodule* were found throughout the study area with a general increase in abundance from south to north. The inverse was true with *Thalassia* abundance, which generally increased in abundance in the southerly direction. A break in *Thalassia* distribution occurred at the Goulds Canal/Black Point Area. For several km south, no *Thalassia* was reported but abundant *Halodule* was found in its place along with unknown green species, brown algae, and other noncalcareous green species. The break in *Thalassia* cover may have been partly due to salinity. Salinity during the survey increased dramatically from north to south, however, highest *Thalassia* densities occurred in the areas experiencing hypersaline conditions. Variability in salinity may have been important to mortality of *Thalassia* but salinity in the area between Goulds and Military Canals is not as variable as it is off the Mowry Canal. The only other water quality variable which may have influenced *Thalassia* was ammonium. The nearshore area between Goulds and Military Canals has the highest concentrations of ammonium in the water column and sediments of any site in this study. Our results indicate a strong correlation between elevated ammonium concentrations with 1) decreased abundance of *Thalassia*, 2) increased abundance of *Halodule* and fast growing algae species, and 3) the increase in filamentous algal cover.

The Mangrove Transect Comparison showed that the mangrove fringe was a source of total phosphorus and possibly some ammonium to the Bay, but not as much as suspected. The Bay itself was a source of nitrate to the mangrove fringe.

Understanding: 1) nutrient concentration spatial and temporal distributions, 2) the relationship between ammonia concentration and the level of benthic community degradation, and 3) the relative significance of natural nutrient addition to the system from anthropogenic or additional loading is paramount to establishing pollution load reduction goals. This project focused on the first two needs listed above to begin to establish a data base for the calculation of load and sources of load to Biscayne National Park.

Acknowledgments

We thank all the field and laboratory technicians involved with this project especially Sean Gilhooly, Braxton Davis, and Amy Renshaw. We also want to thank Max Flandorfer at Biscayne National Park for boat time and field support. This project was possible due to funding by the National Park Service under NPS/FIU Cooperative Agreement No. CA5280-8-9038. Funding for other portions of the SERC Water Quality Monitoring Network was provided by the South Florida Water Management District and Everglades National Park (NPS/SERC Cooperative Agreement #5280-2-9017 and NPS/SFWMD Cooperative Agreement #C-7919). This is Technical Report #T141 of the Southeast Environmental Research Center at Florida International University.

INTRODUCTION

Biscayne Bay is a shallow subtropical lagoonal estuary located on the southeast coast of Florida. The Bay is situated as a topographic basin on the surface of the Miami Limestone which outcrops to the west of the western shoreline forming a coastal ridge. Biscayne Bay is separated from the Atlantic Ocean by a series of barrier islands and limestone keys cut by shallow tidal passes. Biscayne Bay originated ~6,000 ybp as sea level rose during the Holocene transgression and has increased to a maximum depth of ~4 m during that time. The N-S orientation and different coastal morphology allow the Bay to be separated into three distinct regions: North, Central and South Bay (Card Sound). North Bay is a highly urbanized system. Channel dredging, the construction of Haulover Cut, and the extensive enlargement of Government Cut has altered circulation patterns resulting in increased salinity in this zone.

The western shore of Central Bay (Dinner Key to Turkey Point) was originally composed of a mangrove fringe and extensive freshwater marshes reaching to the foot of the coastal ridge several miles inland. These freshwater marshes were maintained by local rainfall and Everglades discharge via the transitional glades. After the turn of the century the transverse glades were channeled and drained directly into Biscayne Bay which resulted in saltwater encroachment. This was identified by the early 1940's and control structures and a coastal storm protection levee (L-31E) were constructed. The L-31E canal and levee system eliminated all sheet flow to Central and South Biscayne Bay. Canal water now enters the Bay as a point source and contains high levels of urban and agricultural waste creating a nutrient loading and time of delivery problems in the ecosystem. South Bay is relatively isolated from urban development, with the exception of Turkey Point Power Plant facility. Although this region has historically received less freshwater runoff than other areas of the Bay, it has also seen the greatest decline in freshwater inputs due to construction of the L-31E levee and US 1.

Biscayne National Park is located adjacent to large population and agricultural centers of Miami-Dade county. Over the past 100 years of land development, Biscayne Bay circulation patterns have been highly altered by management activities. Freshwater sheet flow discharge was replaced by channelized discharge via canals which radically changed the quantity, timing, and distribution of input to the Bay (Alleman et al. 1995). Because of this management activity, the estuarine zone of Biscayne Bay has been much reduced.

In conjunction with the changes in quantity, timing, and distribution of freshwater there have been changes in quality of the input. The water quality of both canal and groundwater inputs has declined as urbanization and agriculture have become more pronounced across the landscape. Numerous landfill and contaminated sites impact the groundwater that enters Biscayne Bay (Meeder et al. 1997). Nutrient loading estimates from the Mowry Canal to Biscayne Bay are very high compared to the typically low levels (oligotrophic conditions) found in other areas (Meeder et al. 1997). The addition of groundwater nutrient inputs to the model suggests that Biscayne Bay may be undergoing considerably more nutrient loading than previously thought (Meeder et al. 1997). This poses not only an environmental degradation problem but one of potential ammonia toxicity. As a consequence, the nearshore aquatic environment has displayed symptoms of decreased primary productivity and offshore migration of desirable benthic communities (Meeder et al. 1997).

This study focuses on ammonia as a potential stressor of marine benthic communities. Coastal mangroves are highly productive systems that are known to export ammonia because of

microbial N_2 fixation associated with aerial roots (Boto and Robertson 1990) and anaerobic decomposition processes (Peligri and Twilley 1999). Ammonia production in the coastal mangrove system is limited to a fraction of the biomass turnover on an annual basis and is therefore fixed within rather narrow bounds at any site (Boto and Robertson 1990; Lara and Dittmar 1999). In addition, most mangrove swamps along the western shore of Biscayne Bay grow in carbonate marl soil, about 1 m thick, which overlies the bedrock (and groundwater). This mud layer is relatively impermeable and separate the surficial interstitial soil and tidal water from the terrestrial groundwater from the watershed. This means that ammonia derived from inner mangrove forests is separate from anthropogenic derived ammonia in groundwater until they discharge into the Bay. An exception to this may be the thin fringing mangrove zone along the waters edge which frequently are not underlain by the marl soil horizon. This is the zone of highest productivity, greatest physical export of detritus, greatest belowground biomass production (actually accretion), and soils with the best gas exchange.

Groundwater nutrient levels obtained 50 m from shore along Biscayne Bay from the Dinner Key to Mowry Canal have total ammonia concentrations 30 or more times greater than those of overlying surface waters (Meeder et al. 1997). In addition, highest groundwater concentrations were found at Black Point and decreased by nearly half both northwards and southwards (Meeder et al. 1997). The location of the highest concentrations off Black Point was no surprise because the site is located close to the old and present Dade County landfills.

Only limited data on Biscayne Bay ammonia concentrations is available for inshore areas. The need to understand the distribution of ammonia in Biscayne National Park is necessary to establish pollution guidelines based upon real spatial and temporal distributions and their impacts to Bay ecology. A restudy of the Black Point area will aid in the determination if remedial environmental protection activities at the landfill have succeeded in lowering the nutrient concentrations delivered to the Bay. Comparisons between the Black Point area and the mangrove reference site should also aid the Park in determining the background levels of ammonia expected from coastal mangroves in contrast to ammonia levels associated with anthropogenic activities.

The specific tasks included in this project were:

- Task 1 - Black Point Monitoring Program
- Task 2 - Black Point Monitoring Comparison
- Task 3 - Shoreline Nutrient Survey
- Task 4 - Shoreline Benthic Community Survey
- Task 5 - Mangrove Transect Comparison

The Black Point Monitoring Program (Task 1) was designed to produce a monthly characterization of nutrient concentrations in the receiving waters surrounding the landfill. Comparisons between previous (Jones 1994) and current nutrient levels at Black Point (Task 2) indicated if remedial activities for the protection of the Bay from excess nutrient loading have been successful.

The purpose of the Shoreline Nutrient Survey (Task 3) was to produce a high resolution map of ammonia along the western BNP shoreline and to point out any hot spots within the mangroves, surface water, and marine sediments. This data was then combined with the ongoing

Biscayne Bay Water Quality Monitoring Program operated by SERC and funded by SFWMD to produce a more generalized “snapshot” of nutrient levels in the Bay.

The concurrent Shoreline Benthic Community Survey (Task 4) was designed to provide a high resolution map of plant community structure along the west coast. Comparisons between benthic community characteristics and ammonia levels in water and sediments were proposed to develop an impact gradient curve of the relationship between ammonia levels and degree of community degradation. Documentation of the distribution of ammonia levels and their impacts on the benthos would then be used in the development of non-degradation criteria for BNP waters.

The comparison of mangroves at Black Point and the reference site (Task 5) is designed to determine whether there is a difference between ammonia levels found in natural and impacted areas. The transect data will provide a source gradient by which we can calculate the relative magnitude of ammonia input to the system via mangrove fringe.

METHODS

Task 1 - Black Point Monitoring Program

The Black Point Monitoring Program was conducted monthly for one year at six canal surface water sample sites and two terrestrial sites (Fig 3). Most of these sites were the same as those sampled in the previous Black Point study (Jones 1994) in order to allow a direct comparison between data sets (Task 2). The purpose of this component is to determine the magnitude and extent of any ammonia source gradient from the landfill site. In addition, two soil sites were established along the east side of the landfills, on separate sides of the canal.

We decided to measure other nutrient variables along with ammonium in order to ascertain if the landfill had an impact on them as well. This decision was made with best science in mind. However, because of the increased costs, we were restricted to conducting only one shoreline ammonia and benthic survey instead of the proposed two.

Surface and bottom salinity (psu) and temperature (°C) were measured using a combination salinity-conductivity-temperature probe (Orion model 140). Dissolved oxygen (DO, mg l⁻¹) was measured 10 cm below the surface using an oxygen electrode (Orion model 840) corrected for salinity and temperature.

Water samples were collected in sample-rinsed HDPE bottles using standard SERC procedures. Interstitial water of soils and sediments for the Shoreline Nutrient Survey were collected by vacuum lysimeter. Soil and sediment were collected by coring. Duplicate, unfiltered water samples were collected using 3x sample rinsed 120 ml HDPE bottles for analysis of total constituents. Duplicate water samples for dissolved nutrients were collected using 3x sample rinsed 150 ml syringes which were then filtered by hand through 25 mm glass fiber filters (Whatman GF/F) into 3x sample rinsed 60 ml HDPE bottles.

Unfiltered water samples were analyzed for total organic carbon (TOC), total nitrogen (TN), total phosphorus (TP), total silicate (Si(OH)₄), and turbidity. TOC was measured by direct injection onto hot platinum catalyst in a Shimadzu TOC-5000 after first acidifying to pH<2 and purging with CO₂-free air. TN was measured using an ANTEK 7000N Nitrogen Analyzer using O₂ as carrier gas to promote complete recovery of the nitrogen in the water samples (Frankovich and Jones 1998). TP was determined using a dry ashing, acid hydrolysis technique (Solórzano and Sharp 1980). TS was measured using the molybdosilicate method (Strickland and Parsons 1972). Turbidity was measured using an HF Scientific model DRT-15C turbidimeter and reported in NTU.

Filtrates were analyzed for soluble reactive phosphorus (SRP), nitrate+nitrite (NO_x), nitrite (NO₂⁻), and total ammonia (NH₄⁺) on a four channel autoanalyzer (Alpkem model RFA 300). All analyses were completed within 28 days after collection (except for NH₄⁺, which was run the following day) in accordance to standard SERC laboratory quality control guidelines.

Some parameters were not measured directly, but were calculated by difference. Nitrate (NO₃⁻²) was calculated as NO_x⁻ - NO₂⁻, dissolved inorganic nitrogen (DIN) as NO_x + NH₄⁺, and total organic nitrogen (TON) defined as TN - DIN. All concentrations are reported as ppm-N or P unless noted. All elemental ratios discussed were calculated on a molar basis.

Task 2 - Black Point Monitoring Comparison

Data from Jones (1994) and current programs were compiled and analyzed by station using the Mann-Whitney U test; the nonparametric version of the two group unpaired *t*-test. Significance was set at $P < 0.05$.

Task 3 - Shoreline Nutrient Survey

During the 1998 dry season, nutrient concentrations in nearshore surface water (~50 m offshore), marine sediment pore water (~50 m offshore), mangrove soils (~25 m onshore), and mangrove surface waters (~25 m onshore) were sampled approximately every 1 km along the west shoreline for a total of 22 (Fig 2). We also sampled near canal mouths and at significant features. Data from the Shoreline Nutrient Survey were combined with data from the FIU water quality monitoring program for Biscayne Bay. All data was collected in the same month and presented as kriged contour plots (Surfer, Golden Software).

Task 4 - Shoreline Benthic Community Survey

The Shoreline Benthic Community Survey was conducted in conjunction with the Shoreline Nutrient Survey. Benthic plant community structure was characterized in three plots (0.25 m²) within one meter of each Shoreline Ammonia Survey sampling site. The number of shoots of marine plants was counted, measured, and weighed in subplots within each of the three plots. Plant taxa and their abundance were recorded using the Braun-Blanquet survey method (Fourqurean et al. 2000). Species presence, percent cover, and community structure along with distance from shore, water depth, soil depth and type, salinity, and other parameters was also recorded. Epiphyte percent cover was recorded on the larger plant leaves and bay bottom at each plot. Data were analyzed by standard methods employed in earlier studies (Meeder et al. 1997).

Task 5 - Mangrove Transect Comparison

The Mangrove Transect Comparison was structured so as to provide information concerning nutrient inputs from mangrove forests in Biscayne Bay. The sampling area was selected based upon several criteria: 1) low range of ammonia concentration, 2) lack of known anthropogenic source of ammonia, and 3) similar type mangrove system as found at Black Point (narrow fringe with wide basin). Five sites were sampled: a upstream mostly freshwater distribution canal (DC) which was 640 m west of the coast and 300 m north of the Mowry Canal; a site east of DC in the mangrove fringe (TF); a site just offshore TF (TBB); a mangrove fringe site 500 m south of the Military Canal (CF); and a corresponding offshore site (CBB). At each site, surface water and soil or sediment were sampled and analyzed for nutrients as above on a monthly basis for one year.

RESULTS

Task 1 - Black Point Monitoring Program

Summary of results from the monthly Black Point Monitoring Program are shown in Table 1. For the period of record, salinity ranged from 0.02 – 39.7 psu; temperature from 20.9 – 31.6 °C, DO from 0.2 – 11.4 mg l⁻¹, pH from 6.90 – 8.78, NH₄⁺ from 0.004 – 26.97 ppm, and NH₃ from 0.0 – 654 ppb. Additional nutrient values also showed large ranges: NO₃⁻² from 0.002 – 0.415 ppm and TP from 0.002 – 0.94 ppm. These large ranges are indicative of terrestrial/groundwater nutrient loading to the canals and inshore areas of Biscayne Bay.

Monthly maps of NH₄⁺ concentration plotted by station are presented in Figs. 3-14. Concentrations are on log scale because the range in data was so large. Highest NH₄⁺ concentrations routinely occurred at Sta #12 which is directly downstream of the landfill. Sta. #12 also had highest DOC, NO₂⁻, NH₃, SRP, and lowest DO levels. The median value of NH₃ at #12 was 122 ppb which may be toxic to some marine fish. However, the very low DO at the same site would also preclude much marine life from thriving in this area.

Differences among stations were shown as box-and-whisker plots (Fig. 15 & 16). The box-and-whisker plot is a powerful statistic which displays the median, range, and the shape of the data distribution. Water quality variable distributions are usually skewed to the right (non-normal) so it is more appropriate to use the median as the measure of central tendency. The central, horizontal line of the box is the median of the data, the top and bottom of the box are the 25th and 75th percentiles (quartiles), the ends of the whiskers are the 10th and 90th percentiles, and any points outside (<10th and >90th percentiles) may be considered outliers (suppressed in the graphs). The box-and-whisker plot also serves as a graphical, nonparametric ANOVA. The notch in the box is the 95% confidence interval of the median. When notches among boxes do not overlap, the medians may be considered significantly different.

Comparing the canal sites (#10, 11, 12, & 13) to the nearshore sites (#14 & 15) it becomes clear that the nearshore sites have higher salinity, pH, and a narrower range in nutrients. We should point out that station #14 was located in the water column above two groundwater wells in ~1 m of water. Water quality at this site may have been influenced by seepage from these wells as they had positive hydraulic pressure at all times of sampling. The shallow well had significantly higher NO₃⁻² and lower salinity than the deep well (data not shown). From this we may imply that groundwater in the shallow well was derived more from surface water than the deep well, which has been previously confirmed by Meeder et al. (1997). Both wells had significant amounts of NH₄⁺ present; generally an order of magnitude greater than un-impacted surface waters.

Task 2 - Black Point Monitoring Comparison

Statistical comparison of data from 1993 surveys with this study resulted in no significant difference (P>0.05) in water quality variables in the canals or nearshore (Fig. 17-20). Each station was treated separately using a Mann-Whitney U test; the nonparametric version of the two group unpaired *t*-test. What was noticeable was that the ranges in the data of the current study were larger than found in the previous study. This was probably the result of climactic influence such as higher rainfall in 1998-99. We can clearly say that there has been no measurable improvement in water quality between surveys.

Task 3 - Shoreline Nutrient Survey

This survey was conducted in April 1998 which happened to occur at the end of a very dry season. Salinity in southern Biscayne Bay was elevated in both nearshore and offshore areas (Fig. 21) as a result of this. Ammonium concentrations (Fig. 22) during this period were highest in the nearshore waters off Black Point (0.035 ppm), the Cutler Channel (0.148 ppm), and the Mowry Canal area (0.013 ppm). NH_3 was also elevated in these areas (Fig. 23) being 3.6, 2.4, 3.1 ppb, respectively. A very different distribution was observed for NO_3^{-2} (Fig. 24) with highest concentrations being found off the Cutler Channel (0.148 ppm) and very low levels found in the nearshore waters between Cutler Channel and Goulds Canal. A hot spot in TP (0.0519 ppm) was observed off Mangrove Key in extreme south Biscayne Bay (Fig 25). Otherwise, TP concentrations were very low (<0.015 ppm) throughout the Bay. TOC (Fig. 26) and TON (Fig. 27) showed similar high nearshore – low offshore gradients. Highest TOC (12.2 ppm) and TON (1.6 ppm) concentrations occurred off the mangroves between Cutler Channel and Goulds Canal. There was also a local increase in TON between Goulds and Military Canals.

Another interesting aspect of the Shoreline Nutrient Survey was the correspondence between sediment and water column nutrient levels. Figure 28 shows the NH_4^+ concentration in water and sediment along the coast from north to south. Levels of NH_4^+ in the sediments are approximately an order of magnitude higher than the water column and generally follow each other. This was also true for TP (Fig. 29) although the concentrations in sediment and water were different by only a factor of 3.

Interestingly, the area around Black Point which showed high NH_4^+ from the landfill had a corresponding depression in TP. This may be because of increased biological demand for P from the external supplement of N.

Task 4 - Shoreline Benthic Community Survey

Table 2 is a list of marine plant taxa reported in this study. Taxa were included only when found in more than three separate plots or if they occupied more than 2% of the area in a single plot. This criteria excluded numerous uncommon species that carry little ecological information at the community level supported by literature. Five angiosperms and 22 algal species were recorded. Filamentous algae were not further classified. Among the angiosperms, *Thalassia testudinum* and *Halodule wrightii*, were the most common, the others being found only at a few stations. *Thalassia* and *Halodule*, although abundant at most sites, did not share the same distribution or abundance patterns from north to south (Fig. 30). Minor amounts of *Halodule* were found throughout the study area with a general increase in abundance from south to north. The inverse was true with *Thalassia* abundance, which generally increased in abundance in the southerly direction. The red algae group was also more abundant in the south. *Penicillus* and most other calcareous green species displayed the same distributional pattern as *Thalassia*. Some fast growing green algae species (*Acetabularia*) did not exhibit obvious trends in distribution or abundance. Filamentous algae was not taxonomically subdivided further but was reported as percent cover as an epiphyte. Generally, either filamentous algae cover was low (less than 20% of available substrate) or significant (over 80% of available cover). Filamentous algae cover was highest in the area between Black Point and the Mowry Canal with minor hot spots located near other canal mouths.

A break in *Thalassia* distribution occurred at the Goulds Canal/Black Point Area. For several km south, no *Thalassia* was reported but abundant *Halodule* was found in its place (Fig. 29).

The break in *Thalassia* was also associated with changes in distribution of other marine plants. An unknown green species, brown algae, and other noncalcareous green species increased in abundance where *Thalassia* was not present.

The break in *Thalassia* cover may have been partly due to salinity. Salinity during the survey increased dramatically from north to south (Fig. 31), however, highest *Thalassia* densities occurred in the areas experiencing hypersaline conditions. Variability in salinity may have been important to mortality of *Thalassia* but salinity in the area between Goulds and Military Canals is not as variable as it is off the Mowry Canal (Boyer, unpublished data). The only other water quality variable which may have influenced *Thalassia* was NH_4^+ (Fig. 32). The nearshore area between Goulds and Military Canals has the highest concentrations of NH_4^+ in the water column and sediments of any site in this study. It was more likely that chronic inputs of NH_4^+ were responsible for *Thalassia* loss.

Task 5 - Mangrove Transect Comparison

Data were analyzed using the nonparametric Mann-Whitney U Test which is comparable to an unpaired *t* Test. Some general trends were observed which are best visualized in Fig. 33. The distribution channel (DC) was not a source of NO_3^{-2} , NH_4^+ , TP, or SRP to the mangroves. However, DC was a significant source of Chl *a* and TOC to the mangrove fringe. The mangrove fringe itself was a source of TP, SRP, and possibly NH_4^+ to the Bay. The Bay itself was a source of NO_3^{-2} to the mangrove fringe.

Nutrient concentrations in the mangrove fringe sites (TF and CF) were not significantly different from each other ($P > 0.10$) so they could be pooled and treated as being representative of the mangrove fringe in Biscayne Bay. However, we did not do this as the Bay sites had some significant differences – NH_4^+ and TOC were slightly higher at CBB and NO_3^{-2} was lower. Most important was the finding that although NH_4^+ concentrations are high in mangroves, a significant portion of that may be derived from upland drainage.

DISCUSSION

The Black Point Monitoring Program showed that nutrient concentrations (especially ammonium) were elevated in the canals adjacent to the landfill. The median value of unionized ammonia at Station 12 was 122 ppb which may be toxic to some marine fish. However, the very low dissolved oxygen at the same site would also preclude much marine life from thriving in this area.

The Black Point Monitoring Comparison was performed by statistical comparison of data from 1993 surveys with this study. We found no difference in water quality in the canals or nearshore area between the two studies. From this we can clearly state that there has been no measurable, beneficial effect of remediation activities on the water quality of the Black Point area.

The Shoreline Nutrient Survey showed that ammonium concentrations were highest in the nearshore waters off Black Point, the Cutler Channel, and the Mowry Canal area. A very different distribution was observed for nitrate where highest concentrations were found off the Cutler Channel and very low levels found in the nearshore waters between Cutler Channel and Goulds Canal. A hot spot in total phosphorus was observed off Mangrove Key in extreme south Biscayne Bay. Another interesting aspect was the correspondence between sediment and water column nutrient levels. Levels of ammonium in the sediments are approximately an order of magnitude higher than the water column and generally follow each other. This was also true for total phosphorus although the concentrations in sediment and water were different by only a factor of 3.

Submerged aquatic plant communities respond to nutrient loading by the replacement of slow growing with faster growing species and finally by phytoplankton (Duarte 1995). In many South Florida water bodies heavy epiphytic algae growth replaces phytoplankton, with the same end result. In many cases, the indirect effect of faster growing species dominance is additional stress on the slower growing species by shading or light exclusion (Orth and Moore 1983). *Thalassia* is replaced by *Halodule* in seagrass areas with increases nutrient loading (Powell et al 1991; Fourqurean et al 1995). In other studies *Zostera marina* and *Ruppia* were replaced by faster growing green algae species.

The distribution of *Thalassia* and other aquatic vegetation have been linked to groundwater discharge in Biscayne Bay (Kohout and Kolipinski 1967; Meeder et al 1996) and other regions such as Yucatan, Mexico (Herrera-Silveira 1994) and Australia (Johannes 1980). Meeder et al (1997) found that *Thalassia* was not abundant in areas receiving groundwater discharge. This area was from the shoreline to 400 m offshore in the area between the Military and Mowry Canals. Benthic community distribution influenced by groundwater discharge usually form bands parallel to the shoreline and the effects of groundwater discharge usually decrease exponentially with distance offshore. However, the major source of western Biscayne Bay nutrient loading is canal discharge.

Canal discharge varies more in both nutrient concentration levels and discharge volumes seasonally than does groundwater. Because most canal discharge occurs during the rainy season with prevailing southerly or southeasterly winds canal waters most frequently pile up along the western shore of Biscayne Bay. Therefore low salinity, nutrient rich canal water is held along the shoreline. The effects of this pattern of freshwater canal discharge is hard to separate from the groundwater discharge pattern in terms of nearshore benthic community structure and

productivity (Meeder et al 1997). The nutrient loading of both canal and ground water is significant.

Although ammonia toxicity or increased nutrient concentration may be responsible for the lack of *Thalassia* and slower growing algae species in the vicinity of Black Point our data does not unequivocally support this relationship. Our data does support a more than causal relationship between high NH_4^+ concentration with the lack of *Thalassia*, however, the nutrient levels may be a surrogate of other causes. For example, both high NH_4^+ and nutrient concentrations are related to freshwater delivery to the bay via canal and groundwater, which may carry other agents acting alone or synergistically with NH_4^+ and nutrients to cause toxic or unfavorable conditions for *Thalassia* and other slow growing plants. In addition, salinity characteristics may also play a role in *Thalassia* competition.

Thalassia responds best to normal marine salinities. Salinities too high or too low or a rapidly changing salinity regime produce stress to *Thalassia* that frequently favors other species. Historically the northern portion of Biscayne Bay was much more estuarine in nature but has maintained near marine salinities since the opening of Haulover Cut and dredging of Miami River-Government Cut Channels which permit rapid freshwater discharge mixing and export. Northern Biscayne Bay also has more frequent high turbidity periods which affects light availability, especially in deeper portions of the Bay (Harlem 1979). The southern part of the Bay is less well flushed, perhaps, but has much less freshwater discharge. This is especially true south of North Canal. In this region salinities are always near marine conditions and can become slightly hypersaline during extended dry periods such as during our April sampling period. Normally *Thalassia* abundance increases from north-to-south because of more continuous near marine salinity and low turbidity levels in Southern Biscayne Bay. This trend is apparent when plotting salinity vs *Thalassia* abundance (Fig. 30). The break in the trend is obviously not solely the result of salinity.

The major purpose of the funding for this project was to determine if NH_4^+ levels were elevated enough in the waters and soils of nearshore Biscayne Bay to produce toxic effects on *Thalassia*. Previously the relationship between *Thalassia* distribution and salinity and nutrient concentrations were discussed with the conclusion that the competitive advantage of fast growing species over slow growing species and the resulting light competition can adequately explain the lack of *Thalassia* along the North-to-south study gradient. However, a close examination of the relationship between NH_4^+ concentration and *Thalassia* abundance indicates that in areas of NH_4^+ concentrations greater than 0.015 ppm excludes *Thalassia*. However, in these areas other nutrients except TP are also quite elevated and therefore NH_4^+ alone cannot be implicated.

The Mangrove Transect Comparison showed that the mangrove fringe was a source of total phosphorus and possibly some ammonium to the Bay, but not as much as suspected. The Bay itself was a source of nitrate to the mangrove fringe. NH_4^+ levels in nearshore Biscayne Bay and in the coastal mangrove soils are often quite high for normal surface waters but probably do not in themselves produce toxicity. One reason for the high concentrations may be groundwater inputs. Anaerobic groundwater contains high levels of NH_4^+ especially the shallow groundwater around the Black Point landfill. High discharge rates of 1-3 $\text{l hr}^{-1} \text{m}^{-2}$ (Meeder et al. 1997) may supply a significant and unrecognized N load to the Bay.

CONCLUSIONS

Freshwaters reaching nearshore Biscayne Bay contains numerous nutrients, metals, hydrocarbons, pesticides, and herbicides from anthropogenic sources. We have quantified nutrients with particular attention to NH_4^+ . Our results indicate a strong correlation between elevated ammonium concentrations with 1) decreased abundance of *Thalassia*, 2) increased abundance of *Halodule* and fast growing algae species, and 3) the increase in filamentous algal cover.

The high salinities encountered during this study are associated with a very dry winter. Therefore, the effects of canal inputs on ambient nutrient concentrations are minimal during this period. The elevated nutrient levels observed should be considered a chronic condition. Conclusions can not be made that ammonia toxicity is solely responsible for the loss of *Thalassia* and other slower growing algae.

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Table 1. Water quality variable statistics.

VARIABLE	STA	MEDIAN	MIN.	MAX.	<i>n</i>
Surface	10	0.20	0.02	1.00	12
Salinity (psu)	11	12.00	2.20	27.10	12
	12	11.91	1.40	29.10	12
	13	7.80	0.20	26.10	12
	14	22.40	5.30	37.50	8
	15	26.45	19.20	39.70	12
	16	5.00	0.70	23.40	3
	17	3.30	3.30	3.30	1
Bottom	10				
Salinity (psu)	11	20.10	12.40	37.20	11
	12	16.40	4.00	33.70	10
	13	19.90	4.80	36.70	12
	14	23.60	11.80	38.00	7
	15	26.75	19.30	39.70	12
	16				
	17				
Surface	10	25.95	23.30	29.60	12
Temperature (°C)	11	25.90	21.40	30.40	12
	12	24.80	23.40	31.60	11
	13	25.95	21.90	30.40	12
	14	25.45	21.40	30.70	8
	15	25.35	20.90	31.50	12
	16	22.05	22.00	22.10	2
	17	21.80	21.70	21.90	2
Bottom	10				
Temperature (°C)	11	24.10	20.90	29.80	10
	12	25.05	22.90	28.50	10
	13	25.25	23.30	31.20	12
	14	23.80	21.40	30.70	7
	15	25.35	21.00	31.50	12
	16				
	17				
Surface	10	5.70	1.10	8.10	12
Dissolved Oxygen (mg l ⁻¹)	11	4.75	1.10	6.80	12
	12	3.80	0.40	5.90	11
	13	4.95	1.00	7.30	12
	14	5.30	2.70	11.20	8
	15	6.90	3.80	8.10	12
	16	3.50	1.90	5.10	2
	17	3.35	2.30	4.40	2

VARIABLE	STA	MEDIAN	MIN.	MAX.	<i>n</i>
Bottom	10				
Dissolved	11	5.00	2.10	8.70	10
Oxygen	12	2.50	0.20	6.60	10
(mg l ⁻¹)	13	4.55	1.20	6.80	12
	14	5.70	2.70	11.40	7
	15	7.15	4.80	11.20	12
	16				
	17				
pH	10	7.815	7.397	8.229	11
	11	7.860	7.109	8.370	11
	12	7.800	6.900	8.590	11
	13	7.870	7.100	8.350	11
	14	8.120	7.300	8.463	7
	15	8.370	6.971	8.780	9
	16	7.985	7.500	8.303	4
	17	8.074	7.854	8.500	4
Total	10	4.040	3.141	13.250	12
Organic	11	6.137	3.717	17.010	12
Carbon	12	8.663	4.797	26.358	12
(ppm)	13	6.540	3.813	9.611	12
	14	6.512	4.974	10.102	9
	15	4.990	3.626	7.947	11
	16	11.471	5.274	16.337	4
	17	18.503	6.899	27.450	3
NO ₂ ⁻	10	0.0070	0.0010	0.0290	12
(ppm)	11	0.0100	0.0020	0.0300	12
	12	0.0280	0.0080	0.1030	12
	13	0.0110	0.0020	0.0320	12
	14	0.0040	0.0020	0.0280	9
	15	0.0100	0.0010	0.0510	12
	16	0.0050	0.0030	0.0350	4
	17	0.0060	0.0040	0.0180	3
NO ₃ ⁻²	10	0.2020	0.0190	0.4120	12
(ppm)	11	0.1090	0.0090	0.4150	12
	12	0.1230	0.0040	0.3870	12
	13	0.1290	0.0140	0.3690	12
	14	0.0950	0.0020	0.1950	9
	15	0.0620	0.0000	0.3380	12
	16	0.0410	0.0340	0.0820	4
	17	0.0300	0.0020	0.0310	3

VARIABLE	STA	MEDIAN	MIN.	MAX.	<i>n</i>
NH ₄ ⁺ (ppm)	10	0.0550	0.0170	0.3530	12
	11	0.2190	0.0970	0.6720	12
	12	3.2650	0.2220	26.9730	12
	13	0.1760	0.1030	0.7520	12
	14	0.2110	0.0110	0.5150	9
	15	0.0420	0.0040	0.1350	12
	16	0.1130	0.0790	0.4810	4
17	0.0470	0.0370	0.0480	3	
NH ₃ (ppb)	10	0.00	0.00	0.02	12
	11	0.01	0.00	0.04	12
	12	0.11	0.00	0.65	12
	13	0.01	0.00	0.04	12
	14	0.01	0.00	0.03	9
	15	0.00	0.00	0.01	12
	16	0.00	0.00	0.04	4
17	0.00	0.00	0.00	2	
Soluble Reactive Phosphorus (ppm)	10	0.0040	0.0010	0.3060	12
	11	0.0030	0.0000	0.0280	12
	12	0.0040	0.0010	0.1120	12
	13	0.0030	0.0000	0.0190	12
	14	0.0030	0.0000	0.0340	9
	15	0.0020	0.0000	0.1370	12
	16	0.0020	0.0002	0.0620	4
17	0.0030	0.0004	0.0060	3	
Total Phosphorus (ppm)	10	0.0110	0.0040	0.3230	11
	11	0.0100	0.0030	0.0420	11
	12	0.0110	0.0020	0.0300	11
	13	0.0080	0.0020	0.0150	10
	14	0.0080	0.0040	0.0200	8
	15	0.0050	0.0020	0.0170	11
	16	0.0240	0.0060	0.9400	4
17	0.0120	0.0060	0.0140	3	
Total Organic Nitrogen (ppm)	10	0.2970	0.2060	0.7020	12
	11	0.3910	0.0860	0.6080	12
	12	0.0370	0.0240	0.8570	12
	13	0.3180	0.1420	0.5890	12
	14	0.3560	0.1320	1.2040	9
	15	0.3270	0.1790	0.5370	12
	16	0.5660	0.2790	1.4580	4
17	0.8470	0.3310	1.9860	3	

VARIABLE	STA	MEDIAN	MIN.	MAX.	<i>n</i>
Si(OH) ₄ (ppm)	10	1.1840	1.1840	1.1840	2
	11	0.6540	0.6540	0.6540	2
	12	0.3370	0.3370	0.3370	2
	13	0.7390	0.7390	0.7390	2
	14				
	15	0.0780	0.0780	0.0780	2
	16				
	17				

Table 2. List of benthic plant taxa.

BENTHIC PLANT SPECIES

ANGIOSPERMS
Halodule wrightii
Halophila engelmannii
Ruppia maritima
Syringodium filiforme
Thalassia testudinum

CHLOROPHYTA
Acetabularia crenulata
Anadyomene stellata
Avrainvillea nigricans
Batophora oerstedii
Caulerpa mexicana
Caulerpa racemosa
Caulerpa verticillata
Halimeda incrassata
Halimeda opuntia
Halimeda simulans
Penicillus capitatus
Rhypocephalus phoenix
Udotea flabellum
Ulva lactuca

PHAEOPHYTA
Dictyota cf crenulata
Rosenvingea sanctae-crusis
Sargassum filipendula

RHODOPHYTA
Acanthophora specifera
Chondria littoralis
Hypnea cornuta
Hypoglossum involvens
Laurencia intricata

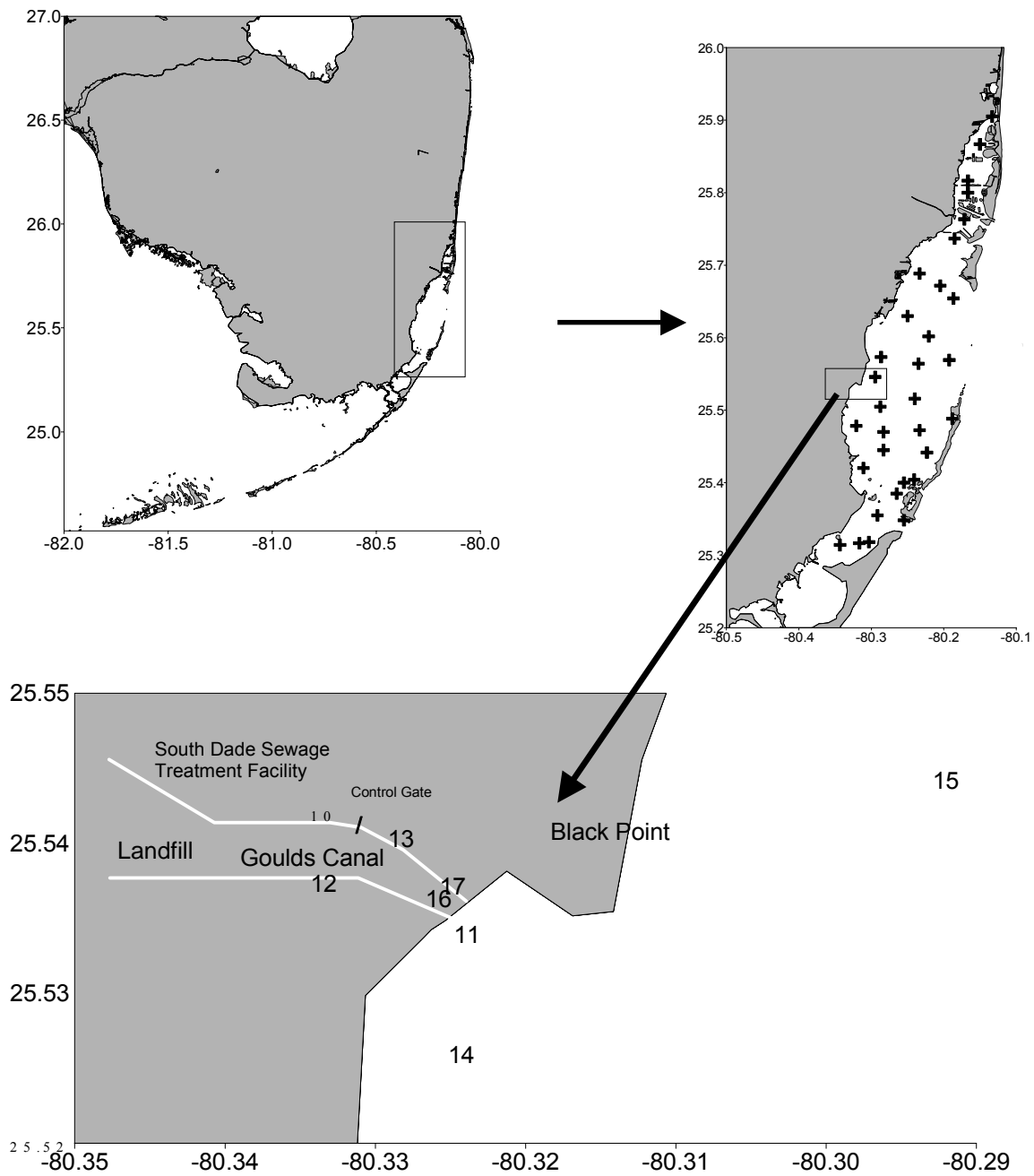


Figure 1. Map of Black Point Monitoring Program sampling sites in relation to FIU Biscayne Bay water quality monitoring program (+) and South Florida ecosystem.

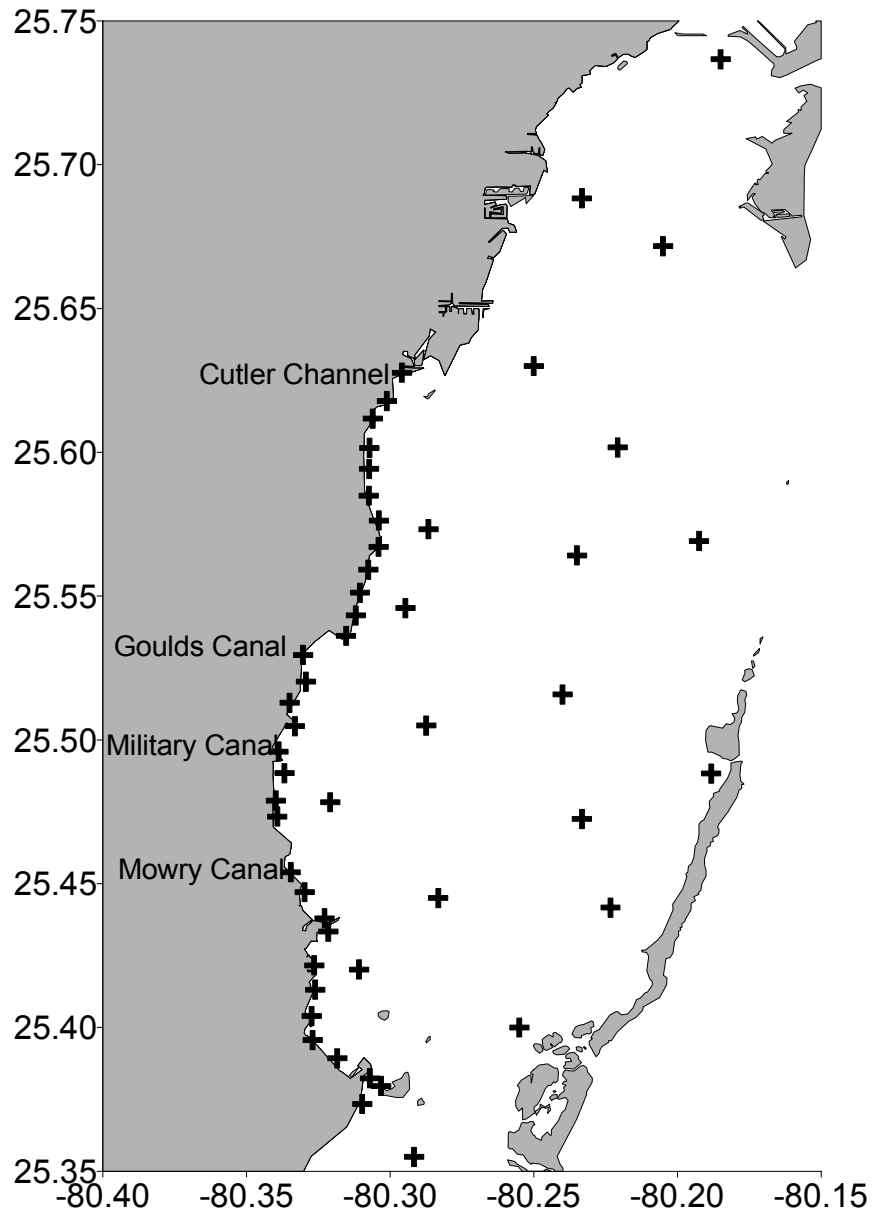


Figure 2. Locations of Shoreline Ammonia Survey sites in relation to FIU Biscayne Bay water quality monitoring program and major canals.

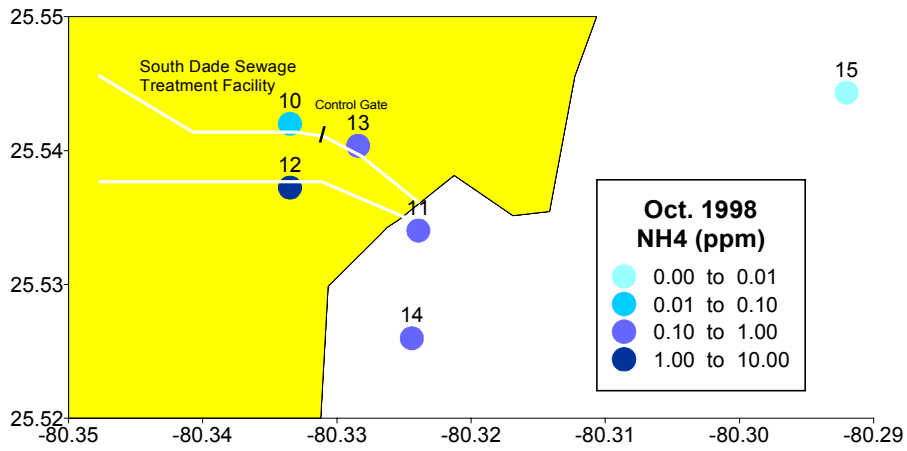


Figure 3. Map of NH_4^+ concentrations at landfill sites in Oct. 1998.

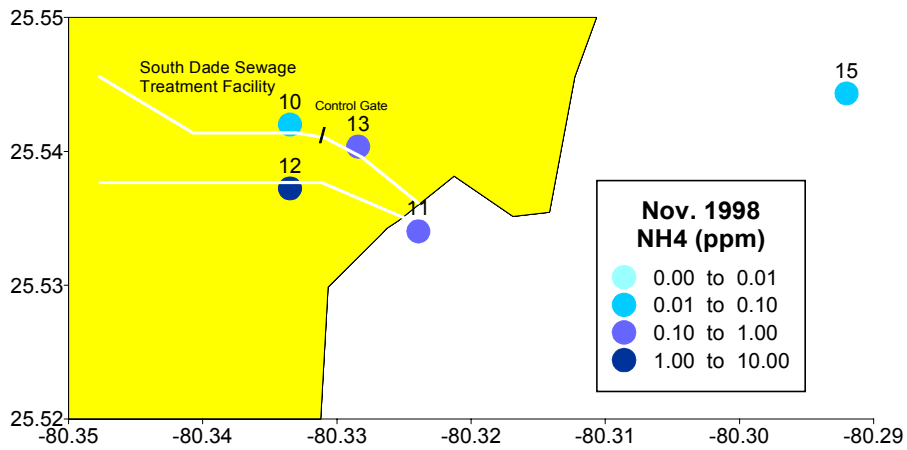


Figure 4. Map of NH_4^+ concentrations at landfill sites in Nov. 1998.

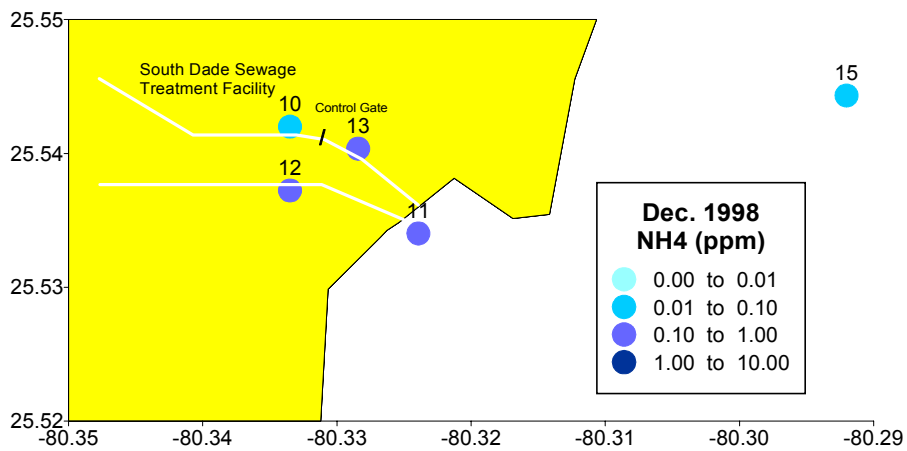


Figure 5. Map of NH_4^+ concentrations at landfill sites in Dec. 1998.

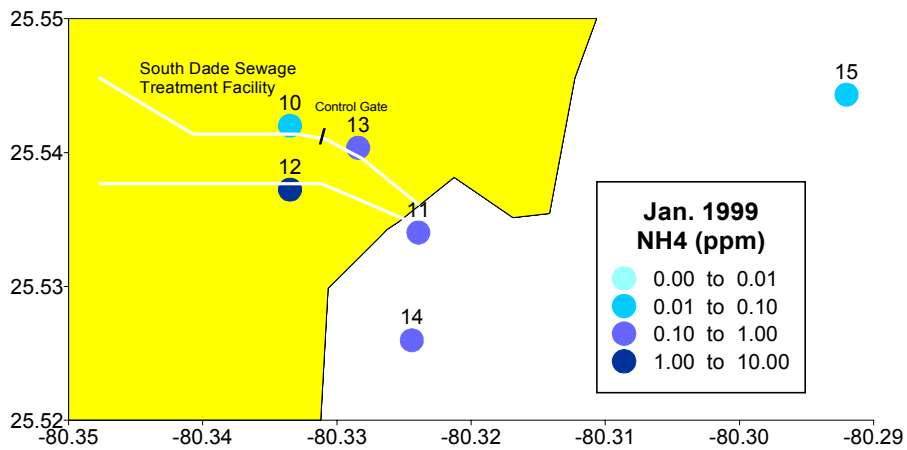


Figure 6. Map of NH₄⁺ concentrations at landfill sites in Jan. 1999.

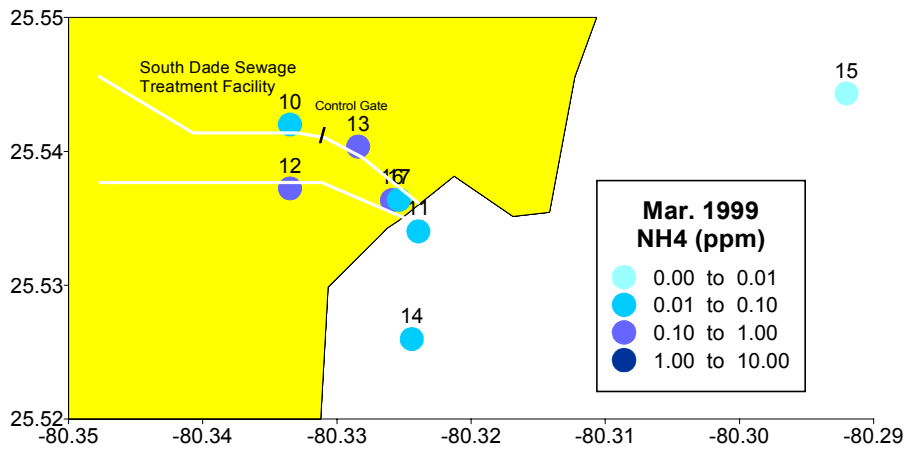


Figure 7. Map of NH₄⁺ concentrations at landfill sites in Mar. 1999.

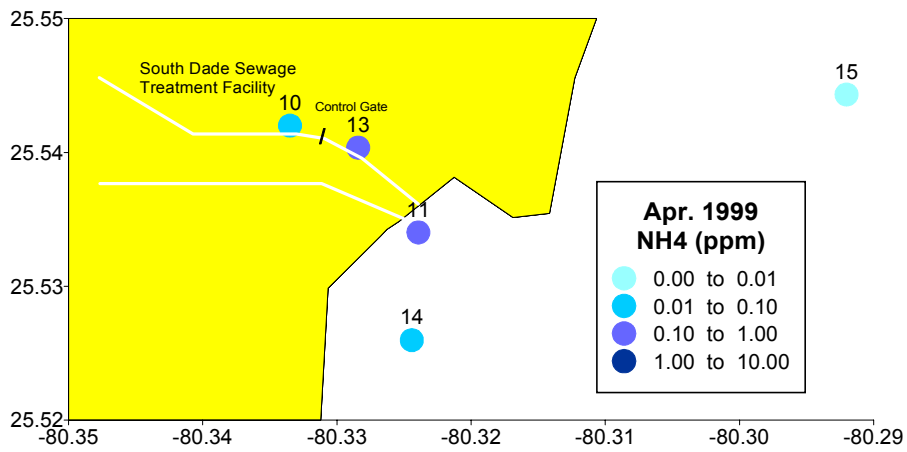


Figure 8. Map of NH₄⁺ concentrations at landfill sites in Apr. 1999.

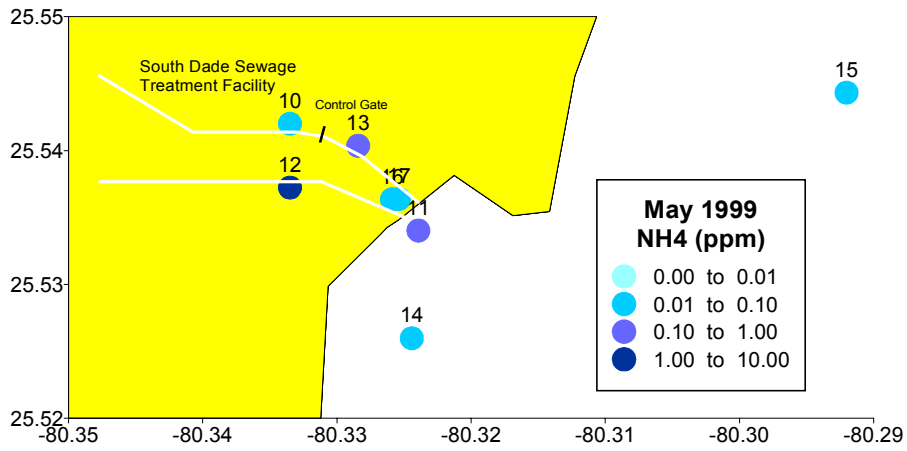


Figure 9. Map of NH_4^+ concentrations at landfill sites in May 1999.

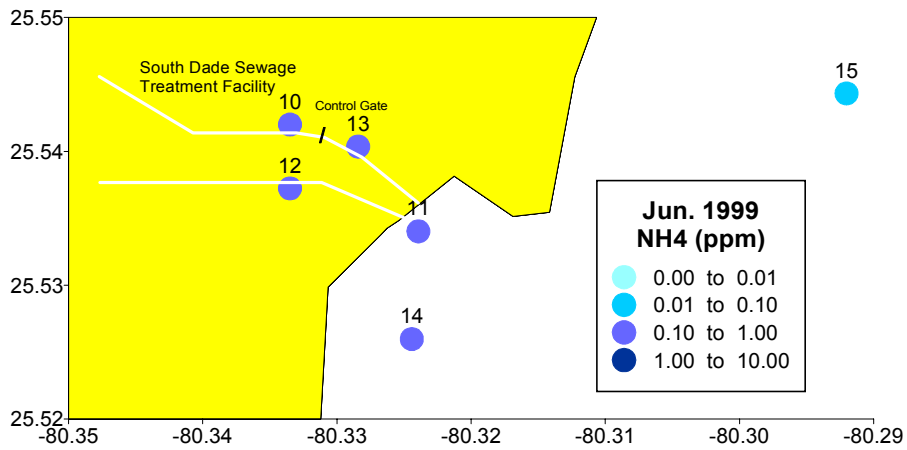


Figure 10. Map of NH_4^+ concentrations at landfill sites in Jun. 1999.

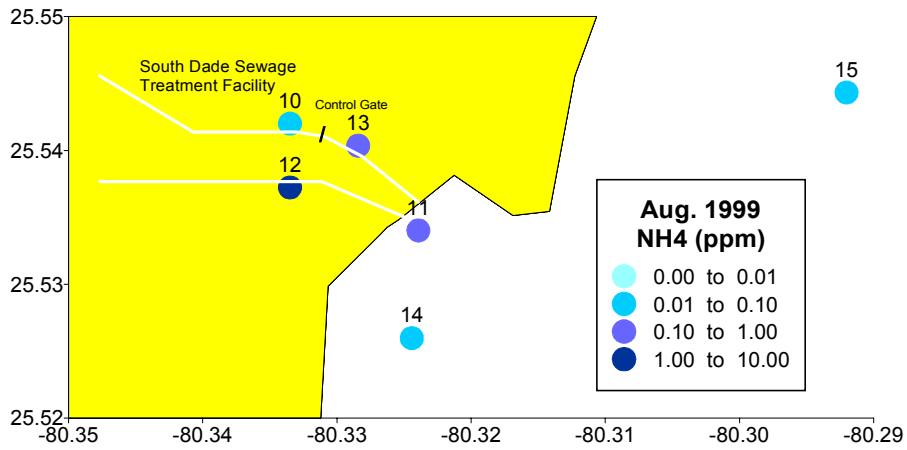


Figure 11. Map of NH_4^+ concentrations at landfill sites in Aug. 1999.

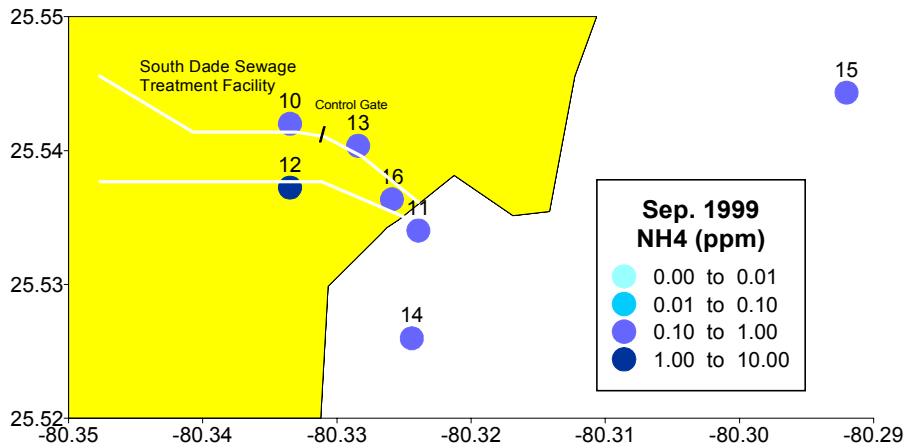


Figure 12. Map of NH_4^+ concentrations at landfill sites in Sep. 1999.

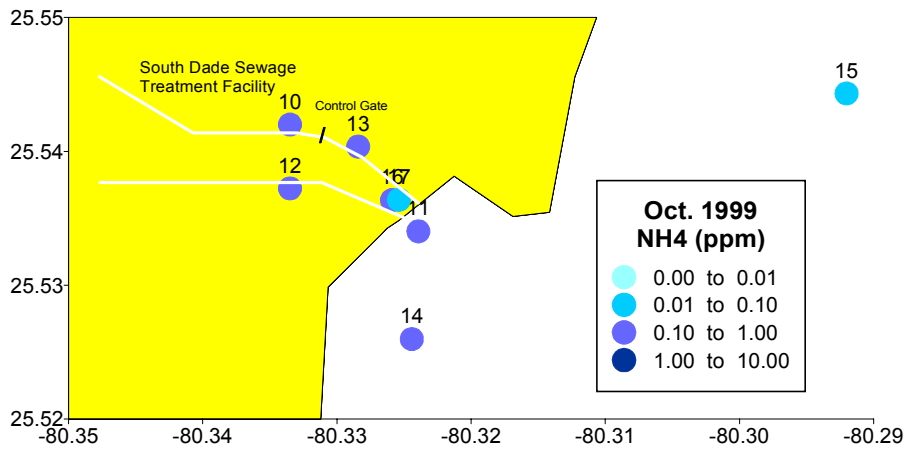


Figure 13. Map of NH_4^+ concentrations at landfill sites in Oct. 1999.

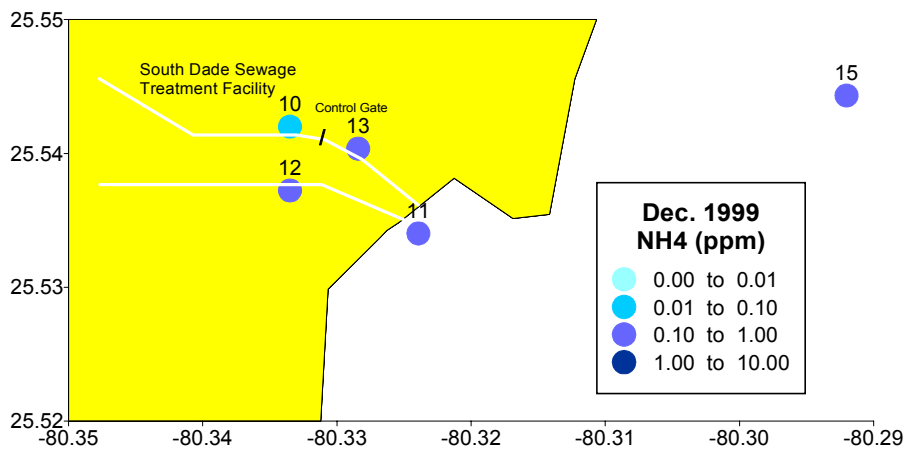


Figure 14. Map of NH_4^+ concentrations at landfill sites in Dec. 1999.

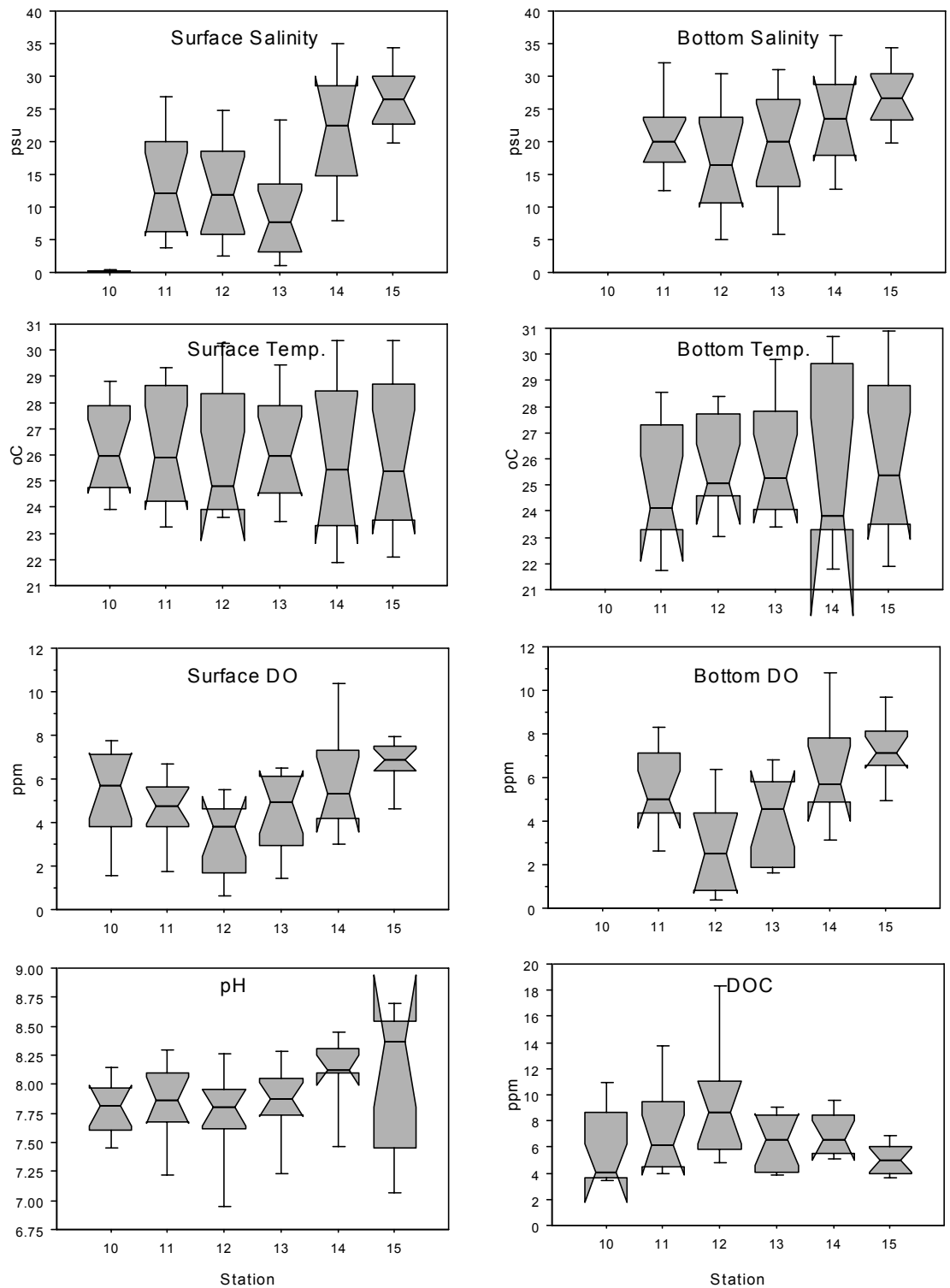


Figure 15. Box-and-whisker plots of water quality variables by station in the landfill canals.

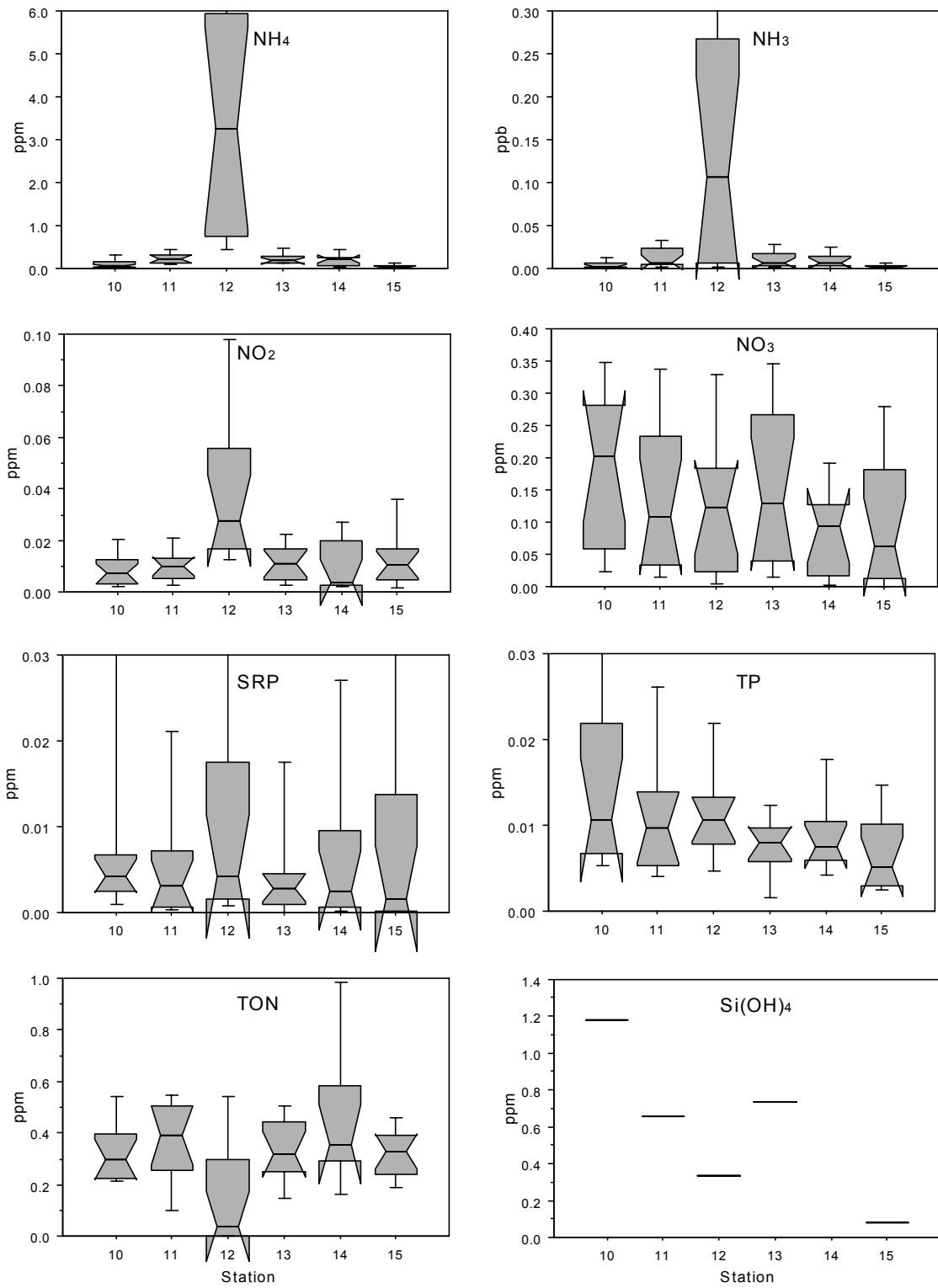


Figure 16. Box-and-whisker plots of water quality variables by station in the landfill canals.

Station 11

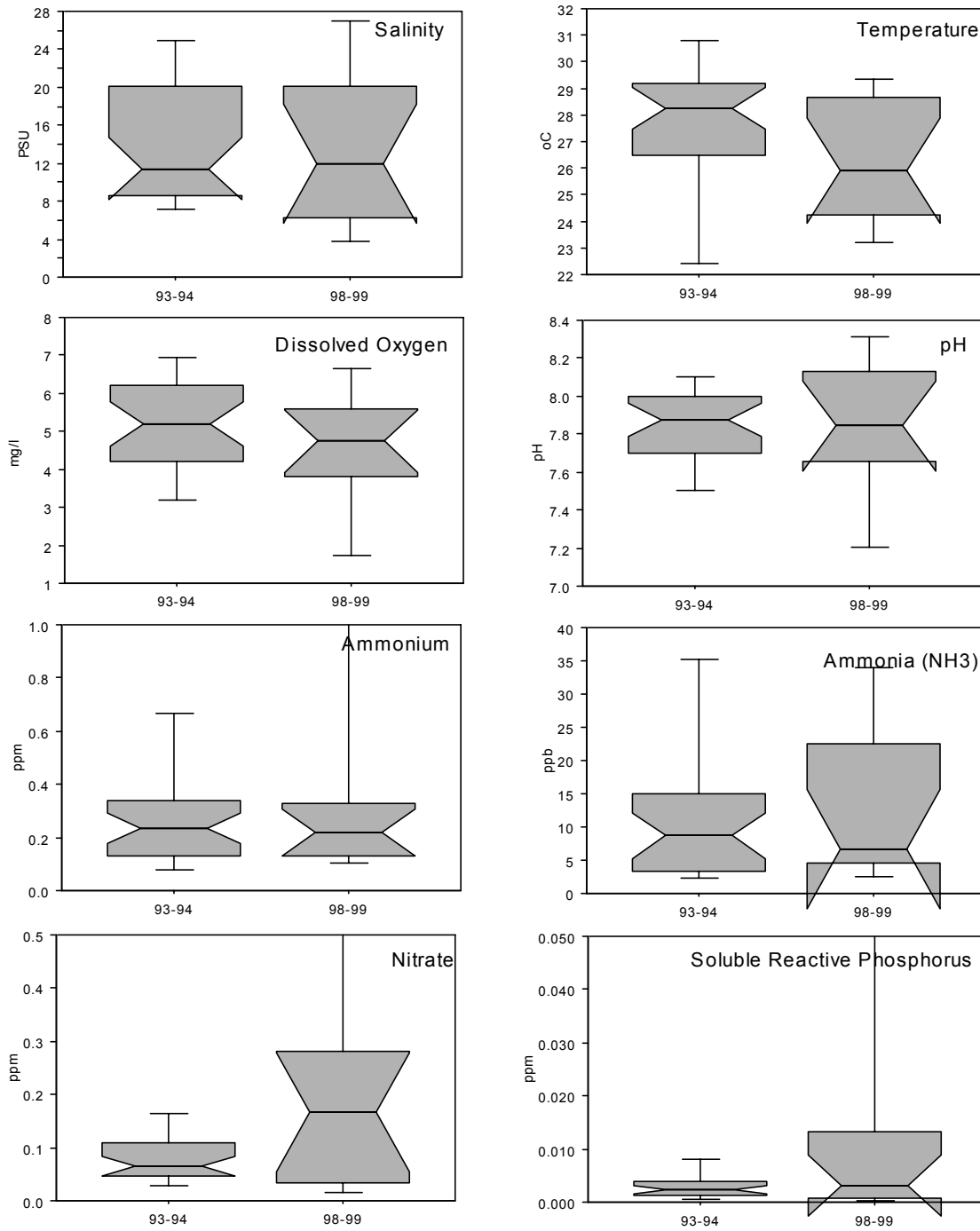


Figure 17. Comparison of landfill water quality variables from 1994 and current study.

Station 12

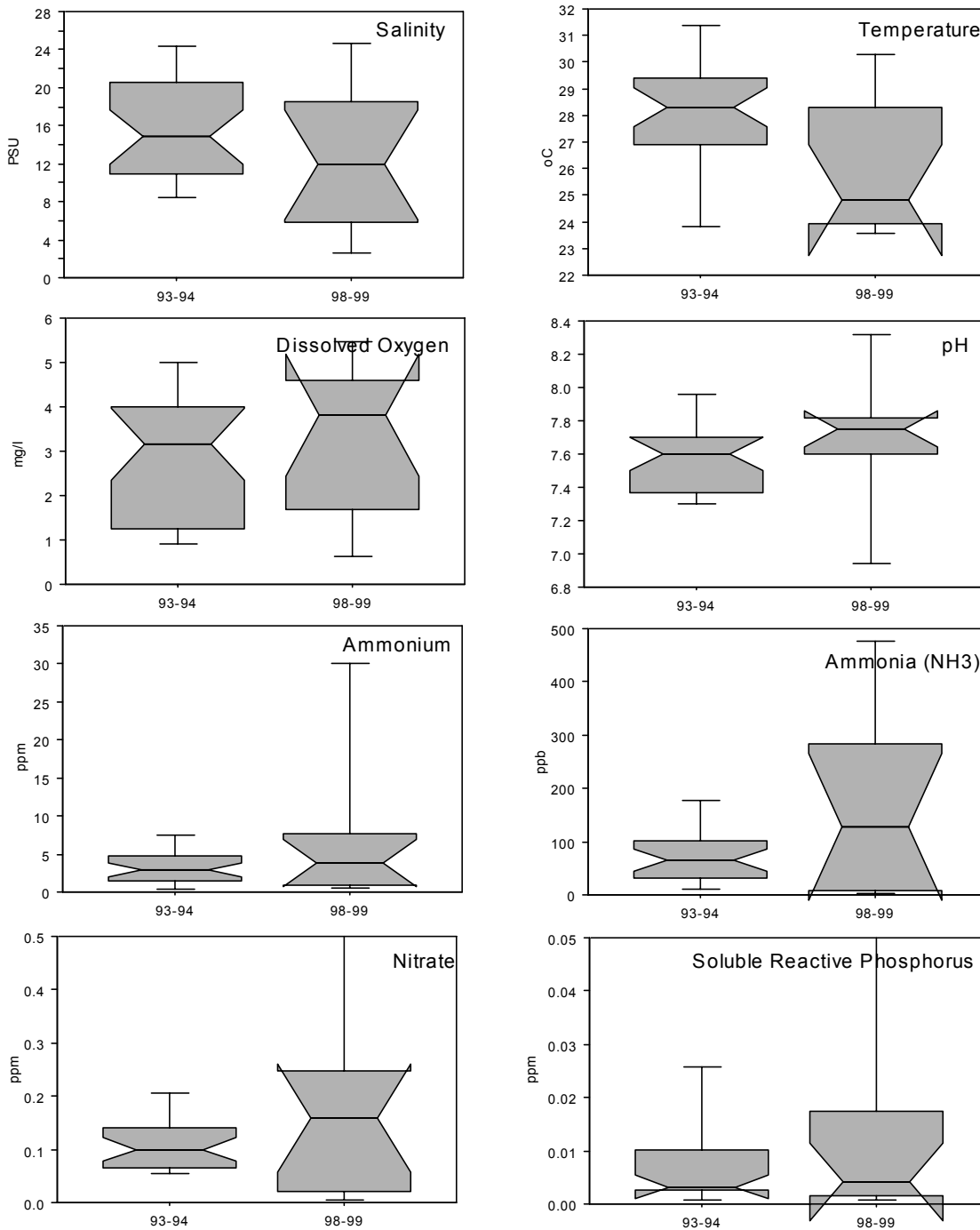


Figure 18. Comparison of landfill water quality variables from 1994 and current study.

Station 13

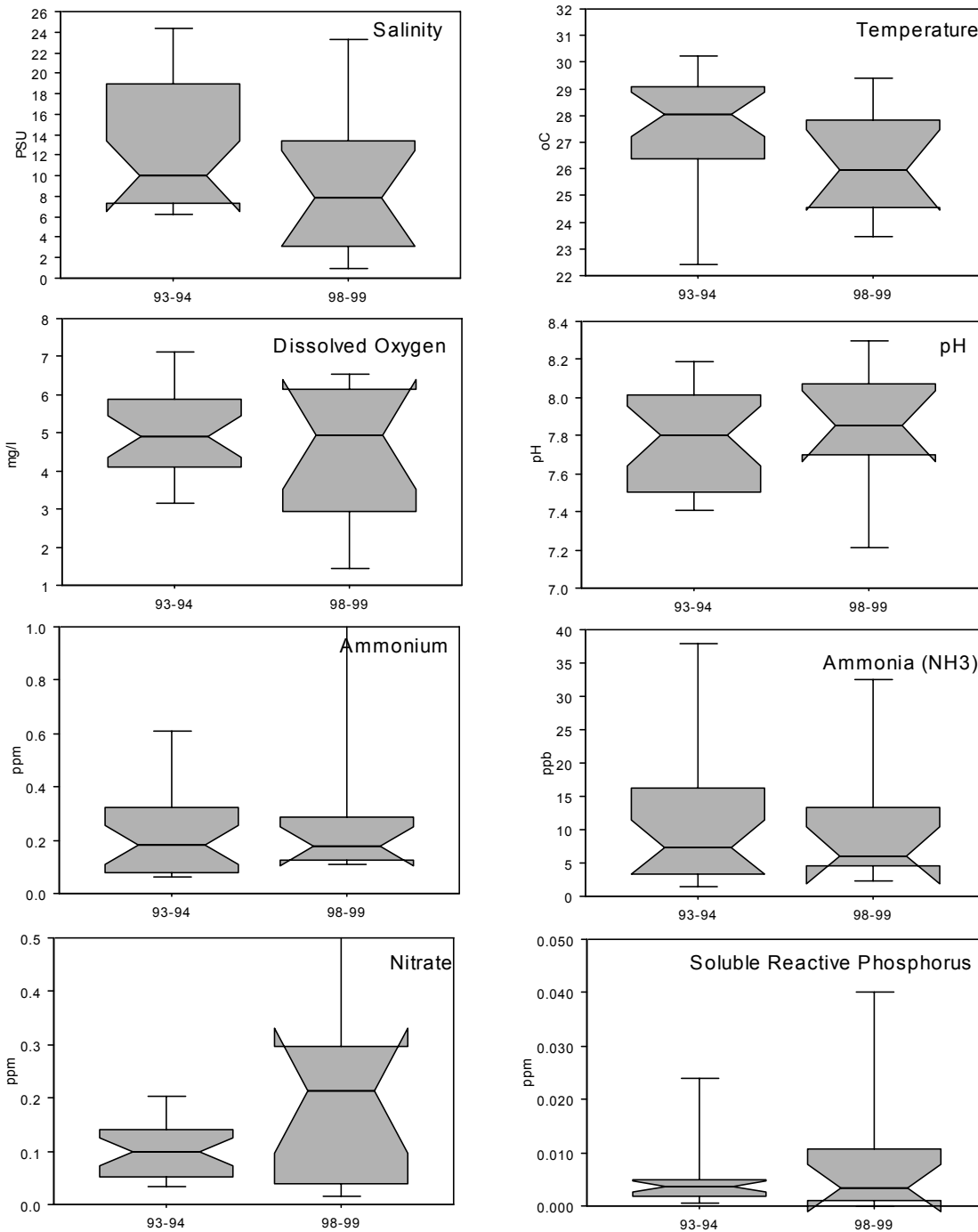


Figure 19. Comparison of landfill water quality variables from 1994 and current study.

Station 15

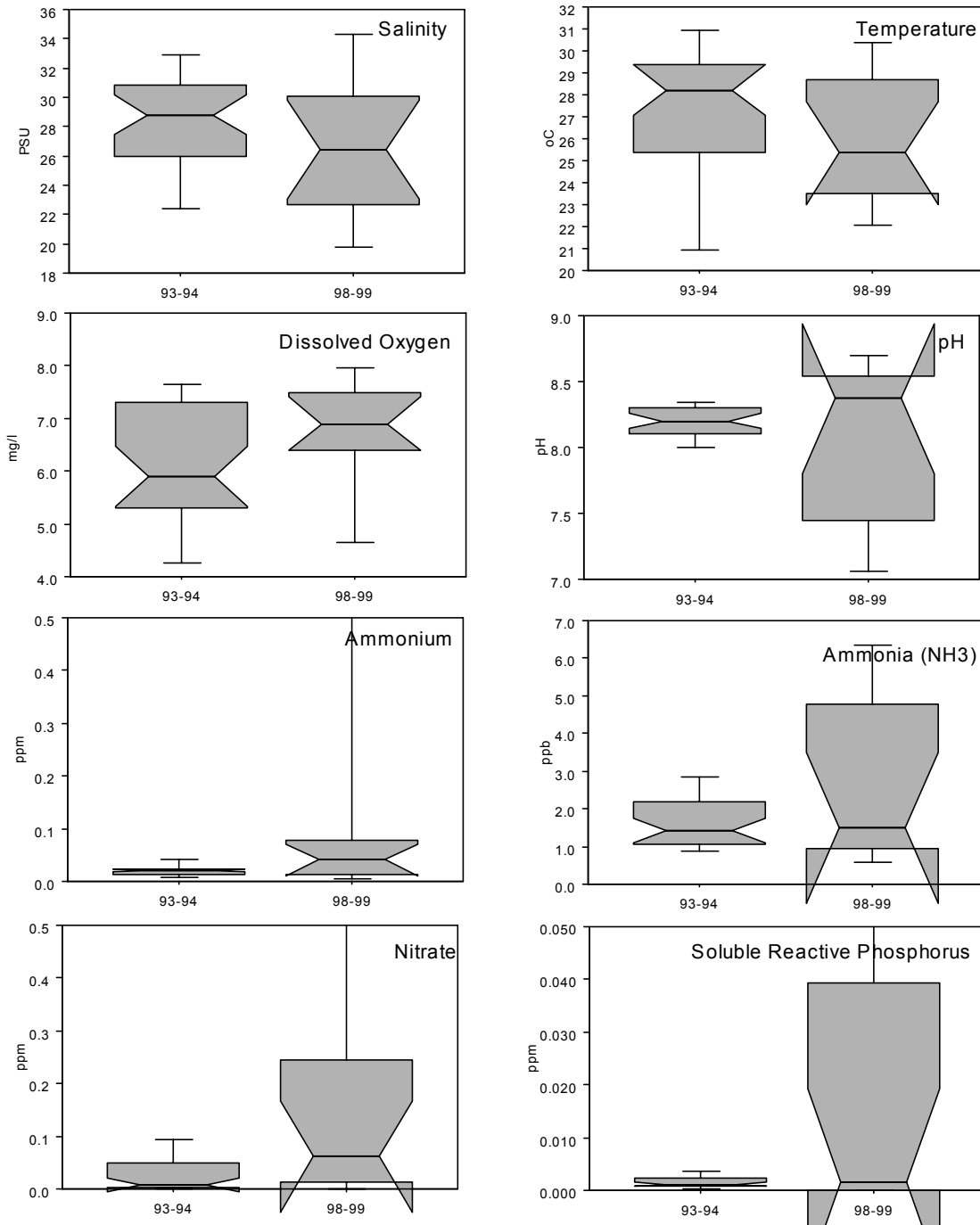


Figure 20. Comparison of landfill water quality variables from 1994 and current study.

Salinity (ppt)

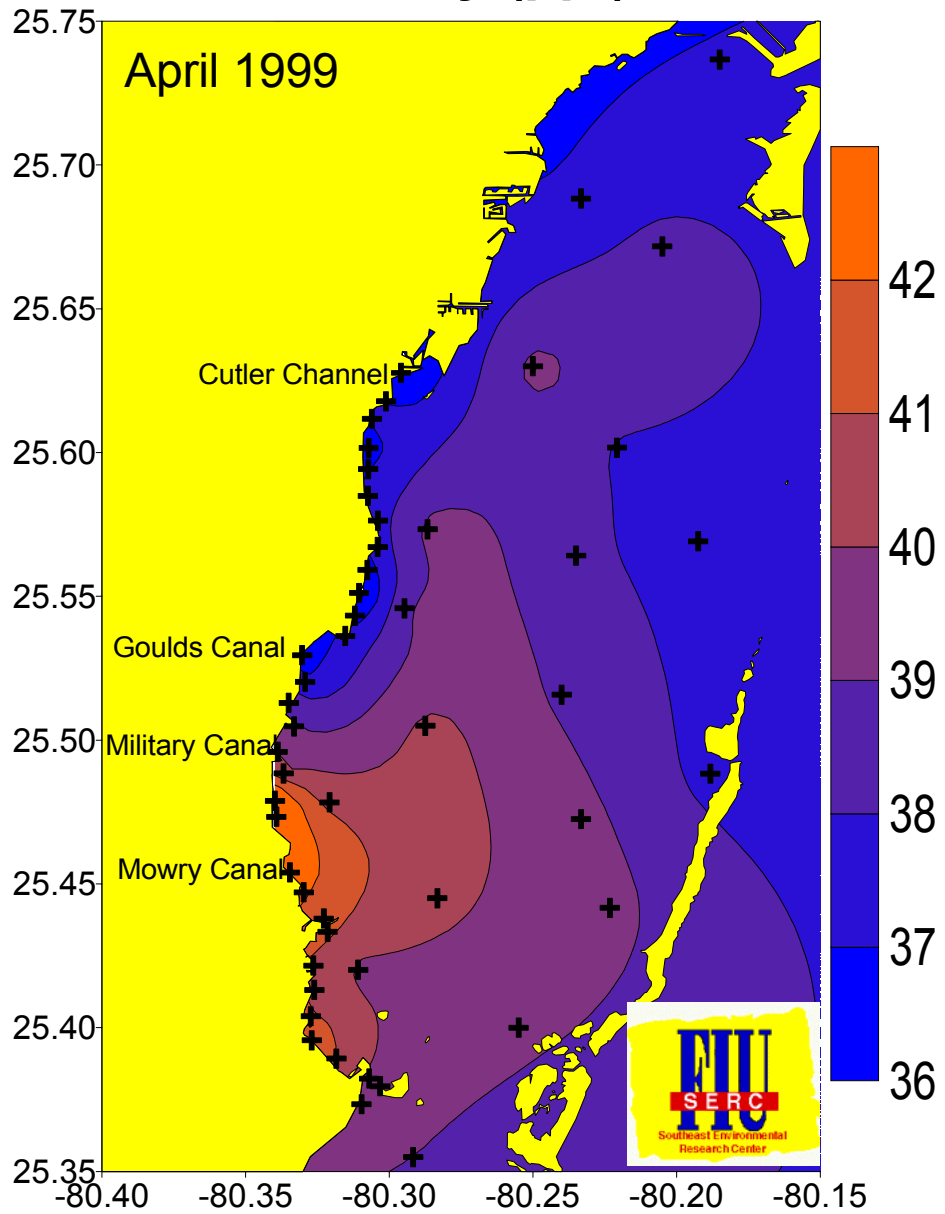


Figure 21. Salinity data from combined Shoreline Ammonia Survey and April 1999 FIU Biscayne Bay water quality monitoring program. Note hypersaline conditions in the south below Military Canal.

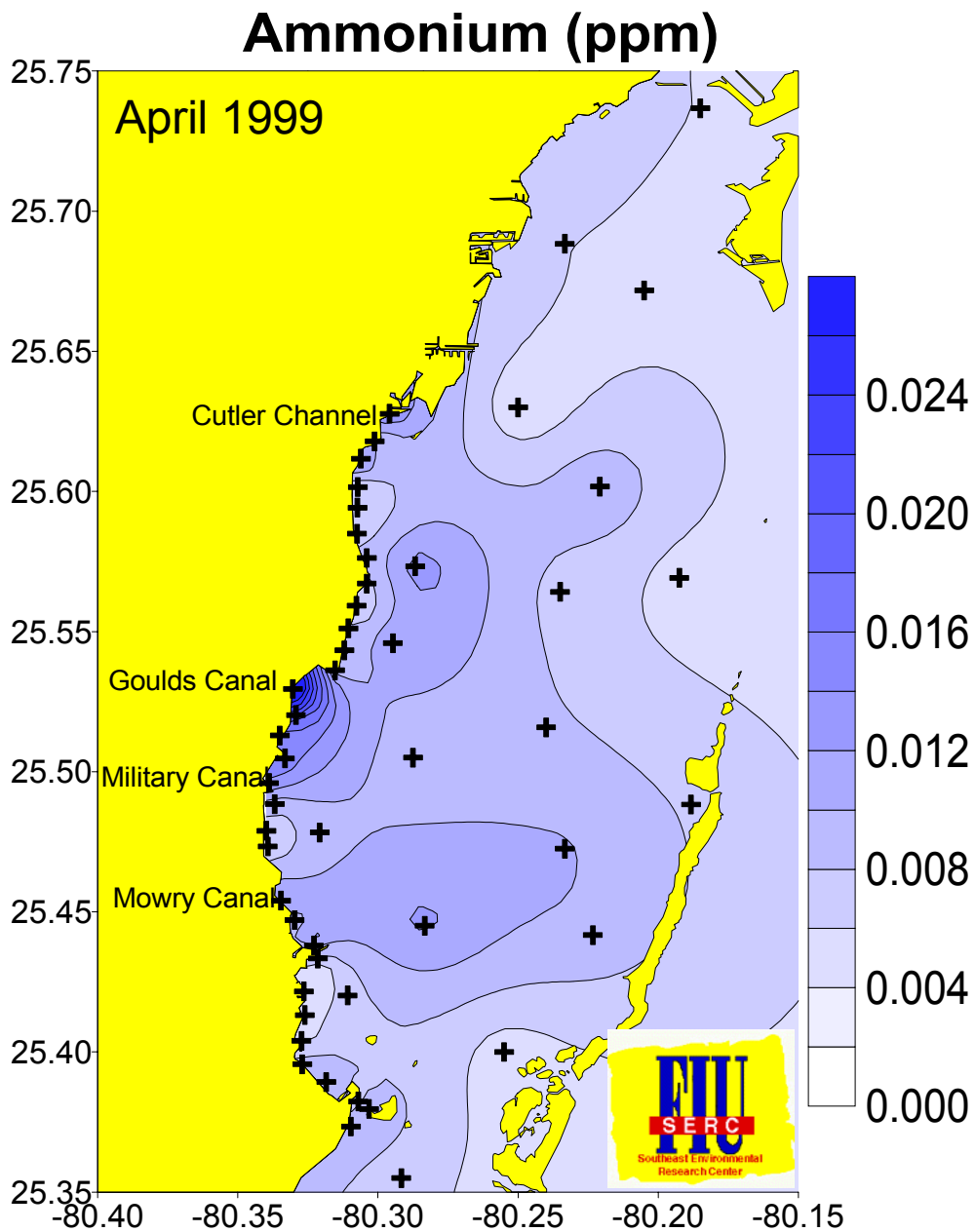


Figure 22. Ammonium data from combined Shoreline Ammonia Survey and April 1999 FIU Biscayne Bay water quality monitoring program. Note strong source in and around the Goulds Canal/Black Point area.

Ammonia (NH₃-ppb)

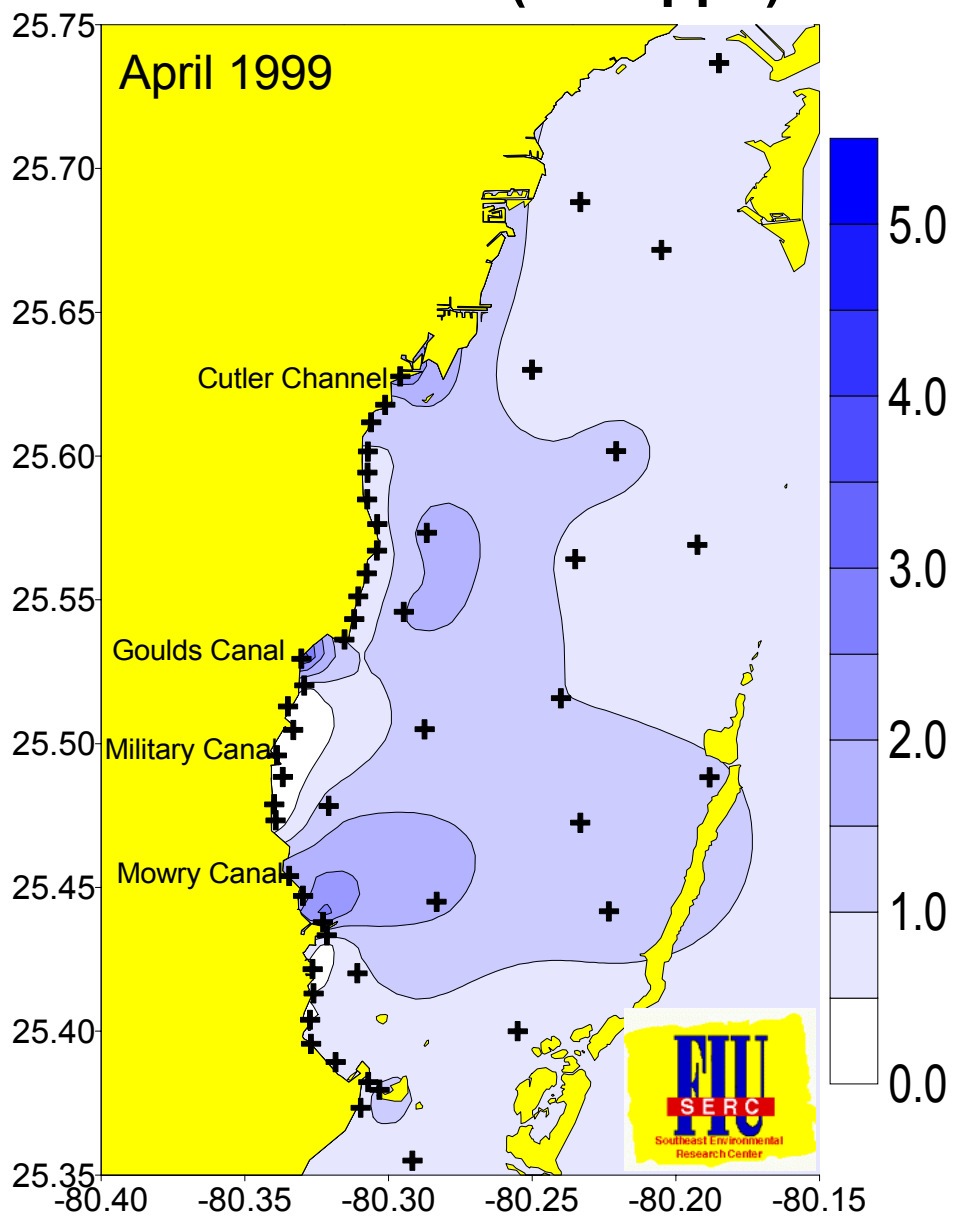


Figure 23. Unionized ammonia data from combined Shoreline Ammonia Survey and April 1999 FIU Biscayne Bay water quality monitoring program. Note slightly higher concentrations around the Cutler Canal, Goulds Canal/Black Point area, and Fender Point.

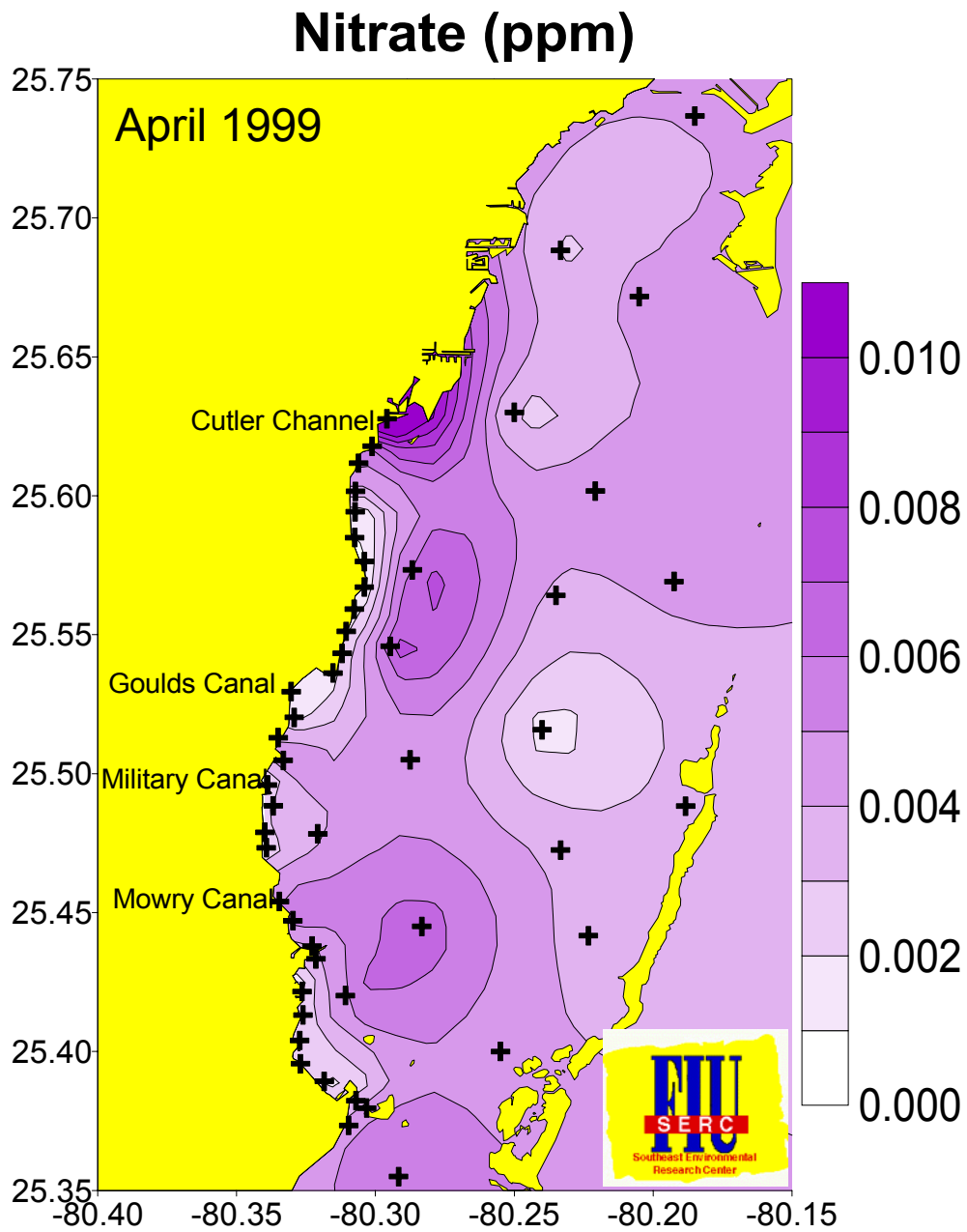


Figure 24. Nitrate data from combined Shoreline Ammonia Survey and April 1999 FIU Biscayne Bay water quality monitoring program. Note strong source from the Cutler Canal.

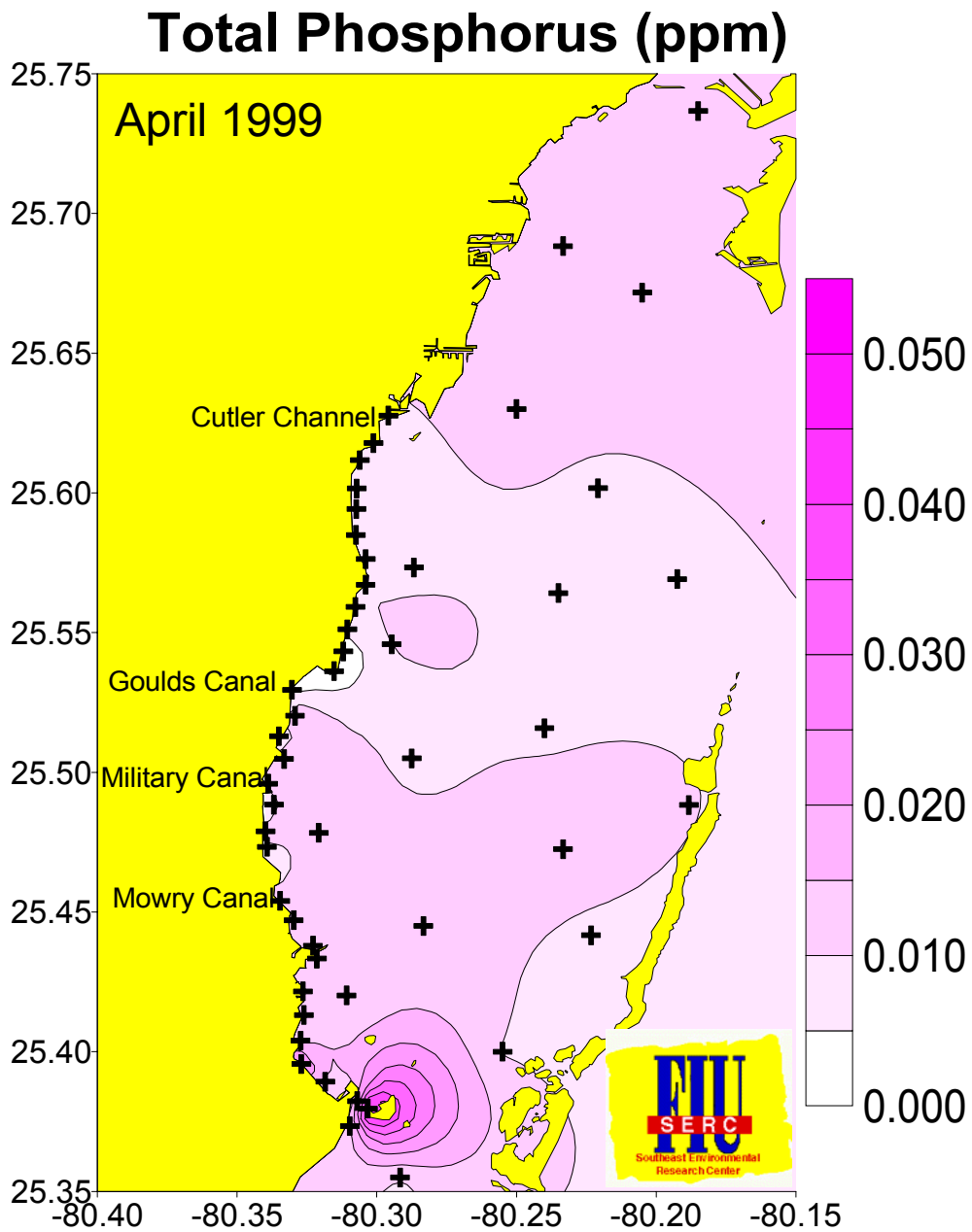


Figure 25. Total Phosphorus data from combined Shoreline Ammonia Survey and April 1999 FIU Biscayne Bay water quality monitoring program. Note elevated concentrations around Mangrove Key.

Total Organic Carbon (ppm)

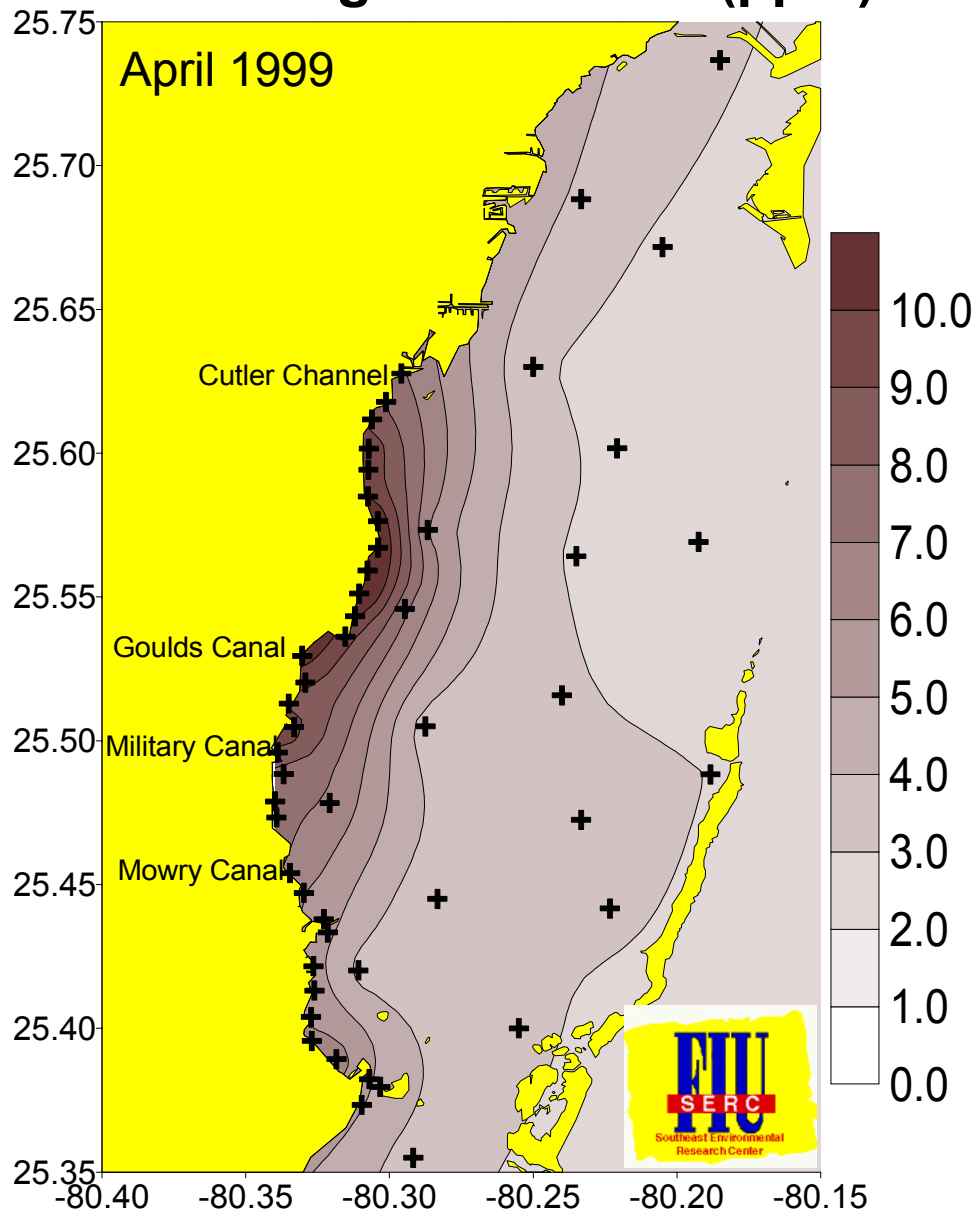


Figure 26. Total organic carbon data from combined Shoreline Ammonia Survey and April 1999 FIU Biscayne Bay water quality monitoring program. Note elevated inshore concentrations occurring from Cutler Canal to Mowry Canal.

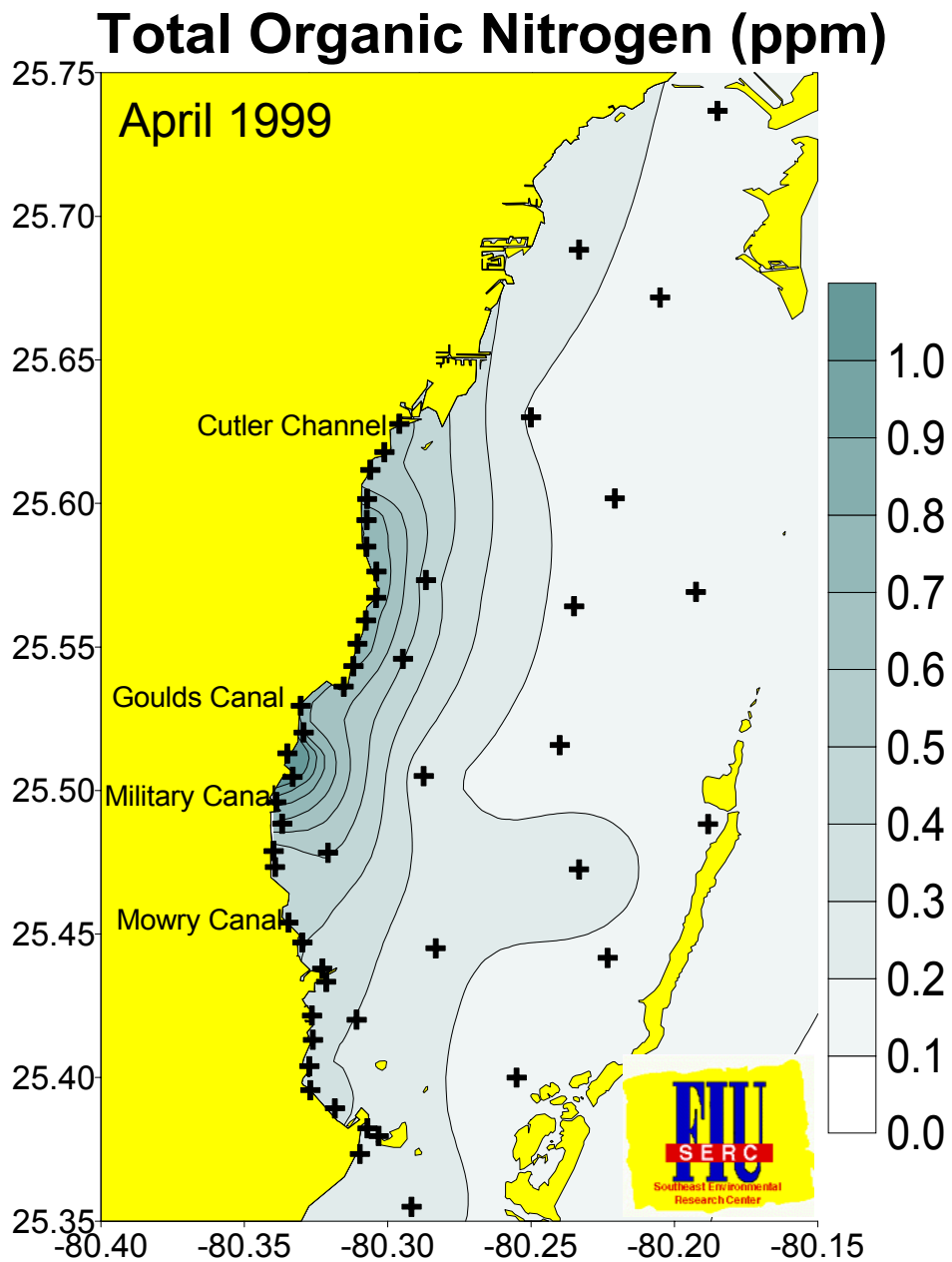


Figure 27. Total organic nitrogen data from combined Shoreline Ammonia Survey and April 1999 FIU Biscayne Bay water quality monitoring program. Note highest concentrations were found inshore between Goulds and Military Canals.

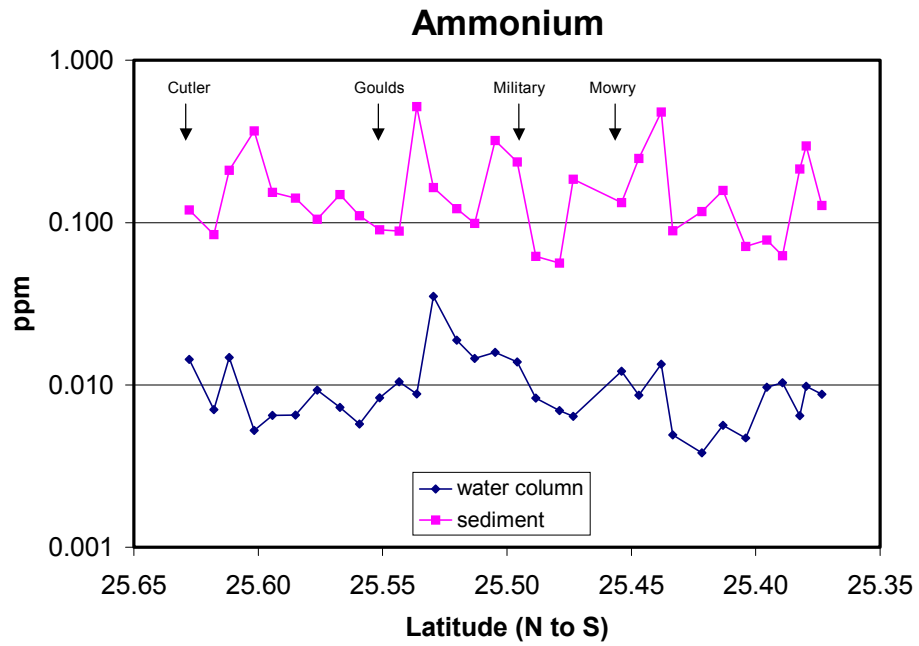


Figure 28. Plot of NH_4^+ in water and sediments along Shoreline Nutrient Survey sites.

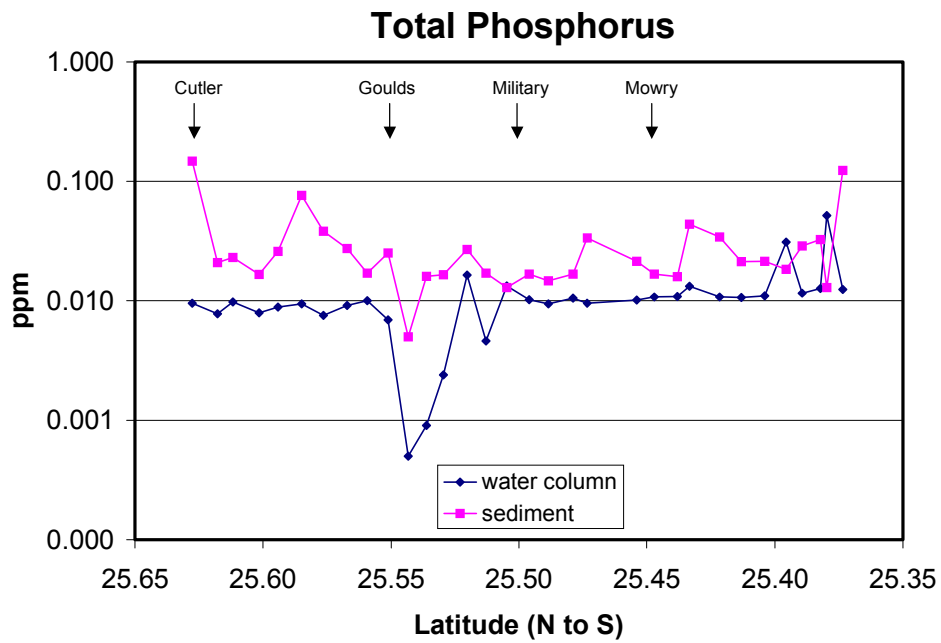


Figure 29. Plot of TP in water and sediments along Shoreline Nutrient Survey sites.

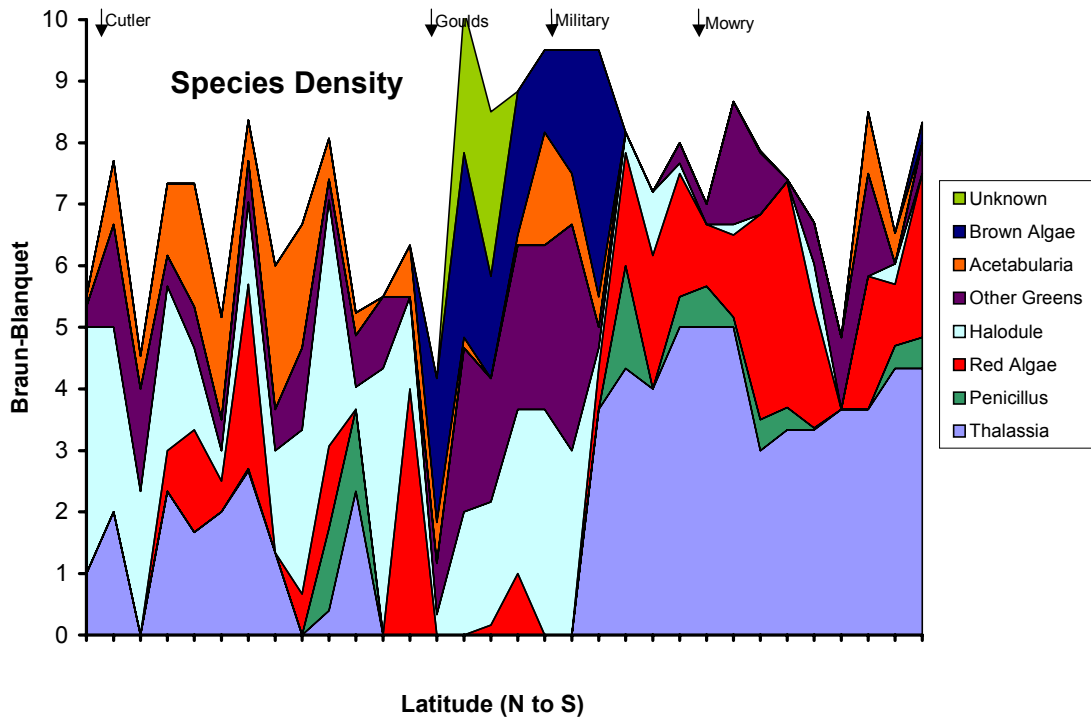


Figure 30. Plot of plant species distribution along Shoreline Benthic Survey sites.

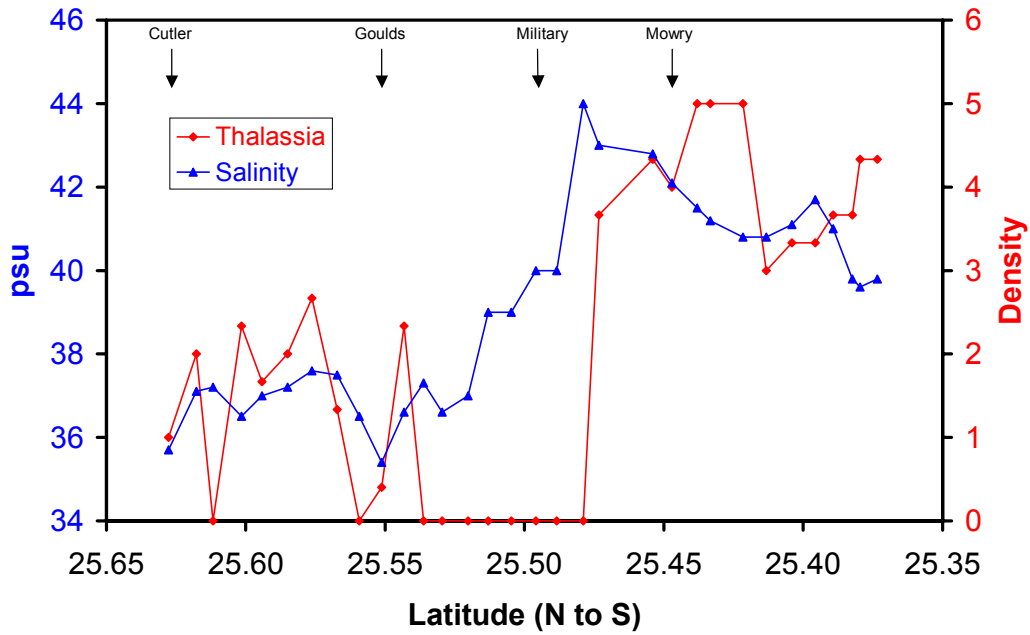


Figure 31. Plot of *Thalassia* vs salinity along Shoreline Benthic Survey sites.

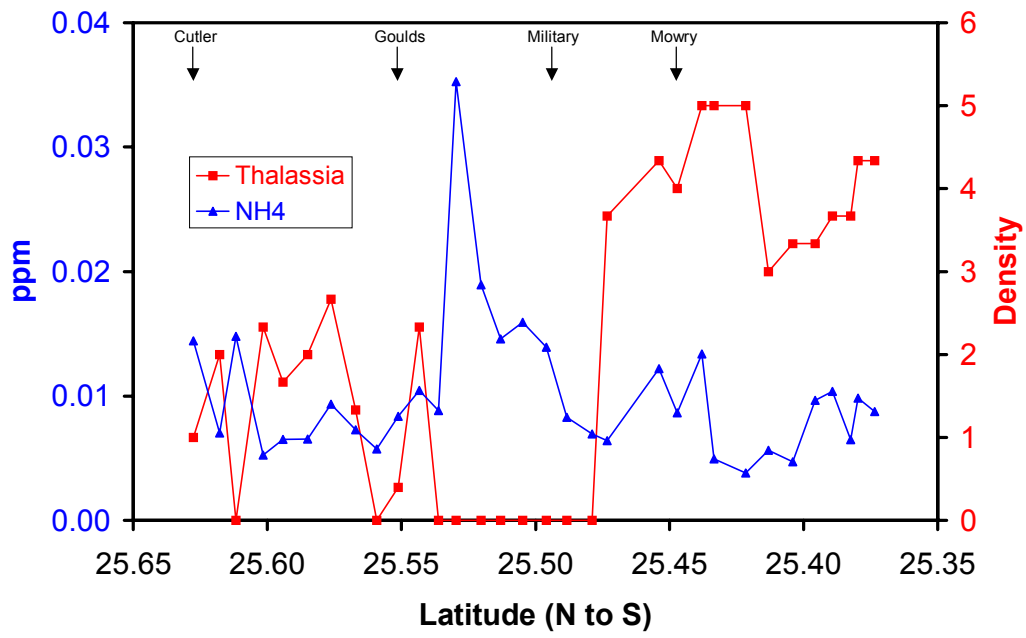


Figure 32. Plot of *Thalassia* vs NH_4^+ along Shoreline Benthic Survey sites.

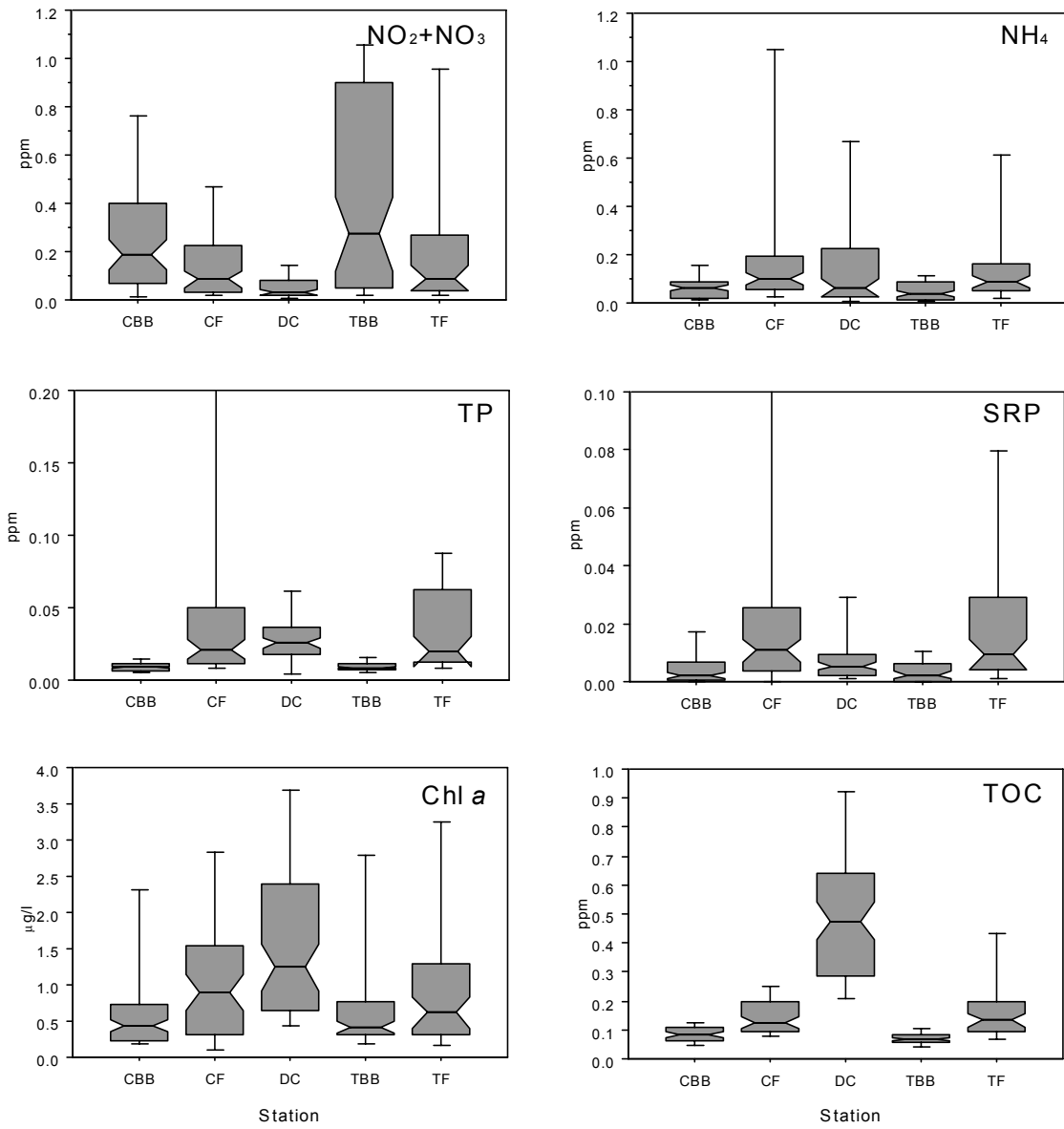


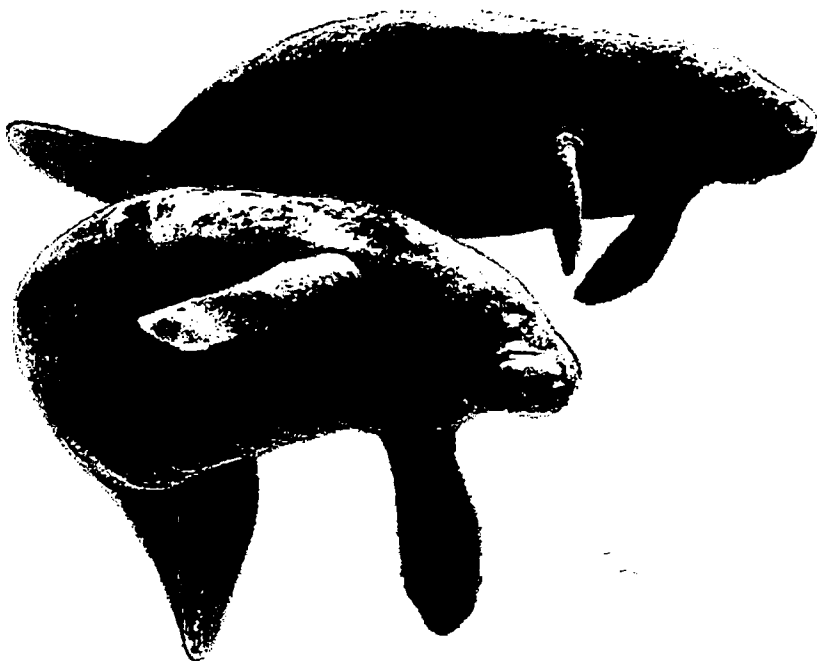
Figure 33. Plots of water quality variables from the Mangrove Transect Surveys. Sites are distribution canal (DC) near Military Canal, adjacent mangrove fringe (CF), offshore CF (CBB), mangrove fringe near Mowry (TF), and offshore TF (TBB).

APPENDIX C

NOAA Technical Memorandum NOS NCCOS CCMA 145

**National Status and Trends Program
for Marine Environmental Quality**

**Biscayne Bay:
Environmental History and Annotated Bibliography**



Silver Spring, Maryland
July 2000

US Department of Commerce

noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Center for Coastal Monitoring and Assessment
National Centers for Coastal Ocean Science
National Ocean Service

7. ECOSYSTEM CHANGES

The rare, endangered and species of special concern found in the Biscayne Bay Aquatic Preserve are listed in Table 5 (Florida Department of Environmental Protection, 2000a).

7.1. Flora

7.1.1. Seagrasses

The major vascular plants found in Biscayne Bay are *Thalassia testudinum* (turtle grass), *Halodule wrightii* (Cuban shoal grass), and *Syringodium filiforme* (manatee grass). *Thalassia* is dominant in many areas of the Bay and *Thalassia* beds support a rich animal community (Zieman, 1982). These plants function as a food source, provide shelter and protection, stabilize sediments, and act as a chemical sink (Thorhaug, 1976). There is a progression of these seagrasses with distance from shore in non-disturbed areas of Biscayne Bay. Intertidally, there is a band of *Halodule*. From sublittoral, there is a band of *Thalassia* interspersed with *Halodule* and *Syringodium*. This thins out into green alga and a sand bottom towards mid-Bay. Seagrasses in the northern part of the Bay have been heavily impacted by man's activities and the normal *Thalassia* community is not observed north of the Port of Miami.

Sediment is generated by *Thalassia* communities and major disruptions to the seagrass beds result in modifications to the sediments.

Attempts were made in 1982 and 1984 to rehabilitate approximately 110 ha of barren sea bed with seagrass (Thorhaug, 1977; Thorhaug, 1980; Thorhaug, 1987; and others). Efforts have been carried out to revegetate areas of Biscayne Bay with seagrasses and currents, wave action and turbidity difficulties in these efforts.

The effect of the thermal effluent released by the Turkey Point Nuclear Power Plant on *Thalassia* beds has been studied extensively. *Thalassia* disappeared in areas of water 5° C above ambient, and declined by 50% in waters 3-4° C above ambient temperature (Thorhaug *et al.*, 1973). Environmental stress caused by temperature or salinity changes may make *Thalassia* more susceptible to disease.

An increasing problem in Biscayne Bay is the scarring of seagrass beds, commonly made when a boat's propeller tears and cuts up roots, stems and leaves (Sargent *et al.*, 1995; Zaneski, 1998). The greatest acreage of moderate to severe scarring occurred in areas of dense human population and a large number of registered boats. An assessment of the degree of seagrass bed scarring statewide indicated that approximately 8% of the seagrass beds in Dade County were scarred, and approximately 6% were rated with moderate/severe scarring (Figures 61 and 62).

7.1.2. Mangroves

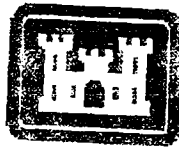
The information in this section was found in Hanlon *et al.* (1975). A thorough discussion of mangrove forest ecology can be found in Odum *et al.* (1982).

The most common mangrove species in the tropical coastlines of North America are: the red mangrove (*Rhizophora mangle*); the black mangrove (*Avicennia germinans*); the white mangrove (*Laguncularia racemosa*); and the buttonwood (*Conocarpus erectus*). The mangroves characterize and dominate a large portion of the world's tropical coastal margins and their

APPENDIX D

**Environmental Baseline Study
Miami Harbor
General Reevaluation Report**

FINAL REPORT



**Revised
November 2001**

**Prepared for
Jacksonville District
U.S. Army Corps of Engineers
400 West Bay Street
Jacksonville, FL 32202**

**by
Dial Cordy and Associates Inc.
490 Osceola Avenue
Jacksonville Beach, FL 32250**

2.0 TECHNICAL APPROACH

The technical approach utilized to document and characterize marine seagrass, hardbottom, and coral reef communities within the study area (Figure 1) is described below. Surveys were conducted during August and September 2000, with additional seagrass mapping of the Critical Wildlife Area (CWA) in November 2000.

2.1 Seagrass Community Assessment

2.1.1 Location of Survey Transects


Survey transects within the study area included the area 400 feet south of Fisherman's Channel, including the area within the CWA, the area adjacent to the Coast Guard Station, the Entrance Channel, and the area 500 feet north and south of the offshore channel (Figure 3).

2.1.2 Seagrass Mapping

Marine seagrass was mapped along 35 transects within the designated project study area by locating the end positions of the transects using Differential Global Positioning System (DGPS), laying a weighted line marked in one meter increments from the shore, and then conducting a visual diver survey along the weighted line to document seagrass distribution and occurrence from the shore to the edge of channel. Seagrass habitat and bottom type observed while crossing each transect were noted. Divers drift dove to the next transect, and if any seagrass was found between transects, a DGPS position at the start and end of the grass bed was recorded and the width of the grass bed estimated. Information recorded on seagrass habitat type and distribution was transferred from field logs and entered into a spreadsheet. Table 1 lists a description of habitat classifications used for mapping purposes. This approach allowed a visual representation of species' associations and occurrences across the shelf, channel, and slope as compared with bottom depth. Maps were produced for all stations surveyed that had seagrass present. A GIS map (ArcView) and database were created to illustrate seagrass distribution throughout the study area.

2.1.3 Seagrass Occurrence, Abundance and Density

To obtain biological data regarding the location, occurrence, abundance, and density of marine seagrass, a SCUBA point intercept survey was performed along each transect. For each transect,



the average percent (percent of sixteen 25 x 25 cm sub-units within a 1m² quadrat that contains at least one seagrass shoot) was estimated in 1m² quadrats at 10m intervals along

Figure 3 Seagrass and Hardbottom/Reef Habitat Assessment Transects

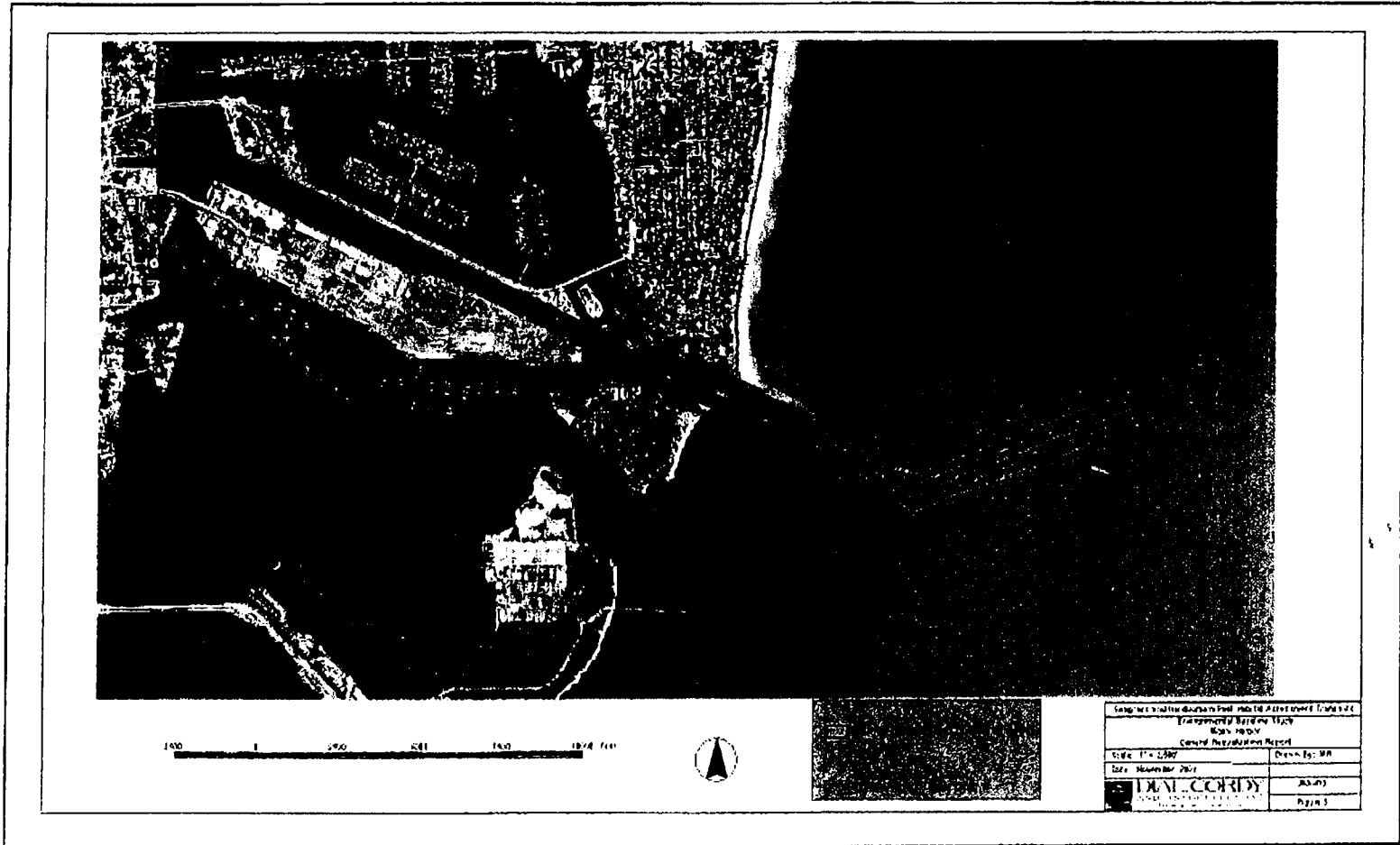


Table 1 Habitat Classification System Used for Mapping of Seagrass Species

Habitat Types	Description
<i>Halophila decipiens</i>	Monospecific bed of this species
<i>Halophila johnsonii</i>	Monospecific bed of this species
<i>Halodule wrightii</i>	Monospecific bed of this species
<i>Syringodium filiforme</i>	Monospecific bed of this species
Mixed Submerged Aquatic Vegetation	<i>S. filiforme</i> or <i>H. wrightii</i> with <i>H. decipiens</i>
Mixed Submerged Aquatic Vegetation with <i>H. johnsonii</i>	<i>S. filiforme</i> and or <i>H. wrightii</i> with <i>H. johnsonii</i>
Mixed Submerged Aquatic Vegetation with <i>H. johnsonii</i> and <i>H. decipiens</i>	<i>H. wrightii</i> with both species of <i>Halophila</i>
Unvegetated Bottom	Sand, silt or shell substrate with no seagrass or live bottom, may have marine algae present
Live-Bottom Habitat	Sponge and soft coral community over thin veneer of silty-sand

the transect line (Vimstein 1995; Fonseca et al. 1998; Braun-Blanquet 1965). Specific data recorded within each 1m² quadrat for each seagrass species present included the number of sub-units containing at least one shoot, an average cover abundance score (Braun-Blanquet 1965), a description of substrate type, and any other observations considered useful. The cover abundance scale is shown below.

Cover abundance was measured at 10m intervals beginning along each transect. The content of each quadrat was visually inspected and a cover-abundance scale value assigned to the seagrass coverage.

The scale values are:

- 0.1 = Solitary shoots with small cover
- 0.5 = Few shoots with small cover
- 1.0 = Numerous shoots but less than 5% cover
- 2.0 = Any number of shoots but with 5-25% cover
- 3.0 = Any number of shoots but with 25-50% cover
- 4.0 = Any number of shoots but with 50-75% cover
- 5.0 = Any number of shoots but with >75% cover

From the survey of quadrats along each transect, frequency of occurrence, abundance, and density of seagrass was computed as follows:

$$\begin{aligned}\text{Frequency of occurrence} &= \text{Number of occupied sub-units}/\text{total number of sub-units} \\ \text{Abundance} &= \text{Sum of cover scale values}/\text{number of occupied quadrats} \\ \text{Density} &= \text{Sum of cover scale values}/\text{total number of quadrats}\end{aligned}$$

2.1.4 Analysis and Interpretation of Seagrass Data

Distribution of seagrass community types were mapped for each transect from data collected in the field, as the potential for occurrence in an area. Frequency of occurrence, abundance, and density were calculated from the quadrat data based on Braun-Blanquet (1965) methodology.

2.2 Hardbottom and Reef Habitat Assessment

A reef and live-hardbottom assessment was conducted in the area offshore from the jetty in the federal channel to 15,000 feet offshore to verify existing resource maps and to characterize the marine resources in the study area. To verify the accuracy of existing reef and hardbottom maps (e.g., those of Continental Shelf Associates, 1993), towed underwater video (J.W. Fishers TOV-1™) in conjunction with DGPS was used to record and mark the occurrence of hardbottom and

3.0 ENVIRONMENTAL BASELINE

This section includes a description and review of the results of the marine resources survey. It outlines the findings of the seagrass community survey, including species occurrence, abundance, and density. It also addresses reef and hardbottom community distribution, species profiles, the presence of EFH, and occurrence records of protected marine plants and mammals. A summary of field data is located in Appendix B, while a list of persons contacted and pertinent correspondence is contained in Appendix A.

3.1 Seagrass Communities

Seagrass habitat cover type, abundance, and density for the study area are described below. Distribution and occurrence observations range from approximately 400 feet south of Fisherman's Channel, including the area of the CWA, and the area adjacent to the Coast Guard Station north of the entrance channel at the southern tip of Miami Beach (Figure 4).

3.1.1 Quantitative Measures

Marine seagrass species observed within the study area included *Halodule wrightii*, *Halophila decipiens*, *Syringodium filiforme* and *Thalassia testudinum*. Of the 35 transects surveyed (Figure 3), marine seagrass species were observed at 25 transects. A summary of occurrence records for each transect where seagrass is found in Table 3. Seagrass occurrence in these areas consisted of mixed Submerged Aquatic Vegetation (SAV) with *H. decipiens* and *H. wrightii*, mixed SAV with *H. wrightii*, and *T. testudinum*, mixed SAV of *T. testudinum* and *S. filiforme*, mixed beds of all species and, monospecific beds of *T. testudinum*, and monospecific beds of *H. decipiens*. No *H. johnsonii* was observed while surveying the 35 transects.

Frequency of Occurrence. *S. filiforme* had a range of occurrence values between 0 to 82 percent with a mean of 36 percent over the study area. *H. wrightii* occurred within 16 of the 35 transects sampled. Frequency of occurrence values ranged from 0 to 52 percent with a mean of 29 percent. *H. decipiens* occurred within 7 transects sampled. Frequency of occurrence for *H. decipiens* values ranged between 0 to 38 percent with a mean of 15 percent. In comparison, *T. testudinum* occurred within 15 transects surveyed, with a range of 0 to 50 percent and a mean of 19 percent.

Figure 4 Seagrass Distribution

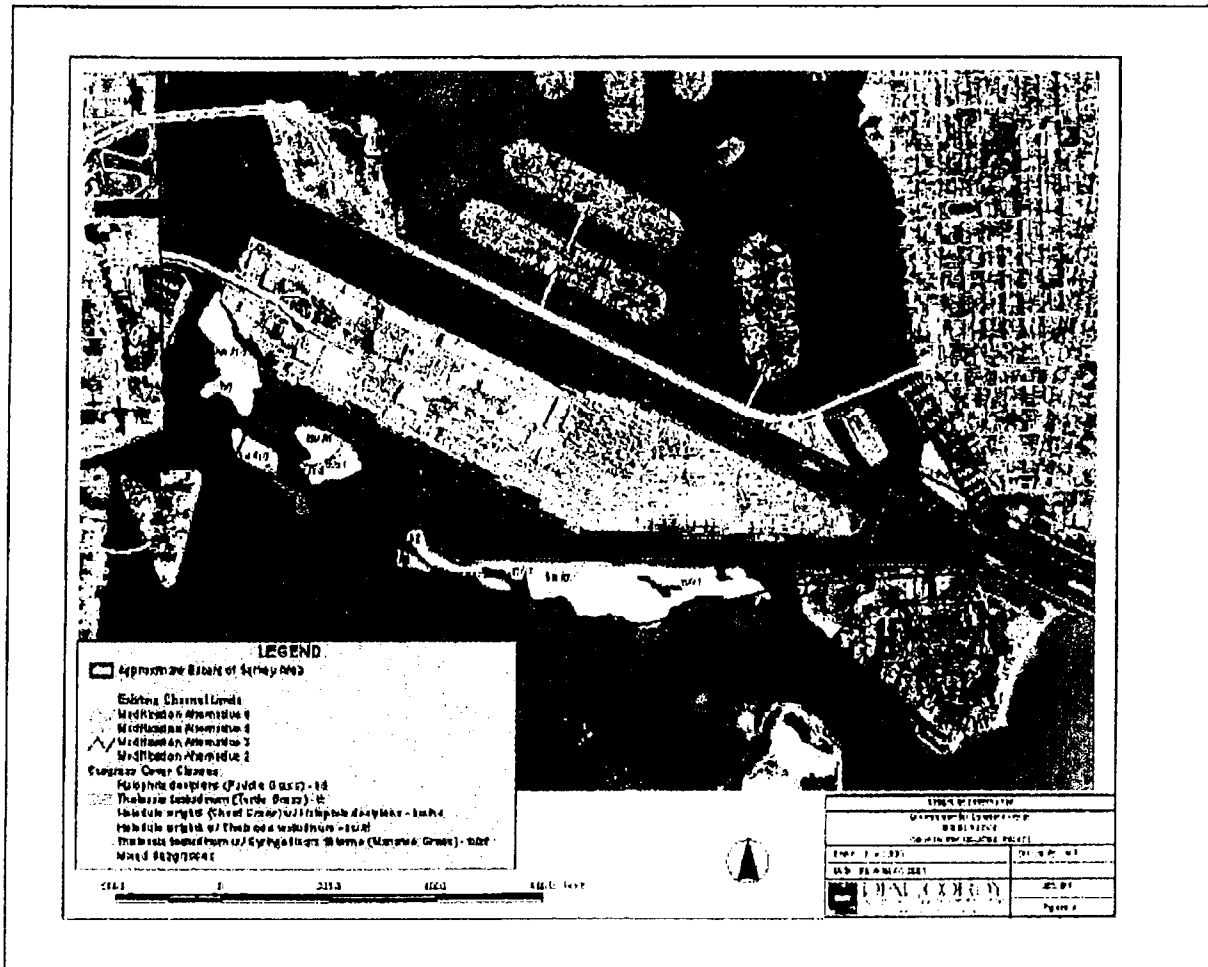


Table 3 Seagrass Frequency of Occurrence, Abundance, and Density Values for Miami Harbor Survey Transects

Transect	Frequency of Occurrence				Abundance				Density			
	<i>Halodule wrightii</i>	<i>Halophila decipiens</i>	<i>Thalassia testudinum</i>	<i>Syringonium filiforme</i>	<i>Halodule wrightii</i>	<i>Halophila decipiens</i>	<i>Thalassia testudinum</i>	<i>Syringonium filiforme</i>	<i>Halodule wrightii</i>	<i>Halophila decipiens</i>	<i>Thalassia testudinum</i>	<i>Syringonium filiforme</i>
F4	-	-	-	-	-	-	-	-	-	-	-	-
F5	-	-	0.1000	0.6000	-	-	4.0000	3.0000	-	-	0.8000	1.8000
F6	-	-	0.2500	0.5000	-	-	3.0000	3.5000	-	-	0.2500	0.5000
F7	-	-	0.2500	0.2969	-	-	2.0000	3.0000	-	-	0.5000	1.5000
F8	-	-	0.1667	0.5417	-	-	2.0000	3.7500	-	-	0.3333	2.5000
F9	-	-	0.4000	0.5250	-	-	3.5000	2.5250	-	-	1.4000	2.0200
F10	-	-	0.5000	0.2500	-	-	2.6667	3.0000	-	-	2.0000	0.7500
F11	-	0.1000	-	-	-	0.7500	-	-	-	0.3000	-	-
F12	0.1750	0.0500	0.2500	0.0500	3.0000	1.0000	1.5000	0.5000	0.6000	0.2000	0.6000	0.1000
F13	0.0625	-	0.0625	-	1.0000	-	1.0000	-	0.2500	-	0.2500	-
F14	-	-	-	0.3375	-	-	-	3.5000	-	-	-	1.4000
F15	0.5250	-	-	0.3375	4.3333	-	-	3.5000	2.6000	-	-	1.4000
F16	-	-	0.0625	0.5000	-	-	1.2500	3.5000	-	-	0.6250	1.7500
F17	-	-	-	-	-	-	-	-	-	-	-	-
B1	0.1667	0.1667	-	-	4.0000	4.0000	-	-	0.6670	0.6670	-	-
B2	0.2000	-	0.3000	-	5.0000	-	3.0000	-	1.0000	-	1.2000	-
B3	0.2000	0.2875	-	0.0063	4.0000	2.8000	-	0.0100	0.8000	1.4000	-	0.0100
B4	0.2153	0.3472	0.0833	-	2.1250	2.5000	3.0000	-	0.9444	1.3889	0.3333	-
B5	0.0179	0.3839	-	-	0.5000	2.1000	-	-	0.0714	1.5000	-	-
B6	-	-	-	-	-	-	-	-	-	-	-	-
B7	0.1339	-	-	0.2857	4.0000	-	-	5.0000	0.5714	-	-	1.4286
B8	-	-	-	-	-	-	-	-	-	-	-	-
B9	-	-	-	-	-	-	-	-	-	-	-	-
B10	-	-	-	-	-	-	-	-	-	-	-	-

Transect	Halodule wrightii	Halophila decipiens	Thalassia testudinum	Syringonium filiforme	Halodule wrightii	Halophila decipiens	Thalassia testudinum	Syringonium filiforme	Halodule wrightii	Halophila decipiens	Thalassia testudinum	Syringonium filiforme
	Frequency of Occurrence				Abundance				Density			
MB1	0.3889	-	-	-	3.5000	-	-	-	2.3330	-	-	-
MB2	-	-	-	-	-	-	-	-	-	-	-	-
MB3	0.0568	0.0682	-	-	1.5500	3.0000	-	-	0.2818	0.2727	-	-
MB4	-	-	-	-	-	-	-	-	-	-	-	-
1A	0.2727	-	-	-	1.6250	-	-	-	0.5909	-	-	-
2A	-	-	-	-	-	-	-	-	-	-	-	-
3A	-	-	-	-	-	-	-	-	-	-	-	-
4A	0.2768	-	-	-	2.0000	-	-	-	0.5714	-	-	-
6A	0.0313	-	0.1719	0.3125	0.5000	-	3.0000	2.1250	0.0625	-	0.7500	1.0625
7A	0.2500	-	0.0179	0.8214	3.0000	-	0.5000	3.8333	0.8571	-	0.1429	3.2870
8A	0.1042	-	0.2639	0.5278	0.6667	-	2.8333	3.0000	0.2222	-	0.9444	1.6667

*= not detected

Note: Transects initially labeled F1, F2, F3, and 5A were determined to be outside of the study area and, therefore, were not surveyed.

Abundance. Abundance is expressed as a sum of the cover abundance scores divided by the number of quadrats where the specific species was assigned a score. Scores range from 0 to 5, where 1.0 is <5 percent cover, 2.0 is 5 to 25 percent cover, 4.0 is 50 to 75 percent cover, and 5.0 is >75 percent cover.

S. filiforme had the highest mean abundance within the study area (2.82). The range of abundance values ranged from 0 to 5 at the 14 transects where *S. filiforme* occurred. *H. wrightii* abundance values ranged from 0 to 5 over transects sampled with a mean of 2.67. *T. testudinum* occurred within 15 transects and had a mean abundance of 2.5, while *H. decipiens* had the lowest abundance values in the survey area with a mean value of 2.24 and a range of 0 to 4.

Density. Density is expressed as the sum of the cover abundance scores divided by the total quadrats sampled. When compared to abundance values, density values are very low compared to abundance because values are averaged across all quadrats within each transect, rather than only at occupied quadrats.

Across all transects sampled *S. filiforme* had the highest density (1.41). Density values for *S. filiforme* ranged from 0 to 3.27. In comparison, *H. wrightii* had density values ranging from 0 to 2.6 with a mean of 1.14. *T. testudinum* and *H. decipiens* both had relatively low density values (0.74 and 0.59).

3.1.2 Flora and Fauna Associated with Seagrasses

Seagrass communities provide important habitat for many different species of flora and fauna. *Caulerpa prolifera* was observed in video transects of *H. wrightii*, and algae of the genera *Halimeda*, *Udotea*, and *Penicillus* have also been listed as associates of seagrasses in southeastern Florida (Zieman, 1982). Many invertebrate species also utilize seagrass communities. The most obvious inhabitants include the queen conch (*Strombus gigas*), urchins including the long spine urchin (*Diadema antillarum*), nudibranchs, bivalve mollusks, and crustaceans including the spiny lobster (*Panulirus argus*), and the blue crab (*Callinectes sapidus*). In some shallow seagrass areas, various soft corals and sponges were observed scattered within and adjacent to seagrass beds (see species listed in Section 3.2). Many fish species have also been shown to have life cycles dependent on seagrass beds. Of particular importance are the mullet (*Mugil cephalus*), snook (*Centropomus undecimalis*), and many prey species including mojarras and pinfish. Seagrass beds are also important nurseries for many of the fish associated with SAFMS Snapper-Grouper Complex (SAFMC 1998b).

B5	7	1	112	2	0.5	HW	0.0179	0.5000	0.0714
B7	7	1	112	15	4	HW	0.1339	4.0000	0.5714
B3	10	1	160	1	0.1	SF	0.0063	0.1000	0.0100
B7	7	2	112	32	10	SF	0.2857	5.0000	1.4286
B2	5	2	80	24	6	TT	0.3000	3.0000	1.2000
B4	9	1	144	12	3	TT	0.0833	3.0000	0.3333
B6									
B8									
B9									
B10									
ALT 3									
Transect	Total Quadrats	Occupied Quadrats	Sub Units	Occupied Sub Units	Sum Cover Score	Species	Frequency	Abundance	Density
MB3	11	1	176	12	3	HD	0.0682	3.0000	0.2727
MB1	9	6	144	56	21	HW	0.3889	3.5000	2.3333
MB3	11	2	176	10	3.1	HW	0.0568	1.5500	0.2818
MB2									
MB4									
ALT 5/6									
Transect	Total Quadrats	Occupied Quadrats	Sub Units	Occupied Sub Units	Sum Cover Score	Species	Frequency	Abundance	Density
1A	11	4	176	48	6.5	HW	0.2727	1.6250	0.5909
2A									
3A									
4A*	7	2	112	31	4	HW	0.2768	2.0000	0.5714
Manatee zone									
Transect	Total Quadrats	Occupied Quadrats	Sub Units	Occupied Sub Units	Sum Cover Score	Species	Frequency	Abundance	Density
6A	8	1	128	4	0.5	HW	0.0313	0.5000	0.0625
7A	7	2	112	28	6	HW	0.2500	3.0000	0.8571
8A	9	3	144	15	2	HW	0.1042	0.6667	0.2222
6A	8	4	128	40	8.5	SF	0.3125	2.1250	1.0625
7A	7	6	112	92	23	SF	0.8214	3.8333	3.2857
8A	9	5	144	76	15	SF	0.5278	3.0000	1.6667
6A	8	2	128	22	6	TT	0.1719	3.0000	0.7500
7A	7	2	112	2	1	TT	0.0179	0.5000	0.1429
8A	9	3	144	38	8.5	TT	0.2639	2.8333	0.9444

APPENDIX E

FINAL RECOVERY PLAN

for

JOHNSON'S SEAGRASS

(*Halophila johnsonii* Eiseman)

prepared by the

Johnson's Seagrass Recovery Team

for the

**National Marine Fisheries Service
National Oceanic and Atmospheric Administration**

September 2002

Approved:

William T. Skyrath

National Marine Fisheries Service

National Oceanic and Atmospheric Administration

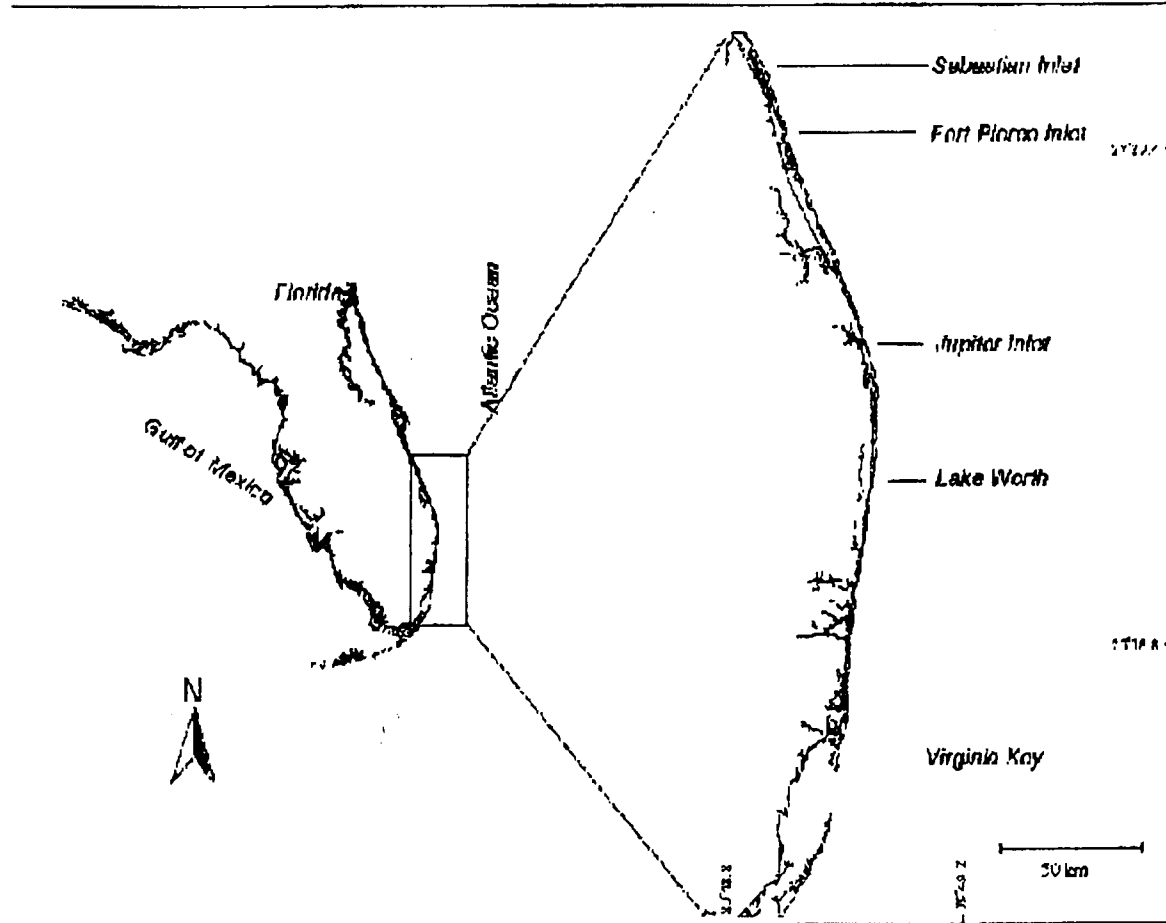


Figure 2 Geographic range of *Halophila johnsonii*: Sebastian Inlet to northern Virginia Key (Kenworthy 1997).

17786 Federal Register / Vol. 65, No. 66 / Wednesday, April 5, 2000 / Rules and Regulations

Assessment or Environmental Impact Statement, as defined under the authority of the National Environmental Policy Act of 1969 in connection with regulations adopted under section 4(a) of the Endangered Species Act, as amended. A notice outlining our reasons for this determination was published in the Federal Register on October 25, 1983 (48 FR 49244).

Required Determinations

This rule does not contain any new collections of information other than those already approved under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq., and assigned Office of Management and Budget clearance number 1018-0094. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a

currently valid OMB control number. For additional information concerning permit and associated requirements for threatened species, see 50 CFR 17.32.

References Cited

A complete list of all references cited herein, as well as others, is available upon request from the Snake River Basin Office (see ADDRESSES above).

Author

The primary author of this proposed rule is Richard Howard, U.S. Fish and Wildlife Service, Snake River Basin Office (see ADDRESSES section).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and record keeping requirements, Transportation.

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

PART 17--[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500; unless otherwise noted.

2. Amend §17.11(h) by adding the following, in alphabetical order under MAMMALS, to the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

(h) * * *

Table with 8 columns: Species (Common name, Scientific name), Historic range, Vertebrate population where endangered or threatened, Status, When listed, Critical habitat, Special rules. Row 1: Ground squirrel, northern Idaho. Scientific name: Spermophilus brunneus brunneus. Historic range: U.S.A. (ID). Status: T. When listed: 693. Critical habitat: NA. Special rules: NA.

Dated: March 29, 2000.

Jamie Rappaport Clark, Director, Fish and Wildlife Service. [FR Doc. 00-8346 Filed 4-4-00; 8:45 am] BILLING CODE 4310-55-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 228

[Docket No. 991116305-0083-02; I.D. No. 110599D][A]

RIN 0648-AL82

Designated Critical Habitat: Critical Habitat for Johnson's Seagrass

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: NMFS is designating critical habitat for Johnson's seagrass (Halophila johnsonii) pursuant to section 4 of the Endangered Species Act (ESA). Johnson's seagrass is found on the east coast of Florida from Sebastian Inlet to

central Biscayne Bay. Within this range, 10 areas are being designated as critical habitat: a portion of the Indian River Lagoon, north of the Sebastian Inlet Channel; a portion of the Indian River Lagoon, south of the Sebastian Inlet Channel; a portion of the Indian River Lagoon near the Fort Pierce Inlet; a portion of the Indian River Lagoon, north of the St. Lucie Inlet; a portion of Hobe Sound; a site on the south side of Jupiter Inlet; a site in central Lake Worth Lagoon; a site in Lake Worth Lagoon, Boynton Beach; a site in Lake Wyman, Boca Raton; and a portion of Biscayne Bay. NMFS is modifying various aspects of the proposed rule, including the removal as critical habitat of the Intracoastal Waterway (ICW) channel in the designated areas, and enlarging the Lake Wyman site.

The designation of critical habitat provides explicit notice to Federal agencies and the public that these areas and features are vital to the conservation of the species.

DATES: This rule is effective May 5, 2000.

FOR FURTHER INFORMATION CONTACT: Layne Bolen, NMFS, Southeast Region, 850-234-6541 ext 237, or Marta

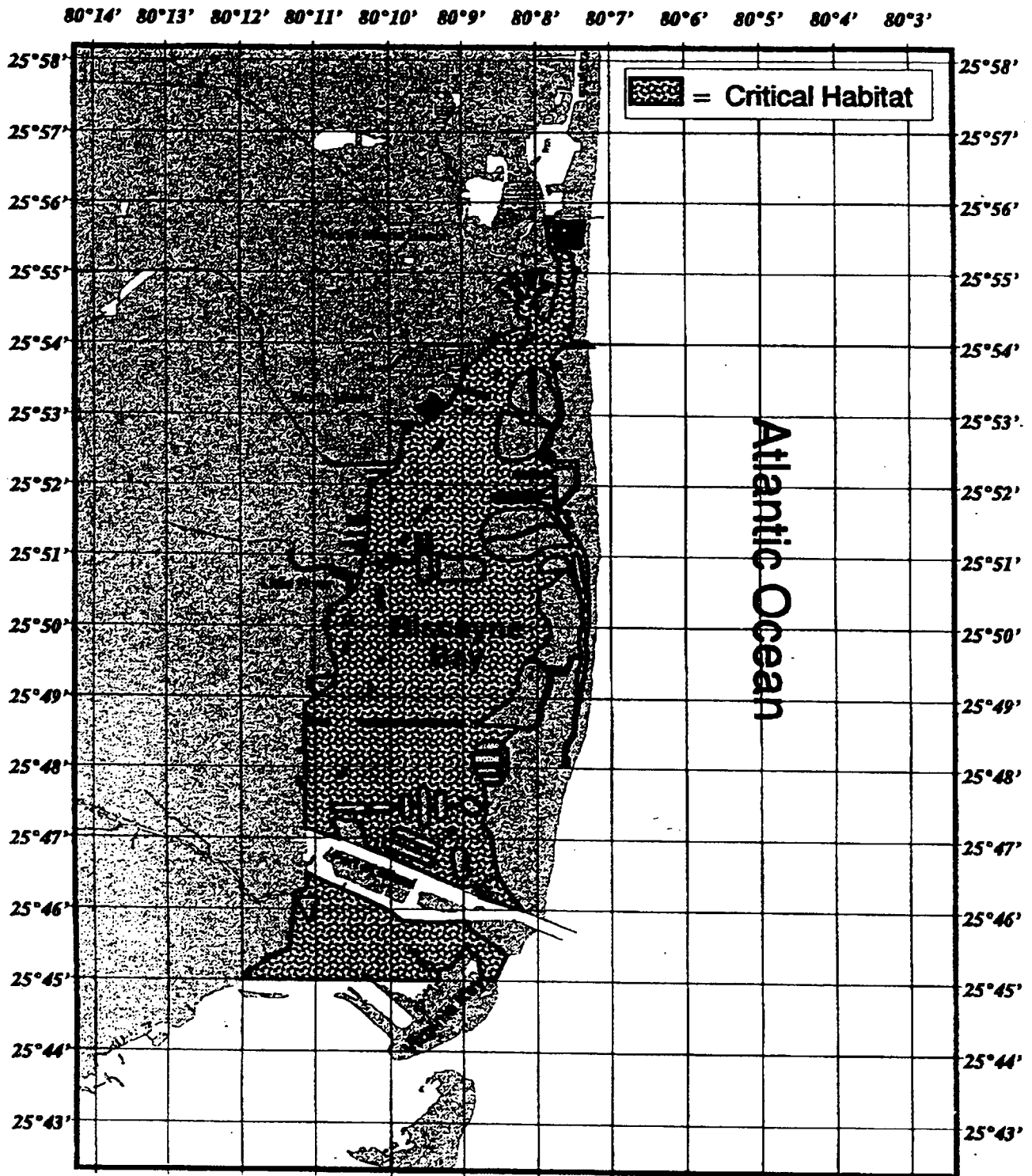
Nammack, NMFS, Office of Protected Resources, 301-713-1401.

SUPPLEMENTARY INFORMATION:

Background

NMFS published a proposed rule to list Johnson's seagrass as a threatened species on September 15, 1993 (58 FR 48326), and a proposed rule to designate critical habitat on August 4, 1994 (59 FR 39716). A public hearing on both the proposed listing and critical habitat designation was held in Vero Beach, Florida, on September 20, 1994. As a result of public input during the comment period, NMFS postponed further action on listing. In order to update the original status report (Kenworthy, 1993) and to include information from new field and laboratory research on species distribution, ecology, genetics and phylogeny, NMFS convened a workshop on the biology, distribution, and abundance of H. johnsonii. The results of this workshop were summarized in the proceedings (Kenworthy, 1997) submitted to NMFS on October 15, 1997. NMFS reopened the comment period for the proposed listing on April 20, 1998 (63 FR 19468). The final rule to list Johnson's seagrass as a threatened

Figure 9



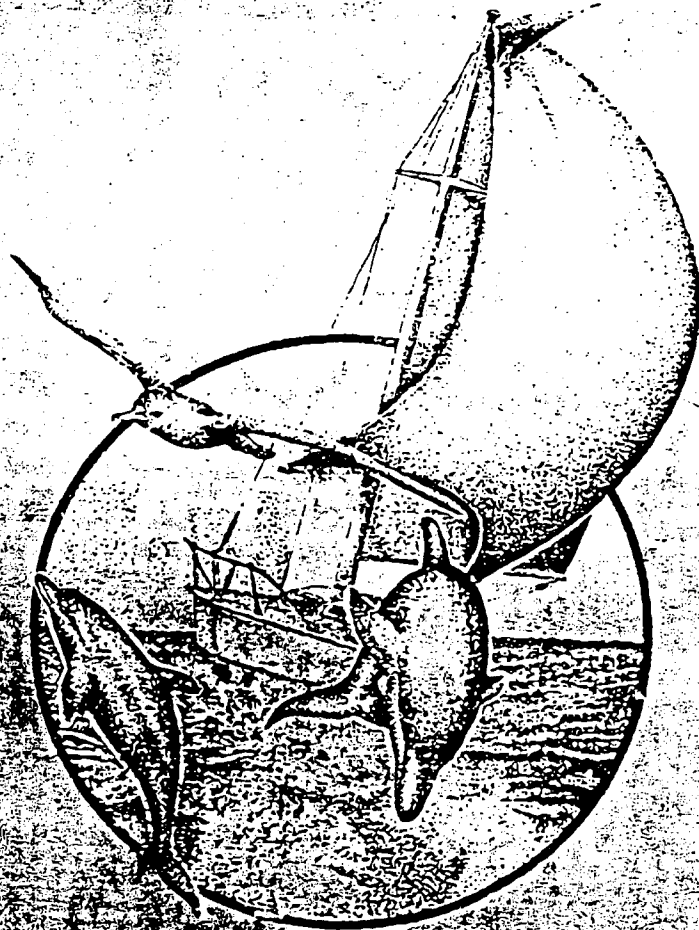
APPENDIX F

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Dept. of Natural Resources
Div. of State Lands Southeast
Florida Field Office



BISCAYNE BAY AQUATIC PRESERVATION MANAGEMENT PLAN

DRAFT



Biscayne Bay. The larvae of mollusks also represent a significant portion, averaging about 22 to 36 percent of the Bay zooplankton (Roman et al., 1983). These animals which graze on phytoplankton or plant detritus, are the principal sources of food for planktonic fish larvae found in Biscayne Bay (Houde and Lovdal, 1984).

*Houde and Lovdal (1984) sampled planktonic fish larvae at a station in Unit VIII west of Key Biscayne. At this location, larvae of clupeids (herrings, sardines and pilchards), anchovies, dragonets, and gobies accounted for approximately 65 percent of all fish larvae collected. According to the authors, it is likely that other types of fish that inhabit the Bay as juveniles or adults may spawn offshore, and their offspring may enter the Bay at a post larval stage in their life cycles. Total numbers of fish eggs and larvae were greatest in the spring and summer, coinciding with seasons of high phytoplankton and zooplankton abundance.

BENTHIC COMMUNITIES

Seagrasses found within the APMA include turtle grass (Thalassia testudinum) with ribbon-like leaves; manatee grass (Syringodium filiform) with long, thin round leaves; shoal grass (Halodule wrightii) with narrow flat leaves; and a species of Halophila which are ephemeral grasses with flat, elongated paired leaves. The amount of light, photoperiod, temperature, salinity and sedimentary environments control the growth and distribution of seagrasses. These grasses, together with several species of green, red and brown algae make up benthic plant communities in Biscayne Bay.






Sunlight is the major driving mechanism in the photosynthetic process and is essential to seagrass and algal growth. In the shallow Bay system, the amount of light that is able to penetrate the water column is generally controlled by the clarity of the water column rather than the depth of the water, except in deep dredged areas. As noted previously, water clarity in the Bay is strongly influenced by the re-suspension of fine particles that are largely derived from deposited spoil material, eroding margins of dredged cuts and unconsolidated shorelines. Blooms of tiny plants and algae within the water column also decrease water clarity, but to a much lesser extent than re-suspended inorganic particles (Wanless et al., 1984).

BENTHIC COMMUNITY DISTRIBUTION

Turtle grass predominates in central and south Bay, generally outside of the APMA. Turtle grass growth is generally most dense in areas where there is more than six inches of sand, mud, or muddy sand sediment and where light penetration is not a limiting factor. Offshore from Chapman Field north to the Kickenbacker Causeway is a mixture of seagrasses together with local assemblages of algae covering the rocky areas covered by Hard Bay Algae (1984) (Figure 16). Along the Bayward margin of this rocky grass area is a strip of shoal grass. The middle of the APMA is green even though this area has not been dredged (Figure 31).



FIGURE 31
CPMA BENTHIC COMMUNITIES
UNIT VIII

-  SEAGRASSES
-  ALGAE/SEAGRASS
-  BARREN (DREDGED)
-  BARREN (UNDREDGED)
-  HARDBOTTOM COMMUNITY

SOURCE: METRO-DADE DERM (1983c.)

On the eastern side of the CPMA mixed seagrasses predominate off the south-west point of Key Biscayne over quartz-carbonate beach sands, and turtle grass dominates to the south and slightly west of Crandon Marina over a similar sedimentary environment. As noted previously, a mixed seagrass bed is developing on the flood delta at Bear Cut.

In summary, the CPMA is covered with 16 percent turtle grass, 47 percent mixed grasses, six percent shoal grass, and three percent algae mixed with seagrass. Twenty-three percent of this area is either dredged or natural barren bottom, and four percent of the area to the east and north of Chicken Key constitutes a hard bottom community where sponges, soft corals, and filtering organisms predominate (Metro-Dade County Planning Department, 1984).

In the NPMA area manatee and shoal grasses predominate wherever light penetration is sufficient to permit plant growth. Species of Halophila are found sporadically in north Bay frequently associated with dredged or nearly barren areas (Metro-Dade County DERM, 1983c). While manatee and shoal grasses are the dominant benthic plants in the NPMA, they comprise slightly less than 24 percent (approximately six and one-quarter square miles) of the total Bay bottom in that area. These grasses together with algae cover an additional eight and one-half percent of the Bay bottom. Thirteen square miles (49 percent) of the NPMA are dredged and barren, and an additional four and one-quarter square miles are naturally barren (Metro-Dade County Planning Department, 1984) (Figures 32, 33 and 34).

As discussed previously, the most extensive and noteworthy grass-algal beds in north Bay are located in Unit III north of the Julia Tuttle Causeway, and on both sides of the Intracoastal Waterway south of Little River adjacent to Bay Point. Other extensive grass beds are located on the lee side of Virginia Key, adjacent to the channel south of the Port, on both sides of the Intracoastal Waterway north of the Rickenbacker Causeway, and south of the Julia Tuttle Causeway on the mainland side bordering the Intracoastal Waterway and on the island side west of Meloy Channel. Further north mixed grasses and algae are found east of the Intracoastal Waterway about one half mile due east of Biscayne Canal and in the undredged areas south of Biscayne Canal.

SEAGRASS REVEGETATION

In October 1980 the Corps of Engineers issued a dredge and fill permit for expansion of the Port of Miami facilities in Biscayne Bay. As a special permit condition the Seaport was required to plant 251 acres of unvegetated or sparsely vegetated Biscayne Bay bottom with the seagrasses to mitigate for damage done to 81 acres of grass beds during the seaport expansion. About two million dollars was allocated for the seagrass planting and monitoring.

Between January and October 1982, 25 acres near Mercy Hospital and 13 one-acre test plots were planted within the APMA. Each of the 13 acre test plots was subdivided into six subplots. In general, two of the subplots were planted in Syringodium shoots, two were planted in Halodule shoots, one was planted in Thalassia shoots, and one was planted in Thalassia seeds. Survival rates were measured about a year after the

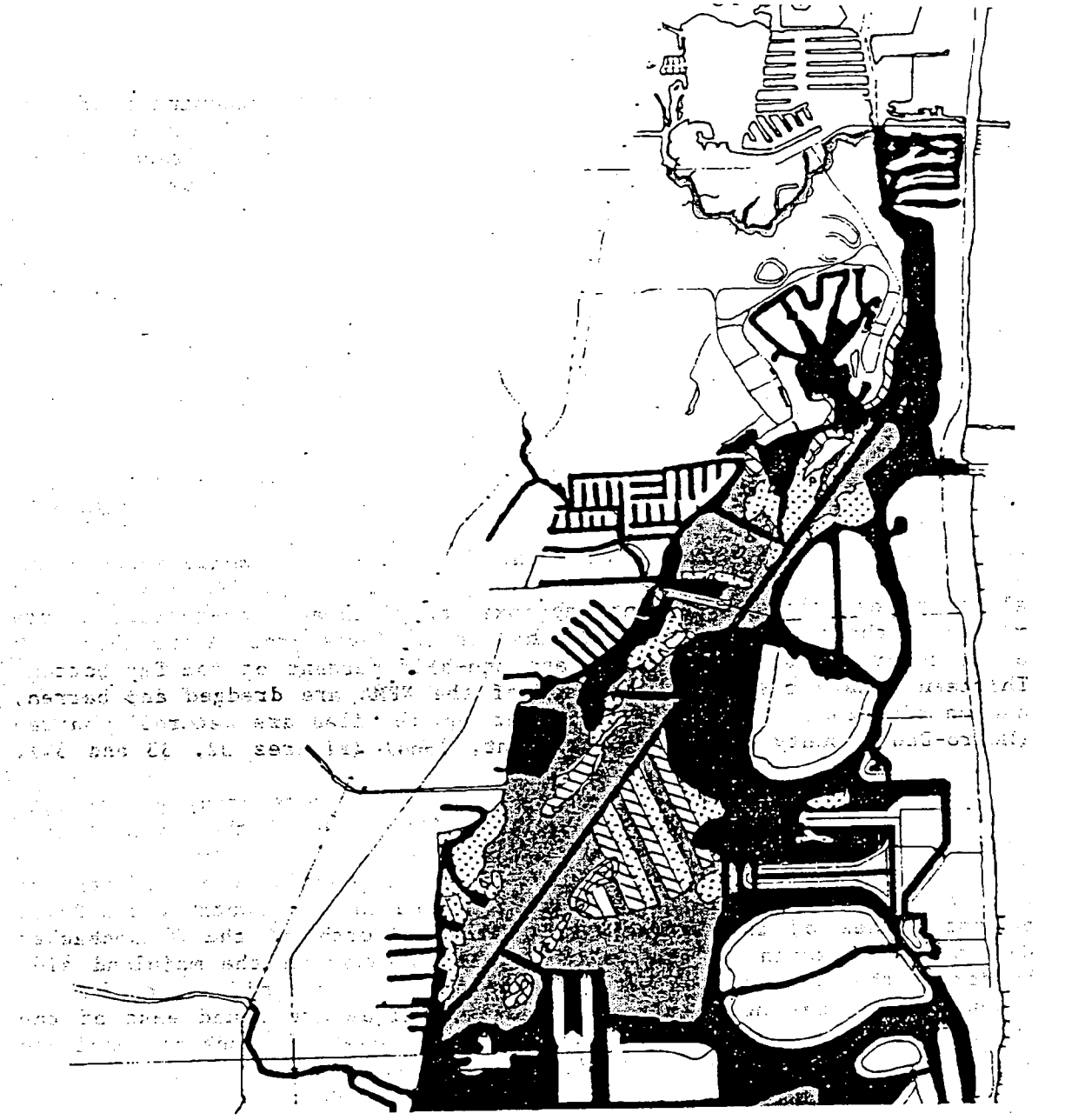






FIGURE 32
NPMA BENTHIC COMMUNITIES
UNITS II

-  SEAGRASSES
-  ALGAE/SEAGRASS
-  BARREN (DREDGED)
-  BARREN (UNDREDGED)

SOURCE: METRO-DADE DERM (1983c)

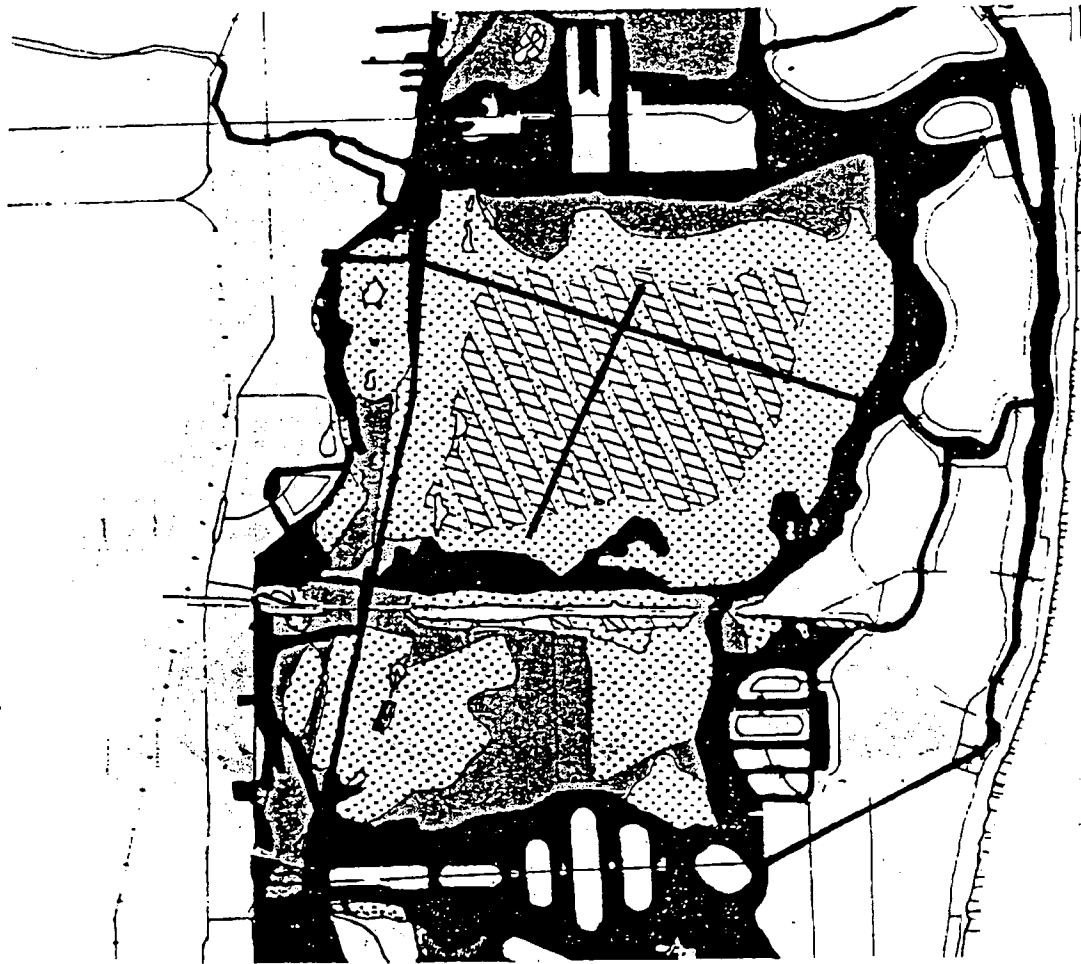
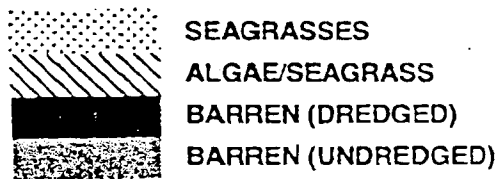


FIGURE 33
NPMA BENTHIC COMMUNITIES
UNITS III-IV



SOURCE: METRO-DADE DERM (1983c.)

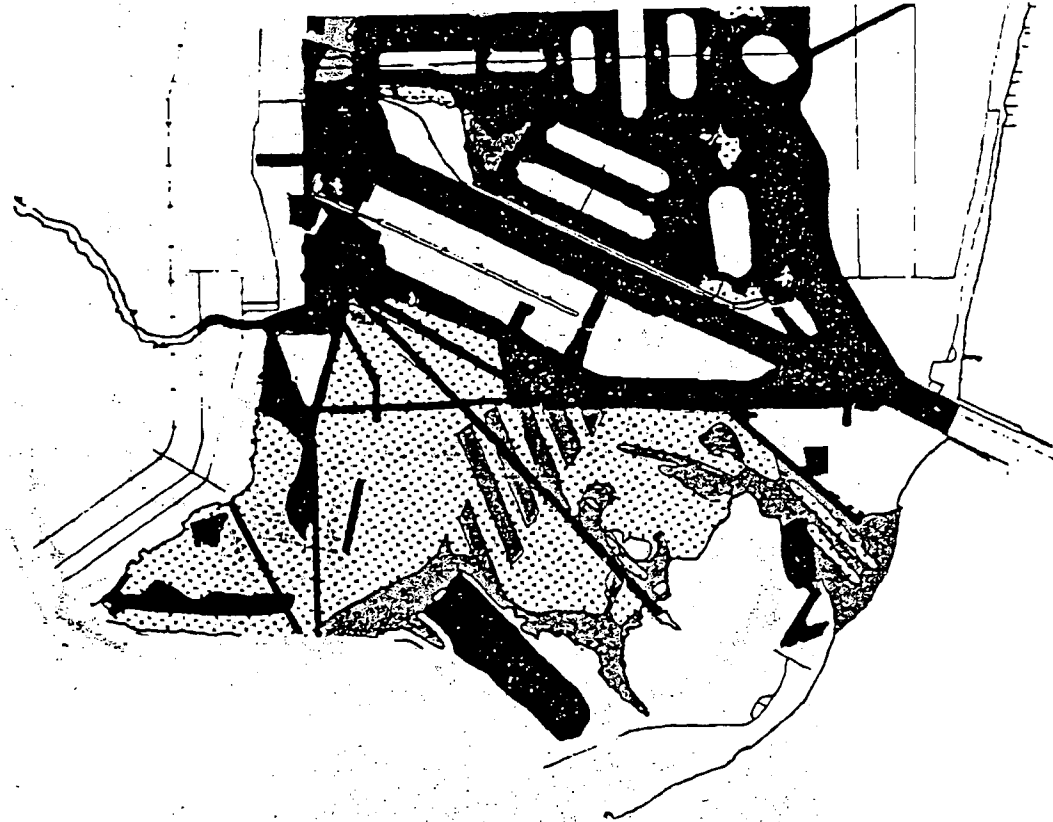
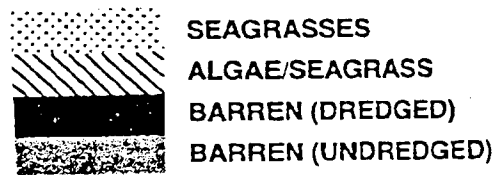


FIGURE 34
NPMA BENTHIC COMMUNITIES
UNITS V-VII



SOURCE: METRO-DADE DERM (1983c.)

APPENDIX G

Table 1. Fishes occurring in Biscayne Bay which are valuable as aquarium fishes.

Blue striped grunt	<i>Haemulon sciurur</i>
Parrotfish	<i>Pseudoscopus coelestinus</i>
Rainbow parrotfish	<i>Pseudoscopus guacamaia</i>
Green parrotfish	<i>Sparisoma viride</i>
Blue parrotfish	<i>Scarus caeruleus</i>
Striped goby	<i>Garmania macrodon</i>
Fat goby	<i>Gobiosoma robustum</i>
Whitehurst's jewfish	<i>Opisthognathus whithursti</i>
Pike blenny	<i>Chaenopsis ocellata</i>
Hairy blenny	<i>Labrisomus nuchipinnis</i>
Marbled clinid	<i>Paraclinus marmoratus</i>
Banded clinid	<i>Paraclinus rasciatus</i>
Sea robin	<i>Prinotus scitulus</i>
Clingfish	<i>Gobiesox strumosus</i>
Cowfish	<i>Lactophrys tricornis</i>
Smooth trunkfish	<i>Lactophrys trigonus</i>
Brown demoiselle	<i>Pomacentrus fuscus</i>
Mapo	<i>Bathygobius soporator</i>
Blue tang	<i>Acanthurus caeruleus</i>
Ocean Surgeon	<i>Acanthurus bahianus</i>
Doctor fish	<i>Acanthurus chirurgus</i>
Fringed filefish	<i>Monacanthus hispidus</i>
Hairy filefish	<i>Monacanthus ciliatus</i>
Spiny boxfish	<i>Chilomycterus schoepfi</i>
Queen angelfish	<i>Holacanthus ciliatus</i>
Blue angelfish	<i>Holacanthus isabellita</i>
Black angelfish	<i>Holacanthus aureus</i>
French angelfish	<i>Holacanthus paru</i>
Foureyed butterflyfish	<i>Chaetodon ocellatus</i>
Butterflyfish	<i>Chaetodon capistratus</i>
Butterflyfish	<i>Chaetodon striatus</i>
Two lined cardinalfish	<i>Apogon binotatus</i>
Spotted cardinalfish	<i>Apogon maculatus</i>
False spotted cardinalfish	<i>Apogon pseudomaculatus</i>
Conchfish	<i>Apogonichthys stellatus</i>
Variegated wrasse	<i>Halichoeres garnoti</i>
Pudding wife	<i>Halichoeres radiata</i>
Blue head	<i>Thalassoma bifasciatum</i>
Dwarf wrasse	<i>Doratonotus megalepis</i>
Dusky squirrelfish	<i>Holocentrus vexillarius</i>
Sergeant major	<i>Abudefduf saxatilis</i>
Rock sergeant	<i>Abudefduf taurus</i>
Spotted moray	<i>Gymnothorax moringa</i>
Green moray	<i>Gymnothorax funebris</i>
Round stingray	<i>Urolophus jamaicensis</i>
Spotted moray	<i>Gymnothorax nigromarginatus</i>
Dwarf seahorse	<i>Hippocampus zosterae</i>
Smooth puffer	<i>Spheroides spengleri</i>
