RAI 3-4 CR Seagrass Technical Advisory Committee Final Report

FINAL REPORT
OF
SEAGRASS TECHNICAL ADVISORY COMMITTEE

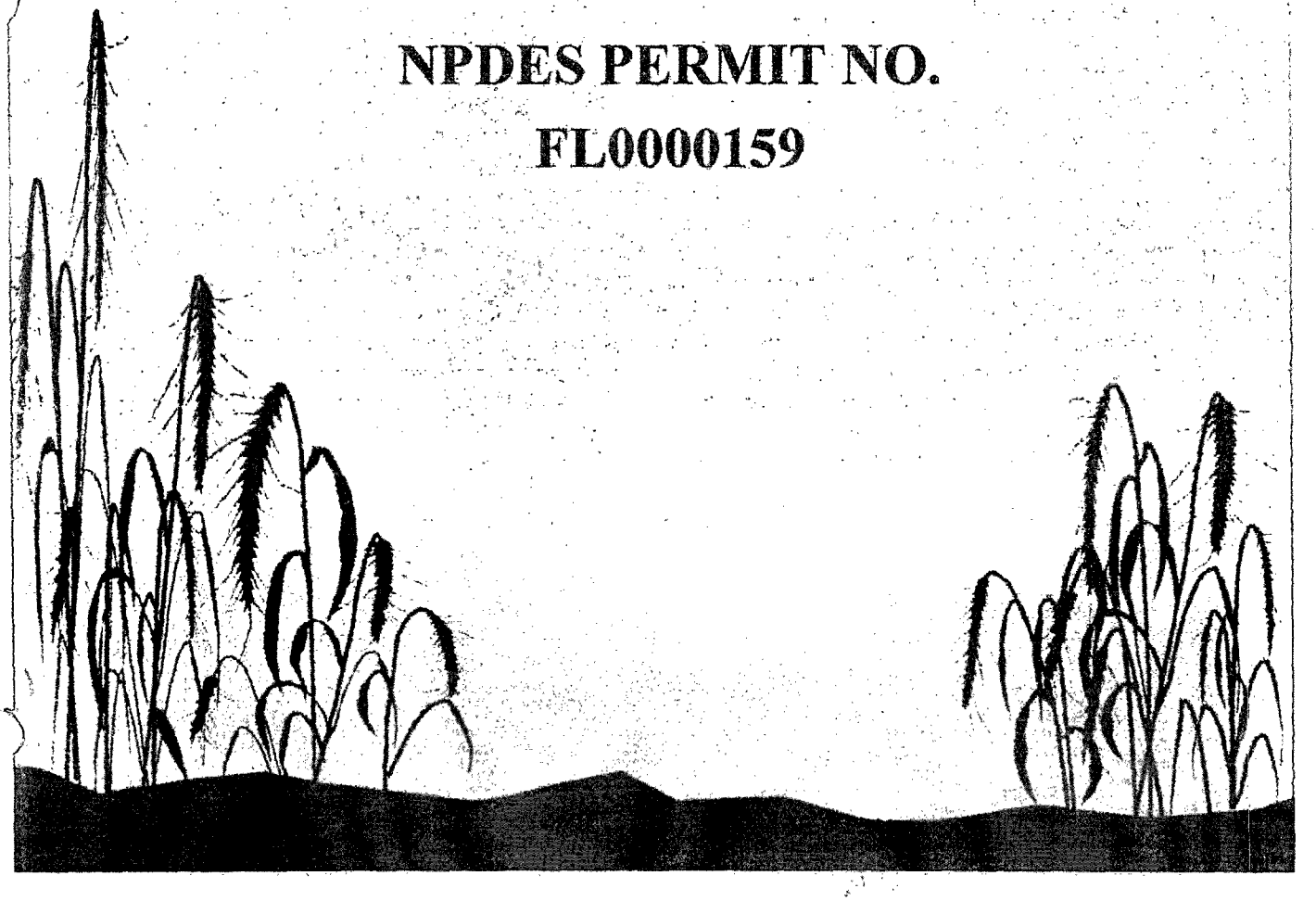
Submitted By

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNITS 1, 2, 3

NPDES PERMIT NO.

FL0000159



The Florida Power Corporation's (FPC) Crystal River Energy Complex is located on the west coast, approximately 1.5 miles from the shore of the Gulf of Mexico. Approximately 2.5 miles north of the site are the mouths of the Withlacoochee River and the Cross Florida Barge Canal.

NPDES Permit No. FL0000159 currently authorizes the discharge of industrial wastewater from Units 1, 2 and 3. Unit 1 began commercial operation in October 1966, Unit 2 in November 1969. On December 31, 1974, EPA issued an NPDES permit for the operation of Units 1, 2 and 3 which required offstream cooling subject to consideration of a variance and alternative thermal limits under Section 316 of the Clean Water Act. Subsequently, Unit 3 began commercial operation in March 1977.

The thermal component of the discharge from the facility was subject to the water quality standards specified in Section 17-3.050 FAC. The rule required that thermal discharges "shall not increase the temperature of the receiving body of water (RBW) so as to cause substantial damage or harm to the aquatic life or vegetation therein or interfere with the beneficial uses assigned to the RBW". During renewal of the NPDES (and state Industrial Wastewater) permit in 1979, and in accordance with Section 316 and Section 17-3, EPA and the FDEP required post-operational biological and thermal studies in order to make a determination of the need for offstream cooling, reduced thermal discharge and/or reduced intake flow. Following the completion of the 316 (a) and (b) studies in 1984, the EPA and the FDEP issued a public notice of determination that "substantial damage" had occurred in approximately 1100 acres of Crystal Bay, primarily due to the thermal discharge from the facility. Subsequently, in accordance with Section 17-3.05(1)(a)(3), FAC, the agencies imposed permit limitations on the thermal component of the discharge consistent with off-stream cooling. The EPA and FDEP agreed that offstream cooling would subsequently satisfy the requirements of the Florida Water Quality Standards and Sections 316 (a) and (b) of the Act. FPC disagreed with the conclusions made from the study. Specifically, FPC questioned if seagrass was ever actually present in the area, the extent of the area identified as affected and if the thermal discharge from the site resulted in substantial damage in the area to plants and animals. In February 1987, FPC initially proposed to extend the discharge canal into deeper water as an alternative to off-stream cooling towers. Following rejection of the initial proposal, FPC offered a second proposal in 1988 which included the construction of helper cooling towers.

In 1989, following several years of testimony, engineering studies and negotiations, the EPA issued an NPDES (and state Industrial Wastewater) permit with the following requirements: installation of flow reduction equipment to reduce flow through the plant by 15 percent during the months of November through April; construction and operation of a multi-species mariculture center to mitigate for intake impacts to aquatic fisheries; and construction and operation of helper cooling towers to mitigate for thermal impacts to water quality, macrophytes and seagrasses. The multi-species mariculture center was operational October 1991 and flow reduction was implemented May 1992. The helper cooling towers were designed and constructed to ensure that a maximum discharge temperature from the Crystal River site point of discharge (POD) of 97.0°F. Following implementation of cooling tower operation in 1993, the permit required that seagrass monitoring be conducted to quantify seagrass presence and recovery within the zone of discharge of the facility and the establishment of a Seagrass Technical Advisory Committee (TAC) to review the report and make recommendations regarding future activities at the site.

The results of the seagrass monitoring project and recommendations of members of the Seagrass TAC are included in this report.

SEAGRASS MONITORING PROJECT SUMMARY

Following commencement of helper cooling tower operation, NPDES Permit FL0000159 required the following:

Seagrass Monitoring
Evaluation of seagrass colonization in the zone of discharge after a period of two years to determine recruitment rates and zones. A baseline distribution survey using aerial photography and field surveys, including one survey no later than two years following the initial survey. If natural colonization is determined to be proceeding at an acceptable rate, no further activity will be required.

Seagrass Technical Advisory Committee
The establishment of a Technical Advisory Committee to review the seagrass monitoring reports and offer suggestions regarding future activities at the site.

Sprig Planting
If natural colonization is unsatisfactory, sprig planting will be conducted during the third year of tower operation and will consist of replicated, multi-species plots in a cross section of discharge habitats.

Seagrass planting
If it is determined that seagrass planting is feasible and necessary, seagrass will be planted in the area within the zone of discharge during years 5 through 9 following tower operation, at a rate of ten (10) acres per year.

SEAGRASS MONITORING RESULTS

Biological studies were conducted by Mote Marine Laboratory for three years following implementation of the helper cooling towers at the Crystal River Energy Complex. The study was conducted to quantify seagrass presence and recovery within a two mile radius of the site point of discharge (POD) into the Gulf of Mexico.

Spatial as well as temporal patterns in the distribution of seagrasses and rhizophytic algae occurred at transacts and seagrass monitoring bed locations. Patterns depicted a system of bed recruitment and expansion in submerged aquatic vegetation (SAV) cover and condition over the three year monitoring period. Six new beds appeared in barren areas, and of those, three persisted into 1995. More than half of the intensely monitored beds had net increases in perimeter and 8 of 15 beds also increased with respect to cover from 1993 to 1994. Biomass was lower and productivity was higher in 1995, than in 1994, possibly a result of the heavy storms and rains which occurred in 1995. Overall, changes along the transact and bed locations within the 2 mile zone of discharge were mirrored by changes at more distant sites.

TECHNICAL ADVISORY COMMITTEE

A Seagrass Technical Advisory Committee (TAC) which consisted of representatives from state and federal environmental agencies and experts in the field of seagrass dynamics convened to review the Crystal River seagrass monitoring reports and make recommendations regarding future activities at the site.

Participants are as follows:

Mr. Gary Serviss, Senior Scientist, CCI Environmental Services, Inc.

Dr. Clinton Dawes, University Distinguished Research Professor, Department of Biology, University of South Florida.

Dr. Michael Durako, Senior Research Scientist, Florida Marine Research Institute, Florida Department of Environmental Protection.

Mr. Phillip Murphy, Acting Chief, Ecological Support Branch, U. S. Environmental Protection Agency.

Mr. David Bruzek, Manager, Crystal River Mariculture Center, Florida Power Corporation.

Ms. Manitia Moultrie, Chair, Seagrass TAC, Environmental Specialist, Florida Power Corporation.

SEAGRASS TAC MEETINGS

The initial meeting of the Seagrass TAC was held on February 21, 1996 at the Florida Power Corporation, General Office Complex.

Seagrass TAC members discussed the history of the Crystal River site and the results of the Seagrass Monitoring Project conducted in 1994 and 1995. The following issues were discussed:

- Expansion of Seagrass Beds
- Percent Cover
- Total Seagrass Biomass
- Shoot Density
- Productivity

Overall, several seagrass beds had net increases in perimeter and cover from 1993 to 1994, with some decrease in cover in 1995. Biomass was lower and productivity was higher in 1995 than in 1994. TAC members agreed that there may be an infinite array of causes for the increase in productivity and decrease in biomass within the seagrass communities. While the inclination of the TAC was to question if the helper cooling towers have had an impact on seagrass recovery, the focus of the committee was to evaluate seagrass recovery rates within a two mile radius of the site POD and determine if "acceptable" recolonization has occurred. The lack of barren controls which are representative of the study area, the lack of historical data and the regional affects on productivity and biomass were discussed.

The second meeting of the Seagrass TAC was held on March 29, 1996 at the Crystal River Mariculture Center. A helicopter tour of Crystal River Units 1, 2 and 3 and the study area was conducted prior to the meeting.

A summary of the 316 studies which was conducted from June 1983 to August 1984 was provided to the TAC. The monitoring program was conducted to evaluate the effects of plant operations on the area within the zone of discharge from the Crystal River site.

The impact of light intensity, turbidity, salinity variation and suspended load on seagrass colonization was evaluated. The TAC suggested that these factors are a significant influence on seagrass colonization and could be more critical than the temperature factor.

TAC members indicated that they could not determine if adequate seagrass colonization has occurred within the zone of discharge in comparison to regional seagrass colonization rates. There are insufficient areas within the region which are actually representative of the zone of discharge due to the location of the spoil dikes and influences offsite from the Withlacoochee River, Cross Florida Barge Canal and Homosassa Springs.

TAC members indicated that based on available data, there are too many factors to consider which may have a dramatic impact on seagrass colonization. The historical data and geography of the area suggest that while temperature cannot be ruled out as an impact to seagrass colonization, the primary factor affecting seagrass recolonization may not be temperature since seagrass recolonization has not been dramatic since implementation of the helper cooling towers. Impacts which need to be considered which were not a part of this study include turbidity, light intensity and salinity variations. TAC members agreed that the isolation of these factors may not be appropriate for FPC to evaluate since FPC performed the necessary mitigation and should not be required to continue to evaluate the area to isolate which factor is responsible for past impacts to the seagrass community.

The TAC also discussed the cost and benefits of sprig planting and subsequent monitoring to evaluate physical data, seagrass survival rates and regrowth. As a result of this discussion, the TAC agreed that sprig planting may be futile if factors such as turbidity and light intensity are as limiting as they appear to be.

Following the final meeting, each TAC member was asked to provide an official comment letter to address the following issues:

- Interpretation of the historical ecological data regarding impact to seagrass communities within the zone of discharge of the Crystal River POD.

- Expected seagrass recolonization rates based on current research, existing data and regional impacts.

- The requirement to conduct sprig planting, if natural colonization is unsatisfactory and conduct subsequent monitoring to evaluate seagrass survival rates,

Comments from the TAC members are provided in the following section.

COMMENTS

SEAGRASS TAC MEMBERS

Dr. Clinton Dawes, USF

Mr. Gary Serviss, CCI

Dr. Michael Durako, FDEP

Mr. Phillip Murphy, U.S. EPA

From the historical data available, it appears that seagrass beds were present in the POD region but were lost due to the discharge/construction activities. By 1983-84 there were only minimal grass patches and this apparently has remained at the same level based on the 1993-95 study. The patchy nature of seagrass communities surrounding the Crystal River Plant indicates that there are wide fluctuations in seagrass development. Thus one cannot anticipate development of extensive beds at any time in the near future but might expect some contraction.

The colonization rate of the beds appears to be static based on the limited data from the 1993-95 study. However, without control sites outside the impacted region, it is difficult to know just how different expansion or contraction rates are. Thus, a small study comparing colonization rates within and outside the POD/impacted sites might be an alternative to planting. The Syringodium beds to the south of the channels might serve as controls. If this is done, continuous recordings of temperature and salinity are needed.

My experience suggests that the impacted area (POD, region of channels) will not change much in the next 10 to 15 years and that the seagrass communities are in a steady state at this time. The one problem, as pointed out, is the high rates of blade growth determined in 1996, without expansion. This suggests a reaction to high temperatures, low light and a future contraction of the beds.

A general seagrass planting should not be attempted unless there is evidence that the sprigs would survive in the POD and impacted region. If sprig planting is decided on, a number of small pilot, or test plantings should first be tried (2 year study) over the zones (A through D) listed in the 1983-84 study (Fig. 6.1-7). Such a study should include continuous monitoring of temperature and salinity data.

Clinton J. Dawes
Distinguished Research Professor
University of South Florida

Historical data relative to the composition, density and distribution of seagrasses within the zone of discharge of the Crystal River POD is limited. A single map from the 1975 Florida Power Corporation (FPC) report documents the distribution and standing crop of submerged aquatic vegetation (SAV). The methods used to prepare the map, the intensity of the survey effort and the antecedent weather conditions are not known. It is also not known if this map accurately reflects the historic distribution and density of SAV in the zone of discharge.

Consideration must be given to the limited historic distribution data. The historic SAV map essentially represents a snapshot in time and actual historic SAV coverage may vary substantially from that shown on the map.

Based on the above-mentioned limitation, the actual impact to seagrass communities in the zone of discharge is difficult to quantify. Although SAV cover is substantially less than in the 1975 map, it appears that a large percent of the zone of discharge area was barren or sparsely vegetated in 1975.

Review of the water quality section of the 316 Study provides insight into the dynamics of the zone of discharge. The water quality data indicates that this area is probably marginal at supporting seagrasses. The photometry data indicate that a significant percentage of incident light is absorbed before reaching the substrate over much of the zone of discharge. Unconsolidated sediments were documented to resuspend under windy conditions and result in increased turbidity. The area was also documented to be a highly depositional environment.

The 316 Study documented the spatial temperature variation from the POD. Isotherms were provided for the zone of discharge for various tidal and seasonal combinations. These figures provide information relative to the potential impact area of SAV which could be attributed to elevated temperature levels.

The two mile zone of discharge radius for seagrass community impacts due to elevated temperatures appears conservative (i.e., larger than the temperature data would indicate). Although the impact of high water temperature on seagrass communities has been well documented, the temperature changes documented in the 316 Study would not be expected, in and of themselves, to result in the loss of seagrasses within the entire area. It appears that other factors may also have contributed to the reduced coverage of SAV in the zone of discharge. Again, it is important to note these results are based upon a limited historical data base relative to SAV coverage.

Seagrass colonization rates at this location are difficult to estimate. As previously discussed, there is limited historical data on actual seagrass coverage. This combined with the depositional nature of the area, wind suspension of unconsolidated material and the low transparency of the water provide variables to consider in predicting colonization rates.

Based upon the temperature modeling before and after helper cooling tower usage, recolonization of seagrasses would be expected within a portion of the zone of discharge. This predicted recolonization, however, assumes that the higher temperatures were the sole or primary cause of seagrass loss in some areas and that the reduction of temperature in and of itself would allow the area to recolonize. This does not appear to be a reasonable assumption based upon the nature of the area.

Drawing conclusions from the Seagrass Monitoring Report data is exacerbated by several factors. Relative to the study design, it generally appears appropriate for answering the questions discussed. The study could, however, have benefited from water quality data at varying distances from the POD. This is especially true because of the climatic events which occurred in 1995. The impact of these climatical events upon seagrass recolonization is difficult to assess in the absence of some abiotic water quality parameters.

Short of phenomenal natural recolonization, it was probably optimistic to expect two years of monitoring to provide sufficient data on recolonization trends. Typically, monitoring would be necessary over several years to allow for natural fluctuations in recolonization rates and still reveal the appropriate trends. This is especially true when the marginal water quality of the area is considered.

The results of the monitoring in 1994 were encouraging since a few new beds were observed to colonize the area near the POD. Unfortunately, the monitoring in 1995 confused the trends, with seagrasses disappearing from 1994 locations and beds appearing in new locations. The climatic events of 1995 may well have contributed to the variable recolonization of seagrasses. The 316 Study documented the effect of storms on turbidity levels and several storms occurred in 1995.

The results of the study do not allow for a finding that recolonization is proceeding at acceptable rates nor are the results such that one would conclude that recolonization is occurring at unacceptable rates. The limited time frame of data collection combined with the regional climatic events in 1995 does not provide a clear picture of recolonization trends.

The following recommendations are provided:

- Continue monitoring the recolonization of seagrasses, as done in 1994 and 1995, until the trend data stabilizes. Once stabilized, the data can be reviewed for acceptable rates of recolonization. Monitoring could be done every other year to provide information on long-term trends.

- Add the collection of key abiotic parameters (e.g., salinity, transparency, temperature, turbidity) to the monitoring program. Data collection points should extend outward from the POD for approximately three miles. The frequency of water quality monitoring should be sufficient to characterize the various basins.

- Sprig planting is not recommended at this time. Before expending funds to study the planting of seagrasses, the issue of natural recolonization rates should be resolved. The water quality data may also be helpful in determining which basins are likely to be compatible with seagrass re-establishment. Failure of areas to naturally recolonize likely indicates that conditions are not suitable for seagrass establishment and sprig planting would be unsuccessful.

Gary M. Serviss
Senior Scientist
CCI Environmental Services, Inc.

A primary limitation to the interpretation of the historical data, is the lack of a reliable, pre-operational seagrass distribution map. Based on the findings of the 316(a) studies which were undertaken after Unit 3 was operational, approximately 3,000 acres adjacent to the POD were biologically adversely affected by POD discharge and 1,100 acres were barren of seagrasses. The 316(a) studies concluded this impact was primarily due to thermal effects. Installation of helper cooling towers, which became operational on June 15, 1993, was intended to return the discharge area to the approximate thermal levels in existence prior to the operation of Unit 3. A three-year monitoring report on the seagrass communities adjacent to and in the area contiguous to the POD suggests that the Crystal River site is dynamic, with increases and decreases in seagrass biomass and coverage being observed throughout the study area over the three-year study period. This study did not demonstrate any persistent seagrass recovery within the zone nearest to the POD. The absence of temperature, salinity or light-availability data precludes any assessment as to the reasons why seagrasses have not recolonized the interior 1,100 acre zone. Individual patches of seagrasses were observed to colonize the area, but most disappeared within a year. The lack of suitable control sites also limits the interpretation of the monitoring data with respect to natural, regional seagrass recolonization rate.

The lack of spatial water temperature data in the study area before and after the installation of the helper cooling towers is most surprising (and disturbing). Water temperature reduction was the reason for the helper cooling tower installation. Merely measuring temperatures at the POD does not provide sufficient information regarding the effective spatial scope of the reduced temperatures.

Statements made in both the seagrass monitoring report and in the presentation of the report's findings by Mote Marine Lab scientists, coupled with my observations during the aerial overflight of the sight suggest that factors (e.g., turbidity, salinity, stochastic meteorological events) other than temperature may also be affecting potential recolonization of the site by seagrasses. Without reliable data on light availability, salinity variation, and disturbance regimes, it is impossible to ascertain what factors are restricting recolonization in the study.

Based on the information provided and discussions with the other TAC members, I would not recommend attempting any significant transplanting efforts until more information regarding the physical attributes of the near-POD area have been gathered, specifically turbidity and light availability data.

Michael J. Durako, Ph.D.
Senior Research Scientist
Florida Marine Research Institute

Phillip Murphy, U. S. EPA

This letter is in response to our conversations over the past three months as they relate to the request for my participation on the Seagrass Technical Advisory Committee for the Crystal River Plant. I regret that our participation was severely hampered by the budgetary crisis and associated travel restraints which our office incurred precisely during the period that the TAC was convened. This likewise, coincided with the retirement of Mr. Delbert Hicks who had served for years as the EPA representative for biological matters regarding the Crystal River Power Plant. With his departure, the institutional knowledge of our staff relative to the Crystal River Plant also went out the door. Consequently, I have been playing catch-up without too much success. Thanks to you for supplying me with the TAC meeting minutes and other associated literature. They are my only connection to the questions and TAC discussion relative to the Seagrass Study. Accordingly, with these qualifiers, I offer the following limited comments.

As we discussed several weeks ago via telephone, the seagrass study by Mote Marine Lab is, at best, inconclusive regarding regeneration of seagrasses within the thermal plume area. I think it would be stretching any facts to suggest that recolonization is occurring. It appears from the information that I have at hand, that there are many compounding variables, within the zone potential impact formerly attributed to the heated discharge, which singularly, or collectively, could affect seagrass growth and/or recolonization. While elevated ambient temperatures are the focus of your company's concerns because of Section 316 requirements, it goes without argument the role of turbidity and associated light attenuation play relative to seagrass communities. Like the members of the TAC who were able to participate in the site visit, I, too, am unable to evaluate the interaction of elevated water temperature, turbidity, and light extinction, in the impact area versus control areas. From the information packages you have provided me, my only evidence of the turbidity fronts which have been discussed, is a single aerial photograph which, indeed, appears to indicate a zone of turbidity in excess of ambient, associated with the thermal plume area. I note within the meeting minutes the attribution of this turbidity to the affects of discharges from the Cross Florida Barge Canal. While I cannot refute or confirm this possibility, it does appear to me that the turbidity is most elevated within the thermal plume area. If this perception is correct, I think an appropriate consideration is whether any physical phenomena associated with the increased water temperature is conducive to enhancing, and sustaining, resuspension of sediments within the thermal plume area beyond what is measurable in adjacent coastal areas beyond the thermal plume. We cannot dismiss too quickly the affects of temperature interaction with other factors.

In closing, it is important for me to emphasize that the above comments are offered solely in a technical advisory capacity and does not reflect EPA's position on regulatory matters. Any such position must come from the NPDES program office in EPA's, Region IV, Water Division. Thanks for your patience with us during the past four difficult months.

Phillip Murphy, Acting Chief
Ecological Support Branch
U. S. Environmental Protection Agency

FLORIDA POWER CORPORATION

SUMMARY

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RECOMMENDATION

As a result of the 316 (a) and (b) studies which were conducted in June 1983 - August 1984, the EPA and FDEP determined that substantial damage had occurred within the zone of discharge to the Gulf of Mexico from the Crystal River site. The demonstration and subsequent determination was controversial due to the complex dynamics of the shallow receiving water body (zone of discharge), the lack of historical baseline data to document conditions within the region prior to the operation of Units 1, 2 and 3 and the lack of environmental justification to require FPC to mitigate for thermal impacts to Crystal Bay.

FPC continues to question if seagrass was ever present in all of the areas identified as being impacted from the thermal discharge from FPC following the 316 studies. A historical vegetation map for the study area provided by the University of Florida provides the only historical baseline map for comparison. The validity of the map is questionable since it does not provide a description of methods, date, an author or narrative.

Ecosystem stress to the biota within the zone of discharge is affected by factors unrelated to the operation of Units 1, 2 and 3 . These factors include salinity, turbidity, siltation and the geography of the area (i.e., fluctuation from the Cross Florida Barge Canal, the input of fresh water and suspended sediment from the Withlacoochee River and Homossassa Springs).

FPC strenuously objected to the requirement to construct helper cooling towers, due to the enormous cost and the lack of environmental justification. While the installation of cooling towers has reduced the temperature in the near shore area and subsequently limited heated water discharges, this change in temperature has not necessarily resulted in any significant measurable benefit to the Crystal Bay area. To date, FPC has completed construction of the helper cooling towers to mitigate for thermal impacts and completed the seagrass monitoring project as specified in the permit, at a cost of over $90 million. Seagrass monitoring results are inconclusive and thus support FPC's initial contention that temperature is not the only factor which affects seagrass colonization in the area.

FPC has always doubted that a cost effective monitoring program could be developed to evaluate biological recovery within the zone of discharge as a function of thermal reductions. It would be difficult for biologists to isolate the individual components which contribute to ecosystem stress and determine their incremental influence on the aquatic community. Additionally, FPC should not be required to conduct long term monitoring to determine the limiting factor to seagrass recovery and/or attempt to identify the impact of light intensity, salinity, regional impacts and/or temperature impacts on seagrass recovery within the zone of discharge from the Crystal River site.

Given the fact that FPC initially questioned the environmental benefit of the construction of cooling towers and contended that temperature was not the limiting factor to seagrass colonization and that a monitoring program would not adequately evaluate biological recovery, FPC request that no further action be required with regard to the seagrass monitoring project.

In conclusion, FPC and members of the TAC currently agree that temperature is not the limiting factor to seagrass recovery. While the TAC suggest that additional data may be warranted to clearly identify the limiting factor to seagrass recovery, they concur that FPC has mitigated for past thermal impacts as required by the FDEP and EPA. FPC should not be required to conduct long term monitoring to determine the limiting factor to seagrass recovery since this is beyond the intent of the seagrass monitoring project. Additionally, an attempt to identify the impact of light intensity, salinity, regional impacts and/or temperature impacts on seagrass recovery within the zone of discharge from Crystal River is overly burdensome and may not result in any significant environmental benefit. Since temperature is not the limiting factor, sprig planting would obviously be futile if factors such as turbidity and light intensity are as limiting as they appear to be. The requirement to conduct sprig planting and subsequent seagrass planting and monitoring should be deleted from the NPDES permit.

RAI 3-4 Crystal River 1993 Seagrass Study

1993 Summary Report for:

CRYSTAL RIVER 3 YEAR NPDES MONITORING PROJECT

FPC Contract S01100

Work Authorization 301 (Addenda 1 and 2)

submitted December 20, 1993 to

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INTRODUCTION

Florida Power Corporation (FPC) and federal and state regulatory agencies seek to demonstrate that the operation of new helper cooling towers at the FPC Crystal River Station will lead to an expansion in the area of benthic habitat occupied by submerged aquatic vegetation (SAV: seagrasses and rhizophytic macroalgae). A monitoring program was begun in the Fall of 1993 and will continue on an annual basis through the Fall of 1995. The monitoring program emphasizes near-shore waters within a two mile radius of the point of discharge (POD) of the Crystal River Station.

Available Information

Early surveys and aerials are described in the 316 Demonstration Report and the 1986 MML report, "Submerged Aquatic Vegetation in the Vicinity of the FPC Crystal River Power Station."

Studies performed in the 1970s by the University of Florida contained a single map by Martin Van Tine of "approximate attached macrophyte standing crop" during the summer of an unknown year (Florida Power Corporation, 1975). The map depicted areas of high and low standing crop, including barren areas. Nothing is known of sampling methods or effort.

Two SAV surveys were performed in the vicinity of the Crystal River Station during the 1980s. The first was conducted under MML supervision as part of the 316 Demonstration Study, in 1983 and 1984. The second was sponsored by FPC and conducted by MML in 1986, to determine the nature of offshore SAV beds closer to the influence of the Withlacoochee River.

The 316 Demonstration Study occupied 50 survey stations. "Thermal" stations fell along four transects between the Barge and Intake Canals. "Control" stations fell along three transects north of the Barge Canal and three transects south of the Intake Canal. (Thirteen of the 50 stations fall within a 2 mile radius from POD, north of the intake canal.) Ten square-meter quadrats were deployed at each station and percent cover of seagrass and algae was determined in each. Nine "intensive" stations were equally divided among Halodule, Thalassia, and Syringodium sites in thermal and control areas. Intensive stations were visited on 6 week intervals. Biomass and productivity (2-week clip method) was measured at each station. No intensive stations were sampled in November of either year. Aerial

photographs were taken in February of 1983 and 1984, and in October/November of 1983. Only three of eight planned, quarterly overflights produced successful aerial images due to poor water quality. Later ground-truthing resulted in SAV maps drawn at a scale of 1:18,000 on stable acetate.

Dense SAV was mapped south of the Intake Canal and between the Intake and Discharge Canals. Sparse SAV beds were mapped in Basins 1 and 3. SAV near Fisherman's Cut was seasonally variable. A large area of SAV in Basin 4 was more persistent. Most of these areas fall within a 2-mile POD radius. Barren areas were most widespread in Basins 1, 2 and 3. Other results are presented in the 316 Demonstration Report.

In November 1986, MML surveyed 177 stations between the Barge and Intake Canals, west of the POD. Station density was determined through a statistical analysis of previous SAV bed distribution. (Twenty-five stations fell within a 2-mile POD radius.) Original LORAN positions of all stations are still available. At each station, 120 meter dive lines were surveyed for dispersion and abundance of SAV.

The survey found that most stations west of the 1983-84 study area contained SAV. SAV (especially sparse macroalgae) was also found at areas mapped as barren in the earlier studies. Caulerpa species were ubiquitous, but other rhizophytic algae were more common in the southern half of the survey area. Overall, there were declines in SAV richness and cover toward the north and toward the west, within the 1986 survey area. Extensive areas of drift and lithophytic Sargassum were also observed.

Rationale

The major questions to be answered by the monitoring plan are:

1) Are barren areas being colonized by SAV?

2) Are existing areas of SAV expanding?

To answer Question 1, it is necessary to design and implement a robust survey program in barren areas. To answer Question 2, selected SAV beds will be surveyed at a very fine scale and results will be compared each year. Beds will be chosen on the basis of geographic (basin), depth, historic temperature, and species characteristics. The perimeter of selected beds will be staked and subsequent surveys will compare edge

locations to stake locations. To anticipate the possibility of stake loss, a second system of benchmarks and measurements was developed.

Professional aerial photography will be used to backstop the field measurements. We have not recommended using aerial imagery as a primary source of SAV dispersion data because past experience has shown that turbidity, color, tide, sea surface conditions, and weather are significant impediments to successful photography at this site. On the other hand, when it is successful, aerial photography can reveal changes in SAV that fixed-station methods might miss. Consequently, we have arranged to fly the site and examine each year's new imagery prior to commencing field work, where possible. If the imagery is good, field time can be spent investigating apparent features and changes. If the imagery is poor, there will be no loss of data.

Important corollary questions include:

3) Changes in SAV cover outside of the designated study area (control sites);

4) Changes in the relative abundance of macroalgae, compared to seagrasses; and

5) Changes in the biomass or productivity of existing SAV beds.

We address Question 3 by occupying barren and vegetated sites in control sites, and by including these areas in the flight lines for aerial photography. Where possible, control stations are selected at a variety of depths comparable to stations within the 2-mile POD radius.

We address Question 4 by measuring percent cover by species, and percent barren area, at stations within the SAV beds selected for more intensive surveys.

Changes in SAV biomass or productivity (Question 5) will be determined by sampling the intensive survey beds during August of each year. The 316 Demonstration Study reported a strong dependence of variation in these parameters, on time. Seagrass biomass and productivity during the Fall are transitional between maxima in August and September, and minima in December and January. Consequently, it may be difficult to identify statistically significant differences between years, using November data. Interannual

differences are particularly difficult to detect in beds of mixed species, which are more common than single-species beds near Crystal River Station.

The 1994 Summary Report will include descriptions of methods and data resulting from the summer measurements of biomass and productivity.

METHODS

Positioning

Several independent systems were employed. Approximate station locations were mapped onto charts carried in the field, to depict the orientation of a station to creeks, islands, day marks, levees, and other land marks. The end points of transects were marked on land or in marshes with steel bars, stones, colored paint, or other permanent material. Locations were also determined by recording compass bearings to local landmarks.

Transect end points and station locations were measured using a Voyager LORAN Navigator and a Magellan NAVPRO global positioning system. Electronic positions also were measured for NOS benchmarks at the mouth of the discharge canal, and at the U.S. Geological Survey "Knott" benchmark on Drum Island. Preliminary analysis of the electronic data indicate high field reproducibility but relatively low map precision (see Discussion).

Barren Area Transects

Prospective barren areas were defined by analyzing historic data and conducting a reconnaissance of the study area. Effort was concentrated in areas suggested as once-vegetated by historical sources, but presently barren. Final transect locations were selected to cover the ranges of depths, bottom types, and thermal effects encountered at the site. As shown in Figure 1, most effort was directed to Basins 1, 2 and 3, with some effort in the areas of Basins 4 and 5, closest to the POD (e.g, inside the 2-mile radius).

Barren areas were surveyed by a diver towed behind a shallow draft vessel. Most transects ran due north or south to pre-determined landmarks. For long transects, or transects run under inclement weather, tows followed transect

lines marked in advance with temporary buoys. Buoys marked end points and way points, as needed. Beginning and end points were permanently positioned and marked. Where needed, tows were made into the current to reduce drift.

If the diver encountered seagrass or rhizophytic algae in barren areas the vessel stopped and marked the site(s). After the transect was finished, the crew returned to temporary markers. The immediate area was reconnoitered to determine the extent of SAV. If it corresponded to a previously-mapped SAV bed, it was recorded as "mapped" and was discounted as barren area. If new, the area, centroid position, species composition, and percent cover (see below) of the SAV was to be recorded, unless the vegetation was found to be Sargassum attached to rock outcrops[1]. All SAV markers and transect buoys were then recovered, and a new transect begun.

Intensive SAV BED Surveys

Sites were chosen for the initial surveys based on their location relative to the discharge canal. An initial field effort (a 2 day reconnaissance trip) was undertaken to determine present-day SAV bed locations. Previous mapping studies and aerial photographs of various ages were used as guides to areas where SAV beds were known to have been present in the past. High probability areas were searched by skin divers and the 15 stations depicted in Figure 1 were occupied. The selection process divided the sites between 3 thermally un-impacted "control" sites and 12 impacted sites.

GPS and LORAN coordinates and compass sightings were used to record the location of seagrass beds selected for study. Several beds were marked by crab trap buoys anchored with screw-in tie down anchors. General site descriptions were recorded for each area in order to relocate the beds on subsequent trips.

Within each bed, the position of a "center" marker was determined by GPS, LORAN, and compass bearings. Center markers are hemispherical concrete parking lot markers. Each marker was painted with blue anti-fouling paint and anchored to the bottom with screw-in anchors. Concrete markers were tied to the anchors with 1" diameter nylon rope.

1/ In fact, the only SAV encountered on barren-area transects was either already mapped, or Sargassum growing on rock outcrops.

Edges of all 15 sites were marked in order to determine whether the seagrass beds expand, contract, or remain unchanged during the duration of the three year study. New growth or contraction of existing seagrass bed edges will be determined by returning to the marked beds at one-year intervals. Seagrass bed edges were marked with short (<1.0 m) sections of 3/8" steel reinforcement rods driven into the bottom with a small sledge hammer. Each steel stake was allowed to extend about 10 cm upward from the sediment surface. Seagrass bed edges were usually very easy to define, based on the sharp delineations between bare bottom and vegetated bottom.

A surveyor's tape was strung out along the set of edge markers at each site. Distances between edge markers and the distance from the center marker to each edge marker were recorded. Relocation of the edge markers and center marker, on future site visits, will be facilitated by these measurements. It should also be possible to locate the exact position of lost edge markers if the center marker is found.

The percentage of bottom covered by SAV on the edge of each bed (from 0.0 to 1.0 m into each bed) and deeper into the bed (at a distance of 2.0 to 3.0 m) was measured. Ten 1.0 m2 quadrat-based estimates of bottom cover were taken along the vegetated edge of each SAV bed. The quadrats were positioned on the vegetated side of a randomly selected subset of the 15 edge markers at each site. Ten 1.0 m2 additional cover estimates were made by flipping the quadrat frame over twice away from the perimeter of each seagrass bed.

Subdivisions (100 cm2) of the 1.0 m2 quadrat were used as the units for the cover estimates. SAV coverage was determined by counting the number of units in which various species of SAV were actually rooted. A barren square was defined as being devoid of any rooted vegetation. Seagrass blades from plants rooted in other units were not counted as cover in the otherwise completely barren units. Four seagrasses (Halodule, Syringodium, Thalassia, and Halophila) were encountered in the study sites. Two species of the rhizophytic algal genus, Caulerpa, were found at several of the sites. Divers recorded data on slates and the data were transferred to log books for later use.

To document that water or sediment depths did not vary so much near the edges of SAV beds that future lateral growth might be inhibited, additional data were collected at each site. Water depth and sediment thickness were measured on the edge of each SAV bed and at 1.0 and 2.0 m distances into the barren zone. A marked measuring stick was used to measure water depth.

Sediment thickness was determined by pushing a 1.5 m long, 3/8" diameter iron rod into the bottom. The rod was pushed in to its full length or to the point of refusal. The rod was then withdrawn and the depth of penetration was measured. Measurements of each type were made adjacent to alternate stake markers along the edges of each of the 15 seagrass beds.

DISCUSSION

All data collected from the 1993 sampling effort appear in the tables and appendix tables that follow. These data form the baseline of descriptive information against which prospective changes in 1994 and 1995 will be measured.

As mentioned before, two additional types of data are likely to be generated before the barren transects and intensive SAV beds are revisited. If the 1993 aerial photography is successful, images will be photo-interpreted, ground-truthed, and digitally mapped by a subcontractor. An effort will be made during ground-truthing to distinguish lithophytic Sargassum from seagrasses and rhizophytic algae. A separate report will accompany the maps.

The digital map will also be useful in plotting the precise locations of transects and intensive survey sites. At present, no existing base map is available at the level of detail needed to plot LORAN and GPS data collected in 1993. If the 1993 aerial photography is successful, the 1994 Summary Report will contain a registered base map showing the precise locations of transects and stations.

The second type of new information will result from the biomass and productivity studies first scheduled for August, 1994. We propose to perform the SAV condition monitoring in August of 1994 and 1995, for 3 reasons. First, November condition data are transitional between seasonal extremes, and highly variable. Second, August water temperatures are annual maxima, so impacts to SAV respiration and net productivity will be accentuated. Third, an August sampling time allows for laboratory processing of samples by the due date of the annual reports.

FIGURE 1

The base map employed in Figure 1A and 1B is a composite in which marsh and canal shorelines, and oyster reefs, have been added to the 1983 SAV map produced as part of the FPC 316 Demonstration Study. Shorelines were transferred from U.S. Geological Survey topographic quadrangles and oyster reefs were taken from unpublished data available at Mote Marine Laboratory. Spoil islands of the Cross-Florida Barge Canal appear at the top of the map, which is north. The discharge canal levee is the shorter feature depicted to the north of the longer levee on the intake canal. In the map, A denotes algal beds; S, seagrass beds; AS, mixed beds dominated by algae; SA, mixed beds dominated by seagrass; O, open or barren bottom.

Figure 1A

This figure depicts the number and orientation of barren area transects established for the present study. One transect, "13W", is not shown. It is north of the Barge Canal, extending from Green 35 day mark on the Canal, to Green 23A day mark on the Withlacoochee River. Note that most transects have at least one land-side end, which has been marked in the field with a permanent monument. Transect "9W" is 2 miles from the point of discharge.

Figure 1B

This figure depicts the locations of SAV beds selected for intensive surveys (percent cover, biomass, productivity, etc.). One station, "10", is immediately south of station "9" but off the figure. Stations 1-3 are in Basin 1. Stations 5-7 are in Basin 2. Four stations between the canals are in Basin 3. Station 11 is in Rocky Cove. Station 13 is 2 miles from the point of discharge.

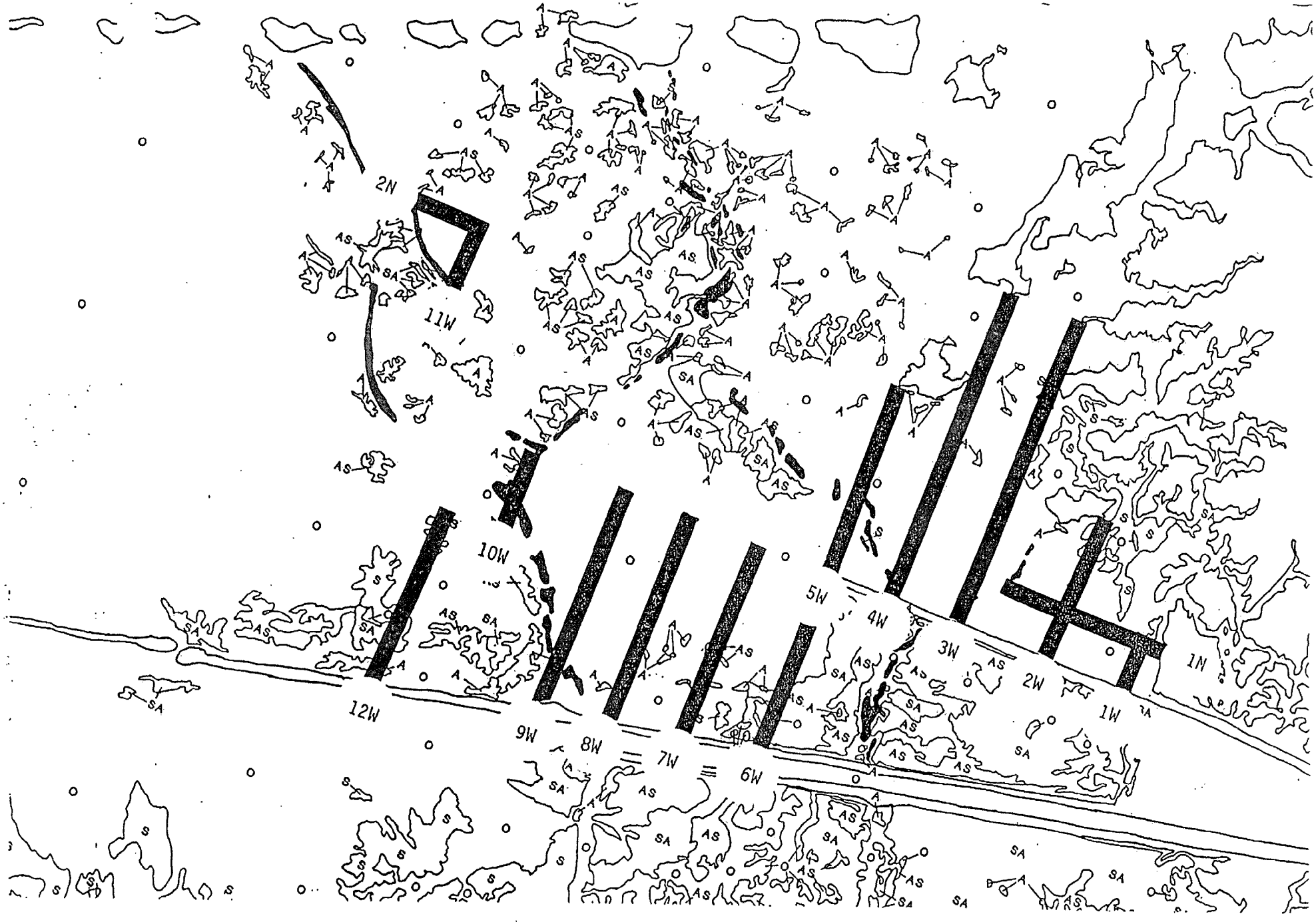

FIGURE 1A

FIGURE 1B

Table 1. Coordinates of seagrass survey transects.

Transect	Base Latitude	Base Longitude	End Latitude	End Longitude	Base Loran (45)	Base Loran (62)	End Loran (45)	End Loran (62)
1W	28 57 35.1	82 43 34.9	28 57 51.9	82 43 33.8	45228.34	62881.46	45230.49	62881.28
2W	28 57 36.4	82 43 49.4	28 58 02.2	82 43 49.1	45230.18	62883.19	45234.21	62882.99
3W	28 57 33.4	82 44 02.5	28 58 34.9	82 44 08.4	45232.58	62885.16	45240.93	62884.77
4W	28 57 35.8	82 44 17.1	28 58 34.0	82 44 23.8	45234.41	62886.86	45242.99	62886.69
5W	28 57 31.8	82 44 36.5	28 58 08.5	82 44 37.3	45236.43	62888.88	45241.70	62888.66
6W	28 57 31.8	82 44 36.5	28 57 11.0	82 44 37.4	45236.43	62888.88	45231.83	62889.06
7W			28 56 58.2	82 44 48.1			45233.29	62890.74
8W			28 56 54.5	82 44 58.4			45234.42	62892.08
9W	28 56 48.9	82 45 15.6			45236.71	62894.34		
1N			28 57 41.4	82 44 05.2			45233.15	62884.81
11W	28 57 54.1	82 36 13.2	28 58 03.9	82 46 12.6	45252.52	62900.14	45253.71	62900.27
2N	28 58 06.5	82 46 26.1	28 58 03.9	82 46 12.6	45255.38	62901.73	45253.71	62900.27
12W	28 58 46.9	82 45 37.8	28 57 05.3	82 45 34.6	45238.65	62896.69	45241.36	62896.41
10W	28 57 31.2	82 45 41.1	28 57 19.2	82 45 42.1	45243.29	62896.76	45243.29	62896.82
13W	28 58 45.4	82 47 07.8	28 59 14.9	82 47 10.2	45266.69	62906.44	45271.22	62906.49

Table 2. Station locations for the seagrass bed edge observations.

Station	Date	Latitude	Longitude	Loran (45)	Loran (62)
1	09-Nov-93	28 57 58.39	82 43 56.35	45234.56	62883.88
2	10-Nov-93	28 58 00.79	82 43 50.00	45234.06	62883.08
3	10-Nov-93	28 58 03.88	82 43 41.91	45233.61	62882.21
4	10-Nov-93	28 57 17.67	82 44 21.52	45232.47	62887.19
5	11-Nov-93	28 58 35.81	82 44 33.48	45244.78	62888.00
6	11-Nov-93	N/A	N/A	45240.33	62885.49
7	11-Nov-93	28 58 25 00	82 44 09 00	45237.91	62884.67
8	11-Nov-93	28 57 07.30	82 44 19.26	45230.70	62887.06
9	23-Nov-93	28 56 49.65	82 43 25.10	45220.91	62880.80
10	23-Nov-93	28 56 41.19	82 43 14.31	45218.47	62879.68
11	23-Nov-93	28 57 23.73	82 43 38.31	45227.68	62882.13
12	24-Nov-93	28 57 10.49	82 44 17.21	45230.03	62886.80
13	24-Nov-93	28 58 12.34	82 45 15.62	45274.30	67893.40
14	07-Dec-93	28 57 04.40	82 44 35.00	45232.39	67889.09
15	07-Dec-93	28 57 05.90	82 44 39.40	45232.91	62889.56

Table 3. Summary statistics for water depth variations (cm) from the grass bed perimeter to 1 meter outside the bed.

Station	(n)	Mean	S.D.	Mininum	Maximum
1	13	.23	1.30	-2	3
2	15	.00	1.20	-2	3
3	9	.67	2.60	-5	4
4	8	-1.63	2.62	-7	0
5	7	2.14	3.93	0	10
6	8	.13	1.73	-2	4
7	8	1.88	3.72	0	10
8	6	-.83	2.04	-5	0
9	8	-1.88	2.53	-5	2
10	8	.63	2.07	-2	5
11	8	-1.25	1.83	-5	1
12	8	.13	2.64	-3	4
13	8	-.63	1.77	-5	0
14	9	5.78	3.63	0	10
15	8	.63	3.20	-5	5

Table 4. Summary statistics for water depth variations (cm) from the grass bed perimeter to 2 meters outside the bed.

Station	(n)	Mean	S.D.	Mininum	Maximum
1	13	-.46	1.13	-2	2
2	15	.27	1.58	-2	5
3	9	1.67	2.50	-1	6
4	8	-2.50	3.02	-7	2
5	7	3.14	2.41	0	5
6	8	.13	.83	-1	2
7	8	4.38	8.21	-5	20
8	6	.83	2.04	0	5
9	8	-3.25	2.19	-5	0
10	8	.88	2.10	-2	5
11	8	-1.50	1.93	-5	1
12	8	-.88	2.42	-3	4
13	8	.00	.00	0	0
14	9	11.89	8.25	2	30
15	8	.25	2.76	-5	5

Table 5. Summary statistics for sediment depth from the grass bed perimeter.

Station	(n)	Mean	S.D.	Mininum	Maximum
1	13	69.00	33.55	15	100
2	15	73.67	34.62	25	120
3	9	12.22	8.80	3	28
4	8	11.75	16.30	0	48
5	7	100.71	24.57	70	150
6	7	59.29	39.52	15	100
7	8	39.25	26.44	20	100
8	6	21.17	8.70	7	30
9	8	11.88	6.79	2	20
10	8	35.63	39.04	5	115
11	8	7.38	5.95	1	20
12	8	6.25	3.06	2	10
13	8	45.63	18.69	20	75
14	9	54.00	43.19	10	140
15	8	8.63	4.47	5	19

Table 6. Summary statistics for sediment depth from 1 meter outside the grass bed perimeter.

Station	(n)	Mean	S.D.	Mininum	Maximum
1	13	70.15	28.67	18	100
2	15	73.73	35.55	25	120
3	9	13.67	6.69	8	30
4	8	10.50	16.80	0	48
5	7	97.86	31.07	65	160
6	7	61.43	37.42	17	100
7	8	30.88	15.76	15	55
8	6	20.83	6.71	12	30
9	8	10.50	6.76	2	20
10	8	35.88	40.52	2	120
11	8	4.25	2.87	1	10
12	8	8.88	5.41	2	20
13	8	39.50	14.40	22	58
14	9	56.11	41.02	5	120
15	8	8.63	3.74	3	15

Table 7. Summary statistics for sediment depth from 2 meters outside the grass bed perimeter.

Station	(n)	Mean	S.D.	Mininum	Maximum
1	13	66.08	29.81	20	100
2	15	78.47	36.16	25	126
3	9	11.89	8.48	5	26
4	8	14.13	19.64	0	53
5	7	91.57	28.41	70	150
6	7	37.14	16.89	15	58
7	8	22.25	12.31	10	48
8	6	17.50	4.59	12	25
9	8	14.13	6.56	2	20
10	8	31.38	41.78	2	120
11	8	5.50	4.34	1	13
12	8	6.63	4.47	1	12
13	8	47.38	20.79	15	70
14	9	55.89	37.67	5	130
15	8	8.00	2.62	5	12

Table 8. Summary statistics for sediment depth differences from the grass bed perimeter and 1 meter outside the bed.

Station	(n)	Mean	S.D.	Mininum	Maximum
1	13	1.15	23.06	-42	42
2	15	.07	11.82	-27	30
3	9	1.44	6.89	-10	8
4	8	-1.25	4.03	-10	4
5	7	-2.86	17.04	-30	20
6	7	2.14	10.01	-10	23
7	8	-8.38	28.44	-75	15
8	6	-.33	5.32	-10	5
9	8	-1.38	8.83	-14	13
10	8	.25	20.12	-22	45
11	8	-3.13	7.22	-19	4
12	8	2.63	5.78	-4	14
13	8	-6.13	10.66	-21	5
14	9	2.11	37.57	-38	90
15	8	.00	5.90	-11	8

Table 9. Summary statistics for sediment depth differences from the grass bed perimeter and 2 meters outside the bed.

Station	(n)	Mean	S.D.	Mininum	Maximum
1	13	-2.92	29.68	-52	72
2	15	4.80	14.72	-25	42
3	9	-.33	6.60	-7	13
4	8	2.38	13.38	-12	31
5	7	-9.14	10.65	-29	0
6	7	-22.14	41.05	-80	33
7	8	-17.00	27.59	-80	8
8	6	-3.67	5.65	-10	5
9	8	2.25	8.46	-10	18
10	8	-4.25	7.05	-13	5
11	8	-1.88	6.36	-15	5
12	8	.38	4.75	-7	7
13	8	1.75	13.04	-18	15
14	9	1.89	27.14	-58	25
15	8	-.63	5.95	-13	7

Table 10. Average percent cover (n=10) of 1m quadrats on the perimeter and 2 meters inside the perimeter of seagrass beds.

Station	Perimeter Total Vegetation	Perimeter Seagrass	Perimeter Algae	Inside Total Vegetation	Inside Seagrass	Inside Algae
1	79.6	79.6	.0	80.0	80.0	.0
2	87.1	87.1	.0	96.4	96.4	.0
3	80.1	80.1	.0	93.7	93.7	.0
4	76.3	76.3	.0	87.0	86.6	1.3
5	90.4	90.4	.0	83.2	83.2	.0
6	91.8	91.8	.0	98.7	98.7	.0
7	91.5	91.5	.0	98.5	98.5	.0
8	94.7	94.7	.5	93.2	93.2	.0
9	87.6	87.6	.2	81.2	81.2	.0
10	76.8	74.7	4.4	57.0	56.7	1.7
11	98.0	98.0	.0	98.3	98.3	.0
12	90.3	86.6	2.2	92.7	88.9	3.8
13	72.2	31.7	40.5	80.4	19.4	63.4
14	90.7	90.7	.0	91.2	91.2	.3
15	83.9	83.9	2.7	96.9	96.9	.0

Table 11. Counts of presence of seagrass and algae species in 1 m^2 quadrats inside (I) and on perimeters (P) of grass beds.

		Halodule wrightii		*Halophila englemannii*		*Syringodium filiforme*		*Thalassia testudinum*		*Caulerpa prolifera*		*Caulerpa mexicana*	
Station	n	P	I	P	I	P	I	P	I	P	I	P	I
1	10	9	10	0	0	0	0	0	0	0	0	0	0
2	10	10	10	0	0	0	0	0	0	0	0	0	0
3	10	10	10	0	0	0	0	0	0	0	0	0	0
4	9	9	9	1	0	0	0	0	0	0	2	0	0
5	10	10	10	0	0	0	0	0	0	0	0	0	0
6	9	9	9	4	2	0	0	0	0	0	0	0	0
7	10	10	10	0	1	0	0	0	0	0	0	0	0
8	9	9	9	2	4	0	0	0	0	1	0	0	0
9	10	0	1	6	2	10	10	0	0	1	0	0	0
10	10	0	0	1	1	10	9	0	0	4	3	0	0
11	10	0	0	2	0	10	10	0	0	0	0	0	0
12	10	0	2	0	0	10	10	0	0	3	4	0	0
13	10	4	1	0	0	0	0	1	3	4	7	7	7
14	10	9	10	0	0	0	0	1	1	0	1	0	0
15	10	7	8	0	0	0	0	3	3	1	0	0	0
Total		96	99	16	10	40	39	5	7	14	17	7	7

Appendix Table 1. Water and sediment depths at the seagrass bed perimeters and differences in depths at 0, 1 and 2 meters from the bed edge.

Station	Perimeter ID. (ft)	Water Depths (cm) 0m	1m	2m	0m-1m	0m-2m	Sediment Depths (cm) 0m	1m	2m	0m-1m	0m-2m
1	0.0	88	87	86	-1	-2	82	47	61	-35	-21
1	16.1	86	89	85	3	-1	87	79	71	-8	-16
1	27.2	89	91	87	2	-2	71	100	100	29	29
1	40.3	88	88	88	0	0	100	100	48	0	-52
1	73.0	90	90	89	0	-1	100	100	100	0	0
1	88.0	91	91	91	0	0	100	100	82	0	-18
1	99.0	93	94	95	1	2	28	70	100	42	72
1	114.0	94	94	95	0	1	100	58	71	-42	-29
1	130.0	90	90	90	0	0	100	100	100	0	0
1	149.0	91	90	90	-1	-1	36	38	36	2	0
1	166.5	89	90	89	1	0	20	18	20	-2	0
1	184.8	82	80	81	-2	-1	58	60	50	2	-8
1	198.7	85	85	84	0	-1	15	42	20	27	5
2	0.0	80	79	80	-1	0	40	40	25	0	-15
2	11.4	80	80	80	0	0	25	25	32	0	7
2	21.6	80	80	81	0	1	34	33	35	-1	1
2	32.1	81	81	81	0	0	26	30	28	4	2
2	44.4	85	88	85	3	0	78	74	120	-4	42
2	60.0	90	90	90	0	0	120	120	120	0	0
2	71.6	90	90	90	0	0	71	101	71	30	0
2	79.1	91	89	89	-2	-2	120	120	95	0	-25
2	90.3	89	90	94	1	5	120	120	120	0	0
2	99.2	90	88	90	-2	0	120	120	126	0	6
2	105.1	90	90	90	0	0	90	80	99	-10	9
2	113.6	88	89	90	1	2	70	43	82	-27	12
2	126.3	90	90	90	0	0	76	71	94	-5	18
2	139.4	90	90	89	0	-1	60	73	70	13	10
2	147.1	89	89	88	0	-1	55	56	60	1	5
3	0.0	70	70	69	0	-1	5	11	5	6	0
3	10.7	68	70	70	2	2	12	8	5	-4	-7
3	22.8	70	70	70	0	0	18	11	13	-7	-5
3	34.9	75	70	75	-5	0	5	11	5	6	0

Appendix Table 1. Continued.

Station	Perimeter ID. (ft)	Water Depths (cm) 0m	1m	2m	0m-1m	0m-2m	Sediment Depths (cm) 0m	1m	2m	0m-1m	0m-2m
3	62.2	70	70	70	0	0	5	12	18	7	13
3	102.3	71	75	77	4	6	28	18	23	-10	-5
3	120.2	70	70	75	0	5	12	12	5	0	-7
3	141.6	70	72	70	2	0	3	10	7	7	4
3	176.2	65	68	68	3	3	22	30	26	8	4
4	0.0	82	80	80	-2	-2	2	1	0	-1	-2
4	20.4	94	90	90	-4	-4	22	20	53	-2	31
4	57.5	95	95	95	0	0	48	48	36	0	-12
4	92.3	85	85	85	0	0	2	3	10	1	8
4	97.8	90	90	86	0	-4	8	12	8	4	0
4	108.8	85	85	80	0	-5	2	0	1	-2	-1
4	132.3	87	80	80	-7	-7	10	0	0	-10	-10
4	139.8	80	80	82	0	2	0	0	5	0	5
5	0.0	125	125	130	0	5	150	160	150	10	0
5	13.5	130	130	132	0	2	70	90	70	20	0
5	21.6	130	140	135	10	5	100	100	90	0	-10
5	52.0	130	135	135	5	5	100	100	100	0	0
5	57.4	135	135	135	0	0	100	70	71	-30	-29
5	82.3	130	130	135	0	5	85	65	70	-20	-15
5	89.0	130	130	130	0	0	100	100	90	0	-10
6	0.0	105	104	105	-1	0	100	100	45	0	-55
6	18.6	105	105	105	0	0	100	100	45	0	-55
6	33.4	100	100	100	0	0	100	100	20	0	-80
6	54.6	95	95	95	0	0	25	25	25	0	0
6	72.8	95	95	95	0	0	15	17	15	2	0
6	101.2	95	95	94	0	-1	50	40	52	-10	2
6	110.4	100	104	100	4	0	N/A	N/A	N/A	0	0
6	120.9	102	100	104	-2	2	25	48	58	23	33
7	0.0	70	70	70	0	0	100	25	20	-75	-80
7	16.2	70	70	70	0	0	22	15	25	-7	3
7	22.1	70	70	70	0	0	45	40	30	-5	-15
7	52.3	70	70	70	0	0	40	55	48	15	8
7	59.2	100	100	95	0	-5	22	18	10	-4	-12

Appendix Table 1. Continued.

Station	Perimeter ID. (ft)	Water Depths (cm) 0m	1m	2m	0m-1m	0m-2m	Sediment Depths (cm) 0m	1m	2m	0m-1m	0m-2m
7	80.7	90	90	100	0	10	25	15	12	-10	-13
7	93.4	80	90	100	10	20	40	50	15	10	-25
7	107.0	90	95	100	5	10	20	29	18	9	-2
8	0.0	150	150	150	0	0	30	20	25	-10	-5
8	10.4	150	150	150	0	0	30	30	20	0	-10
8	22.9	150	150	150	0	0	23	27	15	4	-8
8	43.9	150	150	150	0	0	20	20	15	0	-5
8	79.0	145	140	150	-5	5	17	16	18	-1	1
8	86.6	150	150	150	0	0	7	12	12	5	5
9	0.0	120	115	115	-5	-5	2	15	2	13	0
9	37.3	128	127	125	-1	-3	10	10	18	0	8
9	63.5	125	125	120	0	-5	15	2	10	-13	-5
9	95.1	125	122	120	-3	-5	18	17	20	-1	2
9	116.3	125	120	120	-5	-5	15	20	20	5	5
9	136.9	125	122	122	-3	-3	20	6	10	-14	-10
9	153.8	130	130	130	0	0	2	2	20	0	18
9	167.4	130	132	130	2	0	13	12	13	-1	0
10	0.0	105	105	105	0	0	14	2	2	-12	-12
10	25.1	105	110	110	5	5	14	16	16	2	2
10	48.2	115	115	115	0	0	5	3	6	-2	1
10	75.8	120	120	120	0	0	25	13	15	-12	-10
10	101.0	125	123	123	-2	-2	15	60	15	45	0
10	126.0	120	120	122	0	2	20	18	7	-2	-13
10	149.4	115	115	115	0	0	77	55	70	-22	-7
10	166.3	113	115	115	2	2	115	120	120	5	5
11	0.0	82	80	79	-2	-3	10	10	13	0	3
11	11.1	80	75	78	-5	-2	8	3	1	-5	-7
11	21.0	80	78	75	-2	-5	5	1	10	-4	5
11	29.6	78	78	78	0	0	2	5	1	3	-1
11	51.1	71	71	69	0	-2	8	4	7	-4	-1
11	81.0	80	79	80	-1	0	20	1	5	-19	-15
11	87.6	80	79	79	-1	-1	1	5	2	4	1
11	97.0	79	80	80	1	1	5	5	5	0	0

Appendix Table 1. Continued.

Station	Perimeter ID. (ft)	Water Depths (cm) 0m	1m	2m	0m-1m	0m-2m	Sediment Depths (cm) 0m	1m	2m	0m-1m	0m-2m
12	0.0	118	115	115	-3	-3	5	7	12	2	7
12	18.5	115	115	115	0	0	10	12	12	2	2
12	34.8	116	120	120	4	4	6	20	10	14	4
12	52.5	120	120	120	0	0	2	7	2	5	0
12	71.0	118	118	115	0	-3	4	2	1	-2	-3
12	85.5	112	110	110	-2	-2	4	10	8	6	4
12	100.6	101	105	101	4	0	9	5	5	-4	-4
12	124.3	98	96	95	-2	-3	10	8	3	-2	-7
13	0.0	80	75	80	-5	0	20	25	15	5	-5
13	30.3	95	95	95	0	0	50	35	65	-15	15
13	56.8	110	110	110	0	0	35	35	45	0	10
13	75.4	120	120	120	0	0	22	22	25	0	3
13	87.0	120	120	120	0	0	52	31	34	-21	-18
13	105.5	115	115	115	0	0	75	55	60	-20	-15
13	122.1	120	120	120	0	0	55	55	70	0	15
13	127.5	120	120	120	0	0	56	58	65	2	9
14	0.0	80	80	85	0	5	20	110	45	90	25
14	22.2	89	95	97	6	8	72	52	90	-20	18
14	41.4	115	120	125	5	10	55	76	76	21	21
14	59.1	130	140	160	10	30	140	120	130	-20	-10
14	77.9	130	140	145	10	15	100	62	42	-38	-58
14	87.3	130	140	145	10	15	40	30	35	-10	-5
14	109.7	95	100	110	5	15	30	45	55	15	25
14	129.3	80	82	82	2	2	10	5	25	-5	15
14	149.2	68	72	75	4	7	19	5	5	-14	-14
15	0.0	90	90	95	0	5	5	5	5	0	0
15	19.3	90	95	92	5	2	9	3	7	-6	-2
15	41.4	90	95	90	5	0	8	11	8	3	0
15	62.0	90	90	90	0	0	7	15	12	8	5
15	80.2	90	90	90	0	0	5	8	12	3	7
15	102.1	90	90	90	0	0	7	8	7	1	0
15	116.5	95	90	90	-5	-5	19	8	6	-11	-13
15	133.6	95	95	95	0	0	9	11	7	2	-2

Appendix Table 2. Vegetation coverage (percent) in seagrass beds for 1 m^2 quadrats along bed perimeters and two meters inside beds.

Station	Perimeter ID. (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1	16.1	I	43	43	0	*Halodule wrightii*	43
1	27.2	I	93	93	0	*Halodule wrightii*	93
1	27.2	P	74	74	0	*Halodule wrightii*	74
1	40.3	I	85	85	0	*Halodule wrightii*	85
1	40.3	P	89	89	0	*Halodule wrightii*	89
1	54.0	I	97	97	0	*Halodule wrightii*	97
1	54.0	P	79	79	0	*Halodule wrightii*	79
1	73.0	I	71	71	0	*Halodule wrightii*	71
1	73.0	P	79	79	0	*Halodule wrightii*	79
1	138.7	I	96	96	0	*Halodule wrightii*	96
1	138.7	P	82	82	0	*Halodule wrightii*	82
1	149.0	I	94	94	0	*Halodule wrightii*	94
1	149.0	P	87	87	0	*Halodule wrightii*	87
1	166.5	I	96	96	0	*Halodule wrightii*	96
1	166.5	P	73	73	0	*Halodule wrightii*	73
1	184.8	I	90	90	0	*Halodule wrightii*	90
1	184.8	P	73	73	0	*Halodule wrightii*	73
1	198.7	I	35	35	0	*Halodule wrightii*	35
1	198.7	P	80	80	0	*Halodule wrightii*	80
2	0.0	I	96	96	0	*Halodule wrightii*	96
2	0.0	P	94	94	0	*Halodule wrightii*	94
2	32.1	I	98	98	0	*Halodule wrightii*	98
2	32.1	P	80	80	0	*Halodule wrightii*	80
2	44.4	I	98	98	0	*Halodule wrightii*	98
2	44.4	P	95	95	0	*Halodule wrightii*	95
2	60.0	I	98	98	0	*Halodule wrightii*	98
2	60.0	P	100	100	0	*Halodule wrightii*	100
2	71.6	I	100	100	0	*Halodule wrightii*	100
2	71.6	P	100	100	0	*Halodule wrightii*	100
2	79.1	I	97	97	0	*Halodule wrightii*	97
2	79.1	P	87	87	0	*Halodule wrightii*	87

Appendix Table 2. Continued.

Station	Perimeter ID.	Perimeter/ Interior (ft) (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species		Cover
	2	99.2	I	95	95	0	*Halodule wrightii*	95
	2	99.2	P	93	93	0	*Halodule wrightii*	93
	2	113.6	I	96	96	0	*Halodule wrightii*	96
	2	113.6	P	82	82	0	*Halodule wrightii*	82
	2	126.3	I	92	92	0	*Halodule wrightii*	92
	2	126.3	P	83	83	0	*Halodule wrightii*	83
	2	139.4	I	94	94	0	*Halodule wrightii*	94
	2	139.4	P	57	57	0	*Halodule wrightii*	57
	3	0.0	I	88	88	0	*Halodule wrightii*	88
	3	0.0	P	70	70	0	*Halodule wrightii*	70
	3	10.7	I	87	87	0	*Halodule wrightii*	87
	3	10.7	P	84	84	0	*Halodule wrightii*	84
	3	22.8	I	100	100	0	*Halodule wrightii*	100
	3	22.8	P	92	92	0	*Halodule wrightii*	92
	3	34.9	I	100	100	0	*Halodule wrightii*	100
	3	34.9	P	94	94	0	*Halodule wrightii*	94
	3	62.2	I	98	98	0	*Halodule wrightii*	98
	3	62.2	P	64	64	0	*Halodule wrightii*	64
	3	93.0	I	81	81	0	*Halodule wrightii*	81
	3	93.0	P	84	84	0	*Halodule wrightii*	84
	3	120.2	I	91	91	0	*Halodule wrightii*	91
	3	120.2	P	98	98	0	*Halodule wrightii*	98
	3	141.6	I	100	100	0	*Halodule wrightii*	100
	3	141.6	P	46	46	0	*Halodule wrightii*	46
	3	163.0	I	100	100	0	*Halodule wrightii*	100
	3	163.0	P	93	93	0	*Halodule wrightii*	93
	3	176.2	I	92	92	0	*Halodule wrightii*	92
	3	176.2	P	76	76	0	*Halodule wrightii*	76
	4	0.0	I	84	84	0	*Halodule wrightii*	84
	4	0.0	P	92	92	0	*Halodule wrightii*	92
	4	20.4	I	74	74	0	*Halodule wrightii*	74
	4	20.4	P	71	71	0	*Halodule wrightii*	71

Appendix Table 2. Continued.

Station	Perimeter ID. (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
4	36.1	I	71	71	0	*Halodule wrightii*	71
4	36.1	P	68	68	0	*Halodule wrightii*	68
4	50.5	I	87	87	0	*Halodule wrightii*	87
4	50.5	P	66	66	0	*Halodule wrightii*	65
4	50.5	P	66	66	0	*Halophila englemannii*	1
4	57.5	I	94	94	0	*Halodule wrightii*	94
4	57.5	P	73	73	0	*Halodule wrightii*	73
4	92.3	I	96	96	0	*Halodule wrightii*	96
4	92.3	P	78	78	0	*Halodule wrightii*	78
4	103.8	I	89	87	2	*Caulerpa prolifera*	2
4	103.8	I	89	87	2	*Halodule wrightii*	87
4	103.8	P	70	70	0	*Halodule wrightii*	70
4	124.5	I	95	95	5	*Caulerpa prolifera*	5
4	124.5	I	95	95	5	*Halodule wrightii*	90
4	124.5	P	89	89	0	*Halodule wrightii*	89
4	139.8	I	83	83	0	*Halodule wrightii*	83
4	139.8	P	90	90	0	*Halodule wrightii*	90
5	0.0	I	40	40	0	*Halodule wrightii*	40
5	0.0	P	92	92	0	*Halodule wrightii*	92
5	5.8	I	96	96	0	*Halodule wrightii*	96
5	5.8	P	93	93	0	*Halodule wrightii*	93
5	13.5	I	91	91	0	*Halodule wrightii*	91
5	13.5	P	93	93	0	*Halodule wrightii*	93
5	21.6	I	93	93	0	*Halodule wrightii*	93
5	21.6	P	83	83	0	*Halodule wrightii*	83
5	31.6	I	84	84	0	*Halodule wrightii*	84
5	31.6	P	88	88	0	*Halodule wrightii*	88
5	38.8	I	77	77	0	*Halodule wrightii*	77
5	38.8	P	89	89	0	*Halodule wrightii*	89
5	45.4	I	80	80	0	*Halodule wrightii*	80
5	45.4	P	88	88	0	*Halodule wrightii*	88
5	82.3	I	79	79	0	*Halodule wrightii*	79

Station	Perimeter ID. (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
5	82.3	P	100	100	0	*Halodule wrightii*	100
5	89.0	I	96	96	0	*Halodule wrightii*	96
5	89.0	P	88	88	0	*Halodule wrightii*	88
5	102.3	I	96	96	0	*Halodule wrightii*	96
5	102.3	P	90	90	0	*Halodule wrightii*	90
6	0.0	I	100	100	0	*Halodule wrightii*	100
6	0.0	P	100	100	0	*Halodule wrightii*	100
6	18.6	I	97	97	0	*Halodule wrightii*	59
6	18.6	I	97	97	0	*Halophila englemannii*	38
6	18.6	P	75	75	0	*Halodule wrightii*	75
6	27.9	I	99	99	0	*Halodule wrightii*	99
6	27.9	I	99	99	0	*Halophila englemannii*	1
6	27.9	P	83	83	0	*Halodule wrightii*	83
6	27.9	P	83	83	0	*Halophila englemannii*	10
6	33.4	I	100	100	0	*Halodule wrightii*	100
6	33.4	P	94	94	0	*Halodule wrightii*	92
6	33.4	P	94	94	0	*Halophila englemannii*	2
6	40.6	I	99	99	0	*Halodule wrightii*	99
6	40.6	P	90	90	0	*Halodule wrightii*	90
6	54.6	I	99	99	0	*Halodule wrightii*	99
6	54.6	P	98	98	0	*Halodule wrightii*	97
6	54.6	P	98	98	0	*Halophila englemannii*	1
6	84.5	I	99	99	0	*Halodule wrightii*	99
6	84.5	P	94	94	0	*Halodule wrightii*	94
6	101.2	I	99	99	0	*Halodule wrightii*	99
6	101.2	P	98	98	0	*Halodule wrightii*	98
6	120.9	I	98	98	0	*Halodule wrightii*	98
6	120.9	P	93	93	0	*Halodule wrightii*	93
6	120.9	P	93	93	0	*Halophila englemannii*	15
7	0.0	I	100	100	0	*Halodule wrightii*	100
7	0.0	P	93	93	0	*Halodule wrightii*	93
7	16.2	I	88	88	0	*Halodule wrightii*	88

Appendix Table 2. Continued.

Station	Perimeter ID. (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
7	16.2	P	86	86	0	*Halodule wrightii*	86
7	22.1	I	95	95	0	*Halodule wrightii*	95
7	22.1	P	66	66	0	*Halodule wrightii*	66
7	37.3	I	100	100	0	*Halodule wrightii*	100
7	37.3	P	100	100	0	*Halodule wrightii*	100
7	44.9	I	100	100	0	*Halodule wrightii*	100
7	44.9	P	90	90	0	*Halodule wrightii*	90
7	74.0	I	100	100	0	*Halodule wrightii*	100
7	74.0	P	94	94	0	*Halodule wrightii*	94
7	80.7	I	100	100	0	*Halodule wrightii*	100
7	80.7	P	96	96	0	*Halodule wrightii*	96
7	93.4	I	100	100	0	*Halodule wrightii*	100
7	93.4	P	100	100	0	*Halodule wrightii*	100
7	101.0	I	100	100	0	*Halodule wrightii*	100
7	101.0	I	100	100	0	*Halophila englemannii*	2
7	101.0	P	97	97	0	*Halodule wrightii*	97
7	107.0	I	100	100	0	*Halodule wrightii*	100
7	107.0	P	93	93	0	*Halodule wrightii*	93
8	0.0	I	91	91	0	*Halodule wrightii*	91
8	0.0	I	91	91	0	*Halophila englemannii*	6
8	0.0	P	99	99	2	*Caulerpa prolifera*	2
8	0.0	P	99	99	2	*Halodule wrightii*	99
8	0.0	P	99	99	2	*Halophila englemannii*	2
8	5.7	I	97	97	0	*Halodule wrightii*	97
8	5.7	I	97	97	0	*Halophila englemannii*	2
8	5.7	P	94	94	0	*Halodule wrightii*	94
8	13.4	I	98	98	0	*Halodule wrightii*	98
8	13.4	I	98	98	0	*Halophila englemannii*	6
8	13.4	P	100	100	0	*Halodule wrightii*	100
8	22.9	I	100	100	0	*Halodule wrightii*	100
8	22.9	I	100	100	0	*Halophila englemannii*	4
8	22.9	P	95	95	0	*Halodule wrightii*	95

Appendix Table 2. Continued.

Station	Perimeter ID. (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
8	28.3	I	94	94	0	*Halodule wrightii*	94
8	28.3	P	94	94	0	*Halodule wrightii*	94
8	28.3	P	94	94	0	*Halophila englemannii*	4
8	43.9	I	90	90	0	*Halodule wrightii*	90
8	43.9	P	76	76	0	*Halodule wrightii*	76
8	48.7	I	75	75	0	*Halodule wrightii*	75
8	48.7	P	100	100	0	*Halodule wrightii*	100
8	57.6	I	86	86	0	*Halodule wrightii*	86
8	57.6	P	96	96	0	*Halodule wrightii*	96
8	79.0	I	94	94	0	*Halodule wrightii*	94
8	79.0	P	90	90	0	*Halodule wrightii*	90
9	0.0	I	56	56	0	*Syringodium filiforme*	56
9	0.0	P	94	94	0	*Halophila englemannii*	2
9	0.0	P	94	94	0	*Syringodium filiforme*	94
9	11.0	I	94	94	0	*Syringodium filiforme*	94
9	11.0	P	96	96	0	*Syringodium filiforme*	96
9	24.0	I	94	94	0	*Halodule wrightii*	6
9	24.0	I	94	94	0	*Syringodium filiforme*	94
9	24.0	P	93	93	0	*Syringodium filiforme*	93
9	49.6	I	85	85	0	*Syringodium filiforme*	85
9	49.6	P	80	80	1	*Caulerpa prolifera*	1
9	49.6	P	80	80	1	*Halophila englemannii*	3
9	49.6	P	80	80	1	*Syringodium filiforme*	80
9	63.5	I	93	93	0	*Syringodium filiforme*	93
9	63.5	P	86	86	0	*Syringodium filiforme*	86
9	78.3	I	84	84	0	*Halophila englemannii*	2
9	78.3	I	84	84	0	*Syringodium filiforme*	82
9	78.3	P	92	92	0	*Syringodium filiforme*	92
9	116.3	I	28	28	0	*Syringodium filiforme*	28
9	116.3	P	89	89	0	*Halophila englemannii*	11
9	116.3	P	89	89	0	*Syringodium filiforme*	78
9	136.9	I	91	91	0	*Halophila englemannii*	10

Appendix Table 2. Continued.

Station	Perimeter ID.	Perimeter (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
	9	136.9	I	91	91	0	*Syringodium filiforme*	91
	9	136.9	P	79	79	0	*Halophila englemannii*	10
	9	136.9	P	79	79	0	*Syringodium filiforme*	79
	9	153.8	I	67	67	0	*Syringodium filiforme*	67
	9	153.8	P	89	89	0	*Halophila englemannii*	7
	9	153.8	P	89	89	0	*Syringodium filiforme*	89
	9	167.4	I	94	94	0	*Syringodium filiforme*	94
	9	167.4	P	90	90	0	*Halophila englemannii*	3
	9	167.4	P	90	90	0	*Syringodium filiforme*	90
	10	0.0	I	24	24	0	*Halophila englemannii*	17
	10	0.0	I	24	24	0	*Syringodium filiforme*	7
	10	0.0	P	90	90	4	*Caulerpa prolifera*	4
	10	0.0	P	90	90	4	*Syringodium filiforme*	90
	10	14.0	I	78	78	0	*Syringodium filiforme*	78
	10	14.0	P	77	77	8	*Caulerpa prolifera*	8
	10	14.0	P	77	77	8	*Syringodium filiforme*	77
	10	25.1	I	84	84	4	*Caulerpa prolifera*	4
	10	25.1	I	84	84	4	*Syringodium filiforme*	84
	10	25.1	P	84	68	16	*Caulerpa prolifera*	16
	10	25.1	P	84	68	16	*Syringodium filiforme*	84
	10	36.8	I	59	59	0	*Syringodium filiforme*	59
	10	36.8	P	80	80	0	*Syringodium filiforme*	80
	10	48.2	I	68	68	6	*Caulerpa prolifera*	6
	10	48.2	I	68	68	6	*Syringodium filiforme*	68
	10	48.2	P	77	77	0	*Syringodium filiforme*	77
	10	63.7	I	60	58	2	*Caulerpa prolifera*	2
	10	63.7	I	60	58	2	*Syringodium filiforme*	58
	10	63.7	P	6	6	0	*Syringodium filiforme*	6
	10	75.8	I	0	0	0	Bare	0
	10	75.8	P	13	13	0	*Syringodium filiforme*	13
	10	91.1	I	19	19	0	*Syringodium filiforme*	19
	10	91.1	P	87	87	5	*Caulerpa prolifera*	5

Station	Perimeter ID.	Perimeter (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
	10	91.1	P	87	87	5	*Syringodium filiforme*	87
	10	136.7	I	76	76	0	*Syringodium filiforme*	76
	10	136.7	P	100	100	0	*Halophila englemannii*	3
	10	136.7	P	100	100	0	*Syringodium filiforme*	100
	10	166.3	I	94	94	0	*Syringodium filiforme*	94
	10	166.3	P	100	100	0	*Syringodium filiforme*	100
	11	0.0	I	100	100	0	*Syringodium filiforme*	100
	11	0.0	P	99	99	0	*Syringodium filiforme*	99
	11	11.1	I	100	100	0	*Syringodium filiforme*	100
	11	11.1	P	100	100	0	*Halophila englemannii*	1
	11	11.1	P	100	100	0	*Syringodium filiforme*	100
	11	21.0	I	99	99	0	*Syringodium filiforme*	99
	11	21.0	P	97	97	0	*Syringodium filiforme*	97
	11	29.6	I	100	100	0	*Syringodium filiforme*	100
	11	29.6	P	98	98	0	*Syringodium filiforme*	98
	11	40.6	I	94	94	0	*Syringodium filiforme*	94
	11	40.6	P	100	100	0	*Syringodium filiforme*	100
	11	51.1	I	95	95	0	*Syringodium filiforme*	95
	11	51.1	P	93	93	0	*Halophila englemannii*	2
	11	51.1	P	93	93	0	*Syringodium filiforme*	93
	11	81.0	I	95	95	0	*Syringodium filiforme*	95
	11	81.0	P	100	100	0	*Syringodium filiforme*	100
	11	87.6	I	100	100	0	*Syringodium filiforme*	100
	11	87.6	P	100	100	0	*Syringodium filiforme*	100
	11	104.2	I	100	100	0	*Syringodium filiforme*	100
	11	104.2	P	100	100	0	*Syringodium filiforme*	100
	11	115.0	I	100	100	0	*Syringodium filiforme*	100
	11	115.0	P	96	96	0	*Syringodium filiforme*	96
	12	0.0	I	100	100	0	*Halodule wrightii*	100
	12	0.0	I	100	100	0	*Syringodium filiforme*	100
	12	0.0	P	88	88	0	*Syringodium filiforme*	88
	12	10.0	I	98	92	6	*Caulerpa prolifera*	6

Station	Perimeter ID. (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
12	10.0	I	98	92	6	*Syringodium filiforme*	92
12	10.0	P	88	88	0	*Syringodium filiforme*	88
12	28.1	I	70	68	2	*Caulerpa prolifera*	2
12	28.1	I	70	68	2	*Halodule wrightii*	34
12	28.1	I	70	68	2	*Syringodium filiforme*	34
12	28.1	P	89	88	1	*Caulerpa prolifera*	1
12	28.1	P	89	88	1	*Syringodium filiforme*	88
12	42.2	I	100	80	20	*Caulerpa prolifera*	20
12	42.2	I	100	80	20	*Syringodium filiforme*	80
12	42.2	P	88	66	12	*Caulerpa prolifera*	12
12	42.2	P	88	66	12	*Syringodium filiforme*	66
12	52.5	I	97	97	0	*Syringodium filiforme*	97
12	52.5	P	94	93	1	*Caulerpa prolifera*	1
12	52.5	P	94	93	1	*Syringodium filiforme*	93
12	61.6	I	100	99	1	*Caulerpa prolifera*	1
12	61.6	I	100	99	1	*Syringodium filiforme*	99
12	61.6	P	96	96	0	*Syringodium filiforme*	96
12	71.0	I	97	97	0	*Syringodium filiforme*	97
12	71.0	P	95	95	0	*Syringodium filiforme*	95
12	85.5	I	89	89	0	*Syringodium filiforme*	89
12	85.5	P	95	95	0	*Syringodium filiforme*	95
12	92.6	I	96	96	0	*Syringodium filiforme*	96
12	92.6	P	78	78	0	*Syringodium filiforme*	78
12	110.4	I	98	98	0	*Syringodium filiforme*	98
12	110.4	P	92	92	0	*Syringodium filiforme*	92
13	0.0	I	96	96	15	*Caulerpa prolifera*	15
13	0.0	I	96	96	15	*Halodule wrightii*	96
13	0.0	I	96	96	15	*Thalassia testudinum*	5
13	0.0	P	82	76	6	*Caulerpa prolifera*	6
13	0.0	P	82	76	6	*Halodule wrightii*	78
13	14.5	I	94	10	84	*Caulerpa prolifera*	6
13	14.5	I	94	10	84	*Caulerpa mexicana*	78

Station	Perimeter ID.	Perimeter (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
	13	14.5	I	94	10	84	*Thalassia testudinum*	10
	13	14.5	P	68	55	13	*Caulerpa mexicana*	13
	13	14.5	P	68	55	13	*Halodule wrightii*	55
	13	14.5	P	68	55	13	*Thalassia testudinum*	3
	13	30.3	I	53	16	37	*Caulerpa mexicana*	37
	13	30.3	I	53	16	37	*Thalassia testudinum*	16
	13	30.3	P	55	0	55	*Caulerpa mexicana*	55
	13	48.8	I	97	0	97	*Caulerpa prolifera*	70
	13	48.8	I	97	0	97	*Caulerpa mexicana*	27
	13	48.8	P	100	0	100	*Caulerpa prolifera*	80
	13	48.8	P	100	0	100	*Caulerpa mexicana*	20
	13	56.8	I	50	0	50	*Caulerpa prolifera*	20
	13	56.8	I	50	0	50	*Caulerpa mexicana*	30
	13	56.8	P	72	0	72	*Caulerpa mexicana*	72
	13	75.4	I	90	0	90	*Caulerpa prolifera*	80
	13	75.4	I	90	0	90	*Caulerpa mexicana*	10
	13	75.4	P	60	0	60	*Caulerpa mexicana*	60
	13	87.0	I	70	0	70	*Caulerpa prolifera*	70
	13	87.0	P	70	0	70	*Caulerpa prolifera*	70
	13	94.9	I	42	0	42	*Caulerpa prolifera*	42
	13	94.9	P	40	0	40	*Caulerpa mexicana*	40
	13	122.1	I	95	0	95	*Caulerpa mexicana*	95
	13	122.1	P	60	20	40	*Caulerpa mexicana*	40
	13	122.1	P	60	20	40	*Halodule wrightii*	20
	13	127.5	I	90	0	90	*Caulerpa mexicana*	90
	13	127.5	P	85	75	10	*Caulerpa prolifera*	10
	13	127.5	P	85	75	10	*Halodule wrightii*	75
	14	0.0	I	69	69	0	*Halodule wrightii*	69
	14	0.0	P	100	100	0	*Halodule wrightii*	100
	14	22.2	I	98	98	0	*Halodule wrightii*	98
	14	22.2	P	100	100	0	*Halodule wrightii*	100
	14	41.4	I	95	95	0	*Halodule wrightii*	95

Station	Perimeter ID. (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
14	41.4	P	82	82	0	*Halodule wrightii*	82
14	50.6	I	97	97	0	*Halodule wrightii*	97
14	50.6	P	73	73	0	*Halodule wrightii*	73
14	59.1	I	95	95	0	*Halodule wrightii*	95
14	59.1	P	95	95	0	*Halodule wrightii*	95
14	77.9	I	93	93	2	*Caulerpa prolifera*	2
14	77.9	I	93	93	2	*Halodule wrightii*	91
14	77.9	P	97	97	0	*Halodule wrightii*	97
14	87.3	I	93	93	0	*Halodule wrightii*	93
14	87.3	P	96	96	0	*Halodule wrightii*	96
14	109.7	I	95	95	0	*Halodule wrightii*	95
14	109.7	P	89	89	0	*Halodule wrightii*	89
14	129.3	I	83	83	0	*Halodule wrightii*	3
14	129.3	I	83	83	0	*Thalassia testudinum*	83
14	129.3	P	77	77	0	*Thalassia testudinum*	77
14	149.2	I	100	100	0	*Halodule wrightii*	100
14	149.2	P	98	98	0	*Halodule wrightii*	98
15	0.0	I	95	95	0	*Thalassia testudinum*	95
15	0.0	P	90	90	0	*Thalassia testudinum*	90
15	19.3	I	95	95	0	*Thalassia testudinum*	95
15	19.3	P	88	88	0	*Thalassia testudinum*	88
15	32.4	I	89	89	0	*Halodule wrightii*	18
15	32.4	I	89	89	0	*Thalassia testudinum*	86
15	32.4	P	28	28	0	*Thalassia testudinum*	28
15	41.4	I	100	100	0	*Halodule wrightii*	100
15	41.4	P	89	89	0	*Halodule wrightii*	89
15	62.0	I	100	100	0	*Halodule wrightii*	100
15	62.0	P	100	100	0	*Halodule wrightii*	100
15	69.8	I	100	100	0	*Halodule wrightii*	100
15	69.8	P	78	78	0	*Halodule wrightii*	78
15	90.1	I	100	100	0	*Halodule wrightii*	100
15	90.1	P	100	100	0	*Halodule wrightii*	100

Station	Perimeter ID. (ft)	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
15	102.1	I	100	100	0	*Halodule wrightii*	100
15	102.1	P	75	75	15	*Caulerpa prolifera*	15
15	102.1	P	75	75	15	*Halodule wrightii*	75
15	116.5	I	100	100	0	*Halodule wrightii*	100
15	116.5	P	100	100	0	*Halodule wrightii*	100
15	133.6	I	98	98	0	*Halodule wrightii*	98
15	133.6	P	100	100	0	*Halodule wrightii*	100

RAI 3-4 Crystal River 1994 Seagrass Study

1994 Summary Report for:

CRYSTAL RIVER 3 YEAR NPDES MONITORING PROJECT

FPC Contract S01100

Work Authorization 401 (Addendum 2)

submitted December 19, 1994 to

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INTRODUCTION

Florida Power Corporation (FPC) and federal and state regulatory agencies seek to demonstrate that the operation of new helper cooling towers at the FPC Crystal River Station will lead to an expansion in the area of benthic habitat occupied by submerged aquatic vegetation (SAV: seagrasses and rhizophytic macroalgae). A monitoring program was begun in the Fall of 1993 and is continuing on an annual basis through the Fall of 1995. The monitoring program emphasizes near-shore waters within a two mile radius from the point of discharge (POD) of the Crystal River Station.

The 1993 Summary Report (Estevez and Marshall, 1993[1]) reviewed SAV information available for the Crystal River Station area, and also provided the technical rationale for the present monitoring study. To recapitulate highlights of the rationale:

-- Past efforts at aerial photography have often met with failure due usually to turbidity;

-- New monitoring should take advantage of successful photography but not depend upon it;

-- Surveys are needed to determine whether new SAV beds are recruiting into barren areas, especially the areas that once supported SAV;

-- In the event that barren areas are not recolonized, existing SAV beds should be monitored to determine whether they are expanding along their margins;

-- If SAV is not expanding or colonizing new areas, there may be signs of improvement within existing beds insofar as SAV condition (biomass, productivity) is concerned. Sav condition in August 1994 should be compared to condition in August of 1995 for indications of improvements, although the variances are expected to be high.

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[1]/ Estevez, E.D. and M.A. Marshall. 1993. 1993 summary report for Crystal River 3 year NPDES monitoring project, FPC Contract No. S01100. Mote Marine Laboratory Technical Report Number 343. Sarasota FL.

This report summarizes findings for barren area surveys, "perimeter" studies at intensive SAV beds, and the August 1994 condition assessment.

METHODS

Positioning

Several independent systems were employed. Approximate station locations were mapped onto charts carried in the field, to depict the orientation of a station to creeks, islands, day marks, levees, and other land marks. LORAN and GPS coordinates of all stations and transects, measured in 1993, were also taken into the field. As needed, the end points of transects that were marked on land or in marshes with steel bars, stones, colored paint, or other permanent material were replaced.

In 1994, transect end points and station locations were again measured using a Voyager LORAN Navigator and a Magellan NAVPRO global positioning system. Electronic positions also were measured for NOS benchmarks at the mouth of the discharge canal, and at the U.S. Geological Survey "Knott" benchmark on Drum Island. Preliminary analysis of the electronic data indicate high field accuracy but relatively low map precision (see Discussion).

Barren Area Transects

Barren area transects established in 1993 were revisited in October 1994. As shown in Figure 1, most effort was directed to Basins 1, 2 and 3, with some effort in the areas of Basins 4 and 5, closest to the POD (e.g, inside the 2-mile radius).

Barren areas were surveyed by a diver towed behind a shallow draft vessel. Most transects ran due north or south to pre-determined landmarks. For long transects, tows followed transect lines marked in advance with temporary buoys. Buoys marked end points and way points, as needed. Beginning and end points were permanently positioned and marked. Where needed, tows were made into the current to reduce drift.

If the diver encountered seagrass or rhizophytic algae in barren areas the vessel stopped and marked the site(s). The immediate area was reconnoitered to determine the extent of SAV. If it corresponded to a previously-mapped SAV bed, it was recorded as "mapped" and was discounted as barren area. If new, the area, centroid position, species composition, and percent cover (see below) of the SAV was to be recorded, unless the vegetation was found to be Sargassum attached to rock outcrops. SAV markers were then recovered, and the survey of the transect continued.

Intensive SAV BED Surveys

In October 1994, GPS and LORAN coordinates and compass sightings were used to relocate the seagrass beds selected for study. Several beds were marked by crab trap buoys anchored with screw-in tie down anchors to facilitate site recovery in 1995.

Within each bed, the position of a "center" marker was determined in 1993 by GPS, LORAN, and compass bearings. Center markers are hemispherical concrete parking lot markers. Each marker was painted with blue anti-fouling paint and anchored to the bottom with screw-in anchors. Concrete markers were tied to the anchors with 1" diameter nylon rope.

Edges of all 15 sites were marked during 1993 in order to determine whether the seagrass beds expand, contract, or remain unchanged during the duration of the three year study.

Seagrass bed edges were marked with short (<1.0 m) sections of 3/8" steel reinforcement rods driven into the bottom with a small sledge hammer. Each steel stake was allowed to extend about 10 cm upward from the sediment surface. Seagrass bed edges were usually very easy to define, based on the sharp delineations between bare bottom and vegetated bottom.

A surveyor's tape was strung out along the set of edge markers at each site. In 1993, distances between edge markers and the distance from the center marker to each edge marker were recorded.

In 1994, bed markers were found by wading, snorkeling, or pulling a weighted polypropylene line across the bottom. Center markers and edge markers were relocated or replaced as needed. The majority of markers was relocated, so that only a few needed to be replaced. PVC poles were installed next to

each edge marker to simplify working in turbid water. The distance of the actual SAV bed edge was tape-measured from the edge marker. Seaward changes were recorded as expansions. Changes toward the central bed marker were recorded as contractions.

As in 1993, the percentage of bottom covered by SAV on the edge of each bed (from 0.0 to 1.0 m into each bed) and deeper into the bed (at a distance of 2.0 to 3.0 m) was measured. Ten 1.0 m2 quadrat-based estimates of bottom cover were taken along the vegetated edge of each SAV bed. The quadrats were positioned on the vegetated side of a randomly selected subset of the 15 edge markers at each site. Ten 1.0 m2 additional cover estimates were made by flipping the quadrat frame over twice away from the perimeter of each seagrass bed.

Subdivisions (100 cm2) of the 1.0 m2 quadrat were used as the units for the cover estimates. SAV coverage was determined by counting the number of units in which various species of SAV were actually rooted. A barren square was defined as being devoid of any rooted vegetation. Seagrass blades from plants rooted in other units were not counted as cover in the otherwise completely barren units. Four seagrasses (Halodule, Syringodium, Thalassia, and Halophila) were encountered in the study sites. Two species of the rhizophytic algal genus, Caulerpa, were found at several of the sites. Divers recorded data on slates and the data were transferred to log books for later use.

SAV Condition

Condition was defined as SAV shoot count, above-ground biomass, and productivity. Methods and effort followed the 316 Demonstration Study (Mattson et al.,1986[2]) with some variations as noted below. SAV condition was measured at the 15 intensive beds that are used for perimeter measurements in the 1993-95 monitoring program.

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[2]/ Mattson, R., J.A. Derrenbacker, Jr. and R.R. Lewis. 1986. Effects of thermal addition from the Crystal River generating complex on the submerged macrophytic communities in Crystal Bay, Florida, pp. 11-67 in K. Mahadevan et al. (eds.), Proceedings, Southeastern Workshop on Aquatic Ecological Effects of Power Generation, Mote Marine Laboratory Technical Report Number 124. Sarasota FL.

At each station, 6 samples for biomass of seagrasses and rhizophytic macroalgae were collected with a 25x25 cm sampler. The sampler was a PVC frame partially covered by a dive bag. Macrophytes clipped at the sediment surface floated into the upturned bag, which was labelled, closed and removed before moving to the next clip site. Contents of 6 samples were sorted into seagrasses (by species) and algae (pooled). Sorted samples were dried to constant weight at 105° C and weighed.

Seagrass productivity was determined as 14 day regrowth. At least 4, and usually 5 or 6, replicate measurements were made in each bed, using 11.3 cm diameter clip rings for Halodule, or 16.7 cm diameter clip rings for other seagrasses. After clip rings were installed, all SAV was clipped level with the surface of the ring, and discarded. Two weeks later, new growth was harvested, sorted, preserved, and labelled. Samples were dried to constant weight at 70° C and weighed. Seagrass shoot densities were measured by counting the shoots collected in the clip rings after 14 days of regrowth.

As biomass and productivity samples were being made in the field, percent cover was measured within the interior of each bed. Percent cover was determined by the same methods employed in annual sampling.

RESULTS

All data collected from the 1994 sampling effort appear in the tables and appendix tables that follow. Data from 1993 are included where appropriate.

Barren Area Transects

Three SAV beds were encountered in 1994 that were not seen when the transects were established in 1993 (Table 1). Two were Halodule beds and the third was a mixed Halodule-Syringodium bed with small amounts of the green alga, Caulerpa.

One of the "new" beds was found on Transect 1N, which is Basin 1. It was a small (7x10 m), sparse (5% mean cover) Halodule bed with short (<5 cm) blades. The bed was growing in a silty sand underlain by rock. Many large

(10-20 cm) burrows were found in the rock near the bed and elsewhere on the Basin 1 flats crossed by Transects 1N, 1W and 2W. The burrows were not seen in 1993.

Another Halodule bed was found on Transect 3W, in Basin 2. The bed covered 40 m of transect on flats southwest of Thumb Island. The north end of the bed was characterized by sparse calcareous green algae and Halodule was the principal SAV at the bed's southern end. Average percent cover of Halodule near the south end of the bed was 48%.

A third novel bed was found on Transect 5W, which crosses from Basin 2 into Basin 3. The bed was found in the Basin 2 portion of the transect, south of Drum Island. The bed was a mixture of small, dense patches of either Caulerpa (4% mean cover) or Halodule (14% mean cover), with the two sometimes combined. Syringodium was present but rare (30% cover in 1 of 10 replicates.

Perimeter Beds

Thirteen of 15 intensively studied SAV beds had positive growth along their margins since 1993, based on the mean change observed at 10 to 16 reference markers per bed (Table 2). Mean expansion ranged from 0.06 m to 6.51 m. Standard deviations usually exceeded means because considerable variation was measured, ranging in expanding beds from 0.0 to 14.0 m.

Two stations, 3 in Basin 1 and 5 in Basin 2, contracted by -0.38 m and -0.21 m in terms of their respective mean values.

On a basin-wise basis, Basin 3 SAV beds showed approximately twice the mean expansion values as beds in Basins 1 or 2, or control beds south of the intake canal.

Percent Cover

The majority of cases in both 1993 and 1994 were such that percent cover measurements were made on algae-free SAV beds (Table 3). Although algae were present in some cases, the cover and changes in cover of seagrass generally represent the same values as data for "total vegetation".

In 1994, no basin-wise differences in mean cover were significant. Basin 3 had greater than 90% cover compared to mean covers of 71-78% in Basin 1 and 61-70% in Basin 2.

Percent cover was determined along the perimeters of beds and in the bed interior (Table 4). For both locations, as many beds had increases in seagrass cover as had decreases (7 each, 1 with no data). Perimeter samples averaged a decrease in percent cover of 5.1% from 1993 to 1994, whereas interior samples averaged a decrease of 3.4% over the same period. No basin-wise patterns or trends in cover change were seen.

Biomass

Biomass was evaluated for individual seagrass species, all seagrass, and all vegetation (Table 5). For Halodule, biomass had a bimodal distribution when plotted in terms of station proximity to the POD (Figure 2A). Stations 1 and 15 had maximum Halodule biomass values, but no significant differences occurred between station pairs.

Syringodium occurred at fewer stations but biomass data also displayed a bimodal distribution with respect to station order (Figure 2B). It is noteworthy that the relationship between percent cover and biomass of Syringodium was meaningful whereas the relationship for Halodule was not (Figure 3).

Combining all seagrass species biomass obscured the bimodal pattern seen for individual species biomass (Figure 4), although it is evident that stations closest to the POD had much lower mean biomass values than more distant stations. Mean seagrass biomass values for the six stations closest to the POD were significantly lower than mean biomass values for 3 more distant stations (9,11, and 12).

All vegetation (seagrass plus rhizophytic macroalgae) biomass accentuated the spatial pattern seen for all seagrass species combined (Figure 4). Distant stations north of the Intake Canal had greater mean biomass values than stations closer to the POD, due largely to the increased abundance of macroalgae.

Shoot Density

Mean numbers of Halodule shoots per square meter also displayed a bimodal distribution with respect to station order (Figure 5), whereas the pattern was not as evident for Syringodium.

Productivity

Clip data (Table 6) were normalized for regrowth period and sample size to calculate productivity as mg dry weight per square meter per day (Table 7). Halodule productivity data were bimodally distributed with respect to station proximity to the POD, whereas Syringodium productivity was not (Figure 6).

DISCUSSION

Based on data from 1993 and 1994, including data collected for the first time in 1994, the following points are offered.

1. "New" SAV beds appeared along barren-area transects. Three beds were found in 1994 that were not seen in 1993. Two are small Halodule beds in relatively close proximity (Basins 1 and 2) to the point of discharge. The apparent recruitment of beds into barren areas could be an artifact of sampling dates (November-December 1993 versus October 1994), especially for the multiple species bed on Transect 5 near Drum Island. Beds on transects closer to the point of discharge are more likely to be genuine additions, because the tidal flats in that area are shallow, easily surveyed, and frequently visited. Surveys in 1995 will determine whether these beds have persisted or grown, and whether additional new beds occur.

2. Recruitment of new beds into barren areas has not been extensive. During the first full year of monitoring, there was no evidence that SAV was colonizing extensive areas of barren sediment. This suggests that seasonal differences in SAV cover were not great from 1993 to 1994. Historical data indicate that losses of SAV along the southern side of Basin 3 were considerable. The record is moot as to whether the cause of this decline was thermal stress, turbidity, or other factor(s). To the extent that

thermal stress was involved, the southern side of Basin 3 remains a likely area to expect SAV colonization during the coming year.

3. The seaward edges of selected SAV beds have expanded. Thirteen of 15 SAV beds had positive growth along their margins since 1993, on the order of 0.7 to 1.4 m. Basin 3 SAV beds showed approximately twice the mean expansion values as beds in other basins. This trend could be an artifact of sampling a month earlier in 1994 than in 1993. Sampling in 1995 will be directly comparable to 1994 sampling and will provide insight to the permanence of bed expansion.

4. No significant patterns in 1994 SAV cover were observed. In 1994, Basin 3 beds had higher percent cover[3] averages than beds in other basins. Compared to 1993, there were small (<5.1%) decreases in percent cover along the perimeter and within the interior of beds. Neither temporal trends nor spatial patterns in percent cover were significant.

5. Other indicators of SAV condition covaried and were distributed in a bimodal pattern with respect to station proximity to the POD. Biomass, shoot density, and productivity rates increased, decreased (to minima at Station 5), and then increased relative to distance from the POD, especially for *Halodule*. This pattern suggests that more than one factor influences spatial variation in seagrass condition, a finding consistent with previous investigations.

6. Combining species of seagrass or adding rhizophytic macroalgae to condition data transforms spatial patterns. Mean station biomass values are bimodal on a species basis. Combining species or adding algae changes the spatial pattern so that biomass increases with distance from the POD. Total biomass is much lower at the 6 stations closest to the POD than at more distant stations, reflecting algal contributions.

Photography and Mapping

The 1993-94 aerial photography effort was unsuccessful due to low water clarity. A 1994-95 effort is in progress. If it is successful, images will be photo-interpreted, ground-truthed, and digitally mapped by a subcontractor. An effort will be made during ground-truthing to distinguish

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[3]/ Of seagrasses, the dominant component of total SAV.

lithophytic Sargassum from seagrasses and rhizophytic algae. A separate report will accompany the maps. Progress has also been made in producing an independent GIS map of the study area, at the level of detail needed to plot LORAN and GPS data collected in 1993 and 1994. A draft GIS product was submitted to FPC in October 1994 and a final version will be submitted for approval as soon as a computer hardware failure is repaired.

Conclusions

In 1994 the monitoring program at Crystal River produced repeat data and new data concerning the occurrence, spatial extent, and condition of SAV within a 2 mile radius of the point of discharge. Repeat data indicate that existing SAV beds are stable. No evidence was found that existing beds were retreating from their 1993 dimensions. Most beds expanded along their margins, by an amount that could be due to the one month difference in sampling time. Condition data suggest that the expansion was not an artifact of sampling date, and surveys in 1995 will determine whether expansion is continuing. Condition data were either uninformative (percent cover) or indicated a bimodal spatial pattern relative to proximity of stations to the POD. Shoot densities, biomass, and productivity tended to increase with distance from the POD but the pattern of increases indicates that several factors affect SAV condition. Data to be collected in 1995 will reveal the persistence of these patterns and allow for trends to be identified between years. In 1994, three beds of mostly Halodule were encountered along transects crossing areas that were barren in 1993. One bed was in Basin 1, very close to the POD. Other beds appeared in Basin 2, the area next closest to the POD. No new beds were found in Basin 3, where colonization of barren areas was expected on the basis of historic data, but colonization in Basins 1 and 2 offer hope that additional recruitment will be detected throughout the study area in 1995.

FIGURE 1

The base map employed in Figure 1A and 1B is a composite in which marsh and canal shorelines, and oyster reefs, have been added to the 1983 SAV map produced as part of the FPC 316 Demonstration Study. Shorelines were transferred from U.S. Geological Survey topographic quadrangles and oyster reefs were taken from unpublished data available at Mote Marine Laboratory. Spoil islands of the Cross-Florida Barge Canal appear at the top of the map, which is north. The discharge canal levee is the shorter feature depicted to the north of the longer levee on the intake canal. In the map, A denotes algal beds; S, seagrass beds; AS, mixed beds dominated by algae; SA, mixed beds dominated by seagrass; O, open or barren bottom.

Figure 1A

This figure depicts the number and orientation of barren area transects established for the present study. One transect, "13W", is not shown. It is north of the Barge Canal, extending from Green 35 day mark on the Canal, to Green 23A day mark on the Withlacoochee River. Note that most transects have at least one land-side end, which has been marked in the field with a permanent monument. Transect "9W" is 2 miles from the point of discharge.

The locations of 3 "new" barren area SAV beds encountered in 1994 are highlighted with asterisks (*).

Figure 1B

This figure depicts the locations of SAV beds selected for intensive surveys (percent cover, biomass, productivity, etc.). One station, "10", is immediately south of station "9" but off the figure. Stations 1-3 are in Basin 1. Stations 5-7 are in Basin 2. Four stations between the canals are in Basin 3. Station 11 is in Rocky Cove. Station 13 is 2 miles from the point of discharge.

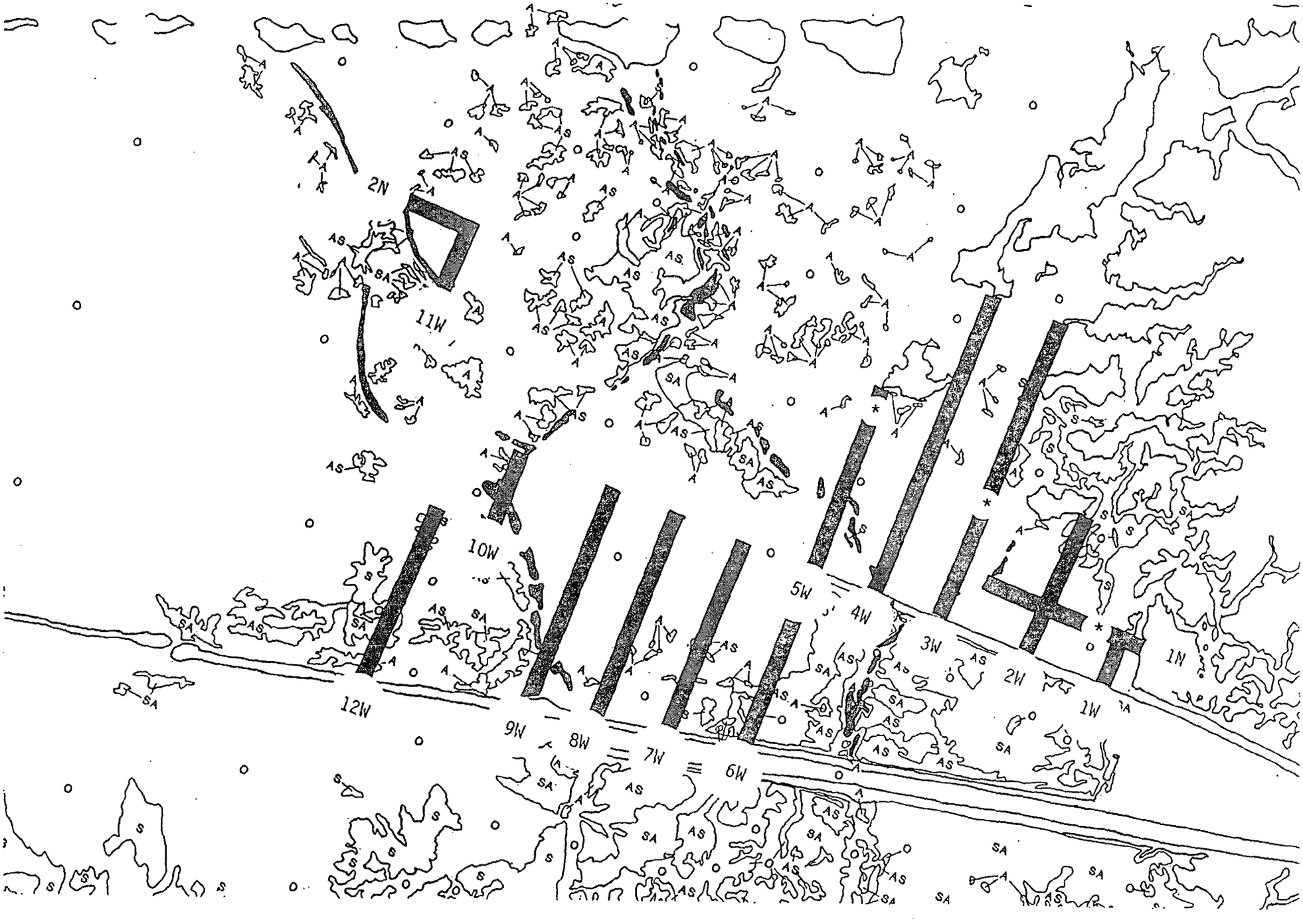


FIGURE 1A: Barren Area Transects

FIGURE 1B: Intensive SAV Beds

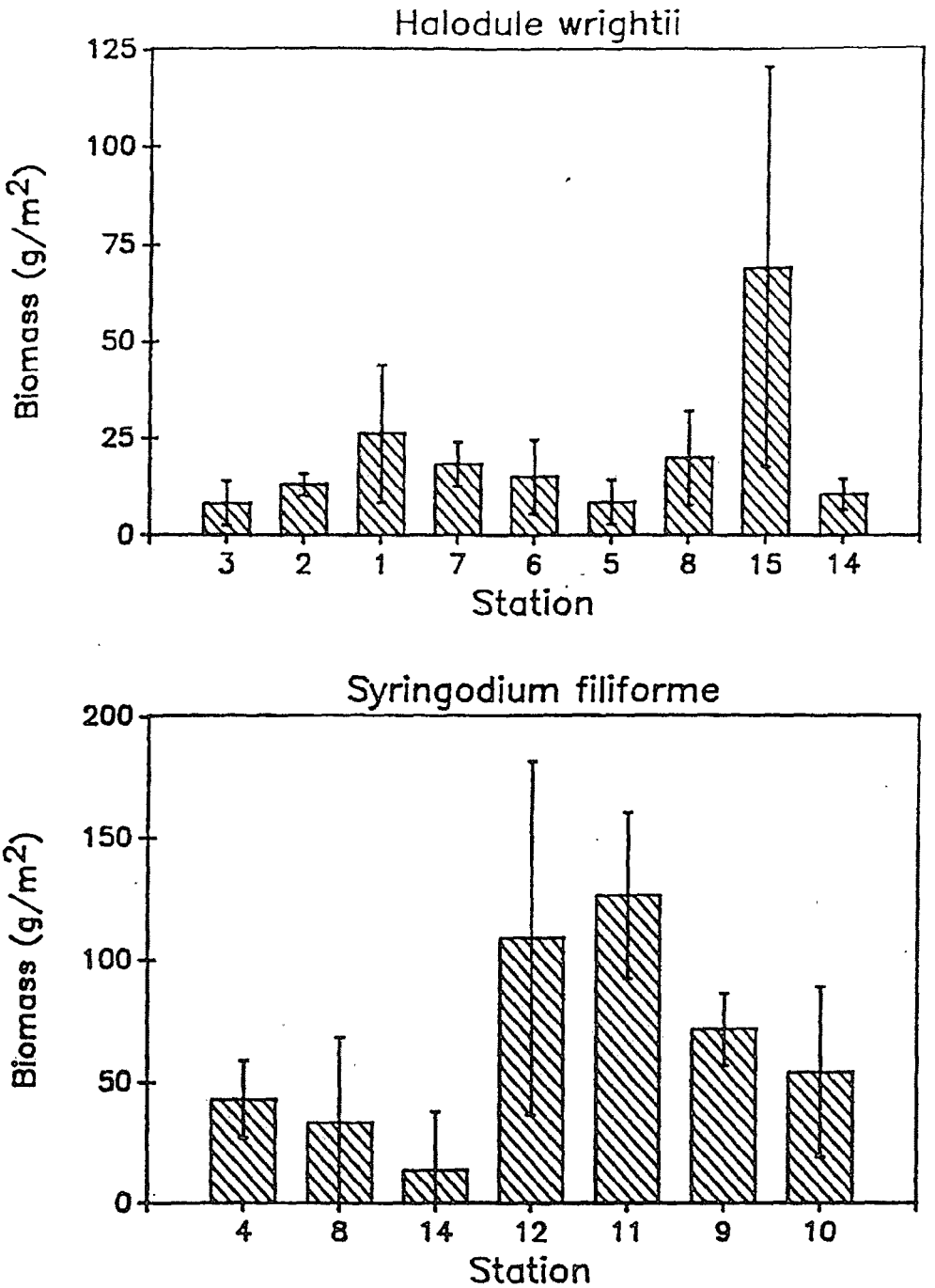
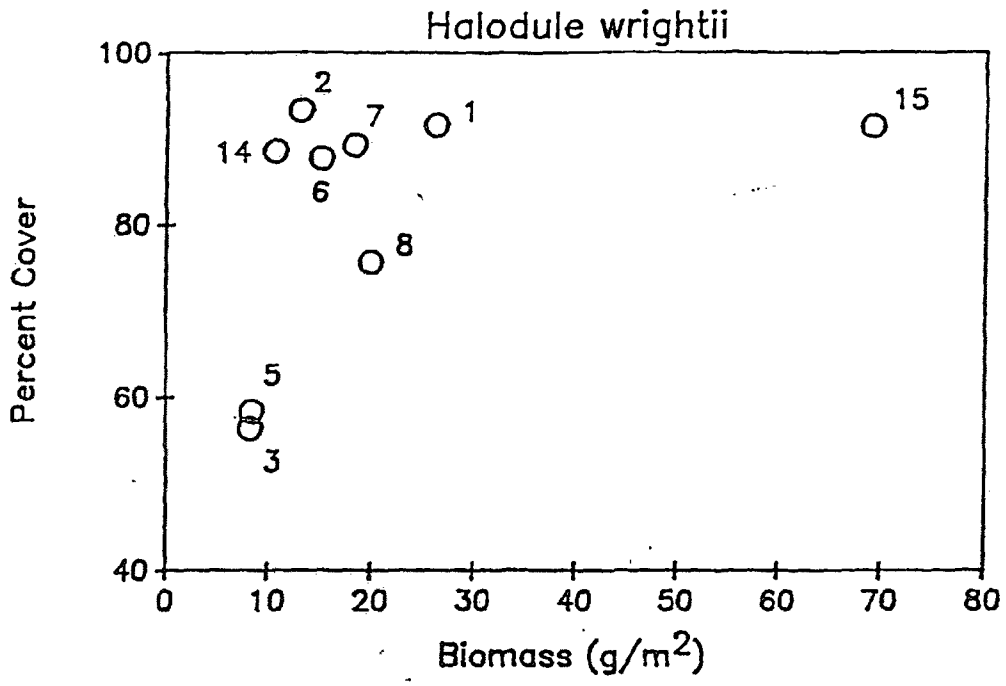


Figure 2. Biomass in order of station proximity to POD. A, Halodule; B, Syringodium.



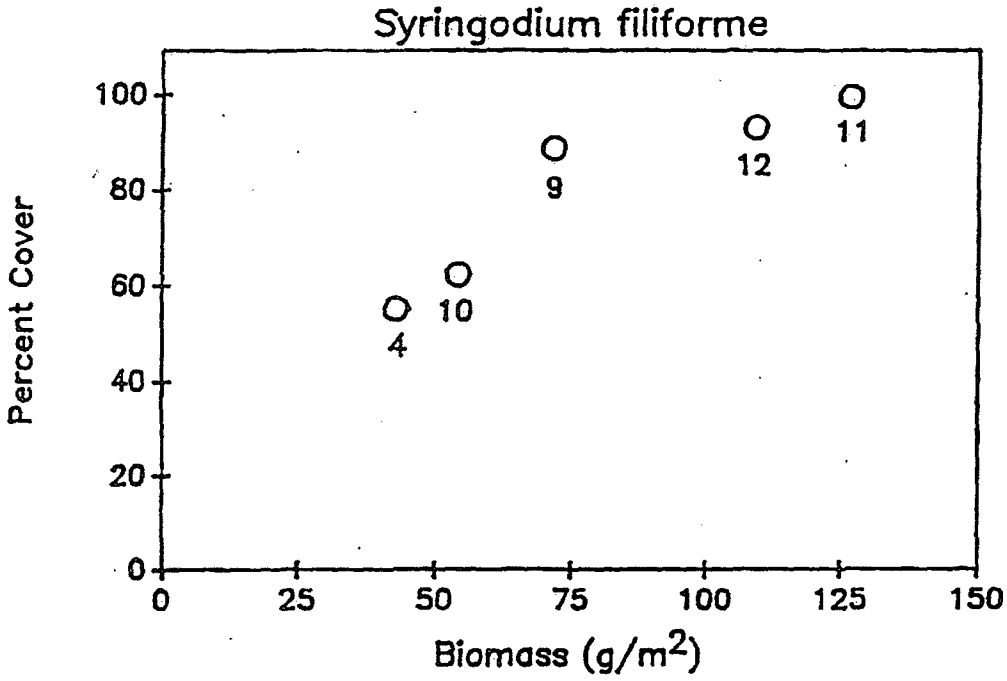


Figure 3. Biomass vs. Percent Cover (mean station values). A, Halodule; B, Syringodium.

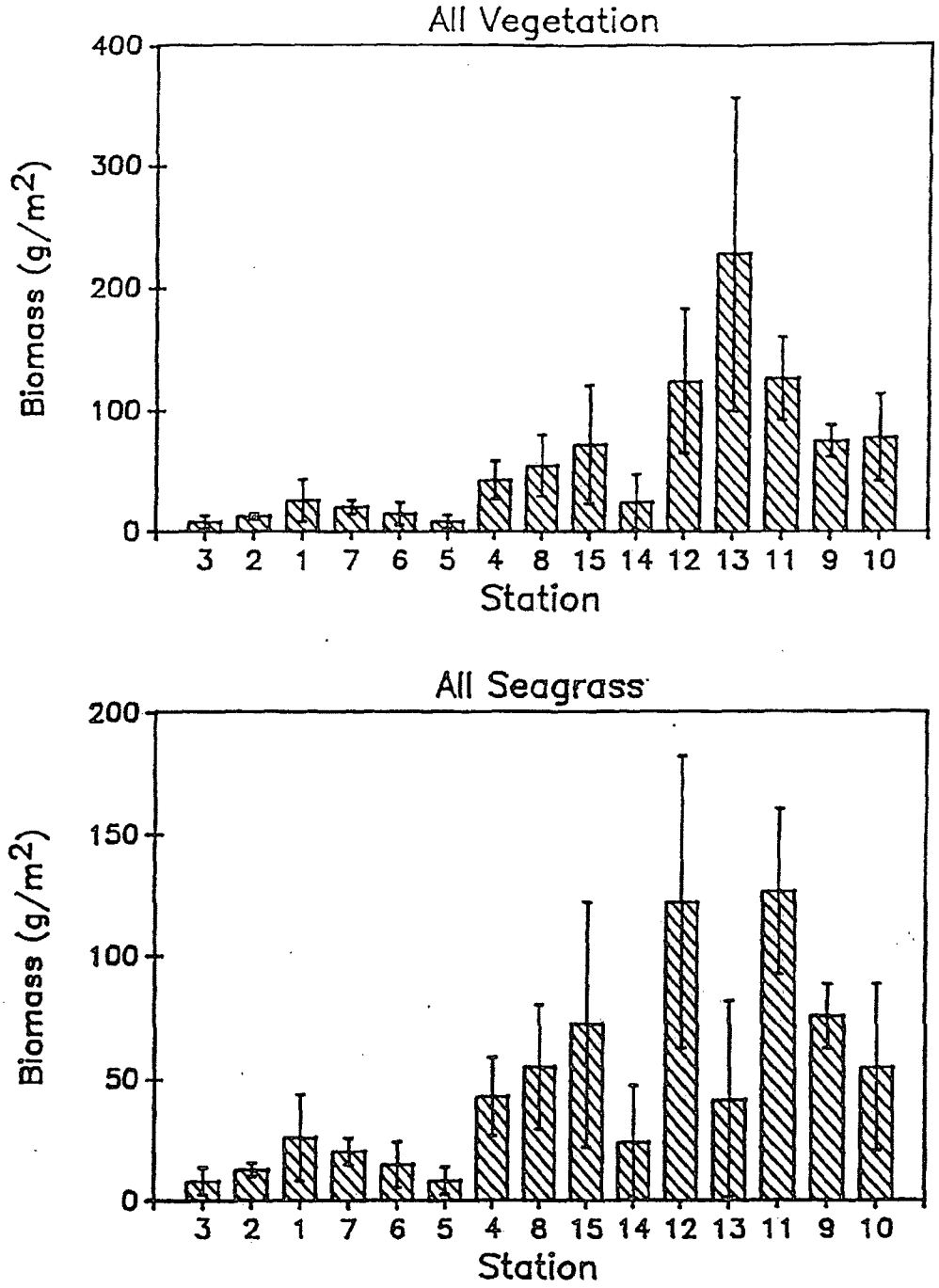
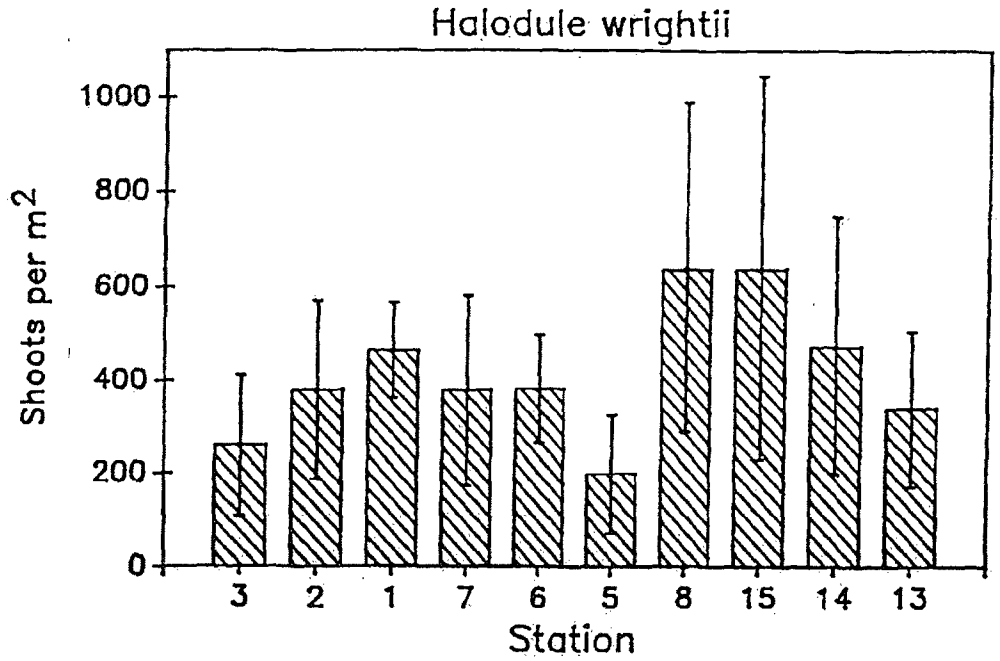


Figure 4. Biomass in order of station proximity to POD. A, All vegetation; B, All seagrass.



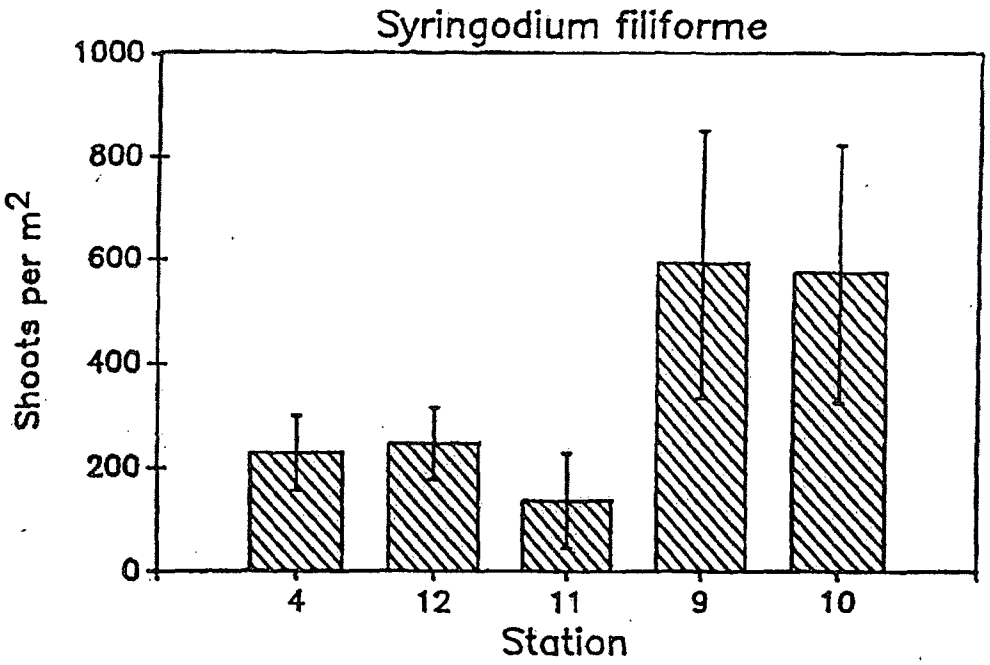
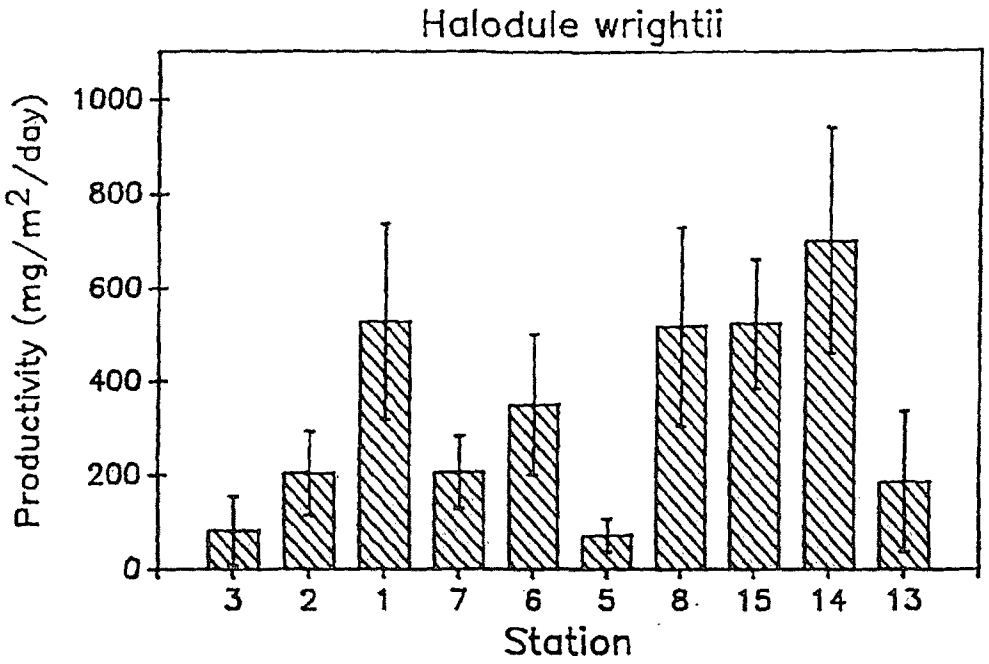


Figure 5. Shoot density in order of station proximity to POD. A, Halodule. B, Syringodium.



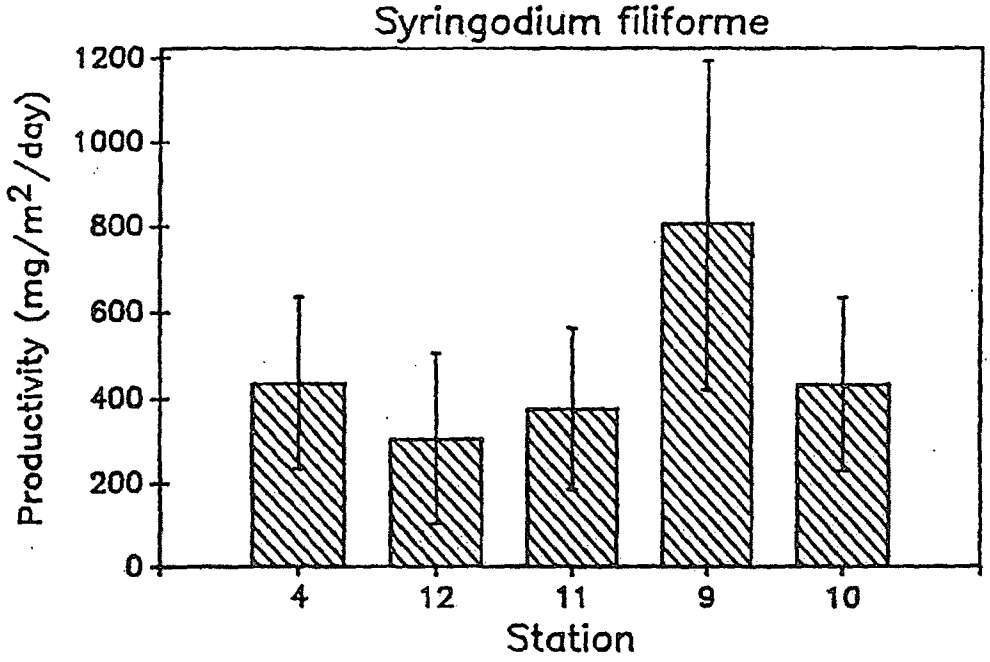


Figure 6. Productivity in order of station proximity to POD. A, Halodule; B, Syringodium.

Table 1. SAV beds found in October 1994 on 1993 barren area transects.

	Bed 1	Bed 2	Bed 3
Transect No.	1N	3W	5W
Basin No.	1	2	2/3
LORAN			
45-	229.16	236.00	240.85
62-	880.75	885.49	888.81
Near to:	POD	Thumb I.	Drum I.
Mean % Cover			
Halodule	5	48	14
Syringodium	0	0	3
Caulerpa	0	0	4
Bare	95	52	85
N	10	9	10

Table 2. Expansion of seagrass beds measured along staked edges: December 1993-October 1994.

Station	No. of Stakes	Mean Expansion (m)	S.D.	Min (m)	Max (m)
1	13	1.90	1.42	-1.40	4.10
2	15	0.98	1.58	-2.30	3.30
3	15	-0.38	0.93	-2.00	1.40
4	14	0.06	0.41	-0.60	0.80
5	16	-0.21	0.52	-1.00	0.70
6	13	0.48	0.99	-0.70	2.30
7	12	2.52	1.99	0.00	6.00
8	10	6.51	4.02	1.30	14.00
9	14	0.83	0.60	0.00	2.30
10	14	0.71	0.79	0.00	2.70
11	12	0.58	0.27	0.00	1.00
12	14	0.30	1.05	-1.40	3.10
13	13	0.05	3.29	-6.00	4.60
14	15	0.56	0.59	-0.60	1.40
15	15	0.56	0.75	-0.10	2.70

Table 3. Counts of presence of seagrass and algae species in $1m^2$ quadrats inside (I) and on perimeters (P) of grass beds.

Date	Station	*Halodule wrightii*		*Halophila englemannii*		*Syringodium filiforme*		*Thalassia testudinum*		*Caulerpa prolifera*		*Caulerpa mexicana*	
		P	I	P	I	P	I	P	I	P	I	P	I
1993-12	1	9	10	0	0	0	0	0	0	0	0	0	0
1994-08	1	10	10	0	0	0	0	0	0	0	0	0	0
1994-10	1	10	10	0	0	0	0	0	0	0	0	0	0
1993-12	2	10	10	0	0	0	0	0	0	0	0	0	0
1994-08	2	10	10	0	0	0	0	0	0	0	0	0	0
1994-10	2	10	10	0	0	0	0	0	0	0	0	0	0
1993-12	3	10	10	0	0	0	0	0	0	0	0	0	0
1994-08	3	10	10	0	0	0	0	0	0	0	0	0	0
1994-10	3	9	10	0	0	0	0	0	0	0	0	0	0
1993-12	4	9	9	1	0	0	0	0	0	0	2	0	0
1994-08	4	0	0	1	0	10	10	0	0	0	0	0	0
1994-10	4	0	0	0	1	11	10	0	0	4	1	0	0
1993-12	5	10	10	0	0	0	0	0	0	0	0	0	0
1994-08	5	10	10	0	0	0	0	0	0	1	0	0	0
1994-10	5	10	10	0	1	0	0	0	0	0	0	0	0
1993-12	6	9	9	4	2	0	0	0	0	0	0	0	0
1994-08	6	8	8	6	5	0	0	0	0	0	0	0	0
1994-10	6	10	10	7	5	0	0	0	0	0	0	0	0
1993-12	7	10	10	0	1	0	0	0	0	0	0	0	0
1994-08	7	10	10	0	6	0	0	0	0	0	0	0	1
1994-10	7	9	8	1	1	1	2	0	0	1	0	0	0
1993-12	8	9	9	2	4	0	0	0	0	1	0	0	0
1994-08	8	7	7	2	1	4	5	0	0	0	2	0	0
1994-10	8	4	4	0	0	10	10	0	0	0	0	0	0
1993-12	9	0	1	6	2	10	10	0	0	1	0	0	0
1994-08	9	0	0	7	5	10	10	0	0	6	3	0	0
1994-10	9	1	0	6	6	10	10	0	0	0	0	0	0
1993-12	10	0	0	1	1	10	9	0	0	4	3	0	0
1994-08	10	0	0	0	0	9	10	0	0	10	9	0	0
1994-10	10	0	0	0	0	10	10	0	0	0	0	0	0
1993-12	11	0	0	2	0	10	10	0	0	0	0	0	0

Table 3. Continued.

Date	Station	*Halodule wrightii* P	*Halodule wrightii* I	*Halophila englemannii* P	*Halophila englemannii* I	*Syringodium filiforme* P	*Syringodium filiforme* I	*Thalassia testudinum* P	*Thalassia testudinum* I	*Caulerpa prolifera* P	*Caulerpa prolifera* I	*Caulerpa mexicana* P	*Caulerpa mexicana* I
1994-08	11	0	0	1	0	10	10	0	0	0	0	0	0
1994-10	11	1	0	0	0	10	10	0	0	2	2	0	0
1993-12	12	0	2	0	0	10	10	0	0	3	4	0	0
1994-08	12	0	0	0	0	10	10	0	0	0	0	0	0
1994-10	12	9	6	2	2	0	0	2	3	8	2	6	7
1993-12	13	4	1	0	0	0	0	1	3	4	7	7	7
1994-08	13	2	0	1	0	0	0	7	0	12	0	8	0
1994-10	13	9	10	0	0	0	0	1	1	1	0	0	0
1993-12	14	9	10	0	0	0	0	1	1	0	1	0	0
1994-08	14	8	10	0	0	0	0	3	0	0	0	0	0
1994-10	14	8	8	1	1	0	0	2	2	2	0	0	0
1993-12	15	7	8	0	0	0	0	3	3	1	0	0	0
1994-08	15	10	10	0	0	0	0	0	0	1	0	0	0

Table 4. Average percent cover (n = 10) of 1 m quadrats on the perimeter and 2 m inside the perimeter of seagrass beds for each station and date.

Date	Station	Perimeter Total Vegetation	Perimeter Seagrass	Perimeter Algae	Inside Vegetation	Inside Total Seagrass	Inside Algae
1993-12	1	79.6	79.6	0.0	80.0	80.0	0.0
1994-08	1	100.0	100.0	0.0	100.0	100.0	0.0
1994-10	1	96.1	96.1	0.0	92.5	92.5	0.0
1993-12	2	87.1	87.1	0.0	96.4	96.4	0.0
1994-08	2	99.0	99.0	0.0	98.9	98.9	0.0
1994-10	2	81.5	81.5	0.0	97.1	97.1	0.0
1993-12	3	80.1	80.1	0.0	93.7	93.7	0.0
1994-08	3	42.0	42.0	0.0	36.9	36.9	0.0
1994-10	3	34.7	34.7	0.0	45.3	45.3	0.0
1993-12	4	76.3	76.3	0.0	87.0	86.6	1.3
1994-08	4	73.5	73.5	0.0	72.5	72.5	0.0
1994-10	4	85.0	84.8	4.9	71.8	71.6	2.5
1993-12	5	90.4	90.4	0.0	83.2	83.2	0.0
1994-08	5	59.7	59.7	0.3	49.7	49.7	0.0
1994-10	5	26.1	26.1	0.0	39.4	39.2	0.0
1993-12	6	91.8	91.8	0.0	98.7	98.7	0.0
1994-08	6	83.9	83.9	0.0	91.1	91.1	0.0
1994-10	6	74.4	74.4	0.0	92.3	92.3	0.0
1993-12	7	91.5	91.5	0.0	98.5	98.5	0.0
1994-08	7	73.1	73.1	0.0	85.8	85.8	0.3
1994-10	7	91.1	91.1	0.3	98.2	98.2	0.0
1993-12	8	94.7	94.7	0.5	93.2	93.2	0.0
1994-08	8	95.5	95.5	0.0	92.0	92.0	2.3
1994-10	8	93.8	93.8	0.0	95.5	95.5	0.0
1993-12	9	87.6	87.6	0.2	81.2	81.2	0.0
1994-08	9	88.7	87.6	9.8	94.2	94.2	1.3
1994-10	9	92.0	92.0	0.2	98.5	98.5	0.4
1993-12	10	76.8	74.7	4.4	57.0	56.7	1.7
1994-08	10	96.4	43.0	75.8	94.8	84.3	38.8
1993-12	11	98.0	98.0	0.0	98.3	98.3	0.0
1994-08	11	99.6	99.6	0.0	100.0	100.0	0.0
1994-10	11	99.8	99.8	0.0	100.0	100.0	0.0
1993-12	12	90.3	86.6	2.2	92.7	88.9	3.8
1994-08	12	98.9	98.9	0.0	95.5	95.5	0.0
1994-10	12	91.8	91.8	0.9	98.0	98.0	0.8
1993-12	13	72.2	31.7	40.5	80.4	19.4	63.4
1994-08	13	N/A	N/A	N/A	82.6	31.8	54.9
1994-10	13	75.7	53.9	40.9	60.4	49.6	13.8
1993-12	14	90.7	90.7	0.0	91.2	91.2	0.3
1994-08	14	85.4	85.4	0.0	87.8	87.8	0.7
1994-10	14	87.4	87.5	0.2	88.0	88.0	0.0
1993-12	15	83.9	83.9	2.7	96.9	96.9	0.0
1994-08	15	86.9	86.9	0.5	98.4	98.4	0.8
1994-10	15	95.2	90.7	24.9	96.5	90.9	17.6

Table 5. Dry Weight biomass (g) per m^2. Means and standard deviations from six replicate 25 x 25 cm quadrats.

	Syringodium filiforme	*Halophila englemannii*	*Halodule wrightii*	*Thalassia testudinum*	*Caulerpa prolifera*	*Caulerpa mexicana*	Drift Algae
Station 1							
Count (>0g)			6				
Mean			26.2				
S.D.			17.7				
Station 2							
Count (>0g)			6				
Mean			13.1				
S.D.			2.8				
Station 3							
Count (>0g)			6				
Mean			8.3				
S.D.			5.7				
Station 4							
Count (>0g)	6						2
Mean	42.9						27.4
S.D.	15.9						42.4
Station 5							
Count (>0g)			6				
Mean			8.5				
S.D.			5.7				
Station 6							
Count (>0g)			6				
Mean			20.3				
S.D.			14.3				
Station 7							
Count (>0g)		2	6				
Mean		2.3	18.3				
S.D.		4.4	5.7				
Station 8							
Count (>0g)	5	4	5				5
Mean	33.4	1.8	19.9				24.3
S.D.	34.9	2.1	12.1				38.1

Table 5. Continued.

	Syringodium filiforme	*Halophila englemannii*	*Halodule wrightii*	*Thalassia testudinum*	*Caulerpa prolifera*	*Caulerpa mexicana*	Drift Algae
Station 9							
Count (>0g)	6	4	1				3
Mean	71.8	3.4	0.5				4.9
S.D.	14.8	3.6	1.1				8.8
Station 10							
Count (>0g)	5	1			6		2
Mean	54.2	0.6			23.4		76.2
S.D.	35.1	1.6			22.5		118.1
Station 11							
Count (>0g)	6						
Mean	126.7						
S.D.	34.0						
Station 12							
Count (>0g)	6		1		5		4
Mean	109.2		13.3		1.6		182.4
S.D.	72.5		32.5		1.9		198.4
Station 13							
Count (>0g)				5	5	4	6
Mean				38.4	18.3	171.8	124.0
S.D.				42.3	15.9	163.0	194.2
Station 14							
Count (>0g)	4		6				5
Mean	13.7		10.6				50.7
S.D.	24.3		4.0				60.8
Station 15							
Count (>0g)			6	2			3
Mean			69.1	3.3			14.5
S.D.			51.5	6.6			29.1

Table 6. Dry weights (ug) from clipped 14-day growth samples.

Station	Species	Clip Area Weight Mean	Clip Area Weight S.D.	Shoot Weight Mean	Shoot Weight S.D.
1	*Halodule wrightii*	743	293	153	34
2	*Halodule wrightii*	288	125	81	29
3	*Halodule wrightii*	117	102	41	13
5	*Halodule wrightii*	110	52	63	26
6	*Halodule wrightii*	492	210	132	68
7	*Halodule wrightii*	291	109	87	38
8	*Halodule wrightii*	621	257	109	32
13	*Halodule wrightii*	261	209	69	43
14	*Halodule wrightii*	843	290	208	82
15	*Halodule wrightii*	629	166	125	60
4	*Syringodium filiforme*	1332	617	260	86
9	*Syringodium filiforme*	2476	1184	189	45
10	*Syringodium filiforme*	1328	623	105	32
11	*Syringodium filiforme*	988	500	355	117
12	*Syringodium filiforme*	934	615	170	113

Table 7. Productivity (mg/m2/day) and number of shoots (m2) from grass clip sample and dry weight biomass (mg/m2) from quadrat collections.

		Productivity				Biomass	
		(mg/m2/day)		Shoots per m2		(g/m2)	
Station	Species	Mean	S.D.	Mean	S.D.	Mean	S.D.
3	Halodule wrightii	83	73	259	151	8.3	5.7
2	Halodule wrightii	205	89	379	192	13.1	2.8
1	Halodule wrightii	529	209	465	103	26.2	17.7
7	Halodule wrightii	207	77	379	204	18.3	5.7
6	Halodule wrightii	350	150	382	117	15.1	9.5
5	Halodule wrightii	73	34	199	126	8.5	5.7
8	Halodule wrightii	516	213	638	350	19.9	12.1
15	Halodule wrightii	522	138	638	409	69.1	51.5
14	Halodule wrightii	700	241	474	275	10.6	4.0
13	Halodule wrightii	186	149	339	167	--	--
4	Syringodium filiforme	434	201	228	72	42.9	15.9
12	Syringodium filiforme	305	201	247	69	109.2	72.5
11	Syringodium filiforme	376	190	137	91	126.7	34.0
9	Syringodium filiforme	807	386	594	258	71.8	14.8
10	Syringodium filiforme	433	203	575	249	54.2	35.1

Appendix Table 1. Station locations for the seagrass bed edge observations in 1994.

Station	Latitude	Longitude	Loran (45)	Loran (62)
1	28 57 58.39	82 43 56.35	45234.56	62883.88
2	28 58 00.79	82 43 50.00	45234.06	62883.08
3	28 58 03.88	82 43 41.91	45233.61	62882.21
4	28 57 17.67	82 44 21.52	45232.47	62887.19
5	28 58 35.81	82 44 33.48	45244.78	62888.00
6	N/A	N/A	45240.33	62885.49
7	28 58 25 00	82 44 09 00	45237.91	62884.67
8	28 57 07.30	82 44 19.26	45230.70	62887.06
9	28 56 49.65	82 43 25.10	45220.91	62880.80
10	28 56 41.19	82 43 14.31	45218.47	62879.68
11	28 57 23.73	82 43 38.31	45227.68	62882.13
12	28 57 10.49	82 44 17.21	45230.03	62886.80
13	28 58 12.34	82 45 15.62	45274.30	67893.40
14	28 57 04.40	82 44 35.00	45232.39	67889.09
15	28 57 05.90	82 44 39.40	45232.91	62889.56

Appendix Table 2. Vegetation coverage (percent) in seagrass beds for $1m^2$ quadrats along bed perimeters and 2 meters inside beds.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	1	1	I	43	43	0	*Halodule wrightii*	43
1993-12	1	2	I	93	93	0	*Halodule wrightii*	93
1993-12	1	2	P	74	74	0	*Halodule wrightii*	74
1993-12	1	3	I	85	85	0	*Halodule wrightii*	85
1993-12	1	3	P	89	89	0	*Halodule wrightii*	89
1993-12	1	4	I	97	97	0	*Halodule wrightii*	97
1993-12	1	4	P	79	79	0	*Halodule wrightii*	79
1993-12	1	5	I	71	71	0	*Halodule wrightii*	71
1993-12	1	5	P	79	79	0	*Halodule wrightii*	79
1993-12	1	6	I	96	96	0	*Halodule wrightii*	96
1993-12	1	6	P	82	82	0	*Halodule wrightii*	82
1993-12	1	7	I	94	94	0	*Halodule wrightii*	94
1993-12	1	7	P	87	87	0	*Halodule wrightii*	87
1993-12	1	8	I	96	96	0	*Halodule wrightii*	96
1993-12	1	8	P	73	73	0	*Halodule wrightii*	73
1993-12	1	9	I	90	90	0	*Halodule wrightii*	90
1993-12	1	9	P	73	73	0	*Halodule wrightii*	73
1993-12	1	10	I	35	35	0	*Halodule wrightii*	35
1993-12	1	10	P	80	80	0	*Halodule wrightii*	80
1993-12	2	1	I	96	96	0	*Halodule wrightii*	96
1993-12	2	1	P	94	94	0	*Halodule wrightii*	94
1993-12	2	2	I	98	98	0	*Halodule wrightii*	98
1993-12	2	2	P	80	80	0	*Halodule wrightii*	80
1993-12	2	3	I	98	98	0	*Halodule wrightii*	98
1993-12	2	3	P	95	95	0	*Halodule wrightii*	95
1993-12	2	4	I	98	98	0	*Halodule wrightii*	98
1993-12	2	4	P	100	100	0	*Halodule wrightii*	100
1993-12	2	5	I	100	100	0	*Halodule wrightii*	100
1993-12	2	5	P	100	100	0	*Halodule wrightii*	100
1993-12	2	6	I	97	97	0	*Halodule wrightii*	97
1993-12	2	6	P	87	87	0	*Halodule wrightii*	87
1993-12	2	7	I	95	95	0	*Halodule wrightii*	95
1993-12	2	7	P	93	93	0	*Halodule wrightii*	93
1993-12	2	8	I	96	96	0	*Halodule wrightii*	96
1993-12	2	8	P	82	82	0	*Halodule wrightii*	82
1993-12	2	9	I	92	92	0	*Halodule wrightii*	92
1993-12	2	9	P	83	83	0	*Halodule wrightii*	83
1993-12	2	10	I	94	94	0	*Halodule wrightii*	94
1993-12	2	10	P	57	57	0	*Halodule wrightii*	57
1993-12	3	1	I	88	88	0	*Halodule wrightii*	88
1993-12	3	1	P	70	70	0	*Halodule wrightii*	70
1993-12	3	2	I	87	87	0	*Halodule wrightii*	87
1993-12	3	2	P	84	84	0	*Halodule wrightii*	84
1993-12	3	3	I	100	100	0	*Halodule wrightii*	100
1993-12	3	3	P	92	92	0	*Halodule wrightii*	92
1993-12	3	4	I	100	100	0	*Halodule wrightii*	100

Appendix Table 2. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	3	4	P	94	94	0	*Halodule wrightii*	94
1993-12	3	5	I	98	98	0	*Halodule wrightii*	98
1993-12	3	5	P	64	64	0	*Halodule wrightii*	64
1993-12	3	6	I	81	81	0	*Halodule wrightii*	81
1993-12	3	6	P	84	84	0	*Halodule wrightii*	84
1993-12	3	7	I	91	91	0	*Halodule wrightii*	91
1993-12	3	7	P	98	98	0	*Halodule wrightii*	98
1993-12	3	8	I	100	100	0	*Halodule wrightii*	100
1993-12	3	8	P	46	46	0	*Halodule wrightii*	46
1993-12	3	9	I	100	100	0	*Halodule wrightii*	100
1993-12	3	9	P	93	93	0	*Halodule wrightii*	93
1993-12	3	10	I	92	92	0	*Halodule wrightii*	92
1993-12	3	10	P	76	76	0	*Halodule wrightii*	76
1993-12	4	1	I	84	84	0	*Halodule wrightii*	84
1993-12	4	1	P	92	92	0	*Halodule wrightii*	92
1993-12	4	2	I	74	74	0	*Halodule wrightii*	74
1993-12	4	2	P	71	71	0	*Halodule wrightii*	71
1993-12	4	3	I	71	71	0	*Halodule wrightii*	71
1993-12	4	3	P	68	68	0	*Halodule wrightii*	68
1993-12	4	4	I	87	87	0	*Halodule wrightii*	87
1993-12	4	4	P	66	66	0	*Halodule wrightii*	65
1993-12	4	4	P	66	66	0	*Halophila englemannii*	1
1993-12	4	5	I	94	94	0	*Halodule wrightii*	94
1993-12	4	5	P	73	73	0	*Halodule wrightii*	73
1993-12	4	6	I	96	96	0	*Halodule wrightii*	96
1993-12	4	6	P	78	78	0	*Halodule wrightii*	78
1993-12	4	7	I	89	87	2	*Caulerpa prolifera*	2
1993-12	4	7	I	89	87	2	*Halodule wrightii*	87
1993-12	4	7	P	70	70	0	*Halodule wrightii*	70
1993-12	4	8	I	95	95	5	*Caulerpa prolifera*	5
1993-12	4	8	I	95	95	5	*Halodule wrightii*	90
1993-12	4	8	P	89	89	0	*Halodule wrightii*	89
1993-12	4	9	I	83	83	0	*Halodule wrightii*	83
1993-12	4	9	P	90	90	0	*Halodule wrightii*	90
1993-12	5	1	I	40	40	0	*Halodule wrightii*	40
1993-12	5	1	P	92	92	0	*Halodule wrightii*	92
1993-12	5	2	I	96	96	0	*Halodule wrightii*	96
1993-12	5	2	P	93	93	0	*Halodule wrightii*	93
1993-12	5	3	I	91	91	0	*Halodule wrightii*	91
1993-12	5	3	P	93	93	0	*Halodule wrightii*	93
1993-12	5	4	I	93	93	0	*Halodule wrightii*	93
1993-12	5	4	P	83	83	0	*Halodule wrightii*	83
1993-12	5	5	I	84	84	0	*Halodule wrightii*	84
1993-12	5	5	P	88	88	0	*Halodule wrightii*	88
1993-12	5	6	I	77	77	0	*Halodule wrightii*	77
1993-12	5	6	P	89	89	0	*Halodule wrightii*	89
1993-12	5	7	I	80	80	0	*Halodule wrightii*	80
1993-12	5	7	P	88	88	0	*Halodule wrightii*	88

Appendix Table 2. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	5	8	I	79	79	0	*Halodule wrightii*	79
1993-12	5	8	P	100	100	0	*Halodule wrightii*	100
1993-12	5	9	I	96	96	0	*Halodule wrightii*	96
1993-12	5	9	P	88	88	0	*Halodule wrightii*	88
1993-12	5	10	I	96	96	0	*Halodule wrightii*	96
1993-12	5	10	P	90	90	0	*Halodule wrightii*	90
1993-12	6	1	I	100	100	0	*Halodule wrightii*	100
1993-12	6	1	P	100	100	0	*Halodule wrightii*	100
1993-12	6	2	I	97	97	0	*Halodule wrightii*	59
1993-12	6	2	I	97	97	0	*Halophila englemannii*	38
1993-12	6	2	P	75	75	0	*Halodule wrightii*	75
1993-12	6	3	I	99	99	0	*Halodule wrightii*	99
1993-12	6	3	I	99	99	0	*Halophila englemannii*	1
1993-12	6	3	P	83	83	0	*Halodule wrightii*	83
1993-12	6	3	P	83	83	0	*Halophila englemannii*	10
1993-12	6	4	I	100	100	0	*Halodule wrightii*	100
1993-12	6	4	P	94	94	0	*Halodule wrightii*	92
1993-12	6	4	P	94	94	0	*Halophila englemannii*	2
1993-12	6	5	I	99	99	0	*Halodule wrightii*	99
1993-12	6	5	P	90	90	0	*Halodule wrightii*	90
1993-12	6	6	I	99	99	0	*Halodule wrightii*	99
1993-12	6	6	P	98	98	0	*Halodule wrightii*	97
1993-12	6	6	P	98	98	0	*Halophila englemannii*	1
1993-12	6	7	I	99	99	0	*Halodule wrightii*	99
1993-12	6	7	P	94	94	0	*Halodule wrightii*	94
1993-12	6	8	I	99	99	0	*Halodule wrightii*	99
1993-12	6	8	P	98	98	0	*Halodule wrightii*	98
1993-12	6	9	I	98	98	0	*Halodule wrightii*	98
1993-12	6	9	P	93	93	0	*Halodule wrightii*	93
1993-12	6	9	P	93	93	0	*Halophila englemannii*	15
1993-12	7	1	I	100	100	0	*Halodule wrightii*	100
1993-12	7	1	P	93	93	0	*Halodule wrightii*	93
1993-12	7	2	I	88	88	0	*Halodule wrightii*	88
1993-12	7	2	P	86	86	0	*Halodule wrightii*	86
1993-12	7	3	I	95	95	0	*Halodule wrightii*	95
1993-12	7	3	P	66	66	0	*Halodule wrightii*	66
1993-12	7	4	I	100	100	0	*Halodule wrightii*	100
1993-12	7	4	P	100	100	0	*Halodule wrightii*	100
1993-12	7	5	I	100	100	0	*Halodule wrightii*	100
1993-12	7	5	P	90	90	0	*Halodule wrightii*	90
1993-12	7	6	I	100	100	0	*Halodule wrightii*	100
1993-12	7	6	P	94	94	0	*Halodule wrightii*	94
1993-12	7	7	I	100	100	0	*Halodule wrightii*	100
1993-12	7	7	P	96	96	0	*Halodule wrightii*	96
1993-12	7	8	I	100	100	0	*Halodule wrightii*	100
1993-12	7	8	P	100	100	0	*Halodule wrightii*	100
1993-12	7	9	I	100	100	0	*Halodule wrightii*	100
1993-12	7	9	I	100	100	0	*Halophila englemannii*	2

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	7	9	P	97	97	0	*Halodule wrightii*	97
1993-12	7	10	I	100	100	0	*Halodule wrightii*	100
1993-12	7	10	P	93	93	0	*Halodule wrightii*	93
1993-12	8	1	I	91	91	0	*Halodule wrightii*	91
1993-12	8	1	I	91	91	0	*Halophila englemannii*	6
1993-12	8	1	P	99	99	2	*Caulerpa prolifera*	2
1993-12	8	1	P	99	99	2	*Halodule wrightii*	99
1993-12	8	1	P	99	99	2	*Halophila englemannii*	2
1993-12	8	2	I	97	97	0	*Halodule wrightii*	97
1993-12	8	2	I	97	97	0	*Halophila englemannii*	2
1993-12	8	2	P	94	94	0	*Halodule wrightii*	94
1993-12	8	3	I	98	98	0	*Halodule wrightii*	98
1993-12	8	3	I	98	98	0	*Halophila englemannii*	6
1993-12	8	3	P	100	100	0	*Halodule wrightii*	100
1993-12	8	4	I	100	100	0	*Halodule wrightii*	100
1993-12	8	4	I	100	100	0	*Halophila englemannii*	4
1993-12	8	4	P	95	95	0	*Halodule wrightii*	95
1993-12	8	5	I	94	94	0	*Halodule wrightii*	94
1993-12	8	5	P	94	94	0	*Halodule wrightii*	94
1993-12	8	5	P	94	94	0	*Halophila englemannii*	4
1993-12	8	6	I	90	90	0	*Halodule wrightii*	90
1993-12	8	6	P	76	76	0	*Halodule wrightii*	76
1993-12	8	7	I	75	75	0	*Halodule wrightii*	75
1993-12	8	7	P	100	100	0	*Halodule wrightii*	100
1993-12	8	8	I	86	86	0	*Halodule wrightii*	86
1993-12	8	8	P	96	96	0	*Halodule wrightii*	96
1993-12	8	9	I	94	94	0	*Halodule wrightii*	94
1993-12	8	9	P	90	90	0	*Halodule wrightii*	90
1993-12	9	1	I	56	56	0	*Syringodium filiforme*	56
1993-12	9	1	P	94	94	0	*Halophila englemannii*	2
1993-12	9	1	P	94	94	0	*Syringodium filiforme*	94
1993-12	9	2	I	94	94	0	*Syringodium filiforme*	94
1993-12	9	2	P	96	96	0	*Syringodium filiforme*	96
1993-12	9	3	I	94	94	0	*Halodule wrightii*	6
1993-12	9	3	I	94	94	0	*Syringodium filiforme*	94
1993-12	9	3	P	93	93	0	*Syringodium filiforme*	93
1993-12	9	4	I	85	85	0	*Syringodium filiforme*	85
1993-12	9	4	P	80	80	1	*Caulerpa prolifera*	1
1993-12	9	4	P	80	80	1	*Halophila englemannii*	3
1993-12	9	4	P	80	80	1	*Syringodium filiforme*	80
1993-12	9	5	I	93	93	0	*Syringodium filiforme*	93
1993-12	9	5	P	86	86	0	*Syringodium filiforme*	86
1993-12	9	6	I	84	84	0	*Halophila englemannii*	2
1993-12	9	6	I	84	84	0	*Syringodium filiforme*	82
1993-12	9	6	P	92	92	0	*Syringodium filiforme*	92
1993-12	9	7	I	28	28	0	*Syringodium filiforme*	28
1993-12	9	7	P	89	89	0	*Halophila englemannii*	11
1993-12	9	7	P	89	89	0	*Syringodium filiforme*	78

Appendix Table 2. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	9	8	I	91	91	0	*Halophila englemannii*	10
1993-12	9	8	I	91	91	0	*Syringodium filiforme*	91
1993-12	9	8	P	79	79	0	*Halophila englemannii*	10
1993-12	9	8	P	79	79	0	*Syringodium filiforme*	79
1993-12	9	9	I	67	67	0	*Syringodium filiforme*	67
1993-12	9	9	P	89	89	0	*Halophila englemannii*	7
1993-12	9	9	P	89	89	0	*Syringodium filiforme*	89
1993-12	9	10	I	94	94	0	*Syringodium filiforme*	94
1993-12	9	10	P	90	90	0	*Halophila englemannii*	3
1993-12	9	10	P	90	90	0	*Syringodium filiforme*	90
1993-12	10	1	I	24	24	0	*Halophila englemannii*	17
1993-12	10	1	I	24	24	0	*Syringodium filiforme*	7
1993-12	10	1	P	90	90	4	*Caulerpa prolifera*	4
1993-12	10	1	P	90	90	4	*Syringodium filiforme*	90
1993-12	10	2	I	78	78	0	*Syringodium filiforme*	78
1993-12	10	2	P	77	77	8	*Caulerpa prolifera*	8
1993-12	10	2	P	77	77	8	*Syringodium filiforme*	77
1993-12	10	3	I	84	84	4	*Caulerpa prolifera*	4
1993-12	10	3	I	84	84	4	*Syringodium filiforme*	84
1993-12	10	3	P	84	68	16	*Caulerpa prolifera*	16
1993-12	10	3	P	84	68	16	*Syringodium filiforme*	84
1993-12	10	4	I	59	59	0	*Syringodium filiforme*	59
1993-12	10	4	P	80	80	0	*Syringodium filiforme*	80
1993-12	10	5	I	68	68	6	*Caulerpa prolifera*	6
1993-12	10	5	I	68	68	6	*Syringodium filiforme*	68
1993-12	10	5	P	77	77	0	*Syringodium filiforme*	77
1993-12	10	6	I	60	58	2	*Caulerpa prolifera*	2
1993-12	10	6	I	60	58	2	*Syringodium filiforme*	58
1993-12	10	6	P	6	6	0	*Syringodium filiforme*	6
1993-12	10	7	I	0	0	0	Bare	0
1993-12	10	7	P	13	13	0	*Syringodium filiforme*	13
1993-12	10	8	I	19	19	0	*Syringodium filiforme*	19
1993-12	10	8	P	87	87	5	*Caulerpa prolifera*	5
1993-12	10	8	P	87	87	5	*Syringodium filiforme*	87
1993-12	10	9	I	76	76	0	*Syringodium filiforme*	76
1993-12	10	9	P	100	100	0	*Halophila englemannii*	3
1993-12	10	9	P	100	100	0	*Syringodium filiforme*	100
1993-12	10	10	I	94	94	0	*Syringodium filiforme*	94
1993-12	10	10	P	100	100	0	*Syringodium filiforme*	100
1993-12	11	1	I	100	100	0	*Syringodium filiforme*	100
1993-12	11	1	P	99	99	0	*Syringodium filiforme*	99
1993-12	11	2	I	100	100	0	*Syringodium filiforme*	100
1993-12	11	2	P	100	100	0	*Halophila englemannii*	1
1993-12	11	2	P	100	100	0	*Syringodium filiforme*	100
1993-12	11	3	I	99	99	0	*Syringodium filiforme*	99
1993-12	11	3	P	97	97	0	*Syringodium filiforme*	97
1993-12	11	4	I	100	100	0	*Syringodium filiforme*	100
1993-12	11	4	P	98	98	0	*Syringodium filiforme*	98

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	11	5	I	94	94	0	*Syringodium filiforme*	94
1993-12	11	5	P	100	100	0	*Syringodium filiforme*	100
1993-12	11	6	I	95	95	0	*Syringodium filiforme*	95
1993-12	11	6	P	93	93	0	*Halophila englemannii*	2
1993-12	11	6	P	93	93	0	*Syringodium filiforme*	93
1993-12	11	7	I	95	95	0	*Syringodium filiforme*	95
1993-12	11	7	P	100	100	0	*Syringodium filiforme*	100
1993-12	11	8	I	100	100	0	*Syringodium filiforme*	100
1993-12	11	8	P	100	100	0	*Syringodium filiforme*	100
1993-12	11	9	I	100	100	0	*Syringodium filiforme*	100
1993-12	11	9	P	100	100	0	*Syringodium filiforme*	100
1993-12	11	10	I	100	100	0	*Syringodium filiforme*	100
1993-12	11	10	P	96	96	0	*Syringodium filiforme*	96
1993-12	12	1	I	100	100	0	*Halodule wrightii*	100
1993-12	12	1	I	100	100	0	*Syringodium filiforme*	100
1993-12	12	1	P	88	88	0	*Syringodium filiforme*	88
1993-12	12	2	I	98	92	6	*Caulerpa prolifera*	6
1993-12	12	2	I	98	92	6	*Syringodium filiforme*	92
1993-12	12	2	P	88	88	0	*Syringodium filiforme*	88
1993-12	12	3	I	70	68	2	*Caulerpa prolifera*	2
1993-12	12	3	I	70	68	2	*Halodule wrightii*	34
1993-12	12	3	I	70	68	2	*Syringodium filiforme*	34
1993-12	12	3	P	89	88	1	*Caulerpa prolifera*	1
1993-12	12	3	P	89	88	1	*Syringodium filiforme*	88
1993-12	12	4	I	100	80	20	*Caulerpa prolifera*	20
1993-12	12	4	I	100	80	20	*Syringodium filiforme*	80
1993-12	12	4	P	88	66	12	*Caulerpa prolifera*	12
1993-12	12	4	P	88	66	12	*Syringodium filiforme*	66
1993-12	12	5	I	97	97	0	*Syringodium filiforme*	97
1993-12	12	5	P	94	93	1	*Caulerpa prolifera*	1
1993-12	12	5	P	94	93	1	*Syringodium filiforme*	93
1993-12	12	6	I	100	99	1	*Caulerpa prolifera*	1
1993-12	12	6	I	100	99	1	*Syringodium filiforme*	99
1993-12	12	6	P	96	96	0	*Syringodium filiforme*	96
1993-12	12	7	I	97	97	0	*Syringodium filiforme*	97
1993-12	12	7	P	95	95	0	*Syringodium filiforme*	95
1993-12	12	8	I	89	89	0	*Syringodium filiforme*	89
1993-12	12	8	P	95	95	0	*Syringodium filiforme*	95
1993-12	12	9	I	96	96	0	*Syringodium filiforme*	96
1993-12	12	9	P	78	78	0	*Syringodium filiforme*	78
1993-12	12	10	I	98	98	0	*Syringodium filiforme*	98
1993-12	12	10	P	92	92	0	*Syringodium filiforme*	92
1993-12	13	1	I	96	96	15	*Caulerpa prolifera*	15
1993-12	13	1	I	96	96	15	*Halodule wrightii*	96
1993-12	13	1	I	96	96	15	*Thalassia testudinum*	5
1993-12	13	1	P	82	76	6	*Caulerpa prolifera*	6
1993-12	13	1	P	82	76	6	*Halodule wrightii*	78
1993-12	13	2	I	94	10	84	*Caulerpa prolifera*	6

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	13	2	I	94	10	84	*Caulerpa mexicana*	78
1993-12	13	2	I	94	10	84	*Thalassia testudinum*	10
1993-12	13	2	P	68	55	13	*Caulerpa mexicana*	13
1993-12	13	2	P	68	55	13	*Halodule wrightii*	55
1993-12	13	2	P	68	55	13	*Thalassia testudinum*	3
1993-12	13	3	I	53	16	37	*Caulerpa mexicana*	37
1993-12	13	3	I	53	16	37	*Thalassia testudinum*	16
1993-12	13	3	P	55	0	55	*Caulerpa mexicana*	55
1993-12	13	4	I	97	0	97	*Caulerpa prolifera*	70
1993-12	13	4	I	97	0	97	*Caulerpa mexicana*	27
1993-12	13	4	P	100	0	100	*Caulerpa prolifera*	80
1993-12	13	4	P	100	0	100	*Caulerpa mexicana*	20
1993-12	13	5	I	50	0	50	*Caulerpa prolifera*	20
1993-12	13	5	I	50	0	50	*Caulerpa mexicana*	30
1993-12	13	5	P	72	0	72	*Caulerpa mexicana*	72
1993-12	13	6	I	90	0	90	*Caulerpa prolifera*	80
1993-12	13	6	I	90	0	90	*Caulerpa mexicana*	10
1993-12	13	6	P	60	0	60	*Caulerpa mexicana*	60
1993-12	13	7	I	70	0	70	*Caulerpa prolifera*	70
1993-12	13	7	P	70	0	70	*Caulerpa prolifera*	70
1993-12	13	8	I	42	0	42	*Caulerpa prolifera*	42
1993-12	13	8	P	40	0	40	*Caulerpa mexicana*	40
1993-12	13	9	I	95	0	95	*Caulerpa mexicana*	95
1993-12	13	9	P	60	20	40	*Caulerpa mexicana*	40
1993-12	13	9	P	60	20	40	*Halodule wrightii*	20
1993-12	13	10	I	90	0	90	*Caulerpa mexicana*	90
1993-12	13	10	P	85	75	10	*Caulerpa prolifera*	10
1993-12	13	10	P	85	75	10	*Halodule wrightii*	75
1993-12	14	1	I	69	69	0	*Halodule wrightii*	69
1993-12	14	1	P	100	100	0	*Halodule wrightii*	100
1993-12	14	2	I	98	98	0	*Halodule wrightii*	98
1993-12	14	2	P	100	100	0	*Halodule wrightii*	100
1993-12	14	3	I	95	95	0	*Halodule wrightii*	95
1993-12	14	3	P	82	82	0	*Halodule wrightii*	82
1993-12	14	4	I	97	97	0	*Halodule wrightii*	97
1993-12	14	4	P	73	73	0	*Halodule wrightii*	73
1993-12	14	5	I	95	95	0	*Halodule wrightii*	95
1993-12	14	5	P	95	95	0	*Halodule wrightii*	95
1993-12	14	6	I	93	93	2	*Caulerpa prolifera*	2
1993-12	14	6	I	93	93	2	*Halodule wrightii*	91
1993-12	14	6	P	97	97	0	*Halodule wrightii*	97
1993-12	14	7	I	93	93	0	*Halodule wrightii*	93
1993-12	14	7	P	96	96	0	*Halodule wrightii*	96
1993-12	14	8	I	95	95	0	*Halodule wrightii*	95
1993-12	14	8	P	89	89	0	*Halodule wrightii*	89
1993-12	14	9	I	83	83	0	*Halodule wrightii*	3
1993-12	14	9	I	83	83	0	*Thalassia testudinum*	83
1993-12	14	9	P	77	77	0	*Thalassia testudinum*	77

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	14	10	I	100	100	0	*Halodule wrightii*	100
1993-12	14	10	P	98	98	0	*Halodule wrightii*	98
1993-12	15	1	I	95	95	0	*Thalassia testudinum*	95
1993-12	15	1	P	90	90	0	*Thalassia testudinum*	90
1993-12	15	2	I	95	95	0	*Thalassia testudinum*	95
1993-12	15	2	P	88	88	0	*Thalassia testudinum*	88
1993-12	15	3	I	89	89	0	*Halodule wrightii*	18
1993-12	15	3	I	89	89	0	*Thalassia testudinum*	86
1993-12	15	3	P	28	28	0	*Thalassia testudinum*	28
1993-12	15	4	I	100	100	0	*Halodule wrightii*	100
1993-12	15	4	P	89	89	0	*Halodule wrightii*	89
1993-12	15	5	I	100	100	0	*Halodule wrightii*	100
1993-12	15	5	P	100	100	0	*Halodule wrightii*	100
1993-12	15	6	I	100	100	0	*Halodule wrightii*	100
1993-12	15	6	P	78	78	0	*Halodule wrightii*	78
1993-12	15	7	I	100	100	0	*Halodule wrightii*	100
1993-12	15	7	P	100	100	0	*Halodule wrightii*	100
1993-12	15	8	I	100	100	0	*Halodule wrightii*	100
1993-12	15	8	P	75	75	15	*Caulerpa prolifera*	15
1993-12	15	8	P	75	75	15	*Halodule wrightii*	75
1993-12	15	9	I	100	100	0	*Halodule wrightii*	100
1993-12	15	9	P	100	100	0	*Halodule wrightii*	100
1993-12	15	10	I	98	98	0	*Halodule wrightii*	98
1993-12	15	10	P	100	100	0	*Halodule wrightii*	100
1994-08	1	1	P	100	100	0	*Halodule wrightii*	100
1994-08	1	1	I	100	100	0	*Halodule wrightii*	100
1994-08	1	2	P	100	100	0	*Halodule wrightii*	100
1994-08	1	2	I	100	100	0	*Halodule wrightii*	100
1994-08	1	3	P	100	100	0	*Halodule wrightii*	100
1994-08	1	3	I	100	100	0	*Halodule wrightii*	100
1994-08	1	4	P	100	100	0	*Halodule wrightii*	100
1994-08	1	4	I	100	100	0	*Halodule wrightii*	100
1994-08	1	5	P	100	100	0	*Halodule wrightii*	100
1994-08	1	5	I	100	100	0	*Halodule wrightii*	100
1994-08	1	6	P	100	100	0	*Halodule wrightii*	100
1994-08	1	6	I	100	100	0	*Halodule wrightii*	100
1994-08	1	7	P	100	100	0	*Halodule wrightii*	100
1994-08	1	7	I	100	100	0	*Halodule wrightii*	100
1994-08	1	8	P	100	100	0	*Halodule wrightii*	100
1994-08	1	8	I	100	100	0	*Halodule wrightii*	100
1994-08	1	9	P	100	100	0	*Halodule wrightii*	100
1994-08	1	9	I	100	100	0	*Halodule wrightii*	100
1994-08	1	10	P	100	100	0	*Halodule wrightii*	100
1994-08	1	10	I	100	100	0	*Halodule wrightii*	100
1994-08	2	1	P	94	94	0	*Halodule wrightii*	94
1994-08	2	1	I	92	92	0	*Halodule wrightii*	92
1994-08	2	2	P	100	100	0	*Halodule wrightii*	100
1994-08	2	2	I	100	100	0	*Halodule wrightii*	100

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	2	3	P	100	100	0	*Halodule wrightii*	100
1994-08	2	3	I	100	100	0	*Halodule wrightii*	100
1994-08	2	4	P	100	100	0	*Halodule wrightii*	100
1994-08	2	4	I	100	100	0	*Halodule wrightii*	100
1994-08	2	5	P	100	100	0	*Halodule wrightii*	100
1994-08	2	5	I	100	100	0	*Halodule wrightii*	100
1994-08	2	6	P	100	100	0	*Halodule wrightii*	100
1994-08	2	6	I	100	100	0	*Halodule wrightii*	100
1994-08	2	7	P	100	100	0	*Halodule wrightii*	100
1994-08	2	7	I	100	100	0	*Halodule wrightii*	100
1994-08	2	8	P	100	100	0	*Halodule wrightii*	100
1994-08	2	8	I	100	100	0	*Halodule wrightii*	100
1994-08	2	9	P	100	100	0	*Halodule wrightii*	100
1994-08	2	9	I	99	99	0	*Halodule wrightii*	99
1994-08	2	10	P	96	96	0	*Halodule wrightii*	96
1994-08	2	10	I	98	98	0	*Halodule wrightii*	98
1994-08	3	1	P	46	46	0	*Halodule wrightii*	46
1994-08	3	1	I	30	30	0	*Halodule wrightii*	30
1994-08	3	2	P	15	15	0	*Halodule wrightii*	15
1994-08	3	2	I	25	25	0	*Halodule wrightii*	25
1994-08	3	3	P	64	64	0	*Halodule wrightii*	64
1994-08	3	3	I	81	81	0	*Halodule wrightii*	81
1994-08	3	4	P	28	28	0	*Halodule wrightii*	28
1994-08	3	4	I	36	36	0	*Halodule wrightii*	36
1994-08	3	5	P	54	54	0	*Halodule wrightii*	54
1994-08	3	5	I	30	30	0	*Halodule wrightii*	30
1994-08	3	6	P	0	0	0	*Halodule wrightii*	0
1994-08	3	6	I	15	15	0	*Halodule wrightii*	15
1994-08	3	7	P	80	80	0	*Halodule wrightii*	80
1994-08	3	7	I	15	15	0	*Halodule wrightii*	15
1994-08	3	8	P	65	65	0	*Halodule wrightii*	65
1994-08	3	8	I	90	90	0	*Halodule wrightii*	90
1994-08	3	9	P	42	42	0	*Halodule wrightii*	42
1994-08	3	9	I	20	20	0	*Halodule wrightii*	20
1994-08	3	10	P	26	26	0	*Halodule wrightii*	26
1994-08	3	10	I	27	27	0	*Halodule wrightii*	27
1994-08	4	1	P	98	98	0	*Syringodium filiforme*	98
1994-08	4	1	I	100	100	0	*Syringodium filiforme*	100
1994-08	4	2	P	73	73	0	*Syringodium filiforme*	73
1994-08	4	2	I	94	94	0	*Syringodium filiforme*	94
1994-08	4	3	P	91	91	0	*Syringodium filiforme*	91
1994-08	4	3	I	58	58	0	*Syringodium filiforme*	58
1994-08	4	4	P	70	70	0	*Syringodium filiforme*	70
1994-08	4	4	I	83	83	0	*Syringodium filiforme*	83
1994-08	4	5	P	48	48	0	*Syringodium filiforme*	48
1994-08	4	5	I	58	58	0	*Syringodium filiforme*	58
1994-08	4	6	P	76	76	0	*Syringodium filiforme*	76
1994-08	4	6	I	84	84	0	*Syringodium filiforme*	84

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	4	7	P	76	76	0	*Syringodium filiforme*	76
1994-08	4	7	I	95	95	0	*Syringodium filiforme*	95
1994-08	4	8	P	80	80	0	*Syringodium filiforme*	80
1994-08	4	8	I	18	18	0	*Syringodium filiforme*	18
1994-08	4	8	P	80	80	0	*Halophila englemannii*	1
1994-08	4	9	P	96	96	0	*Syringodium filiforme*	96
1994-08	4	9	I	91	91	0	*Syringodium filiforme*	91
1994-08	4	10	P	21	21	0	*Syringodium filiforme*	21
1994-08	4	10	I	44	44	0	*Syringodium filiforme*	44
1994-08	5	1	P	56	56	0	*Halodule wrightii*	56
1994-08	5	1	I	50	50	0	*Halodule wrightii*	50
1994-08	5	2	P	53	53	0	*Halodule wrightii*	53
1994-08	5	2	I	65	65	0	*Halodule wrightii*	65
1994-08	5	3	P	71	71	0	*Halodule wrightii*	71
1994-08	5	3	I	18	18	0	*Halodule wrightii*	18
1994-08	5	3	P	71	71	3	*Caulerpa prolifera*	3
1994-08	5	4	P	48	48	0	*Halodule wrightii*	48
1994-08	5	4	I	9	9	0	*Halodule wrightii*	9
1994-08	5	5	P	37	37	0	*Halodule wrightii*	37
1994-08	5	5	I	16	16	0	*Halodule wrightii*	16
1994-08	5	6	P	50	50	0	*Halodule wrightii*	50
1994-08	5	6	I	74	74	0	*Halodule wrightii*	74
1994-08	5	7	P	85	85	0	*Halodule wrightii*	85
1994-08	5	7	I	98	98	0	*Halodule wrightii*	98
1994-08	5	8	P	74	74	0	*Halodule wrightii*	74
1994-08	5	8	I	85	85	0	*Halodule wrightii*	85
1994-08	5	9	P	55	55	0	*Halodule wrightii*	55
1994-08	5	9	I	4	4	0	*Halodule wrightii*	4
1994-08	5	10	P	57	57	0	*Halodule wrightii*	57
1994-08	5	10	I	78	78	0	*Halodule wrightii*	78
1994-08	6	1	P	66	66	0	*Halodule wrightii*	66
1994-08	6	1	I	85	85	0	*Halodule wrightii*	85
1994-08	6	1	P	66	66	0	*Halophila englemannii*	3
1994-08	6	1	I	85	85	0	*Halophila englemannii*	4
1994-08	6	2	P	63	63	0	*Halodule wrightii*	63
1994-08	6	2	I	81	81	0	*Halodule wrightii*	81
1994-08	6	2	P	63	63	0	*Halophila englemannii*	1
1994-08	6	2	I	81	81	0	*Halophila englemannii*	1
1994-08	6	3	P	93	93	0	*Halodule wrightii*	93
1994-08	6	3	I	97	97	0	*Halodule wrightii*	97
1994-08	6	3	P	93	93	0	*Halophila englemannii*	7
1994-08	6	4	P	92	92	0	*Halodule wrightii*	92
1994-08	6	4	I	92	92	0	*Halodule wrightii*	92
1994-08	6	4	P	92	92	0	*Halophila englemannii*	5
1994-08	6	4	I	92	92	0	*Halophila englemannii*	6
1994-08	6	5	P	84	84	0	*Halodule wrightii*	84
1994-08	6	5	I	91	91	0	*Halodule wrightii*	91
1994-08	6	5	P	84	84	0	*Halophila englemannii*	6

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	6	5	I	91	91	0	*Halophila englemannii*	1
1994-08	6	6	P	92	92	0	*Halodule wrightii*	92
1994-08	6	6	I	99	99	0	*Halodule wrightii*	99
1994-08	6	7	P	94	94	0	*Halodule wrightii*	94
1994-08	6	7	I	95	95	0	*Halodule wrightii*	95
1994-08	6	7	P	94	94	0	*Halophila englemannii*	3
1994-08	6	7	I	95	95	0	*Halophila englemannii*	5
1994-08	6	8	P	98	98	0	*Halodule wrightii*	98
1994-08	6	8	I	100	100	0	*Halodule wrightii*	100
1994-08	7	1	P	61	61	0	*Halodule wrightii*	61
1994-08	7	2	P	58	58	0	*Halodule wrightii*	58
1994-08	7	3	P	49	49	0	*Halodule wrightii*	49
1994-08	7	4	P	79	79	0	*Halodule wrightii*	79
1994-08	7	5	P	78	78	0	*Halodule wrightii*	78
1994-08	7	6	P	75	75	0	*Halodule wrightii*	75
1994-08	7	7	P	87	87	0	*Halodule wrightii*	87
1994-08	7	8	P	80	80	0	*Halodule wrightii*	80
1994-08	7	9	P	76	76	0	*Halodule wrightii*	76
1994-08	7	10	P	88	88	0	*Halodule wrightii*	88
1994-08	7	1	I	73	73	2	*Halodule wrightii*	73
1994-08	7	2	I	56	56	0	*Halodule wrightii*	56
1994-08	7	3	I	90	90	0	*Halodule wrightii*	90
1994-08	7	4	I	75	75	0	*Halodule wrightii*	75
1994-08	7	5	I	89	89	0	*Halodule wrightii*	89
1994-08	7	6	I	99	99	0	*Halodule wrightii*	99
1994-08	7	7	I	94	94	0	*Halodule wrightii*	94
1994-08	7	8	I	97	97	0	*Halodule wrightii*	97
1994-08	7	9	I	98	98	0	*Halodule wrightii*	98
1994-08	7	10	I	96	96	0	*Halodule wrightii*	96
1994-08	7	1	I	73	73	0	*Caulerpa mexicana*	2
1994-08	7	2	I	56	56	0	*Halophila englemannii*	10
1994-08	7	4	I	75	75	3	*Halophila englemannii*	3
1994-08	7	6	I	99	99	0	*Halophila englemannii*	15
1994-08	7	7	I	94	94	0	*Halophila englemannii*	3
1994-08	7	9	I	98	98	0	*Halophila englemannii*	7
1994-08	7	10	I	96	96	0	*Halophila englemannii*	7
1994-08	8	1	P	99	99	0	*Halodule wrightii*	99
1994-08	8	2	P	100	100	0	*Halodule wrightii*	100
1994-08	8	3	P	88	88	0	*Halodule wrightii*	88
1994-08	8	4	P	96	96	0	*Halodule wrightii*	96
1994-08	8	5	P	94	94	0	*Halodule wrightii*	94
1994-08	8	6	P	91	91	0	*Syringodium filiforme*	91
1994-08	8	6	P	91	91	0	*Halophila englemannii*	3
1994-08	8	7	P	95	95	0	*Halodule wrightii*	95
1994-08	8	7	P	95	95	0	*Halophila englemannii*	1
1994-08	8	8	P	100	100	0	*Syringodium filiforme*	100
1994-08	8	9	P	98	98	0	*Halodule wrightii*	73
1994-08	8	9	P	98	98	0	*Syringodium filiforme*	83

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	8	10	P	97	97	0	*Syringodium filiforme*	97
1994-08	8	1	I	100	100	0	*Halodule wrightii*	100
1994-08	8	2	I	96	96	0	*Halodule wrightii*	96
1994-08	8	3	I	60	60	0	*Syringodium filiforme*	6
1994-08	8	3	I	60	60	0	*Halodule wrightii*	60
1994-08	8	4	I	100	100	0	*Halodule wrightii*	100
1994-08	8	5	I	95	95	0	*Halodule wrightii*	95
1994-08	8	6	I	99	99	0	*Syringodium filiforme*	99
1994-08	8	7	I	96	96	11	*Halodule wrightii*	96
1994-08	8	7	I	96	96	11	*Caulerpa prolifera*	1
1994-08	8	7	I	96	96	11	*Udotea conglutinata*	11
1994-08	8	8	I	92	92	1	*Halodule wrightii*	55
1994-08	8	8	I	92	92	1	*Caulerpa prolifera*	1
1994-08	8	8	I	92	92	1	*Syringodium filiforme*	28
1994-08	8	9	I	99	99	0	*Syringodium filiforme*	98
1994-08	8	9	I	99	99	0	*Halophila englemannii*	2
1994-08	8	10	I	100	100	0	*Syringodium filiforme*	100
1994-08	9	1	P	100	100	4	*Syringodium filiforme*	100
1994-08	9	1	P	100	100	4	*Halophila englemannii*	8
1994-08	9	1	P	100	100	4	*Caulerpa prolifera*	4
1994-08	9	2	P	11	11	1	*Syringodium filiforme*	11
1994-08	9	2	P	11	11	1	*Caulerpa prolifera*	1
1994-08	9	3	P	71	71	0	*Syringodium filiforme*	71
1994-08	9	3	P	71	71	0	*Halophila englemannii*	5
1994-08	9	4	P	93	93	0	*Syringodium filiforme*	93
1994-08	9	5	P	96	96	0	*Syringodium filiforme*	96
1994-08	9	6	P	100	92	20	*Syringodium filiforme*	92
1994-08	9	6	P	100	92	20	*Halophila englemannii*	38
1994-08	9	6	P	100	92	20	*Caulerpa prolifera*	18
1994-08	9	6	P	100	92	20	*Udotea conglutinata*	2
1994-08	9	7	P	93	93	8	*Syringodium filiforme*	88
1994-08	9	7	P	93	93	8	*Halophila englemannii*	46
1994-08	9	7	P	93	93	8	*Udotea conglutinata*	8
1994-08	9	8	P	96	96	5	*Syringodium filiforme*	81
1994-08	9	8	P	96	96	5	*Halophila englemannii*	60
1994-08	9	8	P	96	96	5	*Caulerpa prolifera*	5
1994-08	9	9	P	96	96	20	*Syringodium filiforme*	87
1994-08	9	9	P	96	96	20	*Halophila englemannii*	32
1994-08	9	9	P	96	96	20	*Caulerpa prolifera*	15
1994-08	9	9	P	96	96	20	*Udotea conglutinata*	5
1994-08	9	10	P	98	98	13	*Syringodium filiforme*	86
1994-08	9	10	P	98	98	13	*Halophila englemannii*	42
1994-08	9	10	P	98	98	13	*Caulerpa prolifera*	9
1994-08	9	10	P	98	98	13	*Udotea conglutinata*	4
1994-08	9	1	I	73	73	1	*Syringodium filiforme*	73
1994-08	9	1	I	73	73	1	*Udotea conglutinata*	1
1994-08	9	1	I	73	73	1	*Halophila englemannii*	3
1994-08	9	2	I	100	100	2	*Syringodium filiforme*	100

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	9	2	I	100	100	2	*Halophila englemannii*	8
1994-08	9	2	I	100	100	2	*Caulerpa prolifera*	2
1994-08	9	3	I	97	97	0	*Syringodium filiforme*	97
1994-08	9	3	I	97	97	0	*Halophila englemannii*	2
1994-08	9	4	I	95	95	3	*Syringodium filiforme*	95
1994-08	9	4	I	95	95	3	*Caulerpa prolifera*	3
1994-08	9	5	I	100	100	0	*Syringodium filiforme*	100
1994-08	9	6	I	98	98	0	*Syringodium filiforme*	98
1994-08	9	7	I	96	96	0	*Syringodium filiforme*	96
1994-08	9	8	I	100	100	0	*Syringodium filiforme*	100
1994-08	9	9	I	100	100	3	*Syringodium filiforme*	100
1994-08	9	9	I	100	100	3	*Halophila englemannii*	12
1994-08	9	9	I	100	100	3	*Caulerpa prolifera*	3
1994-08	9	10	I	96	96	0	*Syringodium filiforme*	95
1994-08	9	10	I	96	96	0	*Halophila englemannii*	29
1994-08	10	1	P	74	42	32	*Syringodium filiforme*	42
1994-08	10	1	P	74	42	32	*Caulerpa prolifera*	32
1994-08	10	2	P	92	55	40	*Syringodium filiforme*	55
1994-08	10	2	P	92	55	40	*Caulerpa prolifera*	40
1994-08	10	3	P	99	6	99	*Syringodium filiforme*	6
1994-08	10	3	P	99	6	99	*Caulerpa prolifera*	99
1994-08	10	4	P	100	47	96	*Syringodium filiforme*	47
1994-08	10	4	P	100	47	96	*Caulerpa prolifera*	96
1994-08	10	5	P	100	64	36	*Syringodium filiforme*	64
1994-08	10	5	P	100	64	36	*Caulerpa prolifera*	36
1994-08	10	6	P	100	74	90	*Syringodium filiforme*	74
1994-08	10	6	P	100	74	90	*Udotea conglutinata*	2
1994-08	10	6	P	100	74	90	*Caulerpa prolifera*	90
1994-08	10	7	P	100	50	80	*Syringodium filiforme*	50
1994-08	10	7	P	100	50	80	*Caulerpa prolifera*	80
1994-08	10	7	P	100	50	80	*Udotea conglutinata*	2
1994-08	10	8	P	99	11	99	*Syringodium filiforme*	11
1994-08	10	8	P	99	11	99	*Caulerpa prolifera*	99
1994-08	10	9	P	99	0	99	*Caulerpa prolifera*	99
1994-08	10	10	P	99	40	89	*Syringodium filiforme*	40
1994-08	10	10	P	99	40	89	*Caulerpa prolifera*	89
1994-08	10	1	I	52	30	22	*Syringodium filiforme*	30
1994-08	10	1	I	52	30	22	*Caulerpa prolifera*	22
1994-08	10	2	I	100	100	7	*Syringodium filiforme*	100
1994-08	10	2	I	100	100	7	*Caulerpa prolifera*	7
1994-08	10	3	I	96	89	9	*Syringodium filiforme*	89
1994-08	10	3	I	96	89	9	*Caulerpa prolifera*	9
1994-08	10	4	I	100	36	66	*Syringodium filiforme*	35
1994-08	10	4	I	100	36	66	*Caulerpa prolifera*	66
1994-08	10	5	I	100	100	0	*Syringodium filiforme*	100
1994-08	10	6	I	100	100	8	*Syringodium filiforme*	100
1994-08	10	6	I	100	100	8	*Caulerpa prolifera*	8
1994-08	10	7	I	100	100	46	*Syringodium filiforme*	100

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	10	7	I	100	100	46	*Caulerpa prolifera*	46
1994-08	10	8	I	100	94	89	*Syringodium filiforme*	94
1994-08	10	8	I	100	94	89	*Caulerpa prolifera*	89
1994-08	10	8	I	100	94	89	*Udotea conglutinata*	5
1994-08	10	9	I	100	99	10	*Syringodium filiforme*	99
1994-08	10	9	I	100	99	10	*Caulerpa prolifera*	10
1994-08	10	10	I	100	98	86	*Syringodium filiforme*	98
1994-08	10	10	I	100	98	86	*Caulerpa prolifera*	86
1994-08	11	1	P	98	98	0	*Syringodium filiforme*	98
1994-08	11	1	P	98	98	0	*Halophila englemannii*	2
1994-08	11	2	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	3	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	4	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	5	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	6	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	7	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	8	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	9	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	10	P	100	100	0	*Syringodium filiforme*	100
1994-08	11	1	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	2	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	3	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	4	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	5	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	6	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	7	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	8	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	9	I	100	100	0	*Syringodium filiforme*	100
1994-08	11	10	I	100	100	0	*Syringodium filiforme*	100
1994-08	12	1	P	100	100	0	*Syringodium filiforme*	100
1994-08	12	1	I	100	100	0	*Syringodium filiforme*	100
1994-08	12	2	P	100	100	0	*Syringodium filiforme*	100
1994-08	12	2	I	100	100	0	*Syringodium filiforme*	100
1994-08	12	3	P	99	99	0	*Syringodium filiforme*	99
1994-08	12	3	I	99	99	0	*Syringodium filiforme*	99
1994-08	12	4	P	90	90	0	*Syringodium filiforme*	90
1994-08	12	4	I	90	90	0	*Syringodium filiforme*	90
1994-08	12	5	P	100	100	0	*Syringodium filiforme*	100
1994-08	12	5	I	70	70	0	*Syringodium filiforme*	70
1994-08	12	6	P	100	100	0	*Syringodium filiforme*	100
1994-08	12	6	I	100	100	0	*Syringodium filiforme*	100
1994-08	12	7	P	100	100	0	*Syringodium filiforme*	100
1994-08	12	7	I	100	100	0	*Syringodium filiforme*	100
1994-08	12	8	P	100	100	0	*Syringodium filiforme*	100
1994-08	12	8	I	100	100	0	*Syringodium filiforme*	100
1994-08	12	9	P	100	100	0	*Syringodium filiforme*	100
1994-08	12	9	I	100	100	0	*Syringodium filiforme*	100
1994-08	12	10	P	100	100	0	*Syringodium filiforme*	100

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	12	10	I	96	96	0	*Syringodium filiforme*	96
1994-08	14	1	P	91	91	0	*Halodule wrightii*	89
1994-08	14	1	P	91	91	0	*Thalassia testudinum*	2
1994-08	14	2	P	92	92	0	*Halodule wrightii*	92
1994-08	14	3	P	90	90	0	*Halodule wrightii*	90
1994-08	14	4	P	81	81	0	*Halodule wrightii*	81
1994-08	14	5	P	93	93	0	*Halodule wrightii*	93
1994-08	14	6	P	100	100	0	*Halodule wrightii*	100
1994-08	14	7	P	100	100	0	*Halodule wrightii*	100
1994-08	14	8	P	100	100	0	*Halodule wrightii*	100
1994-08	14	9	P	90	90	0	*Thalassia testudinum*	90
1994-08	14	10	P	11	11	0	*Thalassia testudinum*	89
1994-08	14	1	I	97	97	4	*Halodule wrightii*	97
1994-08	14	1	I	97	97	4	*Halimeda incrassata*	4
1994-08	14	2	I	77	77	0	*Halodule wrightii*	77
1994-08	14	3	I	85	85	0	*Halodule wrightii*	85
1994-08	14	4	I	97	97	0	*Halodule wrightii*	97
1994-08	14	5	I	13	13	0	*Halodule wrightii*	13
1994-08	14	6	I	100	100	0	*Halodule wrightii*	100
1994-08	14	7	I	100	100	0	*Halodule wrightii*	100
1994-08	14	8	I	100	100	0	*Halodule wrightii*	100
1994-08	14	9	I	100	100	0	*Halodule wrightii*	100
1994-08	14	10	I	100	100	0	*Halodule wrightii*	100
1994-08	15	1	P	90	90	0	*Halodule wrightii*	90
1994-08	15	2	P	88	88	0	*Halodule wrightii*	88
1994-08	15	3	P	78	78	0	*Halodule wrightii*	78
1994-08	15	4	P	71	71	0	*Halodule wrightii*	71
1994-08	15	5	P	80	80	0	*Halodule wrightii*	80
1994-08	15	6	P	99	99	3	*Halodule wrightii*	99
1994-08	15	6	P	99	99	3	*Caulerpa prolifera*	3
1994-08	15	7	P	98	98	0	*Halodule wrightii*	98
1994-08	15	8	P	99	99	0	*Halodule wrightii*	99
1994-08	15	9	P	56	56	0	*Halodule wrightii*	56
1994-08	15	10	P	98	98	0	*Halodule wrightii*	98
1994-08	15	1	I	98	98	0	*Halodule wrightii*	98
1994-08	15	2	I	94	94	0	*Halodule wrightii*	94
1994-08	15	3	I	93	93	0	*Halodule wrightii*	93
1994-08	15	4	I	100	100	0	*Halodule wrightii*	100
1994-08	15	5	I	100	100	0	*Halodule wrightii*	100
1994-08	15	6	I	99	99	3	*Halodule wrightii*	99
1994-08	15	7	I	99	99	3	*Halimeda incrassata*	3
1994-08	15	7	I	99	99	2	*Halodule wrightii*	99
1994-08	15	8	I	99	99	2	*Halimeda incrassata*	2
1994-08	15	8	I	100	100	0	*Halodule wrightii*	100
1994-08	15	9	I	100	100	0	*Halodule wrightii*	100
1994-08	15	10	I	100	100	0	*Halodule wrightii*	100
1994-08	13	1	P/I	99	0	99	*Caulerpa prolifera*	99
1994-08	13	2	P/I	65	1	66	*Caulerpa prolifera*	65

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	13	2	P/I	65	1	66	*Thalassia testudinum*	1
1994-08	13	3	P/I	74	74	0	*Thalassia testudinum*	74
1994-08	13	4	P/I	95	7	88	*Caulerpa prolifera*	88
1994-08	13	4	P/I	95	7	88	*Thalassia testudinum*	7
1994-08	13	5	P/I	28	0	28	*Caulerpa prolifera*	21
1994-08	13	5	P/I	28	0	28	*Caulerpa mexicana*	7
1994-08	13	6	P/I	65	31	34	*Caulerpa prolifera*	18
1994-08	13	6	P/I	65	31	34	*Caulerpa mexicana*	16
1994-08	13	6	P/I	65	31	34	*Thalassia testudinum*	10
1994-08	13	6	P/I	65	31	34	*Halophila englemannii*	21
1994-08	13	7	P/I	87	0	87	*Caulerpa mexicana*	87
1994-08	13	8	P/I	56	0	56	*Caulerpa mexicana*	56
1994-08	13	9	P/I	97	0	97	*Caulerpa prolifera*	97
1994-08	13	10	P/I	94	0	94	*Caulerpa prolifera*	94
1994-08	13	11	P/I	96	96	18	*Thalassia testudinum*	55
1994-08	13	11	P/I	96	96	18	*Halodule wrightii*	41
1994-08	13	11	P/I	96	96	18	*Caulerpa prolifera*	18
1994-08	13	12	P/I	100	61	65	*Thalassia testudinum*	61
1994-08	13	12	P/I	100	61	65	*Caulerpa prolifera*	57
1994-08	13	12	P/I	100	61	65	*Caulerpa mexicana*	8
1994-08	13	13	P/I	87	67	16	*Thalassia testudinum*	42
1994-08	13	13	P/I	87	67	16	*Caulerpa mexicana*	9
1994-08	13	13	P/I	87	67	16	*Halodule wrightii*	15
1994-08	13	13	P/I	87	67	16	*Caulerpa prolifera*	7
1994-08	13	14	P/I	100	0	100	*Caulerpa prolifera*	29
1994-08	13	14	P/I	100	0	100	*Caulerpa mexicana*	100
1994-08	13	15	P/I	100	0	100	*Caulerpa prolifera*	2
1994-08	13	15	P/I	100	0	100	*Caulerpa mexicana*	100
1994-10	1	1	P	71	71	0	*Halodule wrightii*	71
1994-10	1	1	I	54	54	0	*Halodule wrightii*	54
1994-10	1	2	P	100	100	0	*Halodule wrightii*	100
1994-10	1	2	I	99	99	0	*Halodule wrightii*	99
1994-10	1	3	P	96	96	0	*Halodule wrightii*	96
1994-10	1	3	I	77	77	0	*Halodule wrightii*	77
1994-10	1	4	P	100	100	0	*Halodule wrightii*	100
1994-10	1	4	I	97	97	0	*Halodule wrightii*	97
1994-10	1	5	P	99	99	0	*Halodule wrightii*	99
1994-10	1	5	I	99	99	0	*Halodule wrightii*	99
1994-10	1	6	P	96	96	0	*Halodule wrightii*	96
1994-10	1	6	I	100	100	0	*Halodule wrightii*	100
1994-10	1	7	P	100	100	0	*Halodule wrightii*	100
1994-10	1	7	I	100	100	0	*Halodule wrightii*	100
1994-10	1	8	P	99	99	0	*Halodule wrightii*	99
1994-10	1	8	I	99	99	0	*Halodule wrightii*	99
1994-10	1	9	P	100	100	0	*Halodule wrightii*	100
1994-10	1	9	I	100	100	0	*Halodule wrightii*	100
1994-10	1	10	P	100	100	0	*Halodule wrightii*	100
1994-10	1	10	I	100	100	0	*Halodule wrightii*	100

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	2	1	P	85	85	0	*Halodule wrightii*	85
1994-10	2	1	I	93	93	0	*Halodule wrightii*	93
1994-10	2	2	P	93	93	0	*Halodule wrightii*	93
1994-10	2	2	I	96	96	0	*Halodule wrightii*	96
1994-10	2	3	P	92	92	0	*Halodule wrightii*	92
1994-10	2	3	I	92	92	0	*Halodule wrightii*	92
1994-10	2	4	P	98	98	0	*Halodule wrightii*	98
1994-10	2	4	I	100	100	0	*Halodule wrightii*	100
1994-10	2	5	P	96	96	0	*Halodule wrightii*	96
1994-10	2	5	I	100	100	0	*Halodule wrightii*	100
1994-10	2	6	P	65	65	0	*Halodule wrightii*	65
1994-10	2	6	I	99	99	0	*Halodule wrightii*	99
1994-10	2	7	P	81	81	0	*Halodule wrightii*	81
1994-10	2	7	I	99	99	0	*Halodule wrightii*	99
1994-10	2	8	P	50	50	0	*Halodule wrightii*	50
1994-10	2	8	I	100	100	0	*Halodule wrightii*	100
1994-10	2	9	P	87	87	0	*Halodule wrightii*	87
1994-10	2	9	I	97	97	0	*Halodule wrightii*	97
1994-10	2	10	P	68	68	0	*Halodule wrightii*	68
1994-10	2	10	I	95	95	0	*Halodule wrightii*	95
1994-10	3	1	P	22	22	0	*Halodule wrightii*	22
1994-10	3	1	I	26	26	0	*Halodule wrightii*	26
1994-10	3	2	P	6	6	0	*Halodule wrightii*	6
1994-10	3	2	I	8	8	0	*Halodule wrightii*	8
1994-10	3	3	P	91	91	0	*Halodule wrightii*	91
1994-10	3	3	I	6	6	0	*Halodule wrightii*	6
1994-10	3	4	P	72	72	0	*Halodule wrightii*	72
1994-10	3	4	I	12	12	0	*Halodule wrightii*	12
1994-10	3	5	P	17	17	0	*Halodule wrightii*	17
1994-10	3	5	I	16	16	0	*Halodule wrightii*	16
1994-10	3	6	P	46	46	0	*Halodule wrightii*	46
1994-10	3	6	I	55	55	0	*Halodule wrightii*	55
1994-10	3	7	P	28	28	0	*Halodule wrightii*	28
1994-10	3	7	I	96	96	0	*Halodule wrightii*	96
1994-10	3	8	P	4	4	0	*Halodule wrightii*	4
1994-10	3	8	I	74	74	0	*Halodule wrightii*	74
1994-10	3	9	P	0	0	0	Bare	0
1994-10	3	9	I	86	86	0	*Halodule wrightii*	86
1994-10	3	10	P	61	61	0	*Halodule wrightii*	61
1994-10	3	10	I	74	74	0	*Halodule wrightii*	74
1994-10	4	1	P	92	92	8	*Halimeda incrassata*	3
1994-10	4	1	P	92	92	8	*Udotea conglutinata*	5
1994-10	4	1	P	92	92	8	*Syringodium filiforme*	92
1994-10	4	1	I	99	99	0	*Syringodium filiforme*	99
1994-10	4	2	P	78	78	0	*Syringodium filiforme*	78
1994-10	4	2	I	83	83	9	*Syringodium filiforme*	83
1994-10	4	2	I	83	83	9	*Halimeda incrassata*	3
1994-10	4	2	I	83	83	9	*Halophila englemannii*	6

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	4	3	P	75	75	0	*Syringodium filiforme*	75
1994-10	4	3	I	87	87	0	*Syringodium filiforme*	87
1994-10	4	4	P	91	89	2	*Caulerpa prolifera*	2
1994-10	4	4	P	91	89	2	*Syringodium filiforme*	89
1994-10	4	4	I	88	88	3	*Syringodium filiforme*	88
1994-10	4	4	I	88	88	3	*Halimeda incrassata*	3
1994-10	4	5	P	57	57	0	*Syringodium filiforme*	57
1994-10	4	5	I	2	2	0	*Syringodium filiforme*	2
1994-10	4	6	P	13	13	0	*Syringodium filiforme*	13
1994-10	4	6	I	22	22	0	*Syringodium filiforme*	22
1994-10	4	7	P	89	89	2	*Syringodium filiforme*	89
1994-10	4	7	P	89	89	2	*Caulerpa prolifera*	2
1994-10	4	7	I	79	78	1	*Caulerpa prolifera*	1
1994-10	4	7	I	79	78	1	*Syringodium filiforme*	78
1994-10	4	8	P	100	100	14	*Penicillus* sp.	2
1994-10	4	8	P	100	100	14	*Syringodium filiforme*	4
1994-10	4	8	P	100	100	14	*Caulerpa prolifera*	8
1994-10	4	8	P	100	100	14	*Syringodium filiforme*	100
1994-10	4	8	I	88	88	0	*Syringodium filiforme*	88
1994-10	4	9	P	80	80	0	*Syringodium filiforme*	80
1994-10	4	9	I	30	30	0	*Syringodium filiforme*	30
1994-10	4	10	P	92	92	2	*Halimeda incrassata*	1
1994-10	4	10	P	92	92	2	*Caulerpa prolifera*	1
1994-10	4	10	P	92	92	2	*Syringodium filiforme*	92
1994-10	4	10	I	94	94	0	*Syringodium filiforme*	94
1994-10	5	1	P	46	46	0	*Halodule wrightii*	46
1994-10	5	1	I	24	24	0	*Halodule wrightii*	24
1994-10	5	2	P	52	52	0	*Halodule wrightii*	52
1994-10	5	2	I	29	29	0	*Halodule wrightii*	29
1994-10	5	3	P	14	14	0	*Halodule wrightii*	14
1994-10	5	3	I	60	60	0	*Halodule wrightii*	60
1994-10	5	4	P	15	15	0	*Halodule wrightii*	15
1994-10	5	4	I	51	51	0	*Halodule wrightii*	51
1994-10	5	5	P	22	22	0	*Halodule wrightii*	22
1994-10	5	5	I	53	53	0	*Halodule wrightii*	53
1994-10	5	6	P	73	73	0	*Halodule wrightii*	73
1994-10	5	6	I	6	5	0	*Halodule wrightii*	5
1994-10	5	6	I	6	5	0	*Halophila englemannii*	1
1994-10	5	7	P	13	13	0	*Halodule wrightii*	13
1994-10	5	7	I	19	19	0	*Halodule wrightii*	19
1994-10	5	8	P	8	8	0	*Halodule wrightii*	8
1994-10	5	8	I	15	15	0	*Halodule wrightii*	15
1994-10	5	9	P	12	12	0	*Halodule wrightii*	12
1994-10	5	9	I	84	84	0	*Halodule wrightii*	84
1994-10	5	10	P	6	6	0	*Halodule wrightii*	6
1994-10	5	10	I	86	86	0	*Halodule wrightii*	86
1994-10	6	1	P	65	65	0	*Halodule wrightii*	65
1994-10	6	1	P	65	65	0	*Halophila englemannii*	8

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	6	1	I	90	90	0	*Halodule wrightii*	90
1994-10	6	1	I	90	90	0	*Halophila englemannii*	6
1994-10	6	2	P	86	86	0	*Halodule wrightii*	86
1994-10	6	2	P	86	86	0	*Halophila englemannii*	4
1994-10	6	2	I	97	97	0	*Halodule wrightii*	97
1994-10	6	2	I	97	97	0	*Halophila englemannii*	1
1994-10	6	3	P	94	94	0	*Halodule wrightii*	94
1994-10	6	3	I	100	100	0	*Halodule wrightii*	100
1994-10	6	3	I	100	100	0	*Halophila englemannii*	16
1994-10	6	4	P	100	100	0	*Halodule wrightii*	100
1994-10	6	4	I	100	100	0	*Halodule wrightii*	100
1994-10	6	4	I	100	100	0	*Halophila englemannii*	4
1994-10	6	5	P	67	67	0	*Halodule wrightii*	53
1994-10	6	5	P	67	67	0	*Halophila englemannii*	16
1994-10	6	5	I	81	81	0	*Halodule wrightii*	81
1994-10	6	6	P	71	71	0	*Halodule wrightii*	66
1994-10	6	6	P	71	71	0	*Halophila englemannii*	8
1994-10	6	6	I	97	97	0	*Halodule wrightii*	97
1994-10	6	7	P	68	68	0	*Halodule wrightii*	55
1994-10	6	7	P	68	68	0	*Halophila englemannii*	28
1994-10	6	7	I	98	98	0	*Halodule wrightii*	98
1994-10	6	8	P	87	87	0	*Halodule wrightii*	87
1994-10	6	8	P	87	87	0	*Halophila englemannii*	7
1994-10	6	8	I	68	68	0	*Halodule wrightii*	62
1994-10	6	8	I	68	68	0	*Halophila englemannii*	21
1994-10	6	9	P	70	70	0	*Halodule wrightii*	70
1994-10	6	9	P	70	70	0	*Halophila englemannii*	11
1994-10	6	9	I	99	99	0	*Halodule wrightii*	99
1994-10	6	10	P	43	43	0	*Halodule wrightii*	43
1994-10	6	10	I	100	100	0	*Halodule wrightii*	100
1994-10	7	1	P	96	96	0	*Halodule wrightii*	96
1994-10	7	1	I	96	96	0	*Halodule wrightii*	96
1994-10	7	2	P	99	99	0	*Halodule wrightii*	99
1994-10	7	2	I	97	97	0	*Halodule wrightii*	97
1994-10	7	3	P	73	73	0	*Halodule wrightii*	73
1994-10	7	3	I	100	100	0	*Halodule wrightii*	100
1994-10	7	4	P	100	100	0	*Halodule wrightii*	100
1994-10	7	4	I	100	100	0	*Halodule wrightii*	100
1994-10	7	5	P	97	97	0	*Halodule wrightii*	97
1994-10	7	5	I	98	98	0	*Halodule wrightii*	98
1994-10	7	6	P	76	76	0	*Halodule wrightii*	76
1994-10	7	6	I	98	98	0	*Halodule wrightii*	98
1994-10	7	7	P	99	99	0	*Halodule wrightii*	99
1994-10	7	7	I	100	100	0	*Halodule wrightii*	100
1994-10	7	8	P	91	91	1	*Caulerpa prolifera*	1
1994-10	7	8	P	91	91	1	*Halodule wrightii*	88
1994-10	7	8	P	91	91	1	*Halophila englemannii*	16
1994-10	7	8	I	96	96	0	*Halodule wrightii*	96

Appendix Table 2. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	7	8	I	96	96	0	*Halophila englemannii*	9
1994-10	7	9	P	100	100	0	*Syringodium filiforme*	100
1994-10	7	9	I	100	100	0	*Syringodium filiforme*	100
1994-10	7	10	P	80	80	0	*Halodule wrightii*	80
1994-10	7	10	I	99	99	0	*Syringodium filiforme*	99
1994-10	8	1	P	86	86	0	*Syringodium filiforme*	86
1994-10	8	1	I	100	100	0	*Syringodium filiforme*	100
1994-10	8	2	P	96	96	0	*Syringodium filiforme*	96
1994-10	8	2	I	93	93	0	*Syringodium filiforme*	93
1994-10	8	2	I	93	93	0	*Halodule wrightii*	40
1994-10	8	3	P	94	94	0	*Syringodium filiforme*	94
1994-10	8	3	P	94	94	0	*Halodule wrightii*	6
1994-10	8	3	I	92	92	0	*Syringodium filiforme*	92
1994-10	8	4	P	94	94	0	*Syringodium filiforme*	94
1994-10	8	4	I	100	100	0	*Syringodium filiforme*	100
1994-10	8	5	P	92	92	0	*Syringodium filiforme*	92
1994-10	8	5	P	92	92	0	*Halodule wrightii*	26
1994-10	8	5	I	93	93	0	*Syringodium filiforme*	93
1994-10	8	5	I	93	93	0	*Halodule wrightii*	28
1994-10	8	6	P	100	100	0	*Syringodium filiforme*	100
1994-10	8	6	I	100	100	0	*Syringodium filiforme*	100
1994-10	8	7	P	95	95	0	*Syringodium filiforme*	95
1994-10	8	7	P	95	95	0	*Halodule wrightii*	5
1994-10	8	7	I	100	100	0	*Syringodium filiforme*	100
1994-10	8	7	I	100	100	0	*Halodule wrightii*	3
1994-10	8	8	P	75	75	0	*Syringodium filiforme*	75
1994-10	8	8	I	88	88	0	*Syringodium filiforme*	88
1994-10	8	8	I	88	88	0	*Halodule wrightii*	3
1994-10	8	9	P	100	100	0	*Syringodium filiforme*	100
1994-10	8	9	I	98	98	0	*Syringodium filiforme*	98
1994-10	8	10	P	100	100	0	*Syringodium filiforme*	100
1994-10	8	10	P	100	100	0	*Halodule wrightii*	2
1994-10	8	10	I	99	99	0	*Syringodium filiforme*	99
1994-10	9	1	P	92	92	0	*Syringodium filiforme*	92
1994-10	9	1	I	98	98	0	*Syringodium filiforme*	98
1994-10	9	1	I	98	98	0	*Halophila englemannii*	2
1994-10	9	2	P	98	98	0	*Syringodium filiforme*	98
1994-10	9	2	P	98	98	0	*Halophila englemannii*	2
1994-10	9	2	I	95	95	0	*Syringodium filiforme*	95
1994-10	9	2	I	95	95	0	*Halophila englemannii*	12
1994-10	9	3	P	97	97	0	*Syringodium filiforme*	97
1994-10	9	3	I	100	100	0	*Syringodium filiforme*	100
1994-10	9	3	I	100	100	0	*Halophila englemannii*	10
1994-10	9	4	P	92	92	0	*Syringodium filiforme*	92
1994-10	9	4	I	98	98	2	*Syringodium filiforme*	98
1994-10	9	4	I	98	98	2	*Halophila englemannii*	8
1994-10	9	4	I	98	98	2	*Udotea conglutinata*	2
1994-10	9	5	P	85	85	2	*Syringodium filiforme*	85

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	9	5	P	85	85	2	*Udotea conglutinata*	2
1994-10	9	5	I	100	100	0	*Syringodium filiforme*	100
1994-10	9	5	I	100	100	0	*Halophila englemannii*	8
1994-10	9	6	P	100	100	0	*Syringodium filiforme*	100
1994-10	9	6	P	100	100	0	*Halophila englemannii*	14
1994-10	9	6	I	100	100	0	*Syringodium filiforme*	100
1994-10	9	7	P	95	95	0	*Syringodium filiforme*	95
1994-10	9	7	P	95	95	0	*Halophila englemannii*	2
1994-10	9	7	I	97	97	0	*Syringodium filiforme*	97
1994-10	9	8	P	97	97	0	*Syringodium filiforme*	89
1994-10	9	8	P	97	97	0	*Halophila englemannii*	8
1994-10	9	8	P	97	97	0	*Halodule wrightii*	5
1994-10	9	8	I	100	100	0	*Syringodium filiforme*	100
1994-10	9	8	I	100	100	0	*Halophila englemannii*	4
1994-10	9	9	P	80	80	0	*Syringodium filiforme*	80
1994-10	9	9	P	80	80	0	*Halophila englemannii*	1
1994-10	9	9	I	99	99	0	*Syringodium filiforme*	99
1994-10	9	10	P	84	84	0	*Syringodium filiforme*	84
1994-10	9	10	P	84	84	0	*Halophila englemannii*	5
1994-10	9	10	I	98	98	0	*Syringodium filiforme*	98
1994-10	11	1	P	100	100	0	*Syringodium filiforme*	100
1994-10	11	1	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	2	P	100	100	0	*Syringodium filiforme*	100
1994-10	11	2	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	3	P	100	100	0	*Syringodium filiforme*	100
1994-10	11	3	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	4	P	99	99	0	*Syringodium filiforme*	99
1994-10	11	4	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	5	P	100	100	0	*Syringodium filiforme*	100
1994-10	11	5	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	6	P	100	100	0	*Syringodium filiforme*	100
1994-10	11	6	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	7	P	99	99	0	*Syringodium filiforme*	99
1994-10	11	7	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	8	P	100	100	0	*Syringodium filiforme*	100
1994-10	11	8	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	9	P	100	100	0	*Syringodium filiforme*	100
1994-10	11	9	I	100	100	0	*Syringodium filiforme*	100
1994-10	11	10	P	100	100	0	*Syringodium filiforme*	100
1994-10	11	10	I	100	100	0	*Syringodium filiforme*	100
1994-10	12	1	P	98	98	0	*Syringodium filiforme*	98
1994-10	12	1	I	100	100	0	*Syringodium filiforme*	100
1994-10	12	2	P	99	99	0	*Syringodium filiforme*	99
1994-10	12	2	I	100	100	0	*Syringodium filiforme*	100
1994-10	12	3	P	92	92	2	*Syringodium filiforme*	65
1994-10	12	3	P	92	92	2	*Halodule wrightii*	25
1994-10	12	3	P	92	92	2	*Caulerpa prolifera*	2
1994-10	12	3	I	93	93	3	*Syringodium filiforme*	93

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	12	3	I	93	93	3	*Caulerpa prolifera*	3
1994-10	12	4	P	100	100	0	*Syringodium filiforme*	100
1994-10	12	4	I	90	90	0	*Syringodium filiforme*	90
1994-10	12	5	P	100	100	0	*Syringodium filiforme*	100
1994-10	12	5	I	100	100	0	*Syringodium filiforme*	100
1994-10	12	6	P	100	100	0	*Syringodium filiforme*	100
1994-10	12	6	I	100	100	0	*Syringodium filiforme*	100
1994-10	12	7	P	100	100	3	*Syringodium filiforme*	100
1994-10	12	7	P	100	100	3	*Caulerpa prolifera*	3
1994-10	12	7	I	100	100	2	*Syringodium filiforme*	100
1994-10	12	7	I	100	100	2	*Caulerpa prolifera*	2
1994-10	12	8	P	100	100	0	*Syringodium filiforme*	100
1994-10	12	8	I	100	100	0	*Syringodium filiforme*	100
1994-10	12	9	P	21	21	0	*Syringodium filiforme*	21
1994-10	12	9	I	100	100	0	*Syringodium filiforme*	100
1994-10	12	10	P	100	100	0	*Syringodium filiforme*	100
1994-10	12	10	I	100	100	0	*Syringodium filiforme*	100
1994-10	13	1	P	99	90	77	*Halodule wrightii*	90
1994-10	13	1	P	99	90	77	*Caulerpa prolifera*	77
1994-10	13	1	I	99	81	18	*Thalassia testudinum*	81
1994-10	13	1	I	99	81	18	*Caulerpa mexicana*	18
1994-10	13	1	I	99	81	18	*Halodule wrightii*	1
1994-10	13	2	P	96	80	69	*Thalassia testudinum*	72
1994-10	13	2	P	96	80	69	*Halodule wrightii*	8
1994-10	13	2	P	96	80	69	*Caulerpa mexicana*	60
1994-10	13	2	P	96	80	69	*Caulerpa prolifera*	9
1994-10	13	2	I	96	96	8	*Thalassia testudinum*	96
1994-10	13	2	I	96	96	8	*Caulerpa mexicana*	8
1994-10	13	3	P	94	23	84	*Thalassia testudinum*	12
1994-10	13	3	P	94	23	84	*Halodule wrightii*	11
1994-10	13	3	P	94	23	84	*Caulerpa prolifera*	32
1994-10	13	3	P	94	23	84	*Caulerpa mexicana*	52
1994-10	13	3	I	72	8	64	*Caulerpa mexicana*	64
1994-10	13	3	I	72	8	64	*Thalassia testudinum*	8
1994-10	13	4	P	92	0	92	*Caulerpa mexicana*	78
1994-10	13	4	P	92	0	92	*Caulerpa prolifera*	16
1994-10	13	4	I	68	57	11	*Halodule wrightii*	57
1994-10	13	4	I	68	57	11	*Caulerpa prolifera*	10
1994-10	13	4	I	68	57	11	*Caulerpa mexicana*	1
1994-10	13	5	P	25	25	5	*Halodule wrightii*	25
1994-10	13	5	P	25	25	5	*Caulerpa prolifera*	5
1994-10	13	6	P	70	60	19	*Halodule wrightii*	59
1994-10	13	6	P	70	60	19	*Caulerpa prolifera*	15
1994-10	13	6	P	70	60	19	*Caulerpa mexicana*	4
1994-10	13	6	P	70	60	19	*Halophila englemannii*	1
1994-10	13	7	P	70	70	6	*Halodule wrightii*	70
1994-10	13	7	P	70	70	6	*Caulerpa mexicana*	6
1994-10	13	7	P	70	70	6	*Halophila englemannii*	1

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	13	7	I	40	40	7	*Halodule wrightii*	40
1994-10	13	7	I	40	40	7	*Caulerpa prolifera*	6
1994-10	13	7	I	40	40	7	*Caulerpa mexicana*	1
1994-10	13	8	P	80	80	10	*Halodule wrightii*	80
1994-10	13	8	P	80	80	10	*Caulerpa mexicana*	5
1994-10	13	8	P	80	80	10	*Caulerpa prolifera*	5
1994-10	13	8	I	20	20	10	*Halodule wrightii*	20
1994-10	13	8	I	20	20	10	*Caulerpa mexicana*	10
1994-10	13	9	P	83	83	0	*Halodule wrightii*	83
1994-10	13	9	I	30	30	0	*Halodule wrightii*	30
1994-10	13	9	I	30	30	0	*Halophila englemannii*	5
1994-10	13	10	P	20	20	10	*Halodule wrightii*	20
1994-10	13	10	P	20	20	10	*Caulerpa prolifera*	10
1994-10	13	10	I	50	50	1	*Halodule wrightii*	40
1994-10	13	10	I	50	50	1	*Halophila englemannii*	10
1994-10	13	10	I	50	50	1	*Caulerpa mexicana*	1
1994-10	14	1	P	96	96	0	*Halodule wrightii*	96
1994-10	14	1	I	84	84	0	*Halodule wrightii*	84
1994-10	14	2	P	91	91	0	*Thalassia testudinum*	91
1994-10	14	2	I	72	72	0	*Halodule wrightii*	72
1994-10	14	2	I	72	72	0	*Thalassia testudinum*	2
1994-10	14	3	P	67	67	0	*Halodule wrightii*	67
1994-10	14	3	I	84	84	0	*Halodule wrightii*	84
1994-10	14	4	P	96	96	0	*Halodule wrightii*	96
1994-10	14	4	I	99	99	0	*Halodule wrightii*	99
1994-10	14	5	P	99	99	0	*Halodule wrightii*	99
1994-10	14	5	I	97	97	0	*Halodule wrightii*	97
1994-10	14	6	P	95	95	0	*Halodule wrightii*	95
1994-10	14	6	I	98	98	0	*Halodule wrightii*	98
1994-10	14	7	P	76	76	0	*Halodule wrightii*	76
1994-10	14	7	I	97	97	0	*Halodule wrightii*	97
1994-10	14	8	P	87	88	1	*Halodule wrightii*	87
1994-10	14	8	P	87	88	1	*Caulerpa prolifera*	1
1994-10	14	8	I	86	86	0	*Halodule wrightii*	86
1994-10	14	9	P	88	88	0	*Halodule wrightii*	88
1994-10	14	9	I	88	88	0	*Halodule wrightii*	88
1994-10	14	10	P	79	79	0	*Halodule wrightii*	79
1994-10	14	10	I	91	91	0	*Halodule wrightii*	91
1994-10	15	1	P	87	87	0	*Thalassia testudinum*	87
1994-10	15	1	I	87	87	0	*Thalassia testudinum*	87
1994-10	15	2	P	91	91	0	*Thalassia testudinum*	91
1994-10	15	2	I	84	84	0	*Thalassia testudinum*	84
1994-10	15	3	P	86	86	0	*Halodule wrightii*	86
1994-10	15	3	I	97	97	0	*Halodule wrightii*	97
1994-10	15	4	P	96	96	1	*Halodule wrightii*	96
1994-10	15	4	P	96	96	1	*Udotea conglutinata*	1
1994-10	15	4	I	86	86	0	*Halodule wrightii*	86
1994-10	15	5	P	100	100	0	*Halodule wrightii*	100

Appendix Table 2. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	15	5	I	100	100	0	*Halodule wrightii*	100
1994-10	15	6	P	91	91	0	*Halodule wrightii*	83
1994-10	15	6	P	91	91	0	*Halophila englemannii*	11
1994-10	15	6	I	100	100	0	*Halodule wrightii*	100
1994-10	15	6	I	100	100	0	*Halophila englemannii*	4
1994-10	15	7	P	94	94	70	*Halodule wrightii*	94
1994-10	15	7	P	94	94	70	*Halimeda incrassata*	70
1994-10	15	7	I	100	96	22	*Halodule wrightii*	96
1994-10	15	7	I	100	96	22	*Halimeda incrassata*	22
1994-10	15	8	P	96	76	78	*Halodule wrightii*	76
1994-10	15	8	P	96	76	78	*Halimeda incrassata*	76
1994-10	15	8	P	96	76	78	*Udotea conglutinata*	2
1994-10	15	8	I	100	65	98	*Halimeda incrassata*	98
1994-10	15	8	I	100	65	98	*Halodule wrightii*	65
1994-10	15	9	P	100	95	23	*Halodule wrightii*	95
1994-10	15	9	P	100	95	23	*Halimeda incrassata*	2
1994-10	15	9	P	100	95	23	*Caulerpa prolifera*	19
1994-10	15	9	P	100	95	23	*Udotea conglutinata*	2
1994-10	15	9	I	100	100	3	*Halodule wrightii*	100
1994-10	15	9	I	100	100	3	*Halimeda incrassata*	3
1994-10	15	10	P	97	95	3	*Halodule wrightii*	95
1994-10	15	10	P	97	95	3	*Caulerpa prolifera*	3
1994-10	15	10	I	97	97	0	*Halodule wrightii*	97

Appendix Table 3. Expansion or contraction of seagrass beds measured from staked edges: December 1993-October 1994. The "Perimeter" and "Radius" distances identify the stakes.

Station	Perimeter ID	Radius ID	Grass Expansion (m)	
1	0.0	15.7	3.10	
1	16.1	12.5	3.35	
1	27.2	10.2	2.10	
1	40.3	8.7	2.20	
1	54.0	8.5	2.20	
1	73.0	10.3	-1.40	
1	88.0	7.6	well inside bed	
1	99.0	7.4	well inside bed	
1	114.0	11.1	1.30	
1	130.0	14.0	3.10	
1	138.7	16.6	1.60	
1	149.0	18.9	4.10	
1	166.5	21.5	1.50	
1	184.8	19.3	0.60	
1	198.7	15.8	1.00	
2	0.0	12.7	0.00	
2	11.4	12.9	1.60	
2	21.6	14.0	0.30	
2	32.1	11.5	3.30	
2	44.4	8.1	-0.10	
2	60.0	6.4	2.70	
2	71.6	8.2	2.60	
2	79.1	9.7	1.70	
2	90.3	11.8	1.60	
2	99.2	13.9	0.00	
2	105.1	13.8	0.00	
2	113.6	11.6	-2.30	in hole; filled
2	126.3	14.7	0.00	
2	139.4	15.9	0.00	
2	147.1	15.9	3.30	
3	0.0	13.3	1.40	
3	10.7	12.3	-1.50	
3	22.8	11.1	0.00	
3	34.9	9.1	0.00	
3	43.1	7.3	-1.00	
3	62.2	8.4	-0.30	
3	83.3	13.7	0.00	
3	93.0	17.5	0.02	
3	102.3	19.5	1.10	
3	112.6	20.4	-0.10	
3	120.2	22.1	0.00	
3	132.6	22.6	-2.00	
3	141.6	22.7	-1.10	
3	163.0	27.2	-1.10	
3	176.2	31.3	-1.10	

Appendix Table 3. Continued.

Station	Perimeter ID	Radius ID	Grass Expansion (m)	
4	0.0	18.0	0.50	
4	9.5	15.4	-0.50	
4	20.4	12.5	0.60	
4	36.1	7.2	0.10	
4	50.5	4.3	-0.60	
4	57.5	2.1	0.00	
4	84.2	9.8	-0.40	
4	92.3	9.9	0.00	
4	97.8	10.4	0.80	
4	103.8	11.8	0.40	
4	108.8	12.9	0.10	
4	124.5	17.5	0.10	
4	132.3	18.4	0.00	
4	139.8	19.1	-0.20	
5	0.0	9.2	0.50	
5	5.8	8.5	0.00	
5	13.5		0.50	
5	21.6	10.8	0.00	
5	31.6	12.5	-0.20	
5	38.8	11.4	0.00	
5	45.4	10.0	-0.80	
5	52.0	8.4	-0.60	
5	57.4	8.0	-0.30	
5	63.5	7.3	0.70	
5	70.8	8.2	-0.60	
5	82.3	9.4	-1.00	
5	89.0	11.3	0.00	
5	97.0	12.4	-0.60	
5	102.3	14.4	-1.00	
5	111.2	14.8	0.00	
6	0.0	13.1	0.70	
6	11.1	7.9	-0.50	
6	18.6	7.9	-0.70	
6	27.9	7.6	-0.60	
6	33.4	7.6	2.30	
6	40.6	8.1	0.00	
6	54.6	10.7	0.30	new stake
6	66.4	13.5	2.00	new stake
6	72.8	15.4	0.60	
6	84.5	18.9	-0.40	
6	101.2	22.3	0.00	
6	110.4	20.8	1.10	
6	120.9	27.8	1.40	
7	0.0	10.6	4.40	
7	7.4	10.8	4.00	
7	16.2	13.0	missing	
7	22.1	14.4	1.10	
7	37.3	8.6	2.50	

Appendix Table 3. Continued.

Station	Perimeter ID	Radius ID	Grass Expansion (m)
7	44.9	9.6	4.50
7	52.3	10.0	3.00
7	59.2	11.1	6.00
7	64.7	10.7	3.00
7	74.0	9.5	1.50
7	80.7	11.8	missing; not replaced
7	93.4	14.2	missing; not replaced
7	101.0	15.4	0.20
7	107.0	11.9	0.00
7	116.8	18.4	0.00
8	0.0	11.8	14.00
8	5.7	10.9	7.40
8	10.4	8.8	10.20
8	13.6	N/A	--
8	22.9	9.9	3.20
8	28.3	10.2	4.30
8	43.9	9.8	7.20
8	48.7	9.2	7.60
8	57.6	8.6	8.50
8	79.0	11.7	1.30
8	86.6	11.9	1.40
9	0.0	25.5	--
9	11.0	22.7	0.20
9	24.0	1880.0	0.50
9	37.3	15.4	0.00
9	49.6	12.4	found on leaving
9	63.5	13.2	0.00
9	78.3	11.8	0.60
9	95.1	9.0	1.20
9	107.1	9.6	2.30
9	116.3	12.4	1.30
9	126.8	14.3	1.10
9	136.9	16.3	0.70
9	145.1	18.1	0.80
9	153.8	20.7	0.80
9	160.4	22.4	1.10
9	167.4	24.1	1.00
10	0.0	18.5	0.40
10	14.0	15.2	0.25
10	25.1	12.2	0.40
10	36.8	9.0	0.80
10	48.2	6.3	replaced
10	63.7	4.0	0.10
10	75.8	7.4	0.30
10	91.1	11.6	1.30
10	101.0	14.1	0.00
10	118.8	18.7	0.00
10	126.0	20.2	1.20

Appendix Table 3. Continued.

Station	Perimeter ID	Radius ID	Grass Expansion (m)
10	136.7	18.6	2.70
10	149.4	15.1	0.70
10	158.0	12.8	0.00
10	166.3	10.4	1.80
11	0.0	12.8	1.00
11	11.1	11.2	0.50
11	21.0	11.1	0.40
11	29.6	10.2	0.70
11	40.6	12.1	0.00
11	51.1	13.4	0.70
11	61.0	14.2	0.30
11	81.0	8.8	0.70
11	87.6	8.2	0.80
11	97.0	8.9	0.80
11	104.2	8.8	0.50
11	115.0	12.5	0.60
12	0.0	18.9	0.00
12	10.0	19.1	--
12	18.5	20.2	0.10
12	28.1	18.9	0.50
12	34.8	17.0	0.55
12	42.2	15.9	0.40
12	52.5	14.3	0.30
12	61.6	12.8	0.40
12	71.0	12.3	0.80
12	76.8	12.4	1.10
12	85.5	12.6	-0.90
12	92.6	12.6	-1.40
12	100.6	12.7	-0.70
12	110.4	11.7	3.10
12	124.3	14.8	0.00
13	0.0	14.4	0.00
13	14.5	13.9	0.00
13	30.3	12.7	0.00
13	48.8	14.7	-1.40
13	56.8	16.9	-4.00
13	63.9	18.8	-6.00
13	75.4	17.4	-1.30
13	80.5	17.9	-1.60
13	87.0	19.5	-1.50
13	94.9	20.9	2.80
13	105.5	20.6	4.40
13	114.9	23.3	4.60
13	122.1	24.2	found on leaving
13	127.5	24.9	4.60
14	0.0	17.9	1.00
14	11.9	14.4	0.80
14	22.2	11.3	1.00

Appendix Table 3. Continued.

Station	Perimeter ID	Radius ID	Grass Expansion (m)
14	31.1	8.9	1.20
14	41.4	8.6	0.80
14	50.6	7.6	-0.40
14	59.1	5.0	1.40
14	69.5	4.2	0.90
14	77.9	3.8	0.00
14	87.3	6.4	-0.60
14	98.1	8.1	0.00
14	109.7	10.4	replaced
14	119.9	13.5	0.70
14	129.3	16.1	0.20
14	139.5	11.3	0.70
14	149.2	10.6	0.70
15	0.0	19.0	2.70
15	9.4	17.7	0.80
15	19.3	15.3	0.40
15	32.4	11.3	-0.10
15	41.4	9.2	0.30
15	50.3	10.2	0.00
15	62.0	6.7	1.40
15	69.8	4.3	0.10
15	80.2	5.0	0.00
15	90.1	6.2	0.10
15	102.1	8.7	0.00
15	109.4	10.8	0.60
15	116.5	12.1	0.35
15	125.0	14.6	0.50
15	133.6	17.1	1.30

Appendix Table 4. Dry weight biomass from 25 cm x 25 cm quadrats.

Station	Rep.	Spp.	Biomass (g)
1	1	*Halodule wrightii*	1.53
1	2	*Halodule wrightii*	1.66
1	3	*Halodule wrightii*	0.55
1	4	*Halodule wrightii*	1.37
1	5	*Halodule wrightii*	0.98
1	6	*Halodule wrightii*	3.74
2	1	*Halodule wrightii*	0.63
2	2	*Halodule wrightii*	1.06
2	3	*Halodule wrightii*	0.70
2	4	*Halodule wrightii*	0.97
2	5	*Halodule wrightii*	0.87
2	6	*Halodule wrightii*	0.67
3	1	*Halodule wrightii*	0.48
3	2	*Halodule wrightii*	0.12
3	3	*Halodule wrightii*	0.56
3	4	*Halodule wrightii*	0.40
3	5	*Halodule wrightii*	1.18
3	6	*Halodule wrightii*	0.39
4	1	Drift Algae	4.96
4	1	*Syringodium filiforme*	4.14
4	2	*Syringodium filiforme*	1.51
4	3	*Syringodium filiforme*	1.90
4	4	Drift Algae	5.30
4	4	*Syringodium filiforme*	2.76
4	5	*Syringodium filiforme*	2.27
4	6	*Syringodium filiforme*	3.49
5	1	*Halodule wrightii*	0.50
5	2	*Halodule wrightii*	0.16
5	3	*Halodule wrightii*	1.13
5	4	*Halodule wrightii*	0.29
5	5	*Halodule wrightii*	0.35
5	6	*Halodule wrightii*	0.75
6	1	*Halodule wrightii*	1.15
6	2	*Halodule wrightii*	0.43
6	3	*Halodule wrightii*	1.96
6	3	*Halodule wrightii*	0.70
6	4	*Halodule wrightii*	2.04
6	5	*Halodule wrightii*	0.51
6	6	*Halodule wrightii*	0.83
7	1	*Halodule wrightii*	0.83
7	2	*Halodule wrightii*	1.31
7	3	*Halodule wrightii*	1.51
7	4	*Halodule wrightii*	1.55
7	4	*Halophila englemannii*	0.19
7	5	*Halodule wrightii*	0.73
7	5	*Halophila englemannii*	0.69
7	6	*Halodule wrightii*	0.94
8	1	Drift Algae	0.56
8	1	*Halodule wrightii*	1.25

Appendix Table 4. Continued:

Station	Rep.	Spp.	Biomass (g)
8	1	*Halophila englemannii*	0.21
8	1	*Syringodium filiforme*	3.66
8	2	Drift Algae	0.08
8	2	*Syringodium filiforme*	5.74
8	3	Drift Algae	2.23
8	3	*Halodule wrightii*	1.18
8	3	*Halophila englemannii*	0.32
8	3	*Syringodium filiforme*	0.73
8	4	Drift Algae	0.18
8	4	*Halodule wrightii*	2.03
8	4	*Halophila englemannii*	0.09
8	5	Drift Algae	6.08
8	5	*Halodule wrightii*	2.02
8	5	*Syringodium filiforme*	0.94
8	6	*Halodule wrightii*	0.99
8	6	*Halophila englemannii*	0.04
8	6	*Syringodium filiforme*	1.44
9	1	*Halophila englemannii*	0.11
9	1	*Syringodium filiforme*	3.29
9	2	Drift Algae	0.11
9	2	*Halodule wrightii*	0.17
9	2	*Halophila englemannii*	0.56
9	2	*Syringodium filiforme*	4.09
9	3	*Halophila englemannii*	0.38
9	3	*Syringodium filiforme*	3.85
9	4	Drift Algae	1.40
9	4	*Syringodium filiforme*	5.52
9	5	Drift Algae	0.31
9	5	*Syringodium filiforme*	5.58
9	6	*Halophila englemannii*	0.21
9	6	*Syringodium filiforme*	4.61
10	1	*Caulerpa prolifera*	0.61
10	1	*Syringodium filiforme*	4.41
10	2	*Caulerpa prolifera*	0.78
10	2	Drift Algae	14.16
10	2	*Syringodium filiforme*	5.23
10	3	*Caulerpa prolifera*	2.80
10	3	*Syringodium filiforme*	5.85
10	4	*Caulerpa prolifera*	0.52
10	4	*Syringodium filiforme*	2.77
10	5	*Caulerpa prolifera*	3.67
10	5	Drift Algae	14.42
10	5	*Halophila englemannii*	0.24
10	6	*Caulerpa prolifera*	0.38
10	6	*Syringodium filiforme*	2.06
11	1	*Syringodium filiforme*	9.12
11	2	*Syringodium filiforme*	7.84
11	3	*Syringodium filiforme*	6.77
11	4	*Syringodium filiforme*	11.45

Station	Rep.	Spp.	Biomass (g)
11	5	*Syringodium filiforme*	6.97
11	6	*Syringodium filiforme*	5.37
12	1	*Caulerpa prolifera*	0.02
12	1	*Syringodium filiforme*	5.96
12	2	*Caulerpa prolifera*	0.04
12	2	*Syringodium filiforme*	8.36
12	3	Drift Algae	13.16
12	3	*Halodule wrightii*	4.97
12	3	*Syringodium filiforme*	1.45
12	4	*Caulerpa prolifera*	0.17
12	4	Drift Algae	32.31
12	4	*Syringodium filiforme*	9.63
12	5	*Caulerpa prolifera*	0.31
12	5	Drift Algae	5.62
12	5	*Syringodium filiforme*	2.25
12	6	*Caulerpa prolifera*	0.06
12	6	Drift Algae	17.30
12	6	*Syringodium filiforme*	13.30
13	1	*Caulerpa prolifera*	2.58
13	1	Drift Algae	2.34
13	1	*Thalassia testudinum*	7.34
13	2	*Caulerpa mexicana*	20.91
13	2	Drift Algae	2.11
13	3	*Caulerpa prolifera*	2.15
13	3	Drift Algae	3.19
13	3	*Thalassia testudinum*	3.14
13	4	*Caulerpa mexicana*	18.84
13	4	*Caulerpa prolifera*	0.86
13	4	Drift Algae	32.43
13	4	*Thalassia testudinum*	1.70
13	5	*Caulerpa mexicana*	19.90
13	5	*Caulerpa prolifera*	0.70
13	5	Drift Algae	1.74
13	5	*Thalassia testudinum*	1.56
13	6	*Caulerpa mexicana*	4.78
13	6	*Caulerpa prolifera*	0.59
13	6	Drift Algae	4.68
13	6	*Thalassia testudinum*	0.66
14	1	Drift Algae	1.34
14	1	*Halodule wrightii*	0.85
14	1	*Syringodium filiforme*	0.37
14	2	Drift Algae	3.01
14	2	*Halodule wrightii*	0.86
14	3	*Halodule wrightii*	0.41
14	3	*Syringodium filiforme*	0.53
14	4	Drift Algae	4.13
14	4	*Halodule wrightii*	0.37
14	4	*Syringodium filiforme*	0.30
14	5	Drift Algae	0.32

Station	Rep.	Spp.	Biomass (g)
14	5	*Halodule wrightii*	0.95
14	6	Drift Algae	10.23
14	6	*Halodule wrightii*	0.55
14	6	*Syringodium filiforme*	3.92
15	1	*Halodule wrightii*	1.06
15	1	*Thalassia testudinum*	0.21
15	2	Drift Algae	0.09
15	2	*Halodule wrightii*	1.39
15	3	*Halodule wrightii*	8.35
15	4	Drift Algae	4.56
15	4	*Halodule wrightii*	7.63
15	5	Drift Algae	0.79
15	5	*Halodule wrightii*	5.27
15	6	*Halodule wrightii*	2.20
15	6	*Thalassia testudinum*	1.03

Appendix Table 5. Biomass (ug) of 14-day growth clip samples.

Station	Rep.	Species	Number of Shoots	Grass Wt. (μg)	Wt./Shoot (μg)
1	A	*Halodule wrightii*	3	275	92
1	B	*Halodule wrightii*	5	762	152
1	C	*Halodule wrightii*	5	848	170
1	D	*Halodule wrightii*	5	881	176
1	E	*Halodule wrightii*	4	566	142
1	F	*Halodule wrightii*	6	1128	188
2	A	*Halodule wrightii*	3	385	128
2	B	*Halodule wrightii*	2	170	85
2	C	*Halodule wrightii*	7	456	65
2	D	*Halodule wrightii*	3	216	72
2	E	*Halodule wrightii*	4	215	54
3	A	*Halodule wrightii*	3	77	26
3	B	*Halodule wrightii*	2	90	45
3	C	*Halodule wrightii*	1	31	31
3	D	*Halodule wrightii*	5	295	59
3	E	*Halodule wrightii*	2	93	47
4	A	*Syringodium filiforme*	7	1428	204
4	B	*Syringodium filiforme*	6	2190	365
4	C	*Syringodium filiforme*	4	1279	320
4	D	*Syringodium filiforme*	5	1312	262
4	E	*Syringodium filiforme*	3	451	150
5	A	*Halodule wrightii*	3	130	43
5	B	*Halodule wrightii*	1	90	90
5	C	*Halodule wrightii*	1	103	103
5	D	*Halodule wrightii*	1	49	49
5	E	*Halodule wrightii*	2	88	44
5	F	*Halodule wrightii*	4	201	50
6	A	*Halodule wrightii*	5	494	99
6	B	*Halodule wrightii*	3	802	267
6	C	*Halodule wrightii*	4	430	108
6	D	*Halodule wrightii*	2	154	77
6	E	*Halodule wrightii*	4	497	124
6	F	*Halodule wrightii*	5	575	115
7	A	*Halodule wrightii*	2	304	152
7	B	*Halodule wrightii*	2	156	78
7	C	*Halodule wrightii*	6	455	76
7	D	*Halodule wrightii*	6	295	49
7	E	*Halodule wrightii*	3	246	82
8	A	*Halodule wrightii*	2	258	129
8	B	*Halodule wrightii*	4	508	127
8	C	*Halodule wrightii*	8	794	99
8	D	*Halodule wrightii*	11	626	57
8	E	*Halodule wrightii*	7	919	131
9	A	*Syringodium filiforme*	17	3420	201
9	B	*Syringodium filiforme*	9	2054	228
9	C	*Syringodium filiforme*	9	1941	216
9	D	*Syringodium filiforme*	21	3940	188
9	E	*Syringodium filiforme*	9	1023	114

Appendix Table 5. Continued.

Station	Rep.	Species	Number of Shoots	Grass Wt. (μg)	Wt./Shoot (μg)
10	A	*Syringodium filiforme*	8	1066	133
10	B	*Syringodium filiforme*	18	1968	109
10	C	*Syringodium filiforme*	19	1851	97
10	D	*Syringodium filiforme*	8	433	54
10	E	*Syringodium filiforme*	10	1322	132
11	A	*Syringodium filiforme*	2	478	239
11	B	*Syringodium filiforme*	2	818	409
11	C	*Syringodium filiforme*	6	1668	278
11	D	*Syringodium filiforme*	2	986	493
12	A	*Syringodium filiforme*	3	246	82
12	B	*Syringodium filiforme*	5	1764	353
12	C	*Syringodium filiforme*	6	1068	178
12	D	*Syringodium filiforme*	7	1181	169
12	E	*Syringodium filiforme*	6	413	69
13	A	*Halodule wrightii*	6	538	90
13	B	*Halodule wrightii*	3	398	133
13	C	*Halodule wrightii*	2	72	36
13	D	*Halodule wrightii*	4	246	62
13	E	*Halodule wrightii*	2	51	26
14	A	*Halodule wrightii*	6	743	124
14	B	*Halodule wrightii*	3	859	286
14	C	*Halodule wrightii*	8	1230	154
14	D	*Halodule wrightii*	2	540	270
15	A	*Halodule wrightii*	3	533	178
15	B	*Halodule wrightii*	6	468	78
15	C	*Halodule wrightii*	13	688	53
15	D	*Halodule wrightii*	7	889	127
15	E	*Halodule wrightii*	3	565	188

Appendix Table 6. Productivity (mg/m2/day) and number of shoots per m2 calculated from grass clip samples

Station	Rep.	Species	Number of Shoots	Productivity (mg/m2/day)	Shoots/m2	Regrowth Days
1	A	Halodule wrightii	3	196	299	14
1	B	Halodule wrightii	5	543	499	14
1	C	Halodule wrightii	5	604	499	14
1	D	Halodule wrightii	5	627	499	14
1	E	Halodule wrightii	4	403	399	14
1	F	Halodule wrightii	6	803	598	14
2	A	Halodule wrightii	3	274	299	14
2	B	Halodule wrightii	2	121	199	14
2	C	Halodule wrightii	7	325	698	14
2	D	Halodule wrightii	3	154	299	14
2	E	Halodule wrightii	4	153	399	14
3	A	Halodule wrightii	3	55	299	14
3	B	Halodule wrightii	2	64	199	14
3	C	Halodule wrightii	1	22	100	14
3	D	Halodule wrightii	5	210	499	14
3	E	Halodule wrightii	2	66	199	14
5	A	Halodule wrightii	3	86	299	15
5	B	Halodule wrightii	1	60	100	15
5	C	Halodule wrightii	1	68	100	15
5	D	Halodule wrightii	1	33	100	15
5	E	Halodule wrightii	2	58	199	15
5	F	Halodule wrightii	4	134	399	15
6	A	Halodule wrightii	5	352	499	14
6	B	Halodule wrightii	3	571	299	14
6	C	Halodule wrightii	4	306	399	14
6	D	Halodule wrightii	2	110	199	14
6	E	Halodule wrightii	4	354	399	14
6	F	Halodule wrightii	5	409	499	14
7	A	Halodule wrightii	2	216	199	14
7	B	Halodule wrightii	2	111	199	14
7	C	Halodule wrightii	6	324	598	14
7	D	Halodule wrightii	6	210	598	14
7	E	Halodule wrightii	3	175	299	14
8	A	Halodule wrightii	2	214	199	12
8	B	Halodule wrightii	4	422	399	12
8	C	Halodule wrightii	8	660	798	12
8	D	Halodule wrightii	11	520	1097	12
8	E	Halodule wrightii	7	764	698	12
13	A	Halodule wrightii	6	383	598	14
13	B	Halodule wrightii	3	283	299	14
13	C	Halodule wrightii	2	51	199	14
13	D	Halodule wrightii	4	175	399	14
13	E	Halodule wrightii	2	36	199	14
14	A	Halodule wrightii	6	617	598	12
14	B	Halodule wrightii	3	714	299	12
14	C	Halodule wrightii	8	1022	798	12
14	D	Halodule wrightii	2	449	199	12
15	A	Halodule wrightii	3	443	299	12

Station	Rep.	Species	Number of Shoots	Productivity (mg/m2/day)	Shoots/m2	Regrowth Days
15	B	Halodule wrightii	6	389	598	12
15	C	Halodule wrightii	13	572	1296	12
15	D	Halodule wrightii	7	739	698	12
15	E	Halodule wrightii	3	469	299	12
4	A	Syringodium filiforme	7	466	320	14
4	B	Syringodium filiforme	6	714	274	14
4	C	Syringodium filiforme	4	417	183	14
4	D	Syringodium filiforme	5	428	228	14
4	E	Syringodium filiforme	3	147	137	14
9	A	Syringodium filiforme	17	1115	776	14
9	B	Syringodium filiforme	9	670	411	14
9	C	Syringodium filiforme	9	633	411	14
9	D	Syringodium filiforme	21	1285	959	14
9	E	Syringodium filiforme	9	334	411	14
10	A	Syringodium filiforme	8	348	365	14
10	B	Syringodium filiforme	18	642	822	14
10	C	Syringodium filiforme	19	604	868	14
10	D	Syringodium filiforme	8	141	365	14
10	E	Syringodium filiforme	10	431	457	14
11	A	Syringodium filiforme	2	182	91	12
11	B	Syringodium filiforme	2	311	91	12
11	C	Syringodium filiforme	6	635	274	12
11	D	Syringodium filiforme	2	375	91	12
12	A	Syringodium filiforme	3	80	137	14
12	B	Syringodium filiforme	5	575	228	14
12	C	Syringodium filiforme	6	348	274	14
12	D	Syringodium filiforme	7	385	320	14
12	E	Syringodium filiforme	6	135	274	14

RAI 3-4 Crystal River 1995 Seagrass Study

1995 Summary Report for:

CRYSTAL RIVER 3 YEAR NPDES MONITORING PROJECT

FPC Contract S01100

Work Authorization 501 (Addendum 1)

submitted December 15, 1995 to

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EXECUTIVE SUMMARY

Florida Power Corporation (FPC) and federal and state regulatory agencies seek to demonstrate that the operation of new helper cooling towers at the FPC Crystal River Station will lead to an expansion in the area of benthic habitat occupied by submerged aquatic vegetation (SAV; seagrasses and rhizophytic macroalgae). A monitoring program was begun in the Fall of 1993 and was completed in the Fall of 1995. The monitoring program emphasized near-shore waters within a two mile radius from the point of discharge (POD) of the Crystal River Station.

The major questions to be answered by the monitoring plan were 1) Are barren areas being colonized by SAV?, and 2) Are existing areas of SAV expanding? To answer Question 1, it was necessary to design and implement a robust survey program in barren areas. To answer Question 2, selected SAV beds were surveyed at a very fine scale and results were compared between years. Important corollary questions included: 3) Changes in SAV cover outside of the designated study area (control sites); 4) Changes in the relative abundance of macroalgae, compared to seagrasses; and 5) Changes in the biomass or productivity of existing SAV beds. We addressed Question 3 by occupying barren and vegetated sites in control sites. We addressed Question 4 by measuring percent cover by species, and percent barren area, at stations within the SAV beds selected for more intensive surveys. Changes in SAV biomass or productivity (Question 5) were determined by sampling the intensive survey beds during August of each year.

Professional aerial photography was to be used to backstop the field measurements. We did not recommend using aerial imagery as a primary source of SAV dispersion data because past experience has shown that turbidity, color, tide, sea surface conditions, and weather are significant impediments to successful photography at this site. Aerial photography scheduled for 1993 was not completed until spring of 1994 because of unsuitable weather and water conditions. Usefulness of 1994 images was marginal due to turbidity fronts in Basins 1 and 2, equivalent to the study area within a 2 mile POD radius. Photography authorized for fall 1994 was not completed despite extended readiness through 1995. Flight conditions were hampered during winter 1994-95, and unusual tropical storm conditions reduced water clarity during summer and fall, 1995.

Our plans for field sampling were informed by the record of poor conditions for aerial photography at the site. Lack of contemporaneous aerial photographs prevented the production of digitized SAV maps but did not hamper our ability to monitor barren and vegetated areas throughout the study area, in order to answer project questions. Future attempts at aerial photography should be made, with or without collateral field sampling, as opportunities arise.

Results

Exhibit I summarizes all results from the 3 year monitoring program. In 1993, barren area transects encountered few SAV beds, and these were

previously known. The 1993 survey established that most of Basins 1-3 were barren of seagrasses. By 1994, 3 new beds had developed, all north of the Discharge Canal. Two of the 1994 beds could not be found in 1995, but 3 other beds were discovered. These also were north of the Discharge Canal. The gross increase in new seagrass areas during the 3 year survey period was 6 beds. Two failed to persist to 1995. Compared to 1993 conditions, 4 new beds were added to Basins 1 and 2. There were, in general, no signs of bed development in the middle or southern areas of the 2 basins closest to the POD. However, one new 1994 Halodule bed was only a few hundred meters from the POD. There was some minor coverage of new seagrass and rhizophytic algae in the southern part of Basin 3.

Twelve of fifteen beds selected for intensive monitoring expanded beyond their 1993 perimeters, by 1994. Eight expanded between 1993 and 1995. The majority of intensively studied beds also showed increases in percent cover, both along their edges and within their interiors, from 1993 to 1994. The 1994 to 1995 period saw fewer beds with increased cover, perhaps owing to the wet summer of 1995. Biomass measurements also depicted declines from 1994 to 1995, although 14 of the 15 intensively studied beds showed increases in daily productivity rates. These responses are consistent with the effects of tropical storm activity and above-average rainfall and river discharges.

Based on data from 1993, 1994, and 1995, the following points are offered.

1. "New" SAV beds appeared along barren-area transects.
2. Recruitment of new beds into barren areas has not been extensive.
3. All of the new beds have formed north of the point of discharge, in Basins 1 and 2.
4. The seaward edges of SAV beds have expanded at 8 of 15 intensively monitored SAV stations.
5. Patterns of change in percent cover, from 1993 to 1995, showed decreased coverages (by total vegetation) at 10 of 15 sites.
6. Biomass distribution patterns showed a general decline from 1993 to 1995 at 10 of 15 sites irrespective of distance from the POD.
7. Shoot densities increased by 1995 for Halodule at 8 of the 10 stations where it was present in 1994.
8. SAV production rates showed large increases from 1994 to 1995 in Basins 1, 2 and 3, closest to the point of discharge.

Overall, monitoring revealed spatial as well as temporal patterns in the distribution of sea grasses and rhizophytic algae. Most patterns depicted a system of bed recruitment and expansion that promoted persistence, and for several parameters (Exhibit I), improvements in SAV cover and condition during the three years. No abiotic parameters were measured in this program, so it is not possible to assign causes for the SAV changes observed during the past 3 years. Changes in transects and beds within the 2 mile POD radius were mirrored by changes at more distant sites, indicating the extent of the 1995 wet season on the region, as well as the study area.

Exhibit 1. 1993-1995 Summary data, Crystal River NPDES Monitoring Project.

Basin/SAV[1]	I-HW	II-HW	III-SF	IV-Mixed	V-SF/Other	Total
Barren Area Results						
No. Transects	3	3	5	2	2	15
No. New Beds						
1993-1994	1	1	1	0	0	3
1994-1995	1	2	0	0	0	3
Net New Beds						
1993-1995	1	2	1	0	0	4
Intensive Seagrass Bed Results						
No. of beds/area	3	3	3	3	3	15
No. Beds Expanding						
1993-1994	2	2	3	2	3	12
1993-1995	2	1	1[2]	3	1	8
No. Beds Increasing						
% Cover						
Interiors						
1993-1994	2	1	2	0	3	8
1994-1995	1	0	0[2]	0	0	1
Perimeters						
1993-1994	1	0	2	2	3	8
1994-1995	1	0	0[2]	0	1	2
No. Beds Increasing						
Biomass						
1994-1995	0	2	0	1	0	3
No. Beds Increasing						
Productivity						
1994-1995	3	3	3	3	2	14

[1] HW, Halodule wrightii; SF, Syringodium filiforme; mixed, more than one species was abundant
[2] Of two remaining marked beds in this area.

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INTRODUCTION

Florida Power Corporation (FPC) and federal and state regulatory agencies seek to demonstrate that the operation of new helper cooling towers at the FPC Crystal River Station will lead to an expansion in the area of benthic habitat occupied by submerged aquatic vegetation (SAV: seagrasses and rhizophytic macroalgae). A monitoring program was begun in the Fall of 1993 and was completed in the Fall of 1995. The monitoring program emphasizes near-shore waters within a two mile radius from the point of discharge (POD) of the Crystal River Station (Figure 1).

Available Information

Early surveys and aerials are described in the 316 Demonstration Report and the 1986 MML report, "Submerged Aquatic Vegetation in the Vicinity of the FPC Crystal River Power Station."

Studies performed in the 1970s by the University of Florida contained a single map by Martin Van Tine of "approximate attached macrophyte standing crop" during the summer of an unknown year (Florida Power Corporation, 1975). The map depicted areas of high and low standing crop, including barren areas. Nothing is known of sampling methods or effort.

Two SAV surveys were performed in the vicinity of the Crystal River Station during the 1980s. The first was conducted under MML supervision as part of the 316 Demonstration Study, in 1983 and 1984. The second was sponsored by FPC and conducted by MML in 1986, to determine the nature of offshore SAV beds closer to the influence of the Withlacoochee River.

The 316 Demonstration Study occupied 50 survey stations. "Thermal" stations fell along four transects between the Barge and Intake Canals. "Control" stations fell along three transects north of the Barge Canal and three transects south of the Intake Canal. (Thirteen of the 50 stations fall within a 2 mile radius from POD, north of the intake canal.) Ten square-meter quadrats were deployed at each station and percent cover of seagrass and algae was determined in each. Nine "intensive" stations were equally divided among Halodule, Thalassia, and Syringodium sites in thermal and control areas. Intensive stations were visited on 6 week intervals. Biomass and productivity (2-week clip method) was measured at each station.

No intensive stations were sampled in November of either year. Aerial photographs were taken in February of 1983 and 1984, and in October/November of 1983. Only three of eight planned, quarterly overflights produced successful aerial images due to poor water quality. Later ground-truthing resulted in SAV maps drawn at a scale of 1:18,000 on stable acetate.

Dense SAV was mapped south of the Intake Canal and between the Intake and Discharge Canals. Sparse SAV beds were mapped in Basins 1 and 3. SAV near Fisherman's Cut was seasonally variable. A large area of SAV in Basin 4 was more persistent. Most of these areas fall within a 2-mile POD radius. Barren areas were most widespread in Basins 1, 2 and 3. Other results are presented in the 316 Demonstration Report.

In November 1986, MML surveyed 177 stations between the Barge and Intake Canals, west of the POD. Station density was determined through a statistical analysis of previous SAV bed distribution. (Twenty-five stations fell within a 2-mile POD radius.) Original LORAN positions of all stations are still available. At each station, 120 meter dive lines were surveyed for dispersion and abundance of SAV.

The survey found that most stations west of the 1983-84 study area contained SAV. SAV (especially sparse macroalgae) was also found at areas mapped as barren in the earlier studies. Caulerpa species were ubiquitous, but other rhizophytic algae were more common in the southern half of the survey area. Overall, there were declines in SAV richness and cover toward the north and toward the west, within the 1986 survey area. Extensive areas of drift and lithophytic Sargassum were also observed.

Rationale

The major questions to be answered by the monitoring plan were:

1) Are barren areas being colonized by SAV?

2) Are existing areas of SAV expanding?

To answer Question 1, it was necessary to design and implement a robust survey program in barren areas. To answer Question 2, selected SAV beds were surveyed at a very fine scale and results were compared between years.

Professional aerial photography was to be used to backstop the field measurements. We did not recommend using aerial imagery as a primary source of SAV dispersion data because past experience has shown that turbidity, color, tide, sea surface conditions, and weather are significant impediments to successful photography at this site. On the other hand, when it is successful, aerial photography can reveal changes in SAV that fixed-station methods might miss. Consequently, we sought to fly the site and examine each year's new imagery prior to commencing field work, where possible.

Important corollary questions included:

3) Changes in SAV cover outside of the designated study area (control sites);

4) Changes in the relative abundance of macroalgae, compared to seagrasses; and

5) Changes in the biomass or productivity of existing SAV beds.

We addressed Question 3 by occupying barren and vegetated sites in control sites, and by including these areas in the flight lines for aerial photography. Where possible, control stations were selected at a variety of depths comparable to stations within the 2-mile POD radius.

We addressed Question 4 by measuring percent cover by species, and percent barren area, at stations within the SAV beds selected for more intensive surveys.

Changes in SAV biomass or productivity (Question 5) were determined by sampling the intensive survey beds during August of each year. The 316 Demonstration Study reported a strong dependence of variation in these parameters, on time. Seagrass biomass and productivity during the Fall are transitional between maxima in August and September, and minima in December and January. Consequently, difficulty was expected in identifying statistically significant differences between years, using November data. Interannual differences are particularly difficult to detect in beds of mixed species, which are more common than single-species beds near Crystal River Station.

This report summarizes findings for barren area surveys, "perimeter" studies at intensive SAV beds, and the August 1994-95 condition assessment.

METHODS

Positioning

Several independent systems were employed. Approximate station locations were mapped onto charts carried in the field, to depict the orientation of a station to creeks, islands, day marks, levees, and other land marks. LORAN and GPS coordinates of all stations and transects, measured in 1993 and 1994, were also taken into the field. As needed, the end points of transects that were marked on land or in marshes with steel bars, stones, colored paint, or other permanent material were replaced.

In 1995, transect end points and station locations were again measured using a Voyager LORAN Navigator and a Magellan NAVPRO global positioning system. Electronic positions also were measured for NOS benchmarks at the mouth of the discharge canal, and at the U.S. Geological Survey "Knott" benchmark on Drum Island. Analysis of the electronic data indicates high field accuracy (reproducibility) but relatively low map precision (see Discussion).

Barren Area Transects

Barren area transects established in 1993 were visited in October 1994 and October 1995. As shown in Figure 2, most effort was directed to Basins 1, 2 and 3, with some effort in the areas of Basins 4 and 5, closest to the POD (e.g, inside the 2-mile radius).

Transects 1N, 1W and 2W covered Basin 1, the shallowest basin in the study area (-0.3 m relative to chart datum). Transects crossed level bottom comprised of variously-sized sediment overlying an irregular limestone platform. Sediments to the north and east, near Juncus marshes, have an organic component found lacking in sediments to the west and south, where shelly sands dominate. This basin is utilized heavily by the west indian manatee.

Basin 2 is crossed by Transects 3W, 4W, and the northern half of 5W. Basin 2 is deeper than Basin 1 (mean depth -0.9 m) and has minor tidal channels as deep as 1.8 m. Basin 2 transects run close by or over oyster reefs and

mapped SAV beds 1, 6 and 7. Sediments are heterogeneous, and bare limestone occurs on Transects 4W and 5W. The influence of Withlacoochee River discharge is evident in this basin.

Basin 3 is crossed by Transects 6W through 10W. This circular basin has a bowl-shaped profile, deepest near the center (-1.9 m). The basin is ringed by oyster reefs to the east and west, and by the Intake Canal Levee to the south. Perimeter beds 14 and 15 are located on 2 shelly shoals that have accumulated atop limestone steppes within the basin. This basin presents the most exposed limestone bottom in the study area, as well as the most sediment with a high silt and mud content. Tidal currents are strong near Transect 10W (adjacent to Dog Head Reef).

Basin 4 contains 2 transects, 2N and 11W. The transects begin near ends of the middle bar in the English Shoals, and meet in waters 2.1 m deep. This bottom is shelly and supports Caulerpa, calcareous algae, and the sea-whip, Leptogorgia. Basin 5 has 1 transect, 12W, that begins on the levee and ends in 2.5 m of water. Solitary corals are present in this basin, which opens directly to the Gulf of Mexico.

Transects 10W, 12 W, and 2N are beyond the 2 mile POD radius, and are treated as background or control sites. Another control site, Transect 13W, lies between the Barge Canal and Withlacoochee River channel. Transect 13W is in 2 m of water over muddy sand. Appendix Table I describes all transect locations.

Barren areas were surveyed by a diver towed behind a shallow draft vessel. Most transects ran due north or south to pre-determined landmarks. For long transects, tows followed transect lines marked in advance with temporary buoys. Buoys marked end points and way points, as needed. Beginning and end points were permanently positioned and marked. Where needed, tows were made into the current to reduce drift.

If the diver encountered seagrass or rhizophytic algae in barren areas the vessel stopped and marked the site(s). The immediate area was reconnoitered to determine the extent of SAV. If it corresponded to a previously-mapped SAV bed, it was recorded as "mapped" and was discounted as barren area. If new, the area, centroid position, species composition, and percent cover (see below) of the SAV was to be recorded, unless the vegetation was found to be Sargassum attached to rock outcrops. SAV markers were then recovered, and the survey of the transect continued.

Yearly barren area transect surveys were begun on November 9, 1993, October 13, 1994, and October 16, 1995.

Intensive SAV BED Surveys

In October 1994, GPS and LORAN coordinates and compass sightings were used to relocate the seagrass beds selected for study. All beds were marked by crab trap buoys anchored with screw-in tie down anchors to facilitate site recovery in 1995.

Within each bed, the position of a "center" marker was determined in 1993 by GPS, LORAN, and compass bearings. Center markers are hemispherical concrete parking lot markers. Each marker was painted with blue anti-fouling paint and anchored to the bottom with screw-in anchors. Center markers were tied to the anchors with 1" diameter nylon rope.

Edges of all 15 sites were marked during November 1993 in order to determine whether the seagrass beds expanded, contracted, or remain unchanged during the duration of the three year study.

Seagrass bed edges were marked with short (<1.0 m) sections of 3/8" steel reinforcement rods driven into the bottom with a small sledge hammer. Each steel stake was allowed to extend about 10 cm upward from the sediment surface. Seagrass bed edges were usually very easy to define, based on the sharp delineations between bare bottom and vegetated bottom.

A surveyor's tape was strung out along the set of edge markers at each site. In 1993, distances between edge markers and the distance from the center marker to each edge marker were recorded.

In 1994, bed markers were found by wading, snorkeling, or pulling a weighted polypropylene line across the bottom. Center markers and edge markers were relocated or replaced as needed. The majority of markers was relocated, so that only a few needed to be replaced. PVC poles were installed next to each edge marker to simplify working in turbid water. The distance of the actual SAV bed edge was tape-measured from the edge marker. Seaward changes were recorded as expansions. Changes toward the central bed marker were recorded as contractions.

The same methods were used to re-locate bed markers in August and October 1995 and the same measurements from edge markers and the center stone were repeated. All markers, including the center stone and bed edge stakes, were missing at Station 4. All other sites were found although various numbers of stakes were missing at several of the 14 re-located sites.

Physical Features

To document that bottom profiles or sediment depths did not vary so much near the edges of SAV beds that future lateral growth might be inhibited, additional data were collected at each site in 1993. These measurements were repeated in October 1995 to follow possible changes in physical characteristics of the bottom. Water depth and sediment thickness were measured on the edge of each SAV bed and at 1.0 and 2.0 m distances into the barren zone. A marked measuring stick was used to measure water depth. Sediment thickness was determined by pushing a 1.5 m long, 3/8" diameter iron rod into the bottom. The rod was pushed in to its full length or to the point of refusal. The rod was then withdrawn and the depth of penetration was measured. Measurements of each type were made adjacent to alternate stake markers along the edges of each of the 15 seagrass beds.

Seagrass Observations

In 1993, 1994, and 1995 the percentage of bottom covered by SAV on the edge of each bed (from 0.0 to 1.0 m into each bed) and deeper into the bed (at a distance of 2.0 to 3.0 m) was measured. Ten 1.0 m^2 quadrat-based estimates of bottom cover were taken along the vegetated edge of each SAV bed. The quadrats were positioned on the vegetated side of a randomly selected subset of the 15 edge markers at each site. Ten 1.0 m^2 additional cover estimates were made by flipping the quadrat frame over twice away from the perimeter of each seagrass bed.

Subdivisions (100 cm2) of the 1.0 m2 quadrat were used as the units for the cover estimates. SAV coverage was determined by counting the number of units in which various species of SAV were actually rooted. A barren square was defined as being devoid of any rooted vegetation. Seagrass blades from plants rooted in other units were not counted as cover in the otherwise completely barren units. Four seagrasses (*Halodule*, *Syringodium*, *Thalassia*, and *Halophila*) were encountered in the study sites. Two species of the rhizophytic algal genus, *Caulerpa*, were found at several of the sites.

Divers recorded data on slates and the data were transferred to log books for later use.

SAV Condition

Condition was defined as SAV shoot count, above-ground biomass, and productivity. Methods and effort followed the 316 Demonstration Study (Mattson et al.,1986[1]) with some variations as noted below. SAV condition was measured at the 15 intensive beds that are used for perimeter measurements in the 1993-95 monitoring program.

At each station, 6 samples for biomass of seagrasses and rhizophytic macroalgae were collected with a 25x25 cm sampler. The sampler was a PVC frame partially covered by a dive bag. Macrophytes clipped at the sediment surface floated into the upturned bag, which was labelled and closed. Its contents were then transferred to a labelled plastic bag and stored on ice. Contents of 6 samples were sorted into seagrasses (by species) and algae (pooled). Sorted samples were dried to constant weight at 105° C and weighed.

Seagrass productivity was determined as 14 day regrowth. Six clip rings were deployed at each seagrass bed study site. Losses of one or two rings occurred between deployment and retrieval at a few sites. At least 4, and usually 5 or 6, replicate measurements were made in each bed, using 11.3 cm diameter clip rings for Halodule, or 16.7 cm diameter clip rings for other seagrasses. After clip rings were installed, all SAV was clipped level with the surface of the ring, and discarded. Two weeks later, new growth was harvested, sorted, preserved, and labelled. Samples were dried to constant weight at 105° C and weighed. Seagrass shoot densities were measured by counting the shoots collected in the clip rings after 14 days of regrowth.

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[1]/ Mattson, R., J.A. Derrenbacker, Jr. and R.R. Lewis. 1986. Effects of thermal addition from the Crystal River generating complex on the submerged macrophytic communities in Crystal Bay, Florida, pp. 11-67 in K. Mahadevan et al. (eds.), Proceedings, Southeastern Workshop on Aquatic Ecological Effects of Power Generation, Mote Marine Laboratory Technical Report Number 124. Sarasota FL.

Seagrass Bed Designations

Seagrass bed designations were changed for the final report (Figure 3) in order to indicate basin locations and dominant vegetation types. Codes for the new groupings are given in Table 1. Area I-HW, for example, includes the nearly monospecific Halodule beds in Basin I. Area IV-Mix beds contain more than one species of seagrass and algae. Figures for all seagrass bed observations are arranged within each group based on distances from the point of discharge (POD). In Areas I-HW and II-HW and at Station 13 this is a straight-line distance from the POD to the center marker at each station. For all other stations distances were measured from the POD to the tip of the southern discharge dike and then to the station centers.

RESULTS

All data collected from the 1995 sampling effort appear in the tables and appendix tables that follow. Data from 1993 and 1994 were included for comparison to the 1995 data.

BARREN AREA STUDIES

Transect Completeness

All transects were surveyed in 1993. In 1994, the Withlacoochee control transect (13W) was not run due to the riverine discharge of highly colored waters. In 1995, the northern half of the Basin 5 control transect (12W) was not surveyed due to a layer of mineral turbidity near the bottom. The shallower, southern half of this transect was surveyed. Overall completeness by transect-effort for the 3 year study was 97%.

Barren Area Transects in 1994

Three SAV beds were encountered in 1994 that were not seen when the transects were established in 1993 (Table 2; Figure 2). Two were Halodule

beds and the third was a mixed Halodule-Syringodium bed with small amounts of the green alga, Caulerpa.

One of the "new" beds was found on Transect 1N, which is Basin 1. It was a small (7x10 m), sparse (5% mean cover) Halodule bed with short (<5 cm) blades. The bed was growing in a silty sand underlain by rock. Many large (10-20 cm) burrows were found in the rock near the bed and elsewhere on the Basin 1 flats crossed by Transects 1N, 1W and 2W. The burrows were not seen in 1993.

Another Halodule bed was found on Transect 3W, in Basin 2. The bed covered 40 m of transect on flats southwest of Thumb Island. The north end of the bed was characterized by sparse calcareous green algae and Halodule was the principal SAV at the bed's southern end. Average percent cover of Halodule near the south end of the bed was 48%.

A third novel bed was found on Transect 5W, which crosses from Basin 2 into Basin 3. The bed was found in the Basin 2 portion of the transect, south of Drum Island. The bed was a mixture of small, dense patches of either Caulerpa (4% mean cover) or Halodule (14% mean cover), with the two sometimes combined. Syringodium was present but rare (30% cover in 1 of 10 replicates.

Barren Area Transects in 1995

In 1995, four SAV beds were encountered in 1994 that were not seen when the transects were established in 1993 (Table 3). Three of the 1995 beds were not encountered in 1994. All of the new beds in 1995 were in Basins 1 and 2, and were dominated by Halodule.

The smallest of the new beds was found on Transect 1W, in Basin 1. It was a irregular (1x1 m), sparse (<5% mean cover, estimated) Halodule bed with short (<5 cm) blades. The bed was growing in a silty sand.

Another Halodule bed was found on Transect 3W, in Basin 2. The bed covered 35 m of transect on flats northeast of Thumb Island. The bed covered 12 m, east to west. Average percent cover of Halodule near the center of the bed was 72%, and a single Halophila rosette was found in one quadrat.

The third new bed in 1995 was on Transect 4W (Basin 2), close by the southeast corner of Drum Island and an adjacent oyster reef. The bed measured 110 m on a north-south axis. Its east-west borders were irregular and the fringes were dissected by courses of barren bottom, but the east-west width of the bed at its center was 22 m. Halodule was the dominant species (34% mean cover) although 1 quadrat contained 6% Halophila and 2% Caulerpa.

The fourth bed was found on Transect 5W, which crosses from Basin 2 into Basin 3. The bed was found in the Basin 2 portion of the transect, south of Drum Island, at the site of its first discovery in 1994. In 1995 the bed was dominated by Syringodium (17% mean cover) with a trace of Caulerpa. This condition differs from 1994, when the bed was a mixture of small, dense patches of either Caulerpa (4% mean cover) or Halodule (14% mean cover), with the two sometimes combined. Syringodium was present in 1994 but rare (30% cover in 1 of 10 replicates).

Finally, small and sparse amounts of new vegetation were encountered on the southern reaches of Transects 6W and 9W, in Basin 3. On Transect 6W, tufts of Syringodium were found among Caulerpa and Sargassum. Caulerpa, alone, was crossed by Transect 9W.

Net SAV Changes in Barren Areas, 1993 - 1995

In 1993, barren area transects encountered few SAV beds, and these were previously known. The 1993 survey established that most of Basins 1-3 were barren of seagrasses. By 1994, 3 new beds had developed, all north of the Discharge Canal. Two of the 1994 beds could not be found in 1995, but 3 other beds were discovered. These also were north of the Discharge Canal.

The gross increase in new seagrass areas during the 3 year survey period was 6 beds. Two failed to persist to 1995. Compared to 1993 conditions, 4 new beds were added to Basins 1 and 2. There were, in general, no signs of bed development in the middle or southern areas of the 2 basins closest to the POD. However, one new 1994 Halodule bed on Transect 1W was only a few hundred meters from the POD. There was some minor coverage of new seagrass and rhizophytic algae in the southern part of Basin 3.

Other Changes Observed on Barren Area Transects

In 1994, many large (10-20 cm) burrows were found in exposed rock and in sand on the Basin 1 flats crossed by Transects 1N, 1W and 2W. The burrows were not seen in 1993, or in 1995. A similar appearance in 1994, of solitary sponges and tunicates, was observed in Basin 3 (Transects 6W and 7W). These filter feeding animals were abundant in deeper Basin 3 waters, but were absent in 1995.

SEAGRASS BED INTENSIVE STUDIES

General characteristics, derived from field observations made during the 3-year duration of this project, of each of the 15 seagrass stations included in the intensive studies are described in Table 4. Table 1 lists the GPS and LORAN determined latitudes and longitudes of the center markers at each of the 15 seagrass stations. The seagrass species present at a site seemed to be highly dependent on the site's degree of exposure to the open Gulf, turbidity at each site, and on sediment thickness as judged from perceptions based on walking across each seagrass bed. In general *Halodule* was found adjacent to *Juncus* marshes and *Syringodium* was found in open bays adjacent to protective offshore oyster bars.

Physical Features

Measurements of water depth at the marked edges of the seagrass beds and at 1.0 and 2.0 m beyond the edges (Figures 4 to 8; Appendix Table II) indicated gradually sloping bottoms at all stations in Area 1-HW, in Area II-HW, in Area III-SF, and in Area V-SF. Stations 14 and 13 in Area IV-Mix contours were less uniform with more rapid changes in depth from the perimeter to 2 m outside of each bed.

In general there was no evidence that changes in bottom topography limited seagrass growth at any of the study sites.

Sediment depth profiles (Figures 9 to 13; Appendix Table II) show an interesting pattern in that most *Halodule wrightii* beds are situated on soft mud banks with sediment depths reaching 100 cm at 5 of the 6 *Halodule* beds

(Figures 9 and 10). Station 3 was an exception to this pattern. At Station 3 soft sediments were less deep because the site runs closely parallel to an oyster bar on its shoreward side. Limestone rock outcroppings were also scattered throughout this bed.

Syringodium filiforme beds were typically found rooted in shallow-sediment deposits over rocky substrata (Figures 11 and 13). Surface soft sediment layers rarely reached 100 cm depth with the exception of Station 10.

The mixed species beds (Figure 12) were underlain by a complex mosaic of shallow rock and deep soft sediments. Sediments at Station 14 and 15 were soft while rock was encountered at less than 20 cm at Station 15. All of the Syringodium beds seemed to be limited by exposed rock along at least parts of their borders.

Seagrass Bed Expansion and Contraction

Mean changes in grass bed edge positions ranged from -2.06 m to +6.81 m. Standard deviations usually exceeded means because considerable variation was measured at each site. All data for this effort are presented in Appendix Table III. In general more beds expanded or remained unchanged at distances greater than 1.6 miles from the POD while more beds contracted at locations closer to the POD. All bed edge markers and the center stone were lost at Station 4 during the summer of 1995.

Area-wide Bed Expansions

No completely consistent basin-wide patterns were seen with the exception of Area IV-Mix where all beds expanded from 1993 to 1995 (Table 5; Figure 14). In this area, mean bed expansion ranged from 0.58 to 2.07 m. Stations in all other areas showed a mix of expansion and contraction over the study period. Trends toward expansion seen in 1994 were sometimes drastically reversed by 1995. Two of the three stations in this area consistently expanded from 1993 to 1994. Station 13 remained unchanged in 1994 but expanded by 1995. Stations in this group range from 1.77 to 2.05 miles from the POD.

Bed Changes in Other Areas

Five of the remaining 11 intensively studied SAV beds had positive growth along their margins since 1993, based on the mean change observed at 10 to 16 reference markers per bed (Table 5). Halodule beds in Area I-HW (Figure 15) expanded at two stations, following the pattern seen between 1993 to 1994, and contracted at one station. The I-HW stations are located within 0.63 to 0.73 statute miles of the point of discharge (POD).

Halodule beds in Area II-HW (Figure 16) expanded at Station 7 and contracted at Stations 5 and 6 (Table 5). The grassbed at Station 5 virtually disappeared as will be described in later sections of this report. Grassbeds in this area range from 1.23 to 1.67 statute miles from the POD. Station 5 is the most distant from the POD of these three stations.

Syringodium beds in Areas III-SF (Figure 17) and V-SF (Figure 18) expanded at two stations, remained unchanged at two stations, and contracted at one station. No distance to edge measurements were possible in 1995 at Station 4 because all markers were lost by the time of the 1995 visits. Area III-SF stations range from 1.63 to 1.82 miles to the POD while Area V-SF stations are located from 2.25 to 2.95 miles from the POD.

Percent Cover

The majority of cases in 1993, 1994, and 1995 were such that percent cover measurements were made on algae-free SAV beds (Appendix Table IV). Although algae were present in some cases, the cover and changes in cover of seagrass generally represent the same values as data for "total vegetation".

Percent coverage by all vegetation in area I-HW decreased from a high of 86.1% in 1993 to a low of 56.4% in 1995. Decreases of the same approximate magnitude were seen in all other areas from 1993 to 1995 with the exception of area V-SF (Table 6). A large decrease in percent coverage occurred in these areas between August 1995 and October 1995.

All measurements of percent cover from 1993 to 1995 were combined to produce a series of figures (Figures 19 to 25) which show how bottom coverage by individual seagrass species, algae, and total vegetation (SAV) changed from year to year.

Halodule wrightii

Halodule followed similar patterns in bed edges and interiors at each of the nine stations where this seagrass was abundant. All but one of these stations showed decreased coverages on their perimeters and within the beds' interiors from 1993 to 1995. The patterns followed between 1994 and 1995 show a mixture of changes that included both increased and decreased coverage. Halodule (Figure 19) percent coverage fell from nearly 90% in 1993 to less than 10% in 1995 at Station 5 and to 0% at Station 8. Station 5 changed from a nearly uniform carpet of Halodule to a mud flat with only a few tufts of living grass while Station 8 changed from a mixed species bed to a Syringodium bed. The changes seen at other stations were much less pronounced.

Syringodium filiforme

Syringodium (Figure 20) coverage remained approximately constant or increased at stations where it was the only seagrass species. Syringodium increased coverage at Station 8 from 0% coverage in 1993 to much higher levels in 1995 as described above. Stations 9, 10, and 11 (in group V-SF), all control stations, showed no consistent patterns of change. Syringodium within bed interiors was usually more dense than on bed perimeters but interior percent coverages paralleled perimeter fluctuations at most stations.

Halophila engelmannii

Halophila (Figure 21), never abundant, virtually disappeared at all 15 stations by October 1995. It was present in August 1995 biomass samples and in quadrat surveys for percent cover at 4 sites. Its greatest percent coverage, nearly 25% within perimeter quadrats, was seen at Station 9, south of the intake canal, in 1994. By 1995 all traces of this species disappeared. It was never found at 7 stations and never exceeded 10% coverage at the remaining 7 sites.

Thalassia testudinum

Thalassia (Figure 22) was only found within Area IV-Mix's three stations. Its coverage fluctuated from year to year in patterns unique to each of the three stations.

Total Seagrass Coverage

Total seagrass coverage (Figure 23) decreased at 9 of the 15 grassbed station study sites, increased at 2 stations, and remained approximately constant at 4 stations. The largest decline in coverage, from 80% to 3% coverage, was seen at Station 5. Station 3 also showed a large drop in coverage from 1993 to 1994 but recovered some of the loss by October 1995.

Attached Algae

Attached algae (Figure 24), usually Caulerpa prolifera or C. mexicana, were abundant at only 3 of the 15 stations. No long-term trends were seen at these stations.

Total SAV Coverage

Trends in total vegetation coverage (Figure 25) closely followed the site-specific patterns seen in Figure 23 (total seagrass coverage) because of the sporadic algal coverage. Completely barren bottom, with no seagrass or algae for interiors and perimeters of the 15 seagrass stations, can be read in Figure 25 as the white space above the cross-hatched bars. Cross-hatching represents the area covered by SAV. Interiors and exteriors of most sites were very similar in the percent of bottom area covered by SAV.

The largest decrease in SAV coverage was seen at Station 5. This decrease represents the loss of nearly all of the Halodule found at the station in 1993.

Biomass

Biomass was evaluated for each seagrass species, all seagrass, and all vegetation (Appendix Table V; Table 7).

Halodule wrightii

Halodule biomass declined at 7 of the 12 stations where it was found in 1994 (Figure 26). A general trend of increasing biomass with increased distance from the POD can be seen in Areas I-HW and II-HW with the exception of

Station 5. Halodule disappeared completely in the clip box samples taken at Stations 8 and 12 by 1995. It was replaced by Syringodium.

Syringodium filiforme

Syringodium was never collected in Areas I-HW or in II-HW (Figure 27). Syringodium biomass declined at all 7 stations where it was seen in 1994. The declines were most pronounced in Area V-SF and at Station 12 in Area III-SF. The Area V-SF stations were considered to be controls because Stations 9 and 10 are located south of the intake canal (Figure 3). Station 11 is between the intake and discharge canals well behind the last series of oyster bars in Rocky Cove.

Halophila engelmannii

Halophila occurred sporadically at 7 stations over the 2 years in which biomass was monitored (Figure 28). It never occurred in area I-HW but it was collected in all other areas but not at all stations.

Thalassia testudinum

Thalassia occurred in the clip box samples at only 2 stations (Figure 29). It was more abundant in 1994 than in 1995 at both of these stations.

Total Seagrass Biomass

Combining the biomass of all seagrass species obscured the biomass density distribution patterns seen for individual species biomass (Figure 30), although it is evident that stations closest to the POD had much lower mean biomass values than more distant stations. Mean seagrass biomass values for the six stations closest to the POD were considerably lower than mean biomass values for the three more distant stations (9,11, and 12).

Seagrass biomass (Figure 30) declined at 12 of the 15 seagrass stations from 1994 to 1995. The largest declines were seen at Stations 11 and 12. Small increases in seagrass biomass were seen at Stations 6 and 7 in Basin II. Biomass also increased at Station 14. The overall decline in seagrass biomass was seen both at hot-water impacted and at control stations and was not seagrass species specific.

Attached Algal Biomass

Attached algal biomass (Figure 31) was distributed across sites in similar patterns in 1994 and 1995. The two stations where algal biomass was greatest in 1994 showed a decline in biomass in 1995.

Total SAV Biomass

All vegetation (seagrass plus rhizophytic macroalgae) biomass accentuated the spatial pattern seen for all seagrass species combined (Figure 32). Distant stations north of the Intake Canal had greater mean biomass values than stations closer to the POD, due largely to the increased abundance of macroalgae.

Shoot Density

Mean numbers of Halodule shoots per square meter (Table 8) were generally greater in 1995 at all sites where this seagrass was collected in 1994 (Figure 33). The only exception was Station 8 where Halodule disappeared. Syringodium (Figure 34) shoot densities increased greatly in III-SF from 1994 but showed smaller changes in area V-SF. Shoot density data are presented in Appendix Table VI.

Productivity

Clip data (Table 8; Appendix Table VI) were normalized for regrowth period and sample size to calculate productivity as mg dry weight per square meter per day.

Halodule productivity increased in areas I-HW and II-HW from 1994 to 1995 (Figure 35). All Halodule disappeared at Station 8. Halodule in area IV-Mix beds exceeded 1994 growth rates at two of the three stations. The growth rate increases seen in Areas I-HW and II-HW suggest that presumed declines in water temperature following the start-up of the helper cooling towers may have been a factor.

Syringodium growth was also accelerated from 1994 to 1995 in area III-SF (Figure 36). Growth rate differences in area V-SF, at distances exceeding 2.2 miles from the POD, were not as noticeable between years.

DISCUSSION

Photography

Aerial photography scheduled for 1993 was not completed until spring of 1994 because of unsuitable weather and water conditions. Usefulness of 1994 images was marginal due to turbidity fronts in Basins 1 and 2, equivalent to the study area within a 2 mile POD radius. Photography authorized for fall 1994 was not completed despite extended readiness through 1995. Flight conditions were hampered during winter 1994-95, and unusual tropical storm conditions reduced water clarity during summer and fall, 1995.

Conditions suited for aerial photography of SAV in the vicinity of the FPC power station are less common than elsewhere on the west Florida coast. For example, aerial photography of SAV during favorable conditions in Tampa Bay, by Geonex for the Southwest Florida Water Management District, prompted reconnaissance flights to Crystal River. Transparency at Crystal River was judged unsuitable during the same week that optimal conditions existed in Tampa Bay.

Our plans for field sampling were informed by the record of poor conditions for aerial photography at the site. Lack of contemporaneous aerial photographs prevented the production of digitized SAV maps but did not hamper our ability to monitor barren and vegetated areas throughout the study area. Future attempts at aerial photography should be made, with or without collateral field sampling, as opportunities arise.

Weather in 1995

Effects of 2 hurricanes and a tropical storm were felt along the coasts of Citrus and Levy counties. Storm surges completely inundated coastal *Juncus* marshes adjacent to the study area. Organic marsh sediments were deposited along the coastal marsh-front --northern and eastern edges of Basins 1 and 2 were fringed with subtidal deposits of fine organic matter, from August through October, 1995. Inorganic sands also were reworked in parts of every basin. Sand and shell was eroded from levees and islands, and deposited along intertidal oyster reefs.

Rainfall and freshwater (Withlacoochee River) discharge also were above average during summer 1995, although 12 month totals matched long-term averages (SWFWMD, 1995). Highly colored water from the Withlacoochee River, Barge Canal, and coastal runoff reduced local transparency to less than 0.5 m during low tides, and colored freshwater plumes were discernable 6 km from shore. Compared to 1993 and 1994 survey periods, August and October 1995 had more wind, more westerly onshore wind, rougher seas, and reduced visibility in all basins.

Halophila engelmannii's disappearance, from August 1995 to October 1995, was probably due to reduced salinities from rainfall and freshwater discharges throughout the study area. Halophila is reported to discolor and to eventually die when exposed to salinities below 10 ppt[2].

Growth rates (0.15 to 0.91 g dry weight m^{-2} d^{-1}) determined for Halodule during 1995 within the study site fall into the range of growth rates (0.1 g in January to 1.7 g dry weight m^{-2} d^{-1}) reported from the Laguna Madre, Texas[3]. In 1994 several of the growth rate determinations for this species fell below this range. Production rates measured at station 5 in Area II-HW and station 3 in Area I-HW, during August 1994, were 0.073 and 0.083 g dry weight m^{-2} d^{-1}, respectively. The considerable increase in production rates seen at sites closest to the POD may have been due to presumably decreased water temperatures at the POD. The highest shoot production rates in the Laguna Madre study occurred when water temperatures ranged from 28 to 29°C. Temperatures above and below that level caused decreased shoot production rates.

Principal Findings

Based on data from 1993, 1994, and 1995, the following points are offered.

1. "New" SAV beds appeared along barren-area transects.

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[2]Dawes, C., M. Chan, R. Chinn, E.W. Koch, A. Lazar, and D. Tomasko (1987). Proximate composition, photosynthetic and respiratory responses of the seagrass Halophila engelmannii from Florida. Aquat. Bot., 27: 195-201.

[3]Tomasko, D.A. and K.H. Dunton (1995). Primary productivity in Halodule wrightii: a comparison of techniques based on daily carbon budgets. Estuaries 18: 271-278.

Three beds were found in 1994 that were not seen in 1993. Two were small Halodule beds in relatively close proximity (Basins 1 and 2) to the point of discharge. The apparent recruitment of beds into barren areas could have been an artifact of sampling dates (November-December 1993 versus October 1994), especially for the multiple species bed on Transect 5 near Drum Island. Beds on transects closer to the point of discharge are more likely to be genuine additions, because the tidal flats in that area are shallow, easily surveyed, and frequently visited.

In 1995, four SAV beds were encountered in 1994 that were not seen when the transects were established in 1993. Three of the 1995 beds were not encountered in 1994. All of the new beds in 1995 were in Basins 1 and 2, and were dominated by Halodule. The largest new bed (110 m by 22 m) in 1995 was on Transect 4W (Basin 2), near Drum Island. Another bed found near Drum Island in 1994 was found again in 1995. In 1995 the bed was dominated by Syringodium with a trace of Caulerpa, which condition differs from 1994 when the bed was a mixture of small, dense patches of either Caulerpa or Halodule.

2. Recruitment of new beds into barren areas has not been extensive.

During the 3 years of monitoring, there was no evidence that SAV was colonizing extensive areas of barren sediment. All of the new beds were found in the northern parts of Basins 1 and 2, north of the discharge canal. In the 3 years of this study, no new beds were found in any part of Basin 3, although in 1995 small and sparse amounts of new vegetation were encountered on the southern reaches of Transects 6W (tufts of Syringodium in Caulerpa and Sargassum) and 9W (Caulerpa only). Historical data indicate that losses of SAV along the southern side of Basin 3 were considerable.

3. All of the new beds have formed north of the POD, in Basins 1 and 2.

Two of the new beds did not persist, but their appearance conformed with locations of other new beds. Without data on abiotic parameters we cannot attribute this pattern to physical or chemical gradients across the study area. It can be noted, however, that all of the new beds were in the vicinity of stable, persistent beds, and tidal marshes.

4. The seaward edges of SAV beds have expanded at 7 of 15 SAV stations. Expansion was seen at 13 of the 15 beds through 1994. All SAV beds in Area IV-Mix expanded over the study period. No basin-wide contractions of seagrass beds were seen from 1993 to 1995. SAV beds in Areas I-HW and II-HW, in the areas most strongly influenced by thermal discharges, expanded at 3 stations and contracted at 3 stations. Stations in Areas III-SF and V-SF expanded at 2 sites, contracted at 1 site, and remained unchanged at 2 sites.

5. Patterns of change in percent cover, from 1993 to 1995, showed decreased coverages (by total vegetation) at 10 of 15 sites. Five of the six Halodule beds in Areas I-HW and II-HW declined in coverage by total vegetation. Syringodium beds in Areas III-SF and V-SF showed increased coverage at 3 of 6 sites, decreased coverage at 2 sites, and no change at one site.

6. Biomass distribution patterns showed a general decline from 1993 to 1995 at 10 of 15 sites irrespective of distance from the POD.

7. Shoot densities increased by 1995 for Halodule at 8 of the 10 stations where it was present in 1994. Syringodium shoot densities increased by 1995 at 4 of 6 stations where it was seen in 1994.

8. SAV production rates showed large rate increases from 1994 to 1995 in Areas I-HW, II-HW, and III-SF. All of these sites are within the path of historical thermal discharges from the POD. Smaller production increases were measured at stations in Areas IV-Mix and Area V-SF. A decrease in discharge water temperatures may explain part of the increased growth rates seen near the POD, and decreased transparency during the summer of 1995 may also have been a factor.

CONCLUSIONS

Visits in 1994 and 1995 to transects and seagrass beds selected for monitoring in 1993 revealed spatial as well as temporal patterns in the distribution of sea grasses and rhizophytic algae. Most patterns depicted a system of bed recruitment and expansion that promoted persistence, and for several parameters (Table 9), improvements in SAV cover and condition during the three years. Six new beds appeared in barren areas, and 3 persisted

into 1995. More than half of the intensively monitored beds had net increases in perimeter. Until the wet summer of 1995, 8 of 15 beds also increased with respect to cover.

Halodule and Syringodium were the dominant seagrass species in the vicinity of the study area. Halophila, and to a lesser extent, Thalassia, were affected adversely by the wet summer, causing shifts in species dominance within beds, and some declines in percent cover. Halodule demonstrated the greatest potential for recruitment into barren areas, having twice colonized Basin 1, the basin closes to the point of thermal discharge.

No abiotic parameters were measured in this program, so it is not possible to assign causes for the SAV changes observed during the past 3 years. Changes in transects and beds within the 2 mile POD radius were mirrored by changes at more distant sites, indicating the extent of the 1995 wet season on the region, as well as the study area. Biomass was lower and productivity was higher in 1995, than in 1994, consistent with effects of storms and heavy rains.

Table 1. Station codes and locations for all seagrass bed intensive studies. The dominant seagrass species is listed for each station.

Area Codes	Station	Dominant Seagrass	Latitude	Longitude	Loran (45)	Loran (62)	Miles from POD
I-HW							
	3	Halodule wrightii	28 58 03.88	82 43 41.91	45233.61	62882.21	0.63
	2	Halodule wrightii	28 58 00.79	82 43 50.00	45234.06	62883.08	0.68
	1	Halodule wrightii	28 57 58.39	82 43 56.35	45234.56	62883.88	0.73
II-HW							
	7	Halodule wrightii	28 58 25 00	82 44 09 00	45237.91	62884.67	1.23
	6	Halodule wrightii	28 58 24.30	82 44 10.28	45240.33	62885.49	1.29
	5	Halodule wrightii	28 58 35.81	82 44 33.48	45244.78	62888.00	1.67
III-SF							
	4	Syringodium filiforme	28 57 17.67	82 44 21.52	45232.47	62887.19	1.63
	8	Syringodium filiforme	28 57 07.30	82 44 19.26	45230.70	62887.06	1.82
	12	Syringodium filiforme	28 57 10.49	82 44 17.21	45230.03	62886.80	1.79
IV-MIX							
	14	Mixed Species	28 57 04.40	82 44 35.00	45232.39	67889.09	1.79
	15	Mixed Species	28 57 05.90	82 44 39.40	45232.91	62889.56	1.77
	13	Mixed Species	28 58 12.34	82 45 15.62	45274.30	67893.40	2.03
V-SF							
	11	Syringodium filiforme	28 57 23.73	82 43 38.31	45227.68	62882.13	2.23
	9	Syringodium filiforme	28 56 49.65	82 43 25.10	45220.91	62880.80	2.71*
	10	Syringodium filiforme	28 56 41.19	82 43 14.31	45218.47	62879.68	2.95*

* Located south of the intake canal levees.

Table 2. SAV beds found in October 1994 on 1993 barren area transects.

	Bed 1	Bed 2	Bed 3
Transect No.	1N	3W	5W
Basin No.	1	2	2/3
LORAN			
45-	229.16	236.00	240.85
62-	880.75	885.49	888.81
Near to:	POD	Thumb I.	Drum I.
Length, m	7	40	30
Max. Width, m	10	19	31
Mean % Cover			
Halodule	5	48	14
Syringodium	0	0	3
Caulerpa	0	0	4
Bare	95	52	85
N	10	9	10

Table 3. SAV beds found in October 1995 on 1993 barren area transects.

	Bed 3	Bed 4	Bed 5	Bed 6
Transect No.	5W	4W	3W	1W
Basin No.	2/3	2	2	1
LORAN				
45-	240.85	240.13	238.21	230.23
62-	888.81	887.22	885.14	881.30
Near to:	Drum I.	Thumb I.	no name	POD
Length, m	20	110	35	1
Max. Width, m	10	45	12	1
Mean % Cover				
Halodule	0	34	72	<5
Syringodium	17	0	0	0
Caulerpa	t	t	0	0
Halophila	0	t	t	0
Bare	83	66	28	95+
N	10	10	10	10

t, trace record.

Table 4. Brief descriptions of the 15 seagrass stations included in seagrass bed intensive surveys.

Area I-HW Stations:

1) Adjacent to saltmarsh (Juncus sp); very soft bottom; Halodule was only species present; offshore area bordered by oyster bars at varying distances from the study site.

2) same as above

3) same as above except that bottom was rocky in some areas; oyster bar limits grassbed growth on shoreward side; station closest to end of discharge canal

Area II-HW Stations:

5) Saltmarsh bordered by well developed oyster bar at this site. Halodule grassbed reduced to very widely dispersed, small clumps and patches.

6) Site in middle of small embayment away from Juncus marsh; bed bordered by oyster bar on one side.

7) Same as #6 except that original grassbed has grown and merged with other grassbeds. Thalassia seen in the area where the grassbeds merged. Very soft bottom except along edge of oyster bar.

Area III-SF Stations:

4) Bed on seaward edge of Rocky Cove oyster bars. Very exposed to wind and waves; hard bottom with Sargassum attached to rocky bottom at the seaward edge of the seagrass beds. Lost all station markers in 1995. Observations on bottom cover, productivity, biomass all done within GPS and LORAN determined station boundaries

8) Syringodium bed on seaward edge of Rocky Cove oyster bars; very exposed to wind and waves; hard bottom with Sargassum attached to rocky bottom at the seaward edge of the seagrass beds.

12) Syringodium in area between parallel oyster bars at south side of Rocky Cove; good current flow throughout area as tides change.

Area IV-Mix Stations:

13) Very mixed mosaic of seagrasses (Thalassia/ Syringodium/ Halophila/ Halodule) with Caulerpa mexicana and C. prolifera. Oyster bar to west protects this site from heavy chop and waves.

14) Site located on rocky bottom near north edge of intake canal. Open to sea and chop = not protected by bars, mix of Syringodium, Halodule, and Thalassia. This bar drops off to deeper water fairly rapidly

15) same as #14.

Area V-SF Stations:

9) Control site south of the intake canal; soft bottom with luxuriant beds of Syringodium; Lots of drift algae and attached algae outside of bed.

10) Same as #10 except that in October 95 the grassbed was covered with a thick layer of drift algae....made it impossible to find stakes; algal layer was 1 m thick over parts of the bed.

11) Luxuriant Syringodium growth over a thin layer of very soft sediment; easily disturbed. Site in protected water between intake and discharge canals.

Table 5. Seagrass bed expansion or contraction (m) between years.

		1993-1994	1993-1995
I-HW			
Station 3	Mean	-.38	-1.64
	S.D.	.93	2.50
Station 2	Mean	.98	1.63
	S.D.	1.58	1.42
Station 1	Mean	1.90	2.75
	S.D.	1.42	2.43
II-HW			
Station 7	Mean	2.52	6.81
	S.D.	1.99	11.73
Station 6	Mean	.48	-.90
	S.D.	.99	1.89
Station 5	Mean	-.21	-2.06
	S.D.	.52	1.42
III-SF			
Station 4	Mean	.06	N/A
	S.D.	.41	N/A
Station 8	Mean	6.51	-.16
	S.D.	4.02	1.27
Station 12	Mean	.30	1.35
	S.D.	1.05	1.18
IV-MIX			
Station 14	Mean	.56	.58
	S.D.	.59	1.05
Station 15	Mean	.56	1.33
	S.D.	.75	.92
Station 13	Mean	.05	2.07
	S.D.	3.29	2.85
V-SF			
Station 11	Mean	.58	-.17
	S.D.	.27	1.48
Station 9	Mean	.83	1.26
	S.D.	.60	.77
Station 10	Mean	.71	-1.63
	S.D.	.79	2.09

Table 6. Mean percent cover of 1m2 quadrats by rhizophytic algae, seagrass and total vegetation for each station and sampling date. (P/I) indicates grassbed (P)erimeter or 2 meters (I)nside bed).

Year/Month		1993-12 Algae	1994-08 Algae	1994-10 Algae	1995-08 Algae	1995-10 Algae	1993-12 Seagrass	1994-08 Seagrass	1994-10 Seagrass	1995-08 Seagrass	1995-10 Seagrass	1993-12 Total	1994-08 Total	1994-10 Total	1995-08 Total	1995-10 Total
I-HW																
Station 3	I	.0	.0	.0	.0	.0	93.7	36.9	45.3	19.5	51.6	93.7	36.9	45.3	19.5	51.6
	P	.0	.0	.0	.0	.0	80.1	42.0	34.7	11.1	40.8	80.1	42.0	34.7	11.1	40.8
Station 2	I	.0	.0	.0	.0	.0	96.4	98.9	97.1	94.9	47.1	96.4	98.9	97.1	94.9	47.1
	P	.0	.0	.0	.0	.0	87.1	99.0	81.5	89.3	44.0	87.1	99.0	81.5	89.3	44.0
Station 1	I	.0	.0	.0	.0	.0	80.0	100.0	92.5	99.3	76.5	80.0	100.0	92.5	99.3	76.5
	P	.0	.0	.0	.0	.0	79.6	100.0	96.1	100.0	78.4	79.6	100.0	96.1	100.0	78.4
II-HW																
Station 7	I	.0	.2	.0	.0	.0	98.3	86.7	98.4	98.7	94.8	98.3	86.7	98.4	98.7	94.8
	P	.0	.0	.1	.0	.0	91.5	73.1	91.1	94.0	91.2	91.5	73.1	91.1	94.0	91.2
Station 6	I	.0	.0	.0	.0	.0	98.9	92.5	93.0	97.0	70.6	98.9	92.5	93.0	97.0	70.6
	P	.0	.0	.0	1.0	.1	91.7	85.3	75.1	83.4	56.3	91.7	85.3	75.1	83.8	56.3
Station 5	I	.0	.0	.0	.1	.0	83.2	49.7	42.6	6.2	5.7	83.2	49.7	42.7	6.3	5.7
	P	.0	.0	.0	.1	.0	90.4	58.6	26.1	8.7	3.1	90.4	58.6	26.1	8.8	3.1
III-SF																
Station 4	I	.8	.0	1.3	.1	N/A	85.7	72.5	67.1	97.9	N/A	85.9	72.5	67.2	97.9	N/A
	P	.0	.0	2.8	.0	N/A	77.4	72.9	76.5	94.8	N/A	77.4	72.9	76.7	94.8	N/A
Station 8	I	.0	1.2	.0	.0	.0	91.7	93.7	96.3	64.6	63.9	91.7	93.7	96.3	64.6	63.9
	P	.2	.0	.0	.0	.0	93.8	95.8	93.2	48.3	55.0	93.8	95.8	93.2	48.3	55.0
Station 12	I	2.9	.0	.5	.0	.2	91.6	95.5	98.3	94.9	94.8	94.5	95.5	98.3	94.9	94.8
	P	1.4	.0	.5	.0	.1	87.9	98.9	91.0	95.2	86.6	90.3	98.9	91.0	95.2	86.6
IV-MIX																
Station 14	I	.2	.4	.0	.0	.0	91.8	86.9	89.6	93.3	84.8	91.8	86.9	89.6	93.3	84.8
	P	.0	.0	.1	.0	.0	90.7	84.8	87.5	91.2	71.6	90.7	84.8	87.4	91.2	71.6
Station 15	I	.0	.0	12.3	.0	.0	97.7	98.0	91.2	83.9	67.0	97.7	98.0	95.1	83.9	67.0
	P	1.5	.3	17.5	.0	.0	84.8	85.7	91.1	84.7	85.0	84.8	85.7	93.8	84.7	85.0
Station 13	I	67.0	63.2	14.9	65.6	59.1	12.2	22.5	47.8	23.1	.7	77.7	82.9	59.4	82.3	59.4
	P	46.6	63.2	37.2	62.8	48.8	22.6	22.5	53.1	30.7	14.6	69.2	82.9	72.9	72.6	57.6
V-SF																
Station 11	I	.0	.0	.0	.0	.0	98.3	100.0	100.0	98.8	98.4	98.3	100.0	100.0	98.8	98.4
	P	.0	.0	.0	.0	.0	98.3	99.8	99.8	99.8	97.3	98.3	99.8	99.8	99.8	97.3
Station 9	I	.0	.9	.2	.0	.0	78.6	95.5	98.5	98.8	96.5	78.6	95.5	98.5	98.8	96.5
	P	.1	7.1	.2	.0	.0	88.8	84.6	92.0	95.6	96.3	88.8	85.4	92.0	95.6	96.3
Station 10	I	1.2	34.3	N/A	9.7	.0	56.0	84.6	N/A	50.0	55.4	56.2	94.8	N/A	59.2	55.4
	P	3.3	76.0	N/A	2.9	.0	69.8	38.9	N/A	45.9	41.4	71.4	96.2	N/A	48.8	41.4

Table 7. Dry Weight biomass (g/m2) Means and standard deviations from six replicate 25x25cm Quadrats.

	Syringodium filiforme		Halophila englemannii		Halodule wrightii		Thalassia testudinum		Caulerpa prolifera		Caulerpa mexicana		Udotea		Drift Algae	
	94	95	94	95	94	95	94	95	94	95	94	95	94	95	94	95
I-HW																
Station 3																
Count (>0g)					6	6										
Mean					8.3	6.8										
S.D.					5.7	3.9										
Station 2																
Count (>0g)					6	6										
Mean					13.1	5.1										
S.D.					2.8	2.7										
Station 1																
Count (>0g)					6	6										
Mean					26.2	12.1										
S.D.					17.7	6.7										
II-HW																
Station 7																
Count (>0g)			2	1	6	6										3
Mean			2.3	.1	18.3	38.2										2.8
S.D.			4.4	.1	5.7	22.9										3.5
Station 6																
Count (>0g)				1	6	6									1	3
Mean				.4	15.1	32.9									5.2	4.1
S.D.				1.0	9.5	15.3									12.8	5.5
Station 5																
Count (>0g)					6	3						2				
Mean					8.5	.6						2.0				
S.D.					5.7	.7						1.0				
III-SF																
Station 4																
Count (>0g)	6	6		2											2	3
Mean	42.9	35.2		1.2											27.4	2.0
S.D.	15.9	13.1		2.8											42.4	4.0
Station 8																
Count (>0g)	5	5	4		5										5	4
Mean	33.4	12.1	1.8		19.9										24.3	56.4
S.D.	34.9	14.9	2.1		12.1										38.1	112.1

Table 7. Continued.

	Syringodium filiforme		Halophila englemannii		Halodule wrightii		Thalassia testudinum		Caulerpa prolifera		Caulerpa mexicana		Udotea		Drift Algae	
	94	95	94	95	94	95	94	95	94	95	94	95	94	95	94	95
Station 12																
Count (>0g)	6	6			1				5	3		1			4	5
Mean	109.2	21.4			13.3				1.6	.6		.1			182.4	15.7
S.D.	72.5	10.8			32.5				1.9	1.1		.3			198.4	12.7
IV-MIX																
Station 14																
Count (>0g)	4				6	6									5	
Mean	13.7				10.6	48.9									50.7	
S.D.	24.3				4.0	19.0									60.8	
Station 15																
Count (>0g)		2			6	6	2	2		1					3	4
Mean		.1			69.1	31.6	3.3	.1		.2					14.5	13.4
S.D.		.1			51.5	17.1	6.6	.3		.6					29.1	17.0
Station 13																
Count (>0g)				2		3	5	1	5	5	4	3			6	2
Mean				.9		8.6	38.4	.2	18.3	13.8	171.8	1.6			124.0	1.0
S.D.				1.7		14.7	42.3	.5	15.9	10.7	163.0	2.4			194.2	2.4
V-SF																
Station 11																
Count (>0g)	6	6														1
Mean	126.7	43.1														7.9
S.D.	34.0	23.2														19.3
Station 9																
Count (>0g)	6	6	4		1	1				3					3	4
Mean	71.8	34.5	3.4		.5	.6				.2					4.9	19.4
S.D.	14.8	16.6	3.6		1.1	1.6				.4					8.8	17.8
Station 10																
Count (>0g)	5	6	1	1					6	3				1	2	6
Mean	54.2	27.8	.6	1.3					23.4	8.8				1.6	76.2	346.9
S.D.	35.1	17.6	1.6	3.2					22.5	11.7				3.9	118.1	403.9

Table 8. Biomass data and productivity of grass clip samples.

	Calculated Productivity (mg/m2/day)		Calculated Shoots/m2		Wt./Shoot (μg)	
	1994	1995	1994	1995	1994	1995
I-HW						
Station 3						
Mean	83.46	907.04	259.22	1096.71	41.43	129.69
S.D.	72.96	210.12	151.20	471.87	13.27	46.60
Station 2						
Mean	205.38	596.35	378.86	1116.65	80.85	73.64
S.D.	88.71	197.37	191.78	310.52	28.86	6.93
Station 1						
Mean	529.36	858.85	465.27	1246.26	153.23	94.43
S.D.	208.60	386.31	102.97	511.30	34.45	15.84
II-HW						
Station 7						
Mean	207.38	908.81	378.86	977.07	87.40	117.30
S.D.	77.47	444.89	204.33	459.06	38.36	30.31
Station 6						
Mean	350.38	779.20	382.19	681.29	131.65	145.79
S.D.	149.76	581.42	116.55	298.55	68.40	88.22
Station 5						
Mean	73.22	150.70	199.40	332.34	63.26	N/A
S.D.	34.33	108.60	126.11	265.04	26.21	N/A
III-SF						
Station 4						
Mean	434.44	3417.38	228.31	2213.36	260.30	176.70
S.D.	201.37	900.92	72.20	826.38	86.26	25.03
Station 8						
Mean	515.95	1037.04	638.09	1080.09	108.69	105.32
S.D.	213.16	519.14	349.66	342.00	31.74	31.82
Station 12						
Mean	304.76	1078.28	246.58	951.29	170.07	160.92
S.D.	200.57	272.45	69.25	274.61	113.42	19.51
IV-MIX						
Station 14						
Mean	700.40	713.50	473.58	980.39	208.48	101.36
S.D.	240.72	151.37	274.55	277.85	81.66	33.05
Station 15						
Mean	522.27	665.85	638.09	867.58	124.78	112.67
S.D.	137.98	359.78	408.65	502.70	59.57	16.73
Station 13						
Mean	185.87	269.83	338.98	398.80	69.07	N/A
S.D.	149.19	195.32	166.83	209.13	43.35	N/A
V-SF						
Station 11						
Mean	375.76	666.12	136.99	266.36	354.75	N/A
S.D.	190.44	512.39	91.32	145.59	117.39	N/A
Station 9						
Mean	807.44	551.05	593.61	304.41	189.27	188.61
S.D.	386.26	700.66	258.30	128.07	44.93	140.21
Station 10						
Mean	433.14	670.25	575.34	520.55	105.27	168.45
S.D.	203.22	306.73	249.27	245.05	32.41	25.89

Table 9. 1993-1995 Summary data, Crystal River NPDES Monitoring Project.

Basin/SAV[1]	I-HW	II-HW	III-SF	IV-Mixed	V-SF	Total
Barren Area Results						
No. Transects	3	3	5	2	2	15
No. New Beds						
1993-1994	1	1	1	0	0	3
1994-1995	1	2	0	0	0	3
Net New Beds						
1993-1995	1	2	1	0	0	4
Intensive Seagrass Bed Results						
No. of beds/area	3	3	3	3	3	15
No. Beds Expanding						
1993-1994	2	2	3	2	3	12
1993-1995	2	1	1[2]	3	1	8
No. Beds Increasing % Cover						
Interiors						
1993-1994	2	1	2	0	3	8
1994-1995	1	0	0[2]	0	0	1
Perimeters						
1993-1994	1	0	2	2	3	8
1994-1995	1	0	0[2]	0	1	2
No. Beds Increasing Biomass						
1994-1995	0	2	0	1	0	3
No. Beds Increasing Productivity						
1994-1995	3	3	3	3	2	14

[1] HW, *Halodule wrightii*; SF, *Syringodium filiforme*; mixed, more than one species was abundant
[2] Of two remaining marked beds in this area.

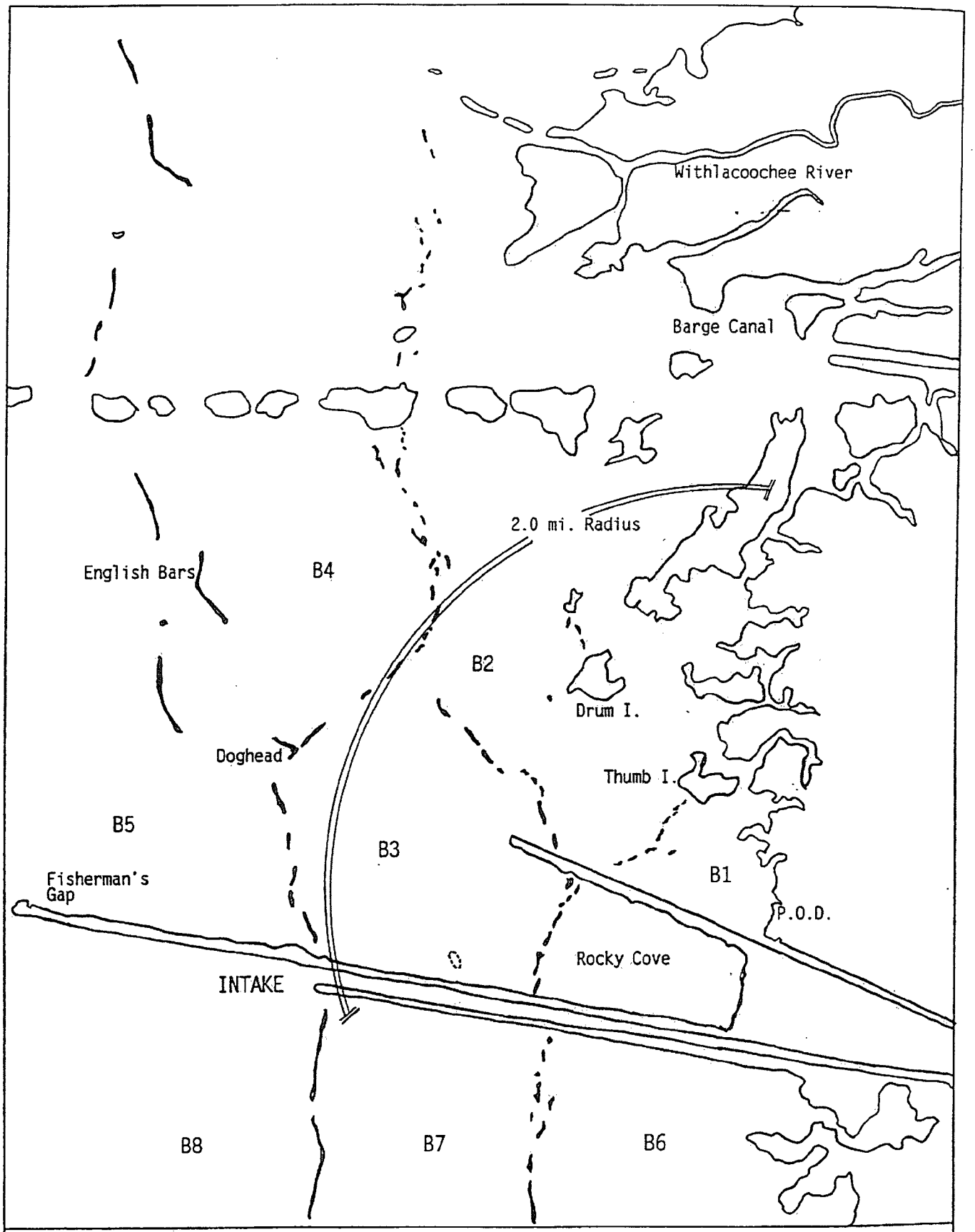

Figure 1. Crystal River SAV Monitoring Area. B1, Basin 1.

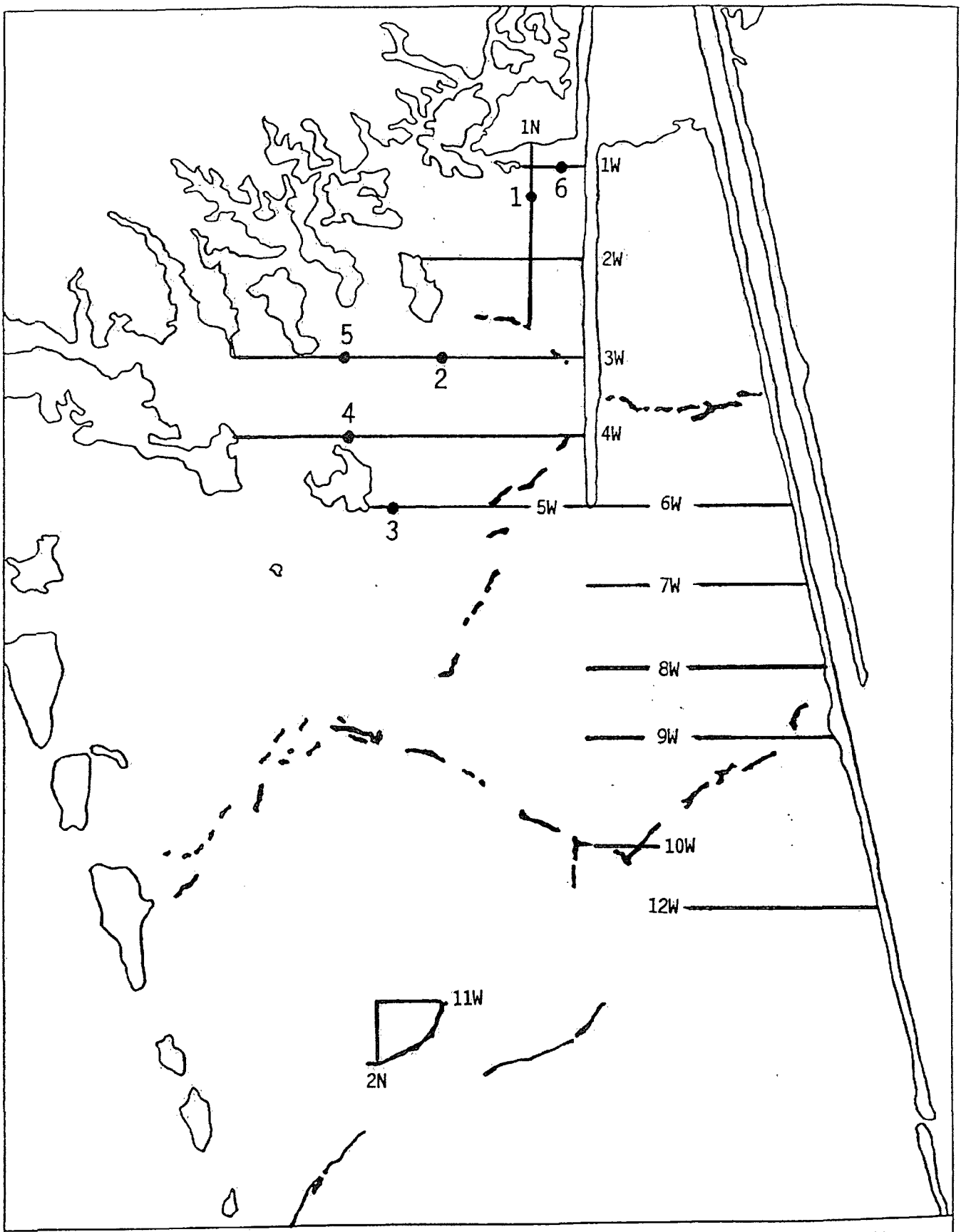

Figure 2. Crystal River SAV Monitoring-Barren Transects (1W) and New Beds (1).

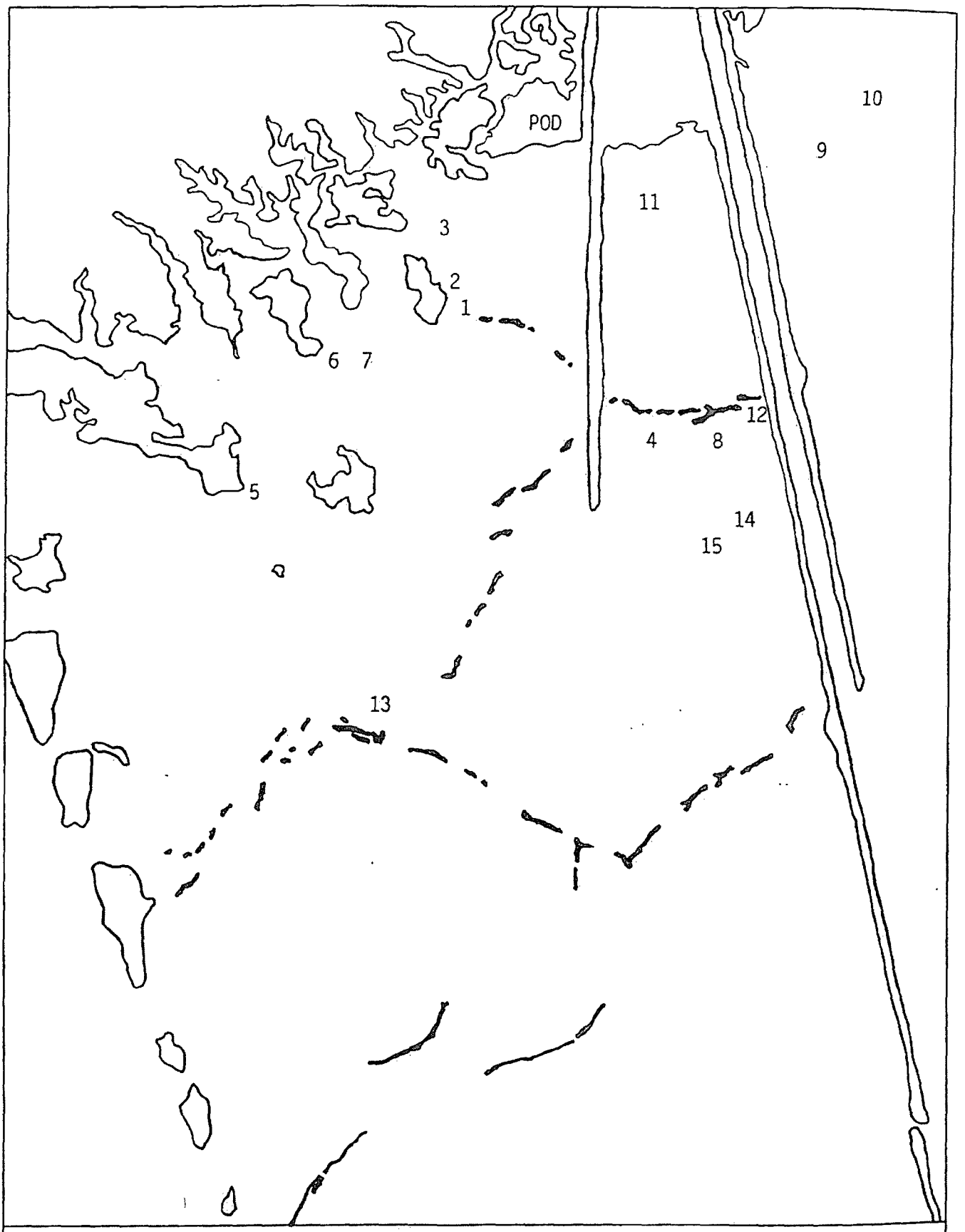

Figure 3. Crystal River SAV Monitoring - Intensive Bed Locations.

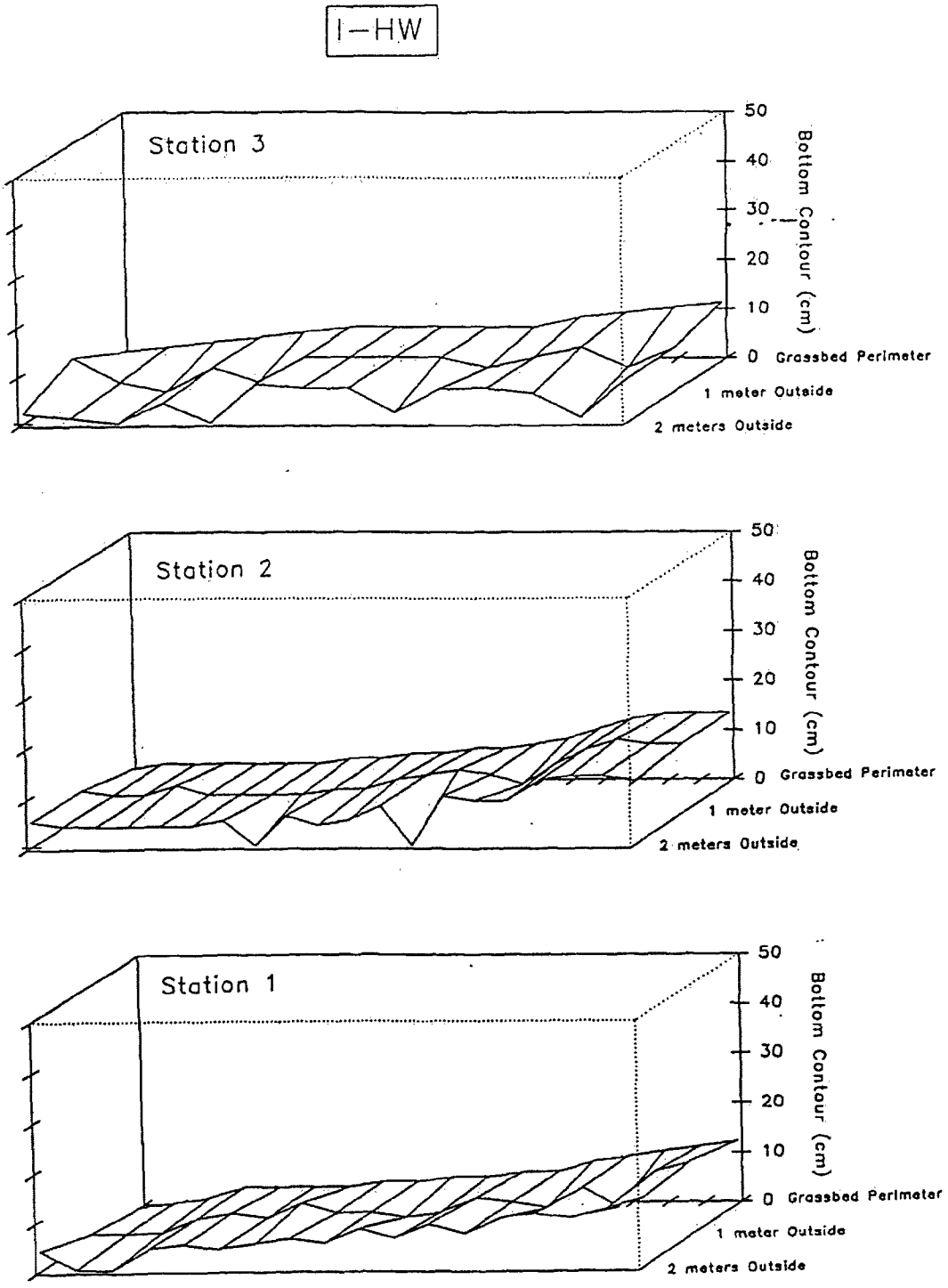

Figure 4. Bottom profiles at seagrass stations 1, 2, and 3, in area I-HW. Water depth measurements were taken on the seagrass bed perimeters and at 1 m and 2 m increments seaward of the seagrass bed edges.

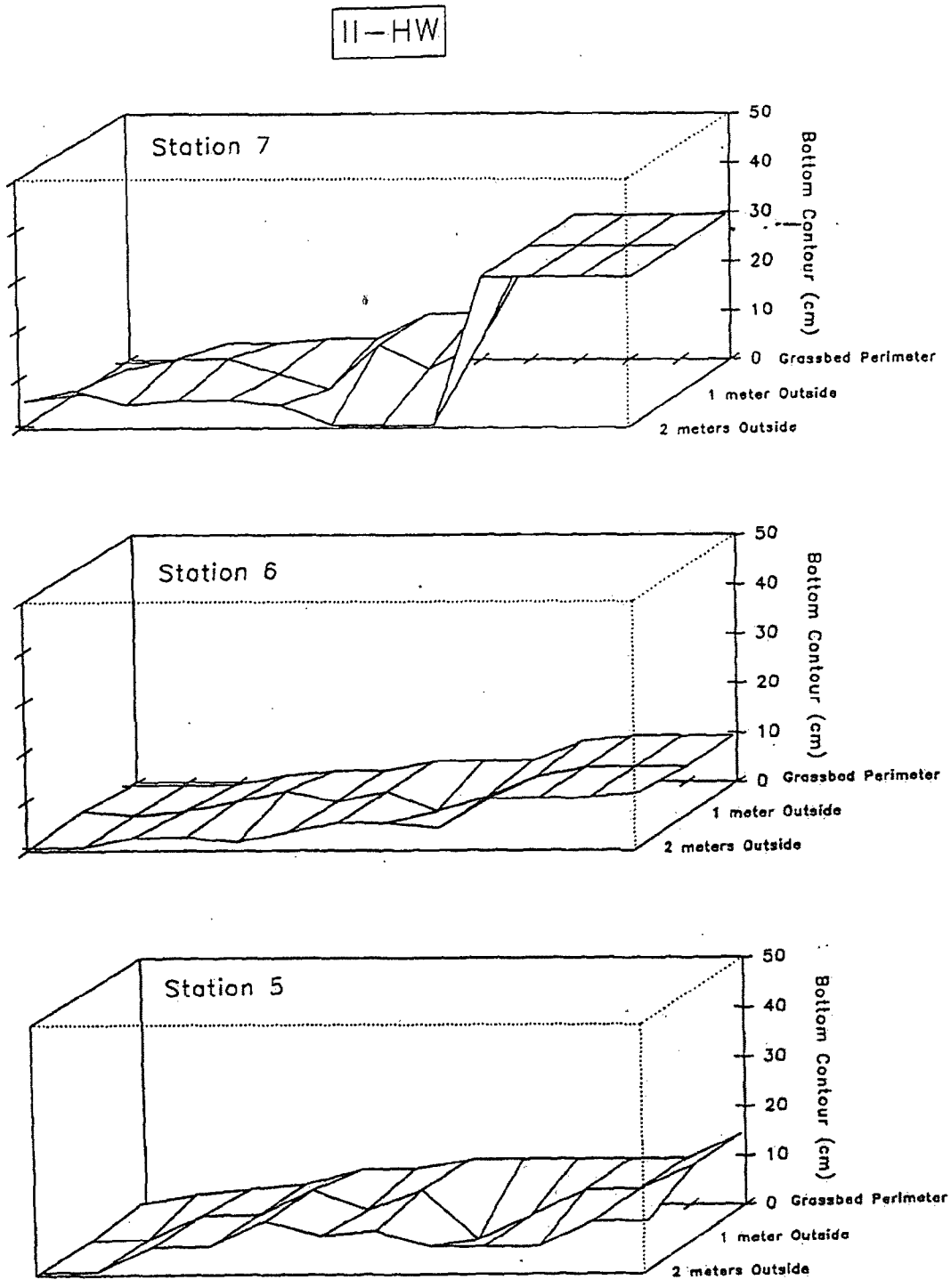

Figure 5. Bottom profiles at seagrass stations 5, 6, and 7, in area II-HW. Water depth measurements were taken on the seagrass bed perimeters and at 1 m and 2 m increments seaward of the seagrass bed edges.

III-SF

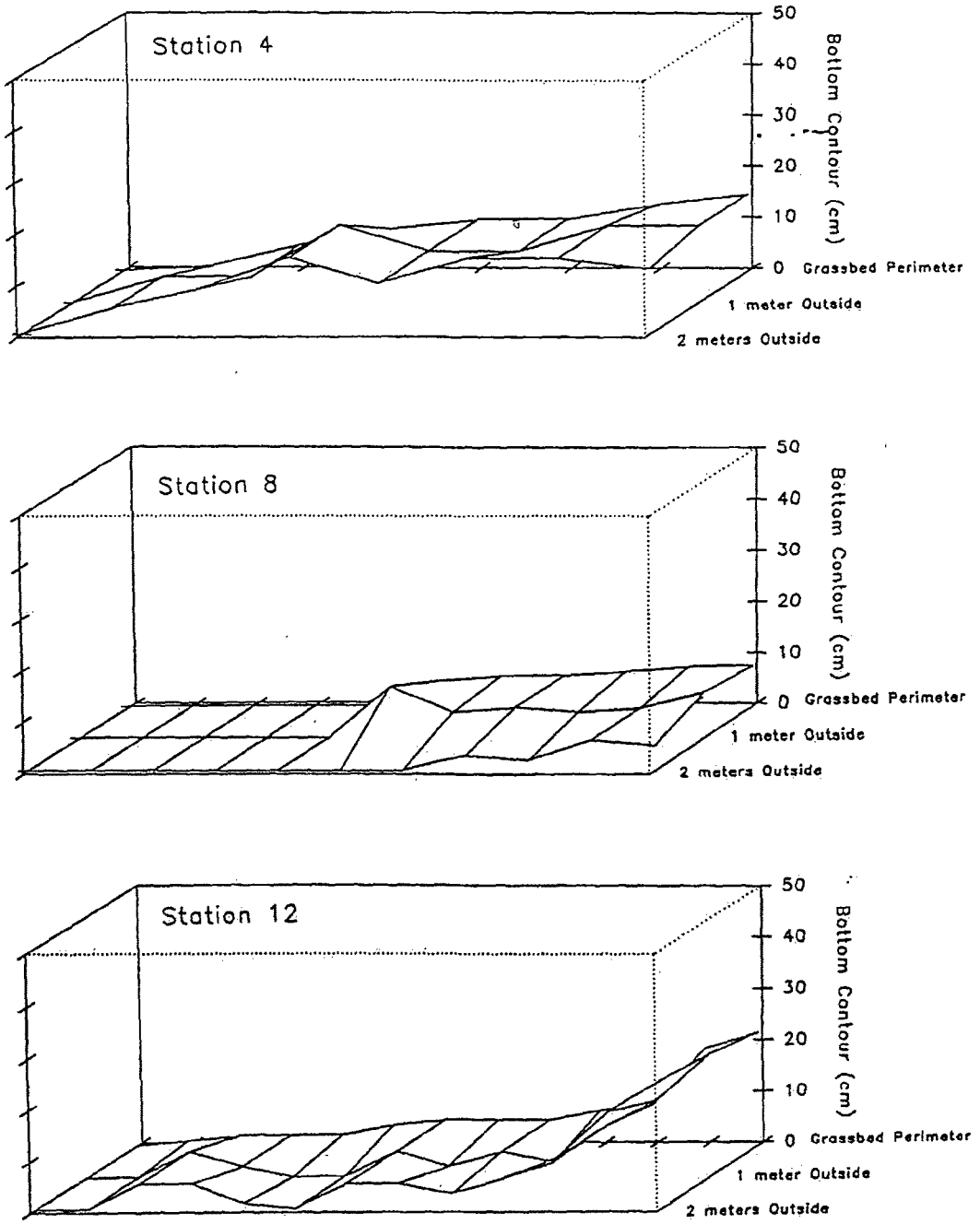

Figure 6. Bottom profiles at seagrass stations 4, 8, and 12, in area III-SF. Water depth measurements were taken on the seagrass bed perimeters and at 1 m and 2 m increments seaward of the seagrass bed edges.

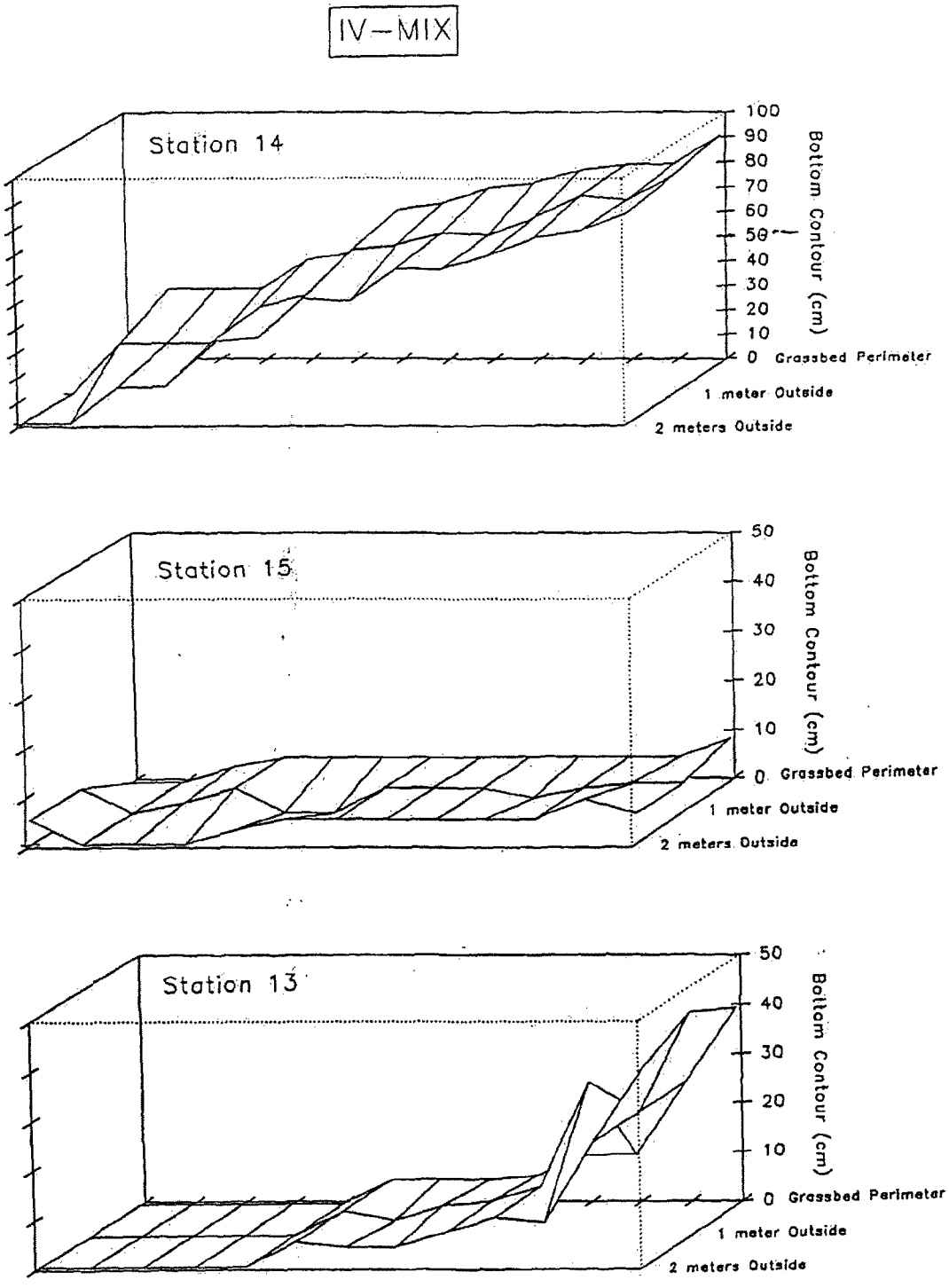

Figure 7. Bottom profiles at seagrass stations 13, 14, and 15, in area IV-Mix. Water depth measurements were taken on the seagrass bed perimeters and at 1 m and 2 m increments seaward of the seagrass bed edges.

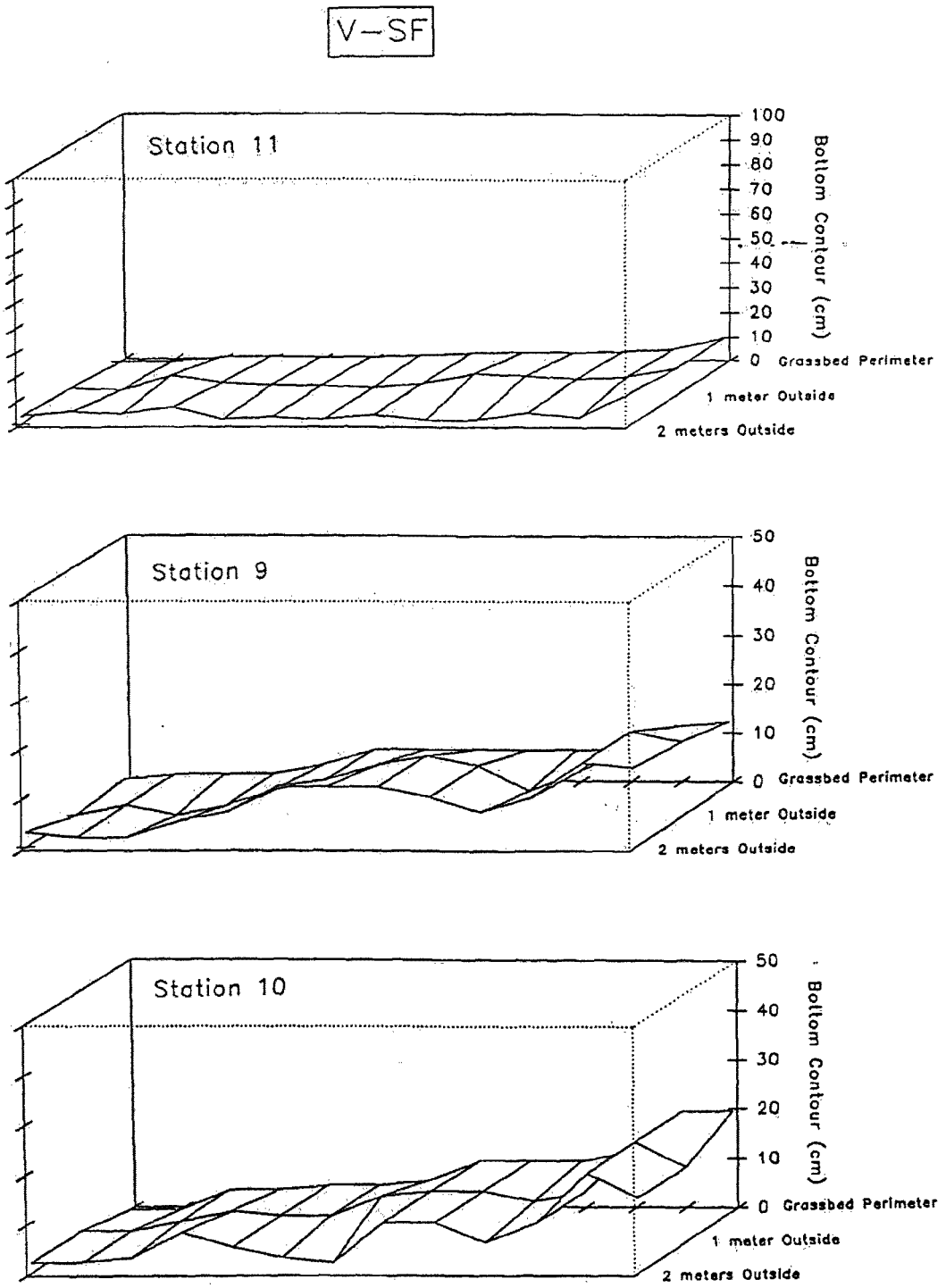

Figure 8. Bottom profiles at seagrass stations 9, 10, and 11, in area V-SF. Water depth measurements were taken on the seagrass bed perimeters and at 1 m and 2 m increments seaward of the seagrass bed edges.

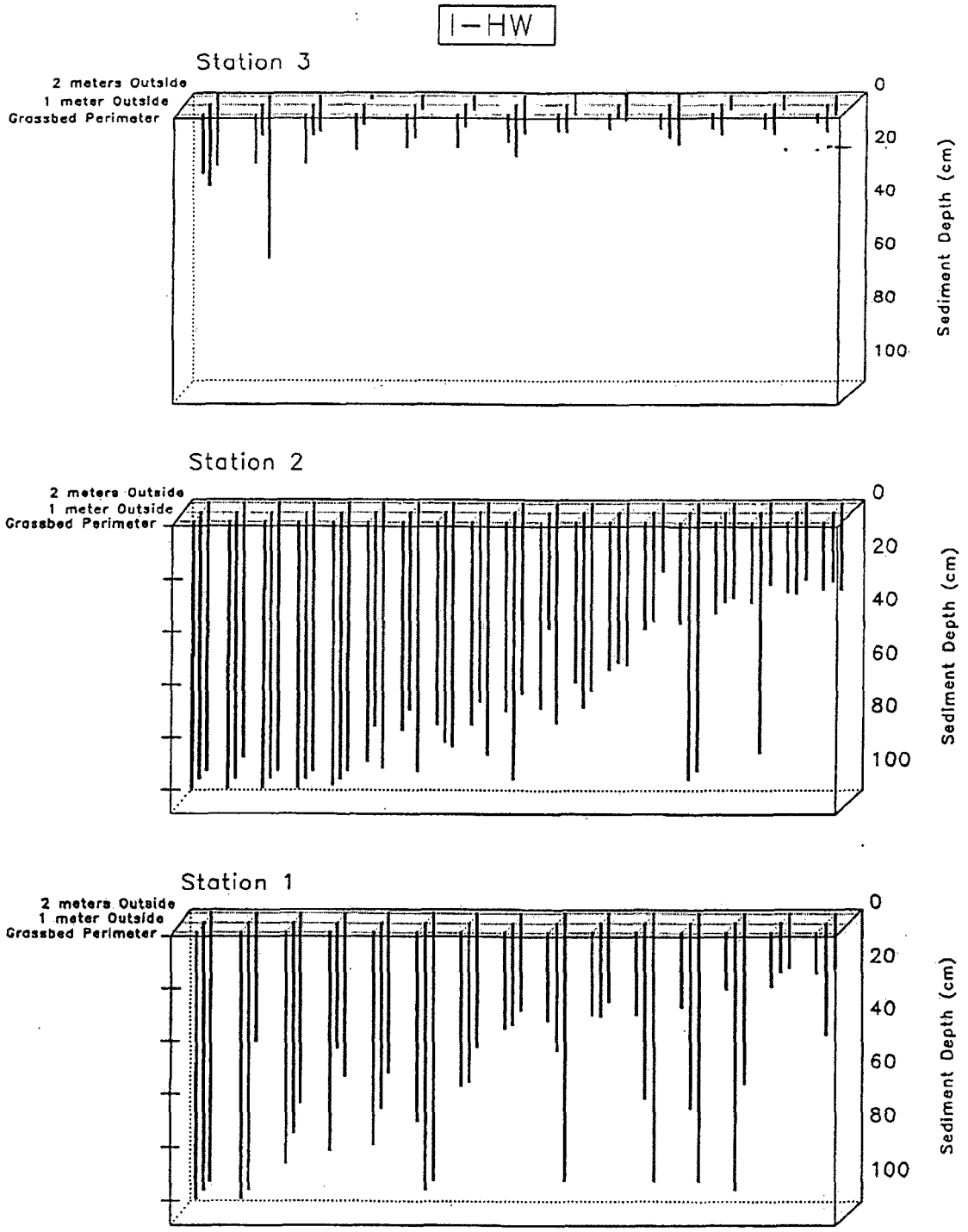

Figure 9. Sediment depth profiles at seagrass stations 1, 2, and 3 in Area I-HW during October 1995. Vertical drop bars represent sediment depths, in cms, as determined by probing the bottom on seagrass bed perimeters and at 1 m and 2 m increments seaward of the grassbed edges.

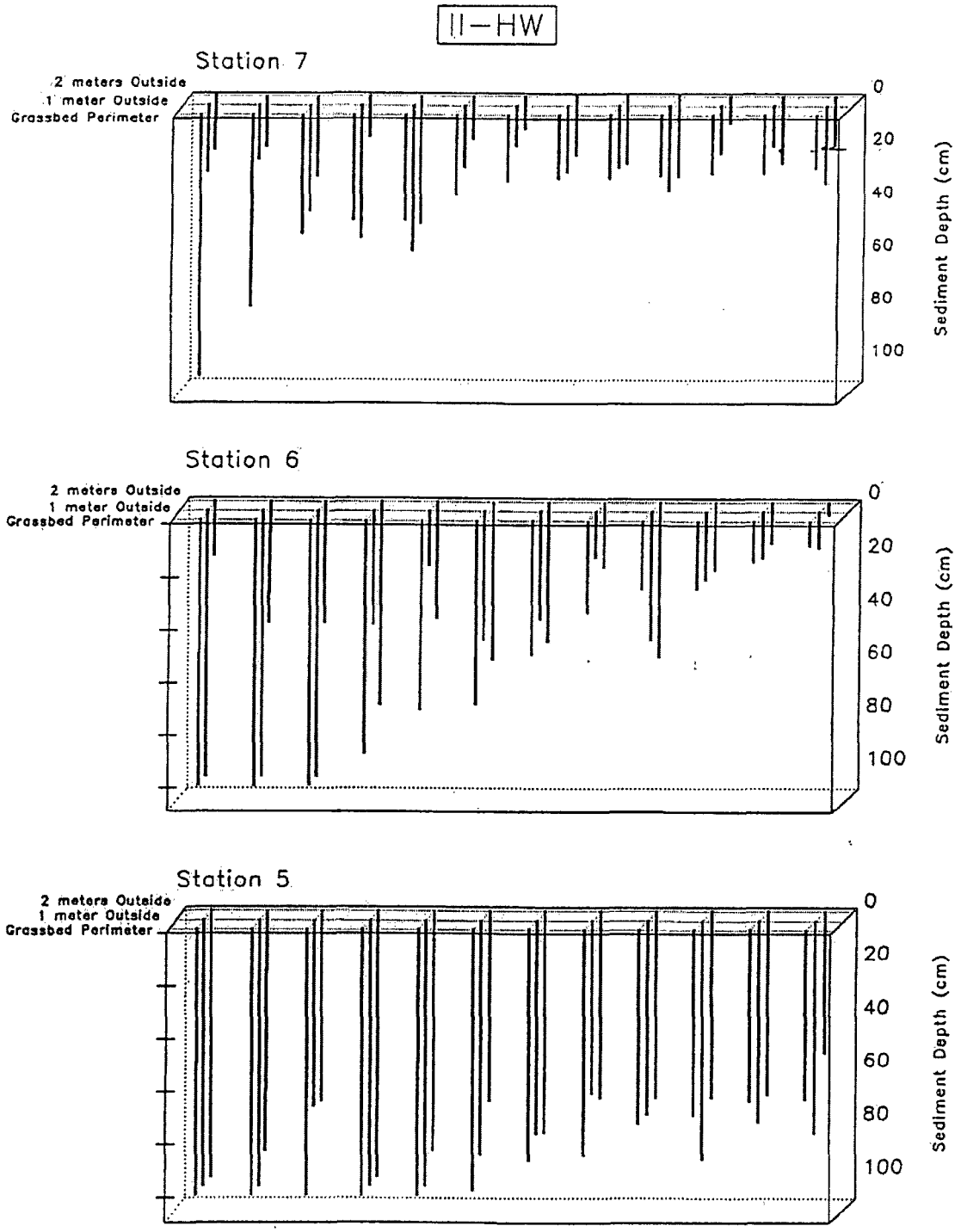

Figure 10. Sediment depth profiles at seagrass stations 5, 6, and 7 in Area II-HW during October 1995. Vertical drop bars represent sediment depths, in cms, as determined by probing the bottom on seagrass bed perimeters and at 1 m and 2 m increments seaward of the grassbed edges.

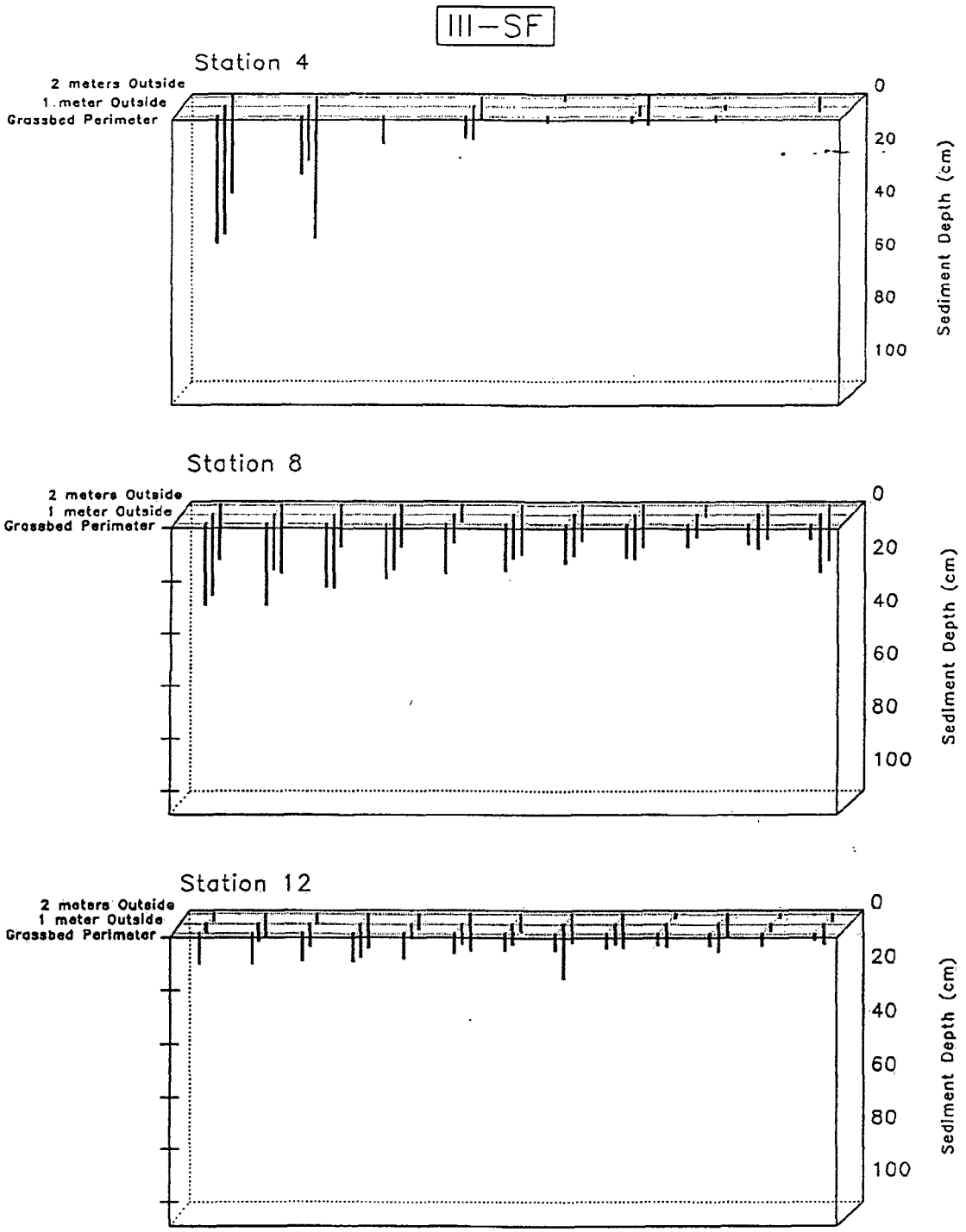

Figure 11. Sediment depth profiles at seagrass stations 4, 8, and 12 in Area III-SF during October 1995. Vertical drop bars represent sediment depths, in cms, as determined by probing the bottom on seagrass bed perimeters and at 1 m and 2 m increments seaward of the grassbed edges.

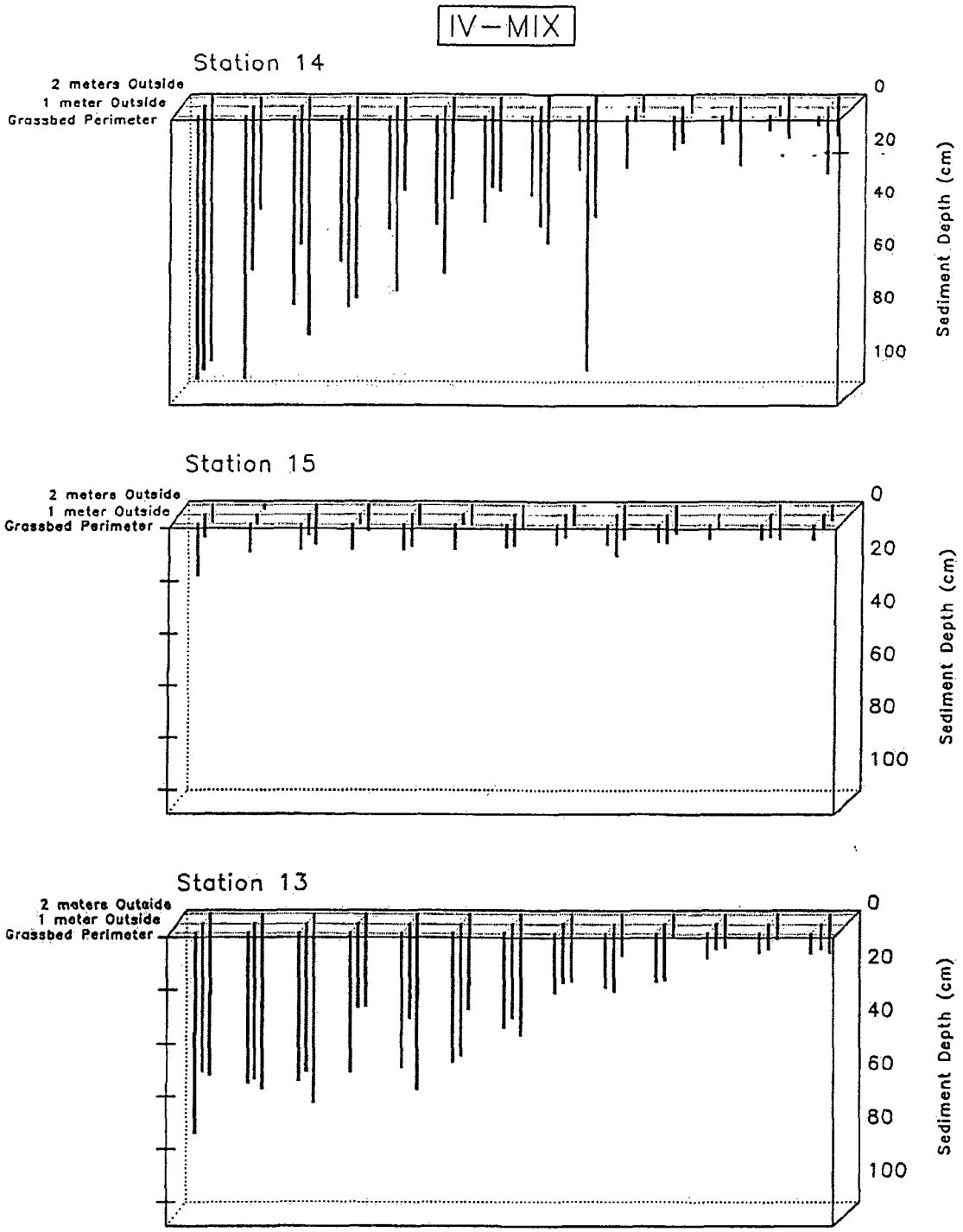

Figure 12. Sediment depth profiles at seagrass stations 13, 14, and 15 in Area IV-Mix during October 1995. Vertical drop bars represent sediment depths, in cms, as determined by probing the bottom on seagrass bed perimeters and at 1 m and 2 m increments seaward of the grassbed edges.

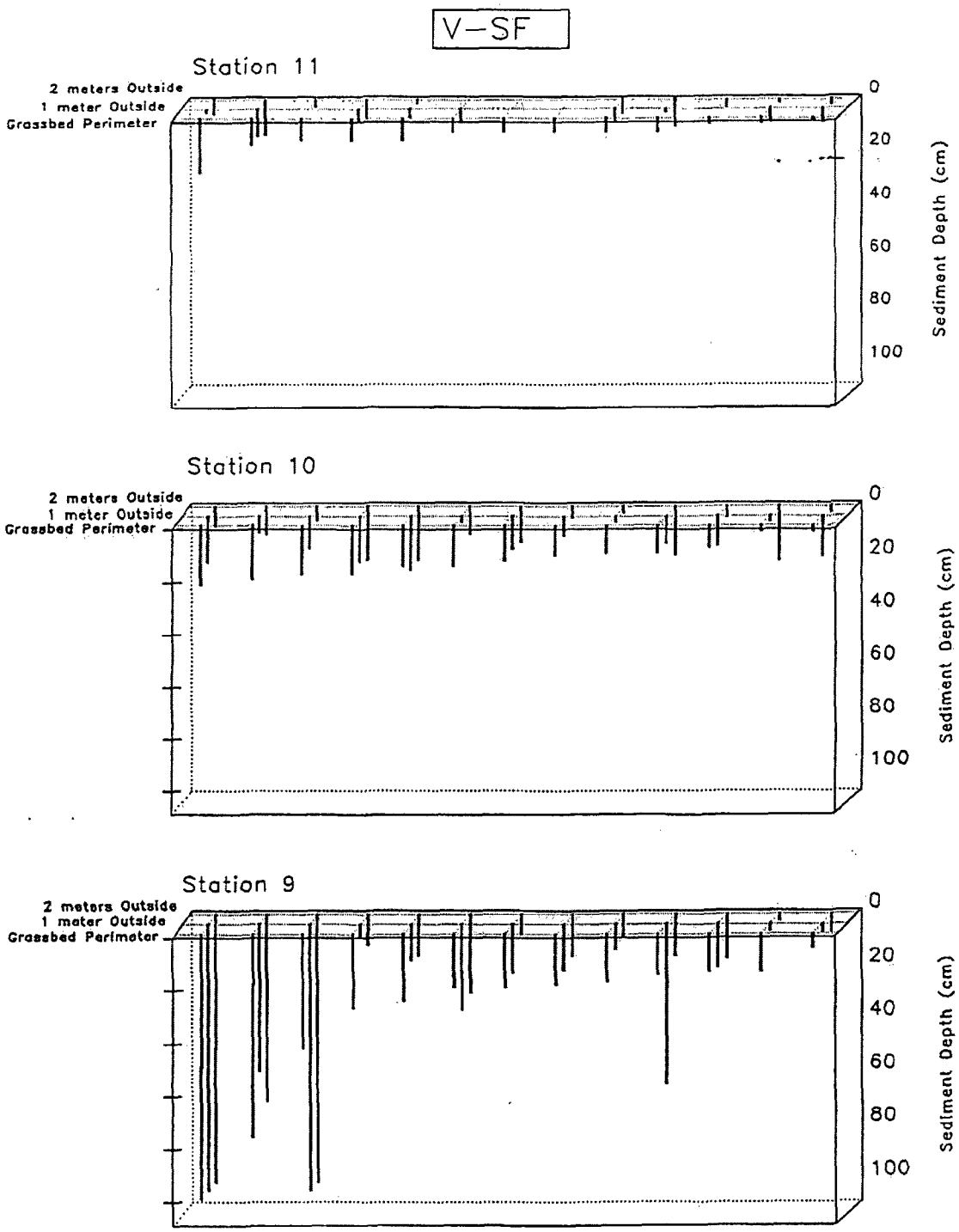

Figure 13. Sediment depth profiles at seagrass stations 11, 10, and 9 in Area V-SF during October 1995. Vertical drop bars represent sediment depths, in cms, as determined by probing the bottom on seagrass bed perimeters and at 1 m and 2 m increments seaward of the grassbed edges.

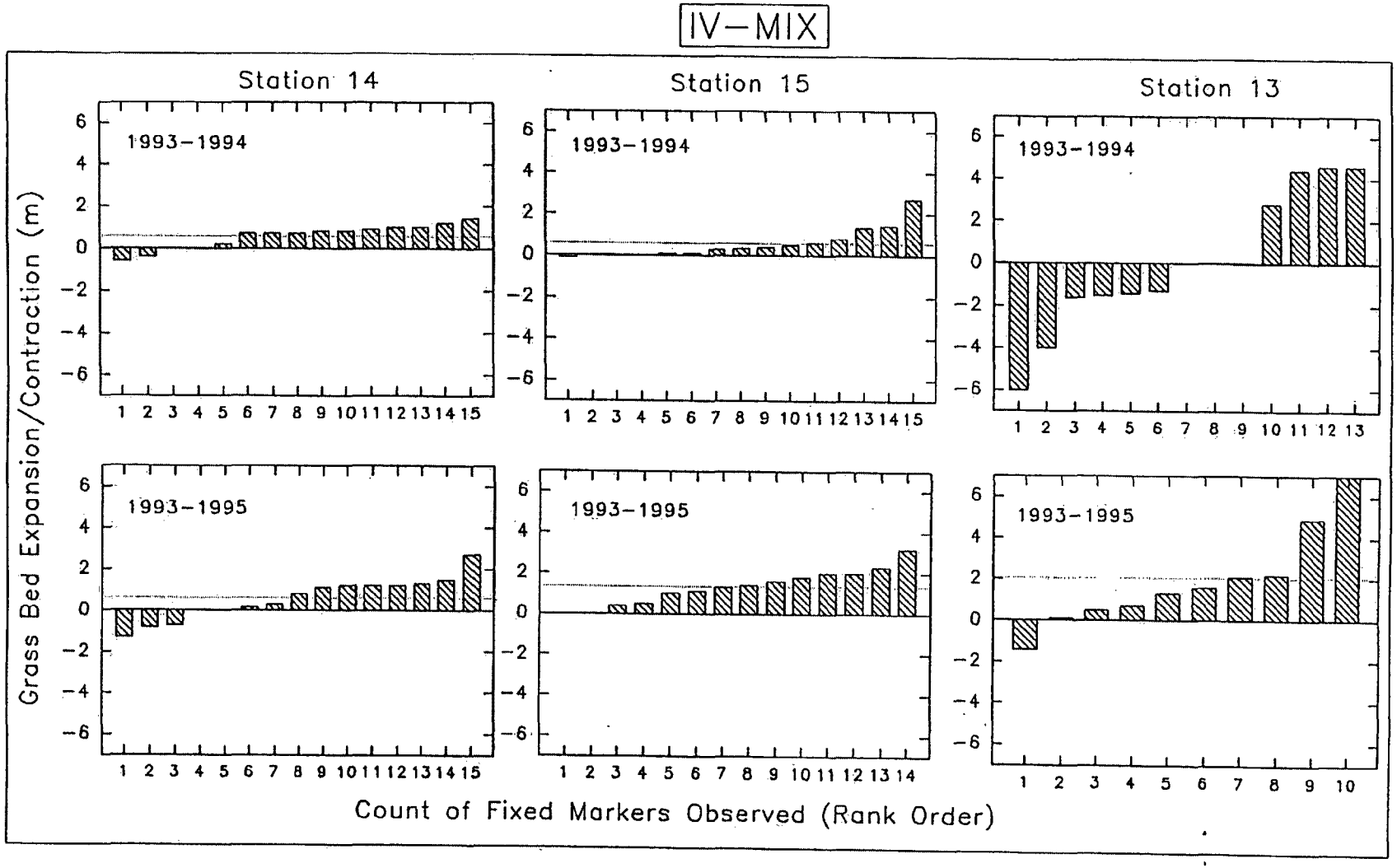

Figure 14. Seagrass bed expansion (+ values) or contraction (- values) from 1993 to 1994 (top row of figures) and from 1993 to 1995 (bottom figures) at Stations 13, 14, and 15 in Area IV-Mix. Dotted lines across each bar graph represent the mean change for each station.

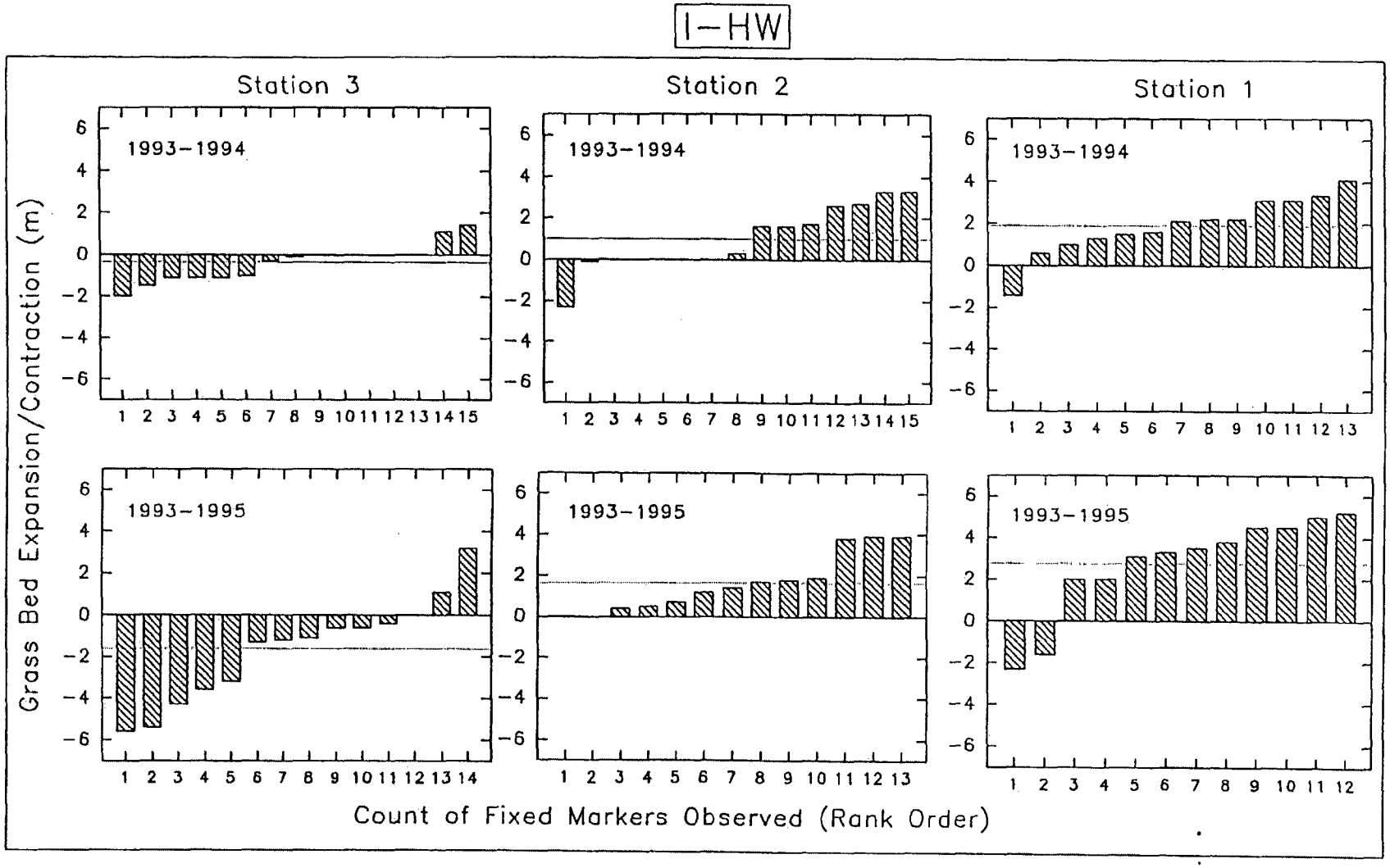

Figure 15. Seagrass bed expansion (+ values) or contraction (- values) from 1993 to 1994 (top row of figures) and from 1993 to 1995 (bottom figures) at Stations 1, 2, and 3 in Area I-HW. Dotted lines across each bar graph represent the mean change for each station.

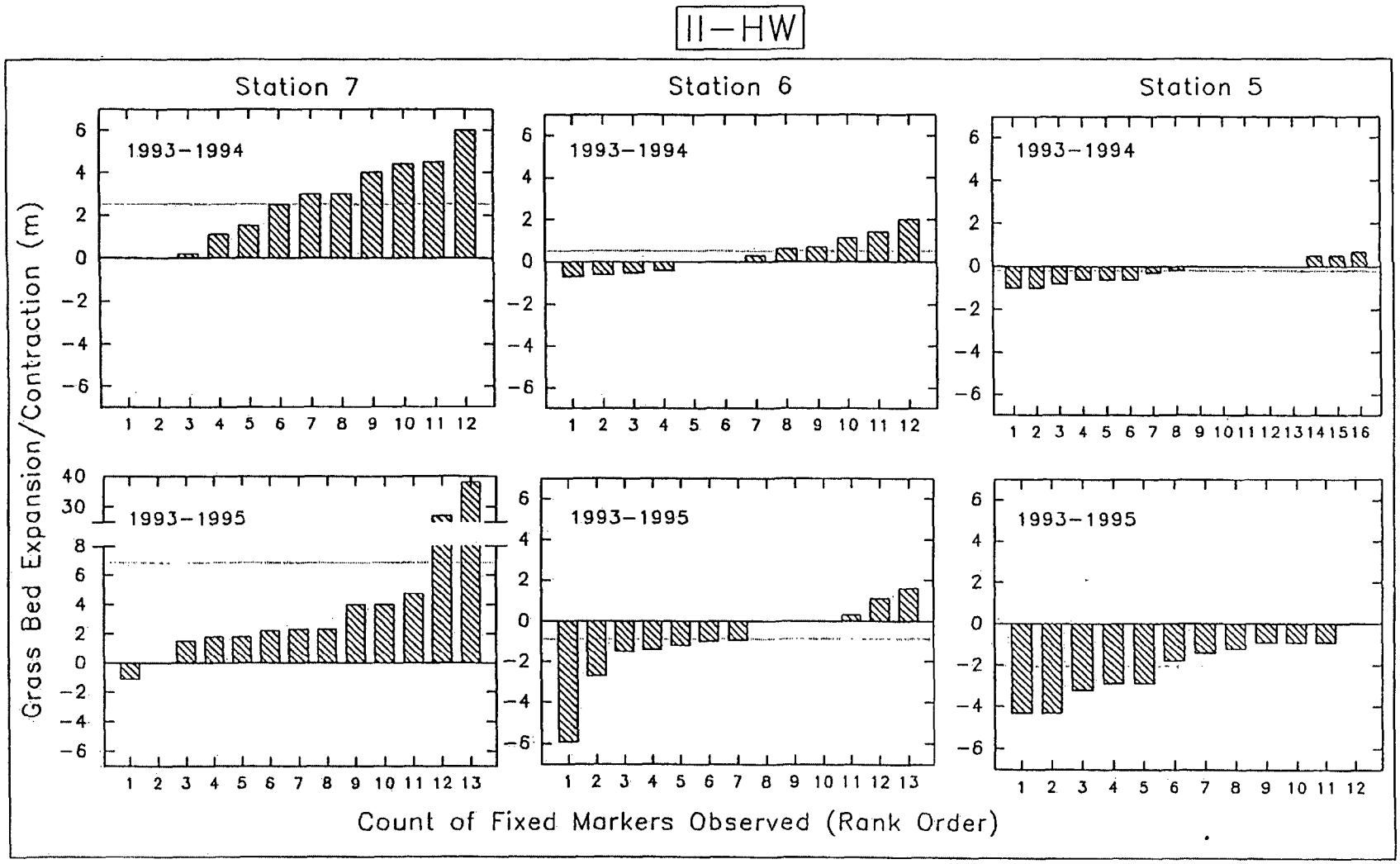

Figure 16. Seagrass bed expansion (+ values) or contraction (- values) from 1993 to 1994 (top row of figures) and from 1993 to 1995 (bottom figures) at Stations 5, 6, and 7 in Area II-HW. Dotted lines across each bar graph represent the mean change for each station.

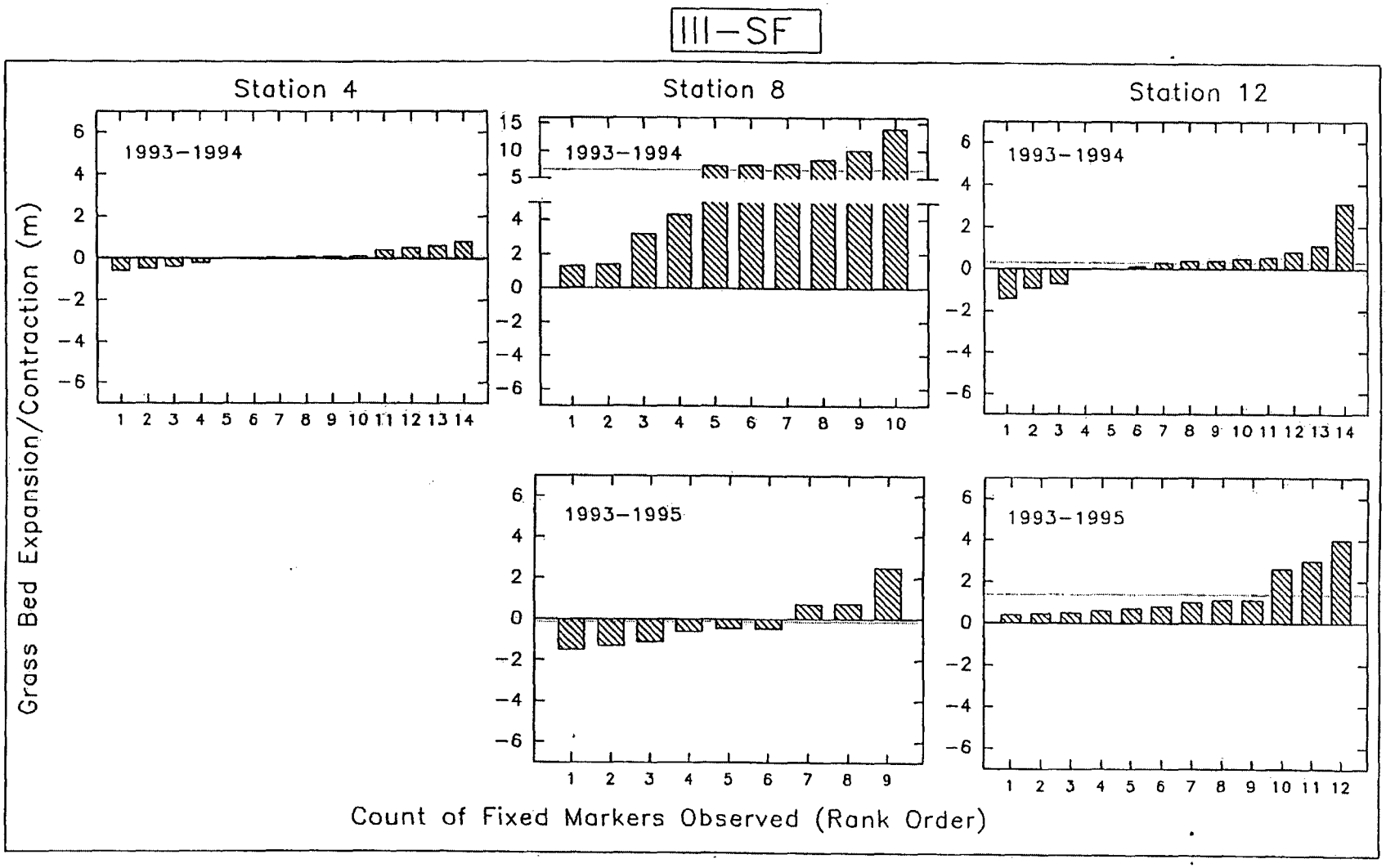

Figure 17. Seagrass bed expansion (+ values) or contraction (- values) from 1993 to 1994 (top row of figures) and from 1993 to 1995 (bottom figures) at Stations 4, 8, and 12 in Area III-SF. Dotted lines across each bar graph represent the mean change for each station. All markers were lost at Station 4 in 1995.

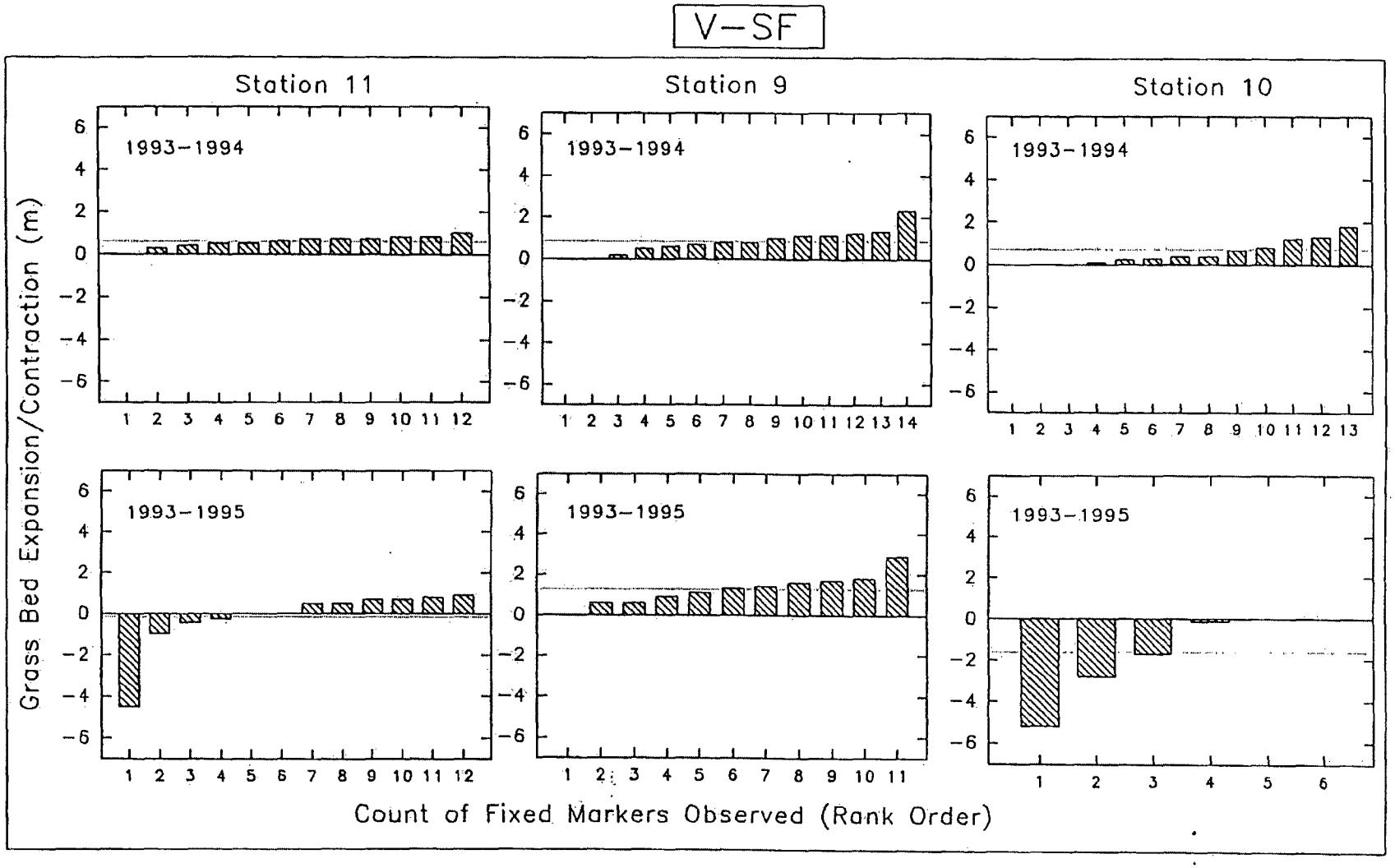

Figure 18. Seagrass bed expansion (+ values) or contraction (- values) from 1993 to 1994 (top row of figures) and from 1993 to 1995 (bottom figures) at Stations 9, 10, and 11 in Area V-SF. Dotted lines across each bar graph represent the mean change for each station.

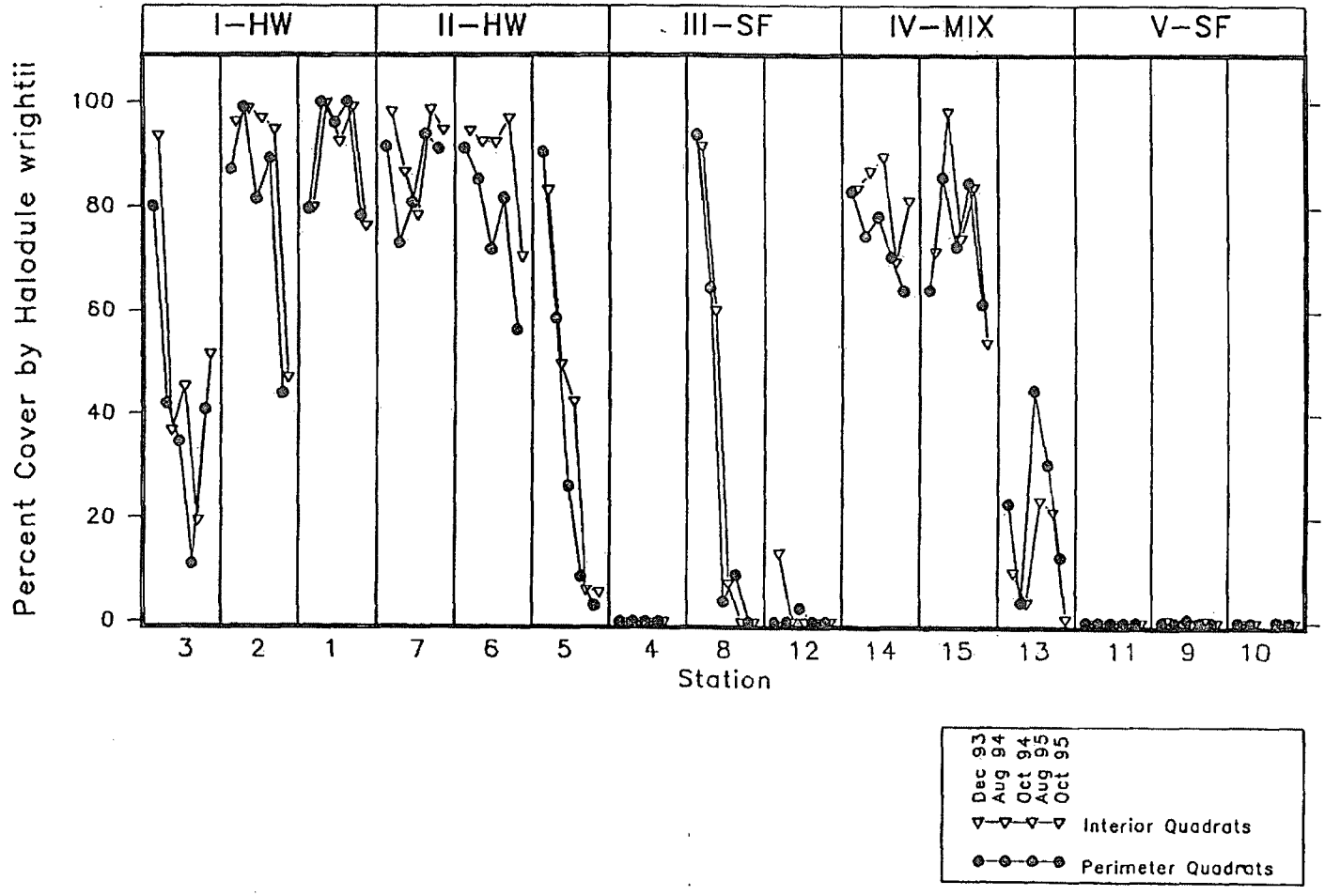

Figure 19. Changes in percent bottom coverage by Halodule wrightii from December 1993 through October 1995 for seagrass bed perimeters and interiors.

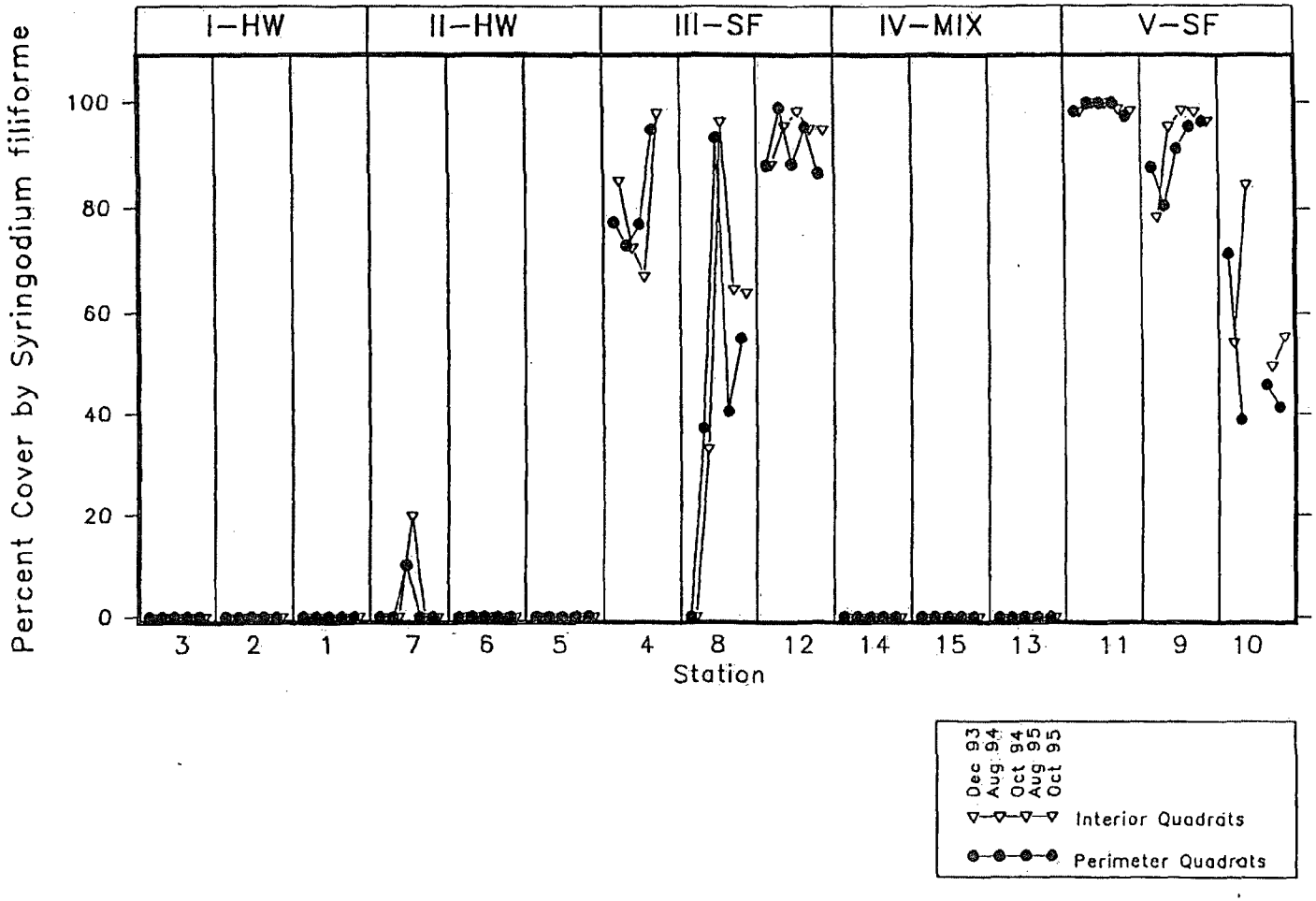

Figure 20. Changes in percent bottom coverage by Syringodium filiforme from December 1993 through October 1995 for seagrass bed perimeters and interiors.

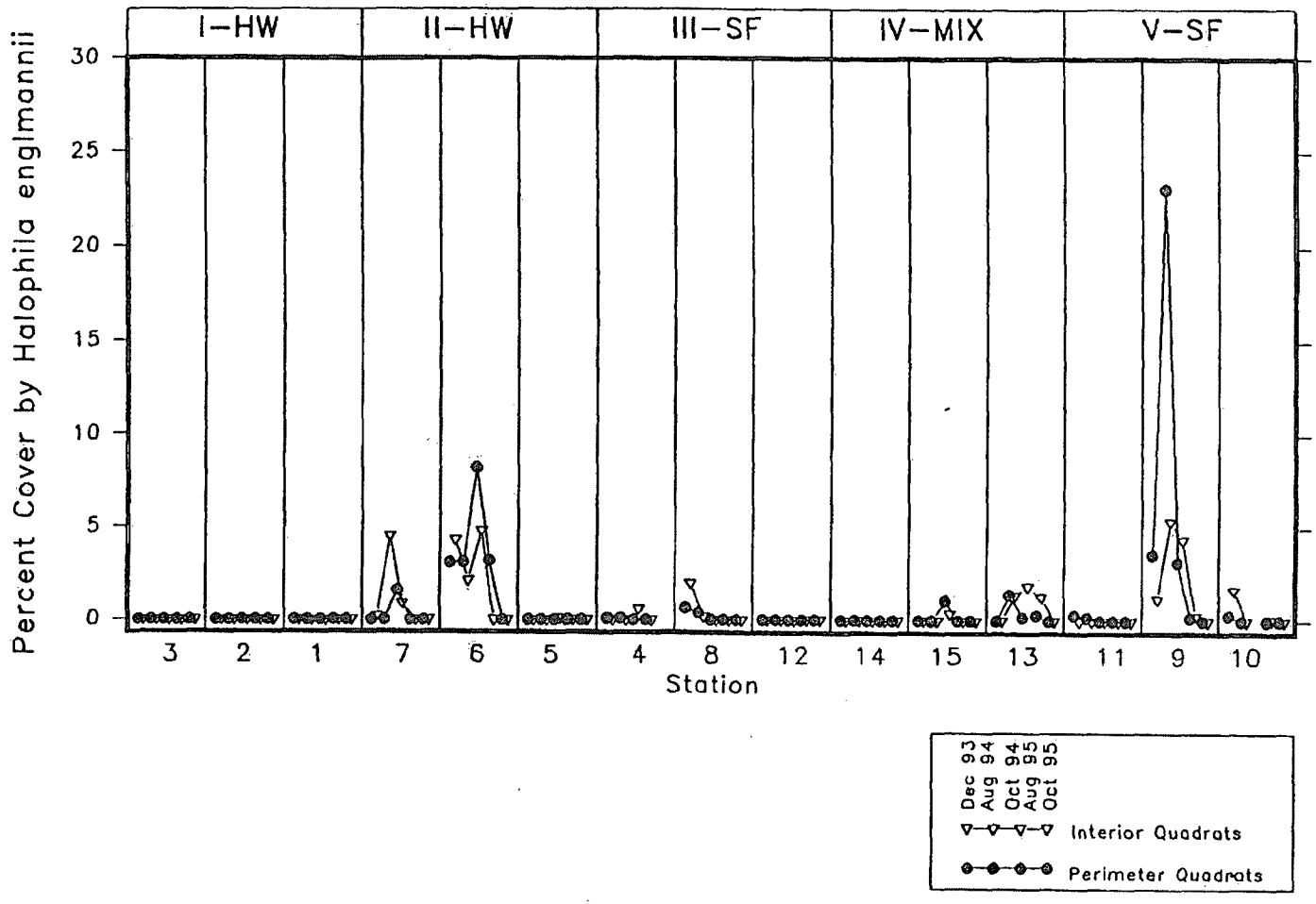

Figure 21. Changes in percent bottom coverage by Halophila englemanii from December 1993 through October 1995 for seagrass bed perimeters and interiors.

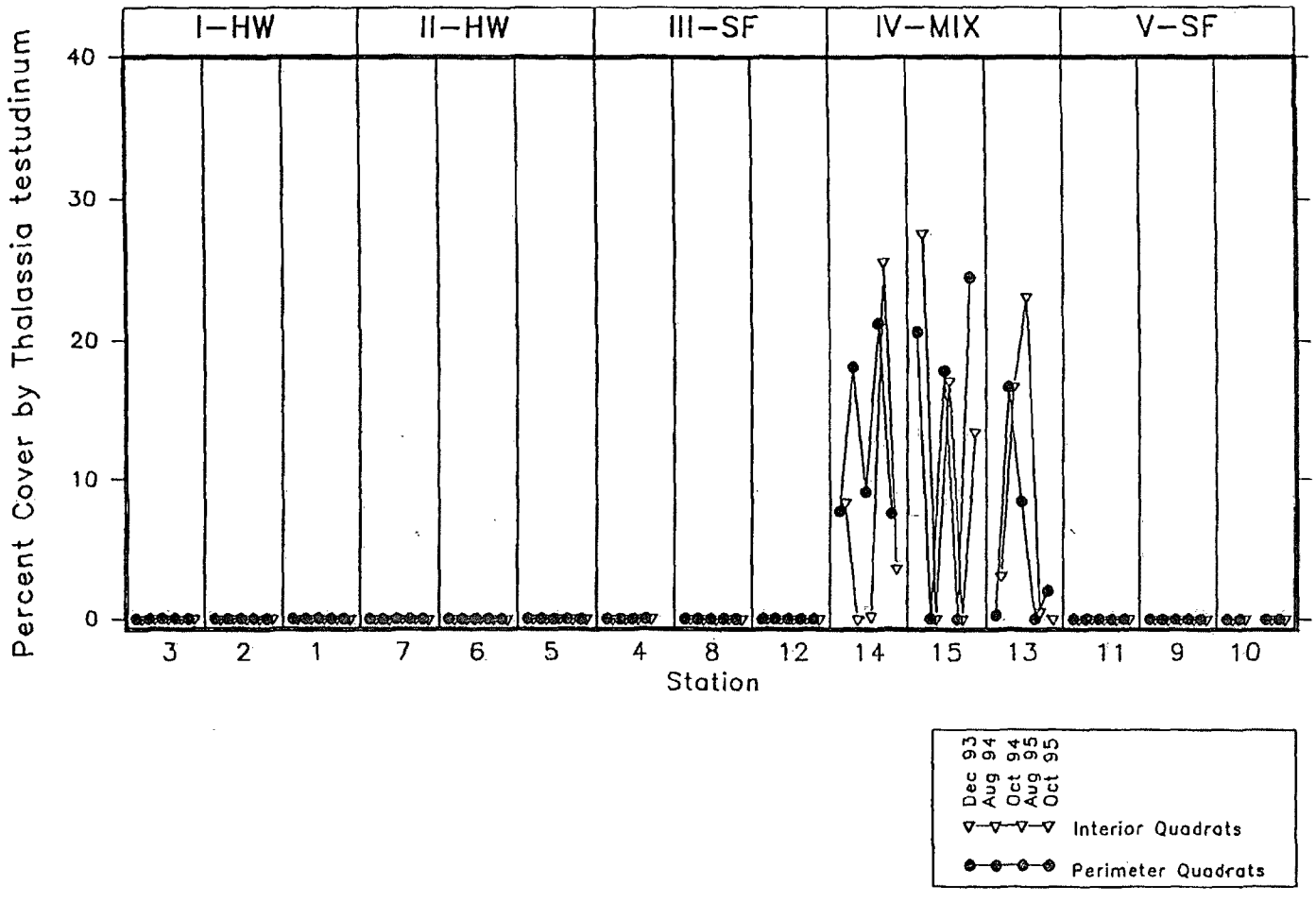

Figure 22. Changes in percent bottom coverage by Thalassia testudinum from December 1993 through October 1995 for seagrass bed perimeters and interiors.

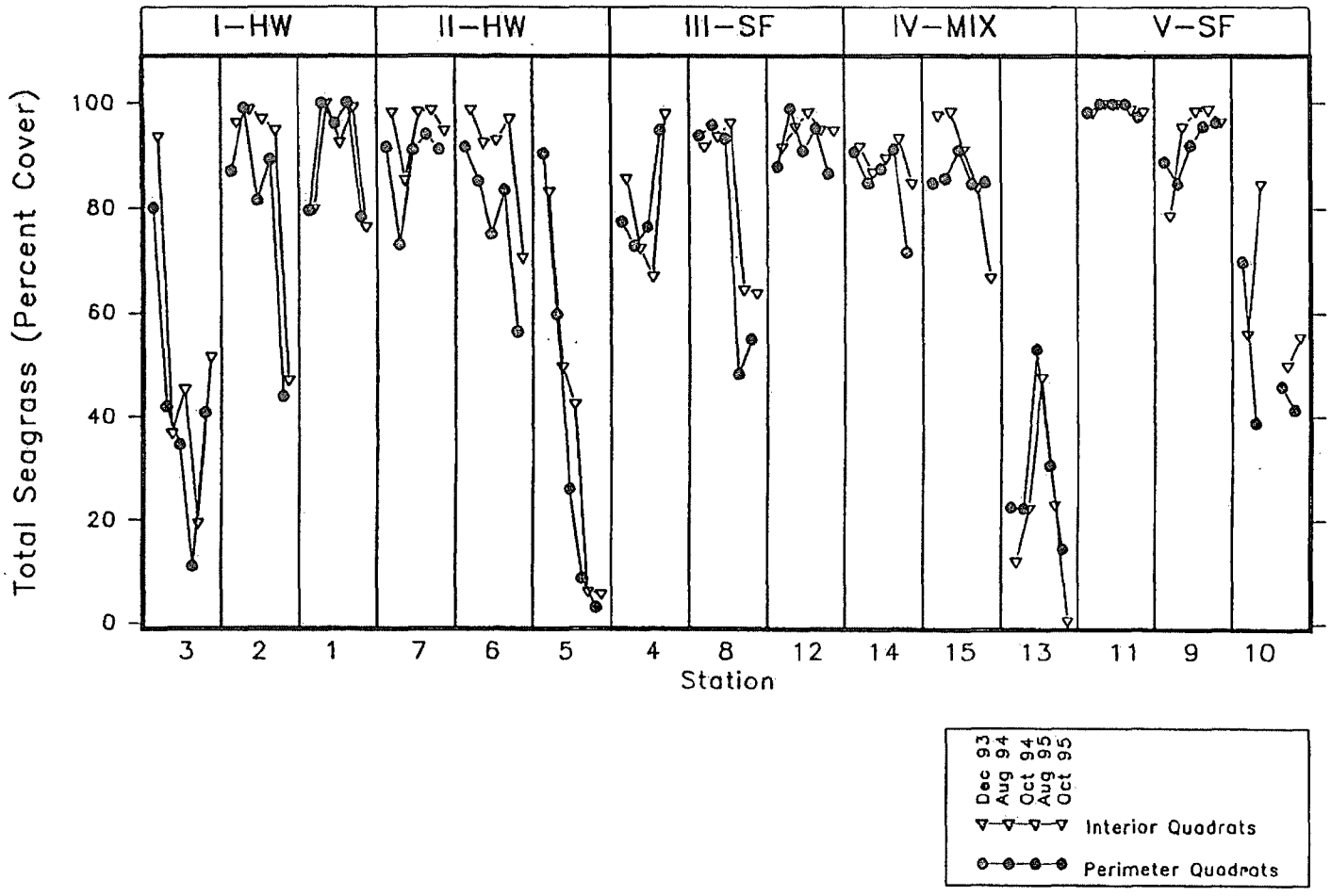

Figure 23. Changes in percent bottom coverage by all seagrass species from December 1993 through October 1995 for seagrass bed perimeters and interiors.

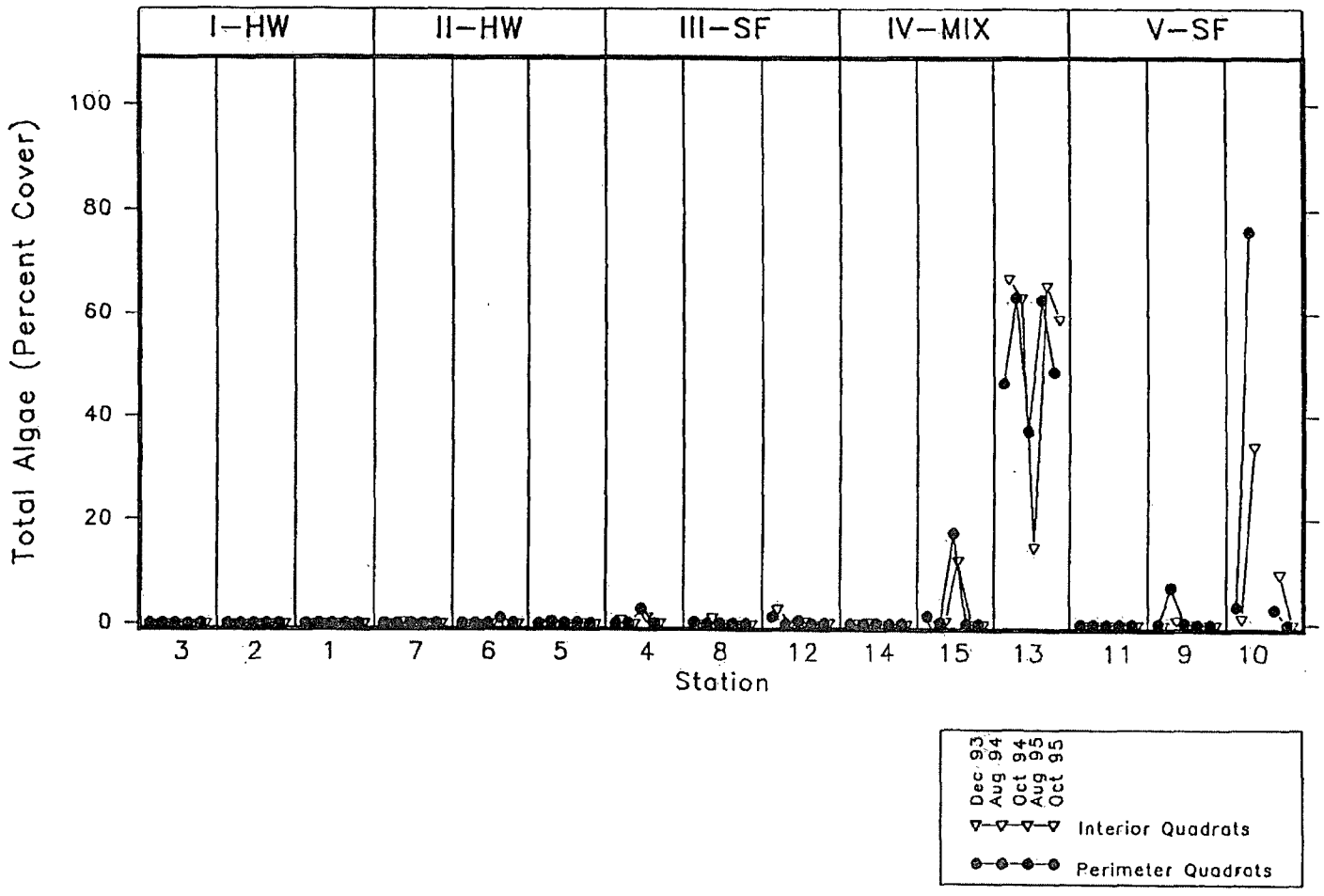

Figure 24. Changes in percent bottom coverage by all attached rhizophytic algae from December 1993 through October 1995 for seagrass bed perimeters and interiors.

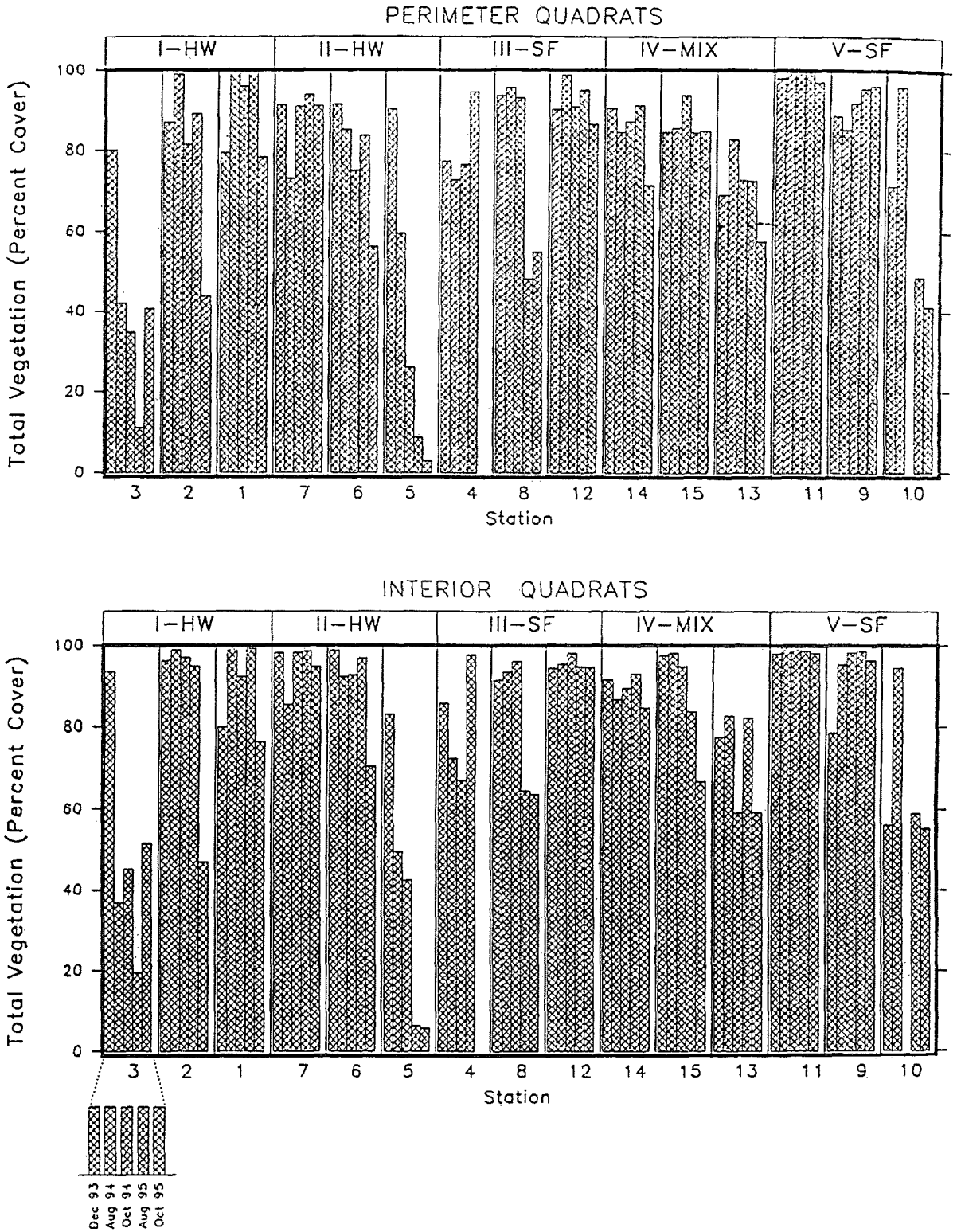

Figure 25. Bar graphs representing total SAV (seagrass and rhizophytic algae) coverage (cross-hatched area) vs. bare bottom (white space above bars) at 15 seagrass stations from December 1993 through October 1995. The top figure shows SAV coverage on seagrass bed perimeters and the bottom set shows coverages in bed interiors.

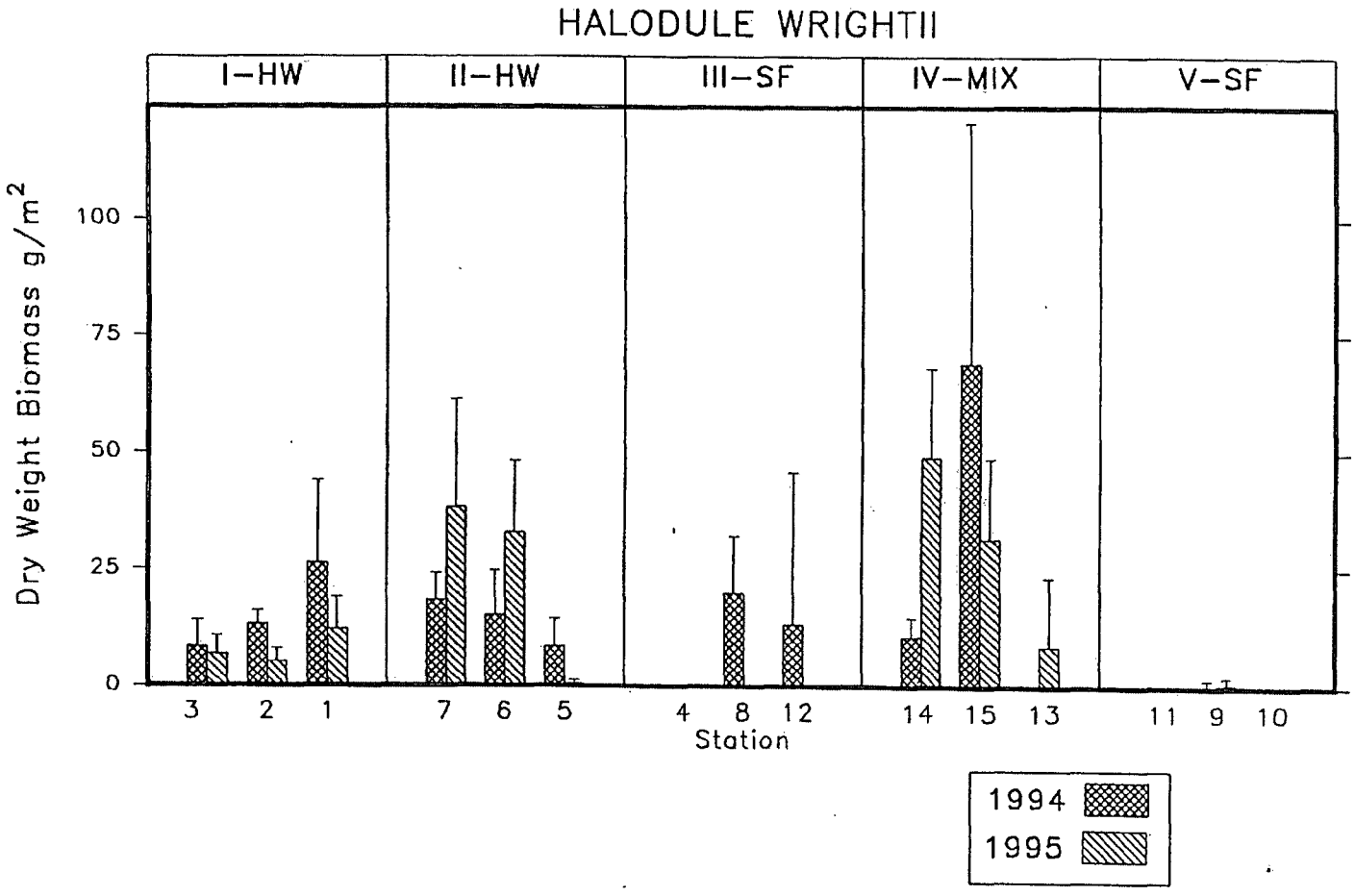

Figure 26. Dry weight biomass (g m^{-2}) of Halodule wrightii at all seagrass stations in August 1994 and 1995. Vertical error bars represent + one standard deviation.

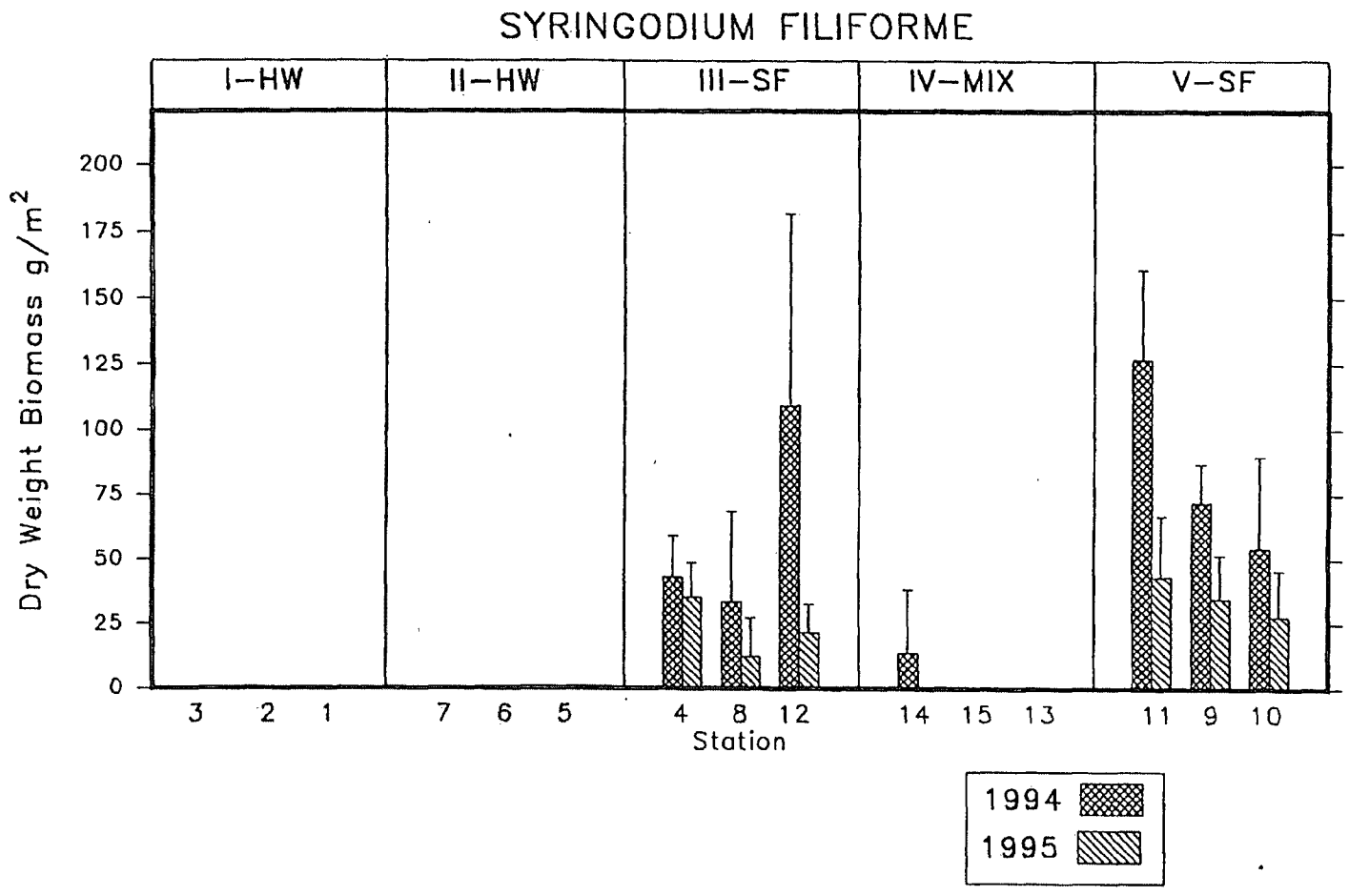

Figure 27. Dry weight biomass (g m^{-2}) of Syringodium filiforme at all seagrass stations in August 1994 and 1995. Vertical error bars represent + one standard deviation.

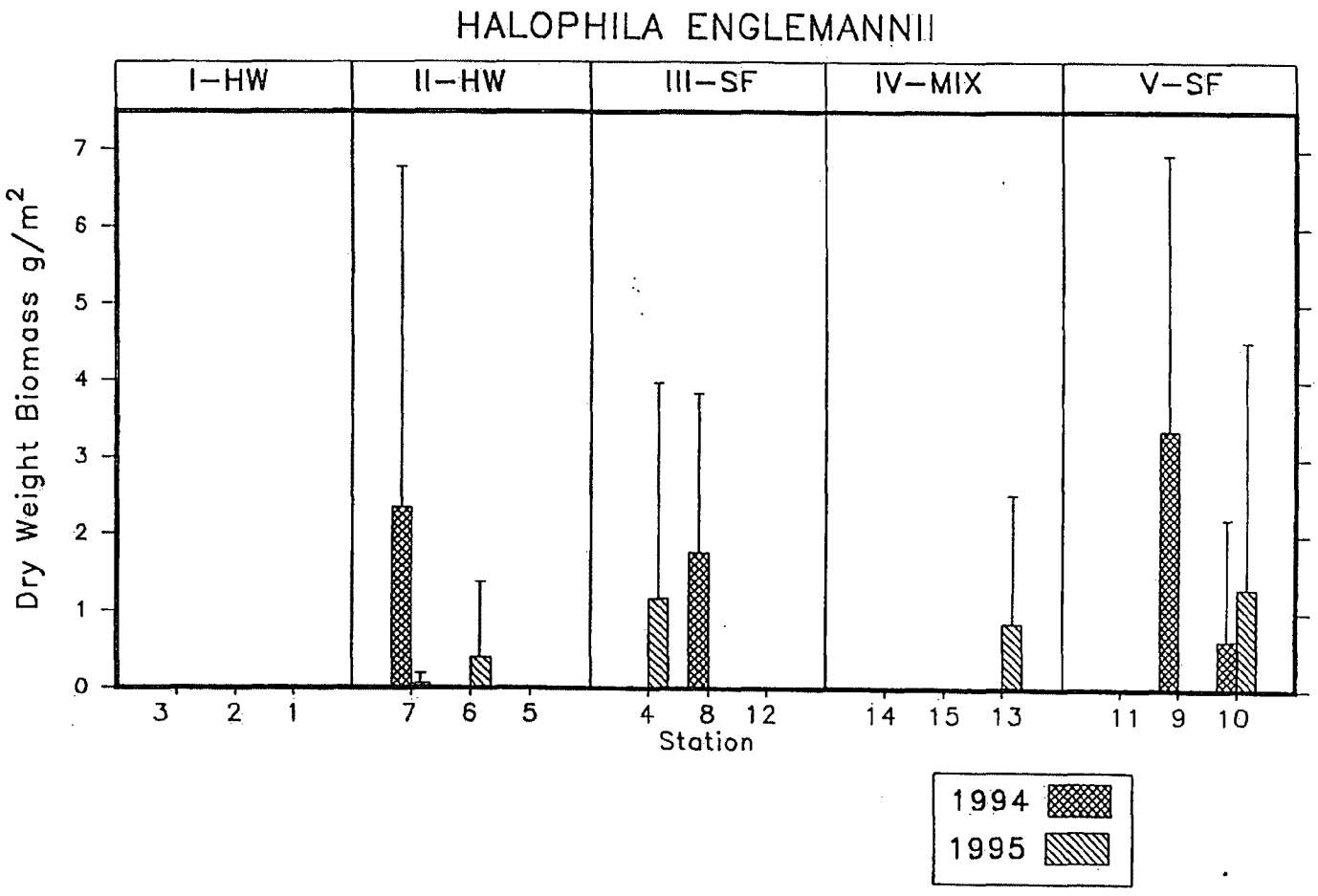

Figure 28. Dry weight biomass (g m^{-2}) of Halophila englemanii at all seagrass stations in August 1994 and 1995. Vertical error bars represent + one standard deviation.

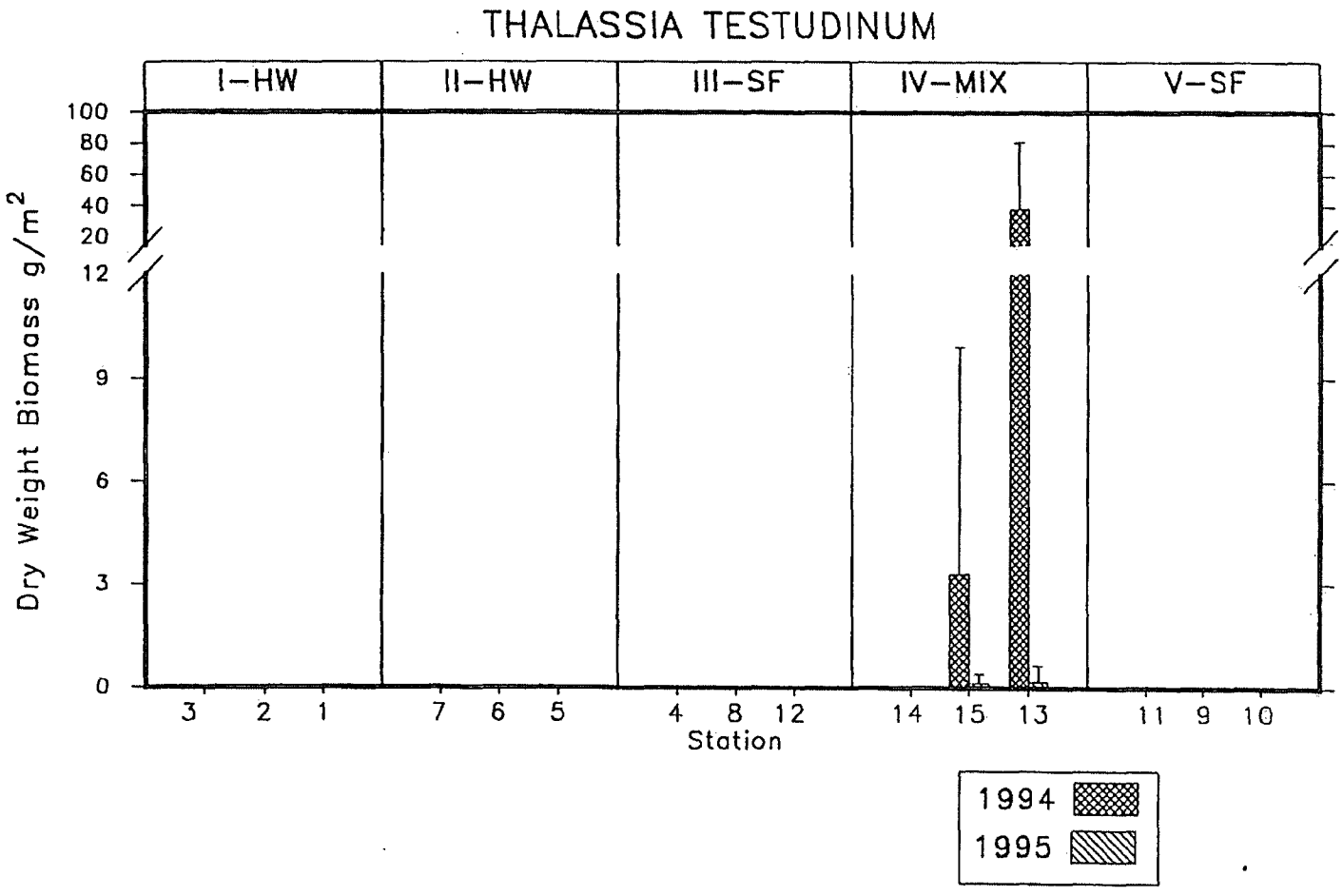

Figure 29. Dry weight biomass (g m^{-2}) of Thalassia testudinum at all seagrass stations in August 1994 and 1995. Vertical error bars represent + one standard deviation.

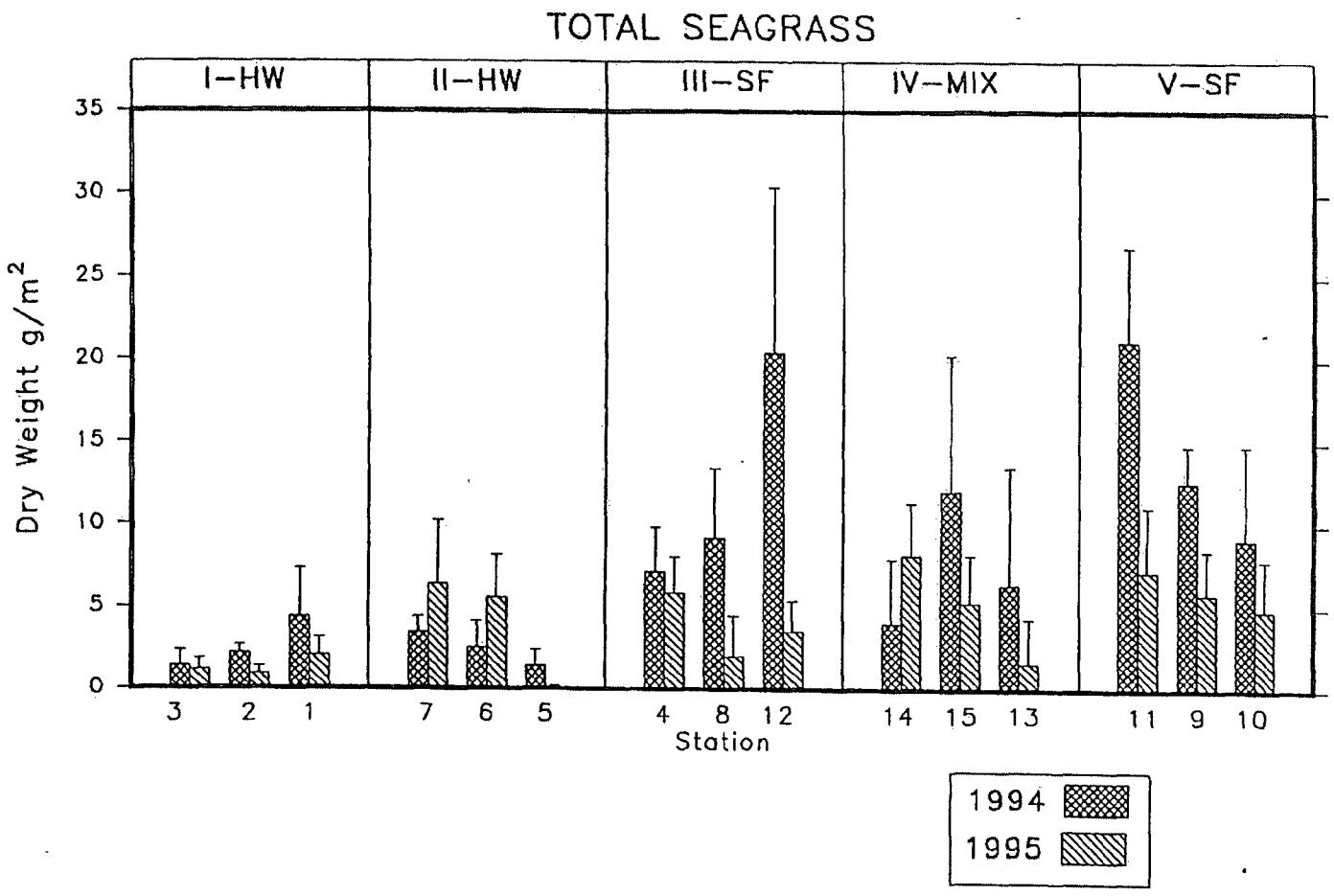

Figure 30. Dry weight biomass (g m^{-2}) of all seagrass species at all seagrass stations in August 1994 and 1995. Vertical error bars represent + one standard deviation.

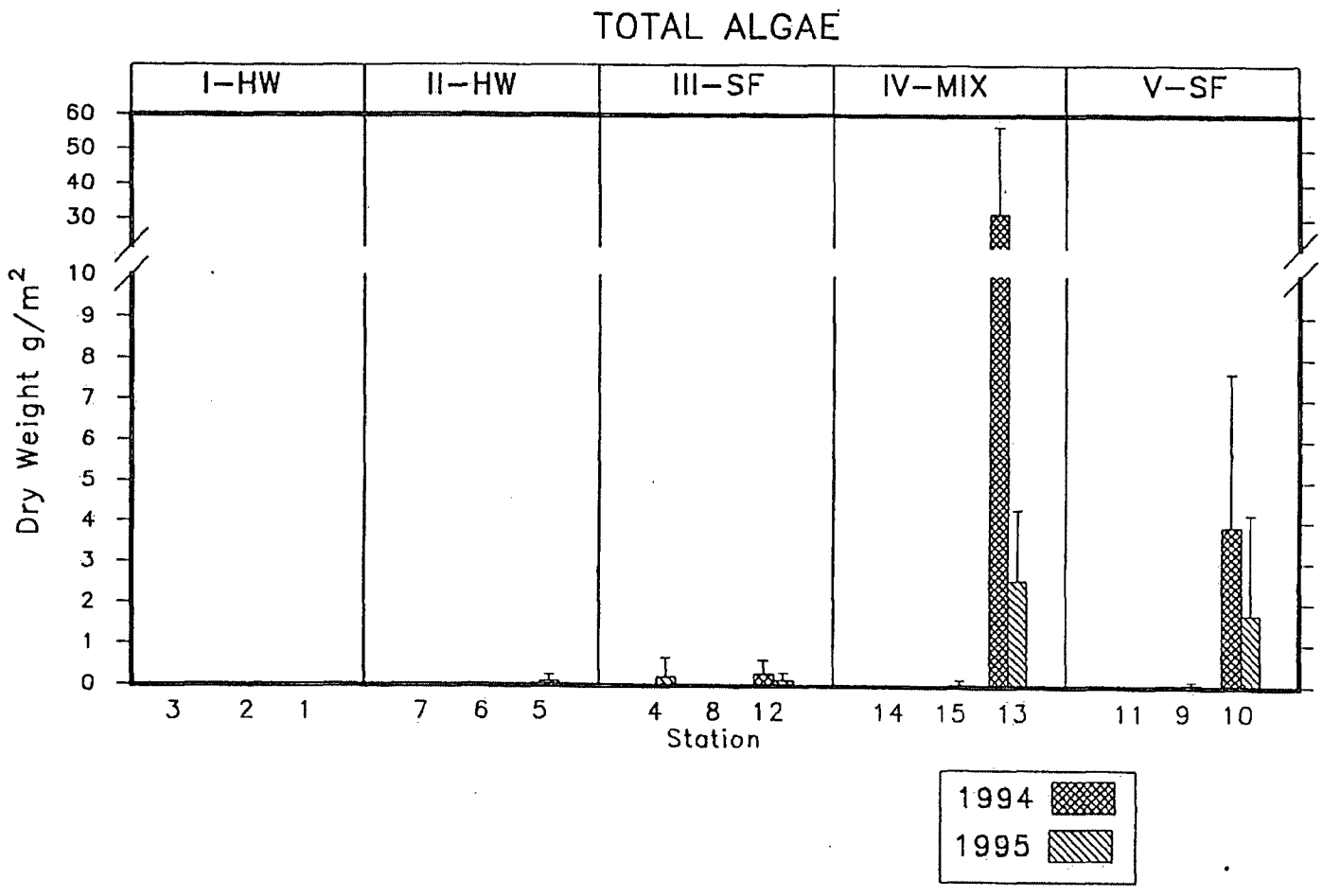

Figure 31. Dry weight biomass (g m^{-2}) of all rhizophytic algae at all seagrass stations in August 1994 and 1995. Vertical error bars represent + one standard deviation.

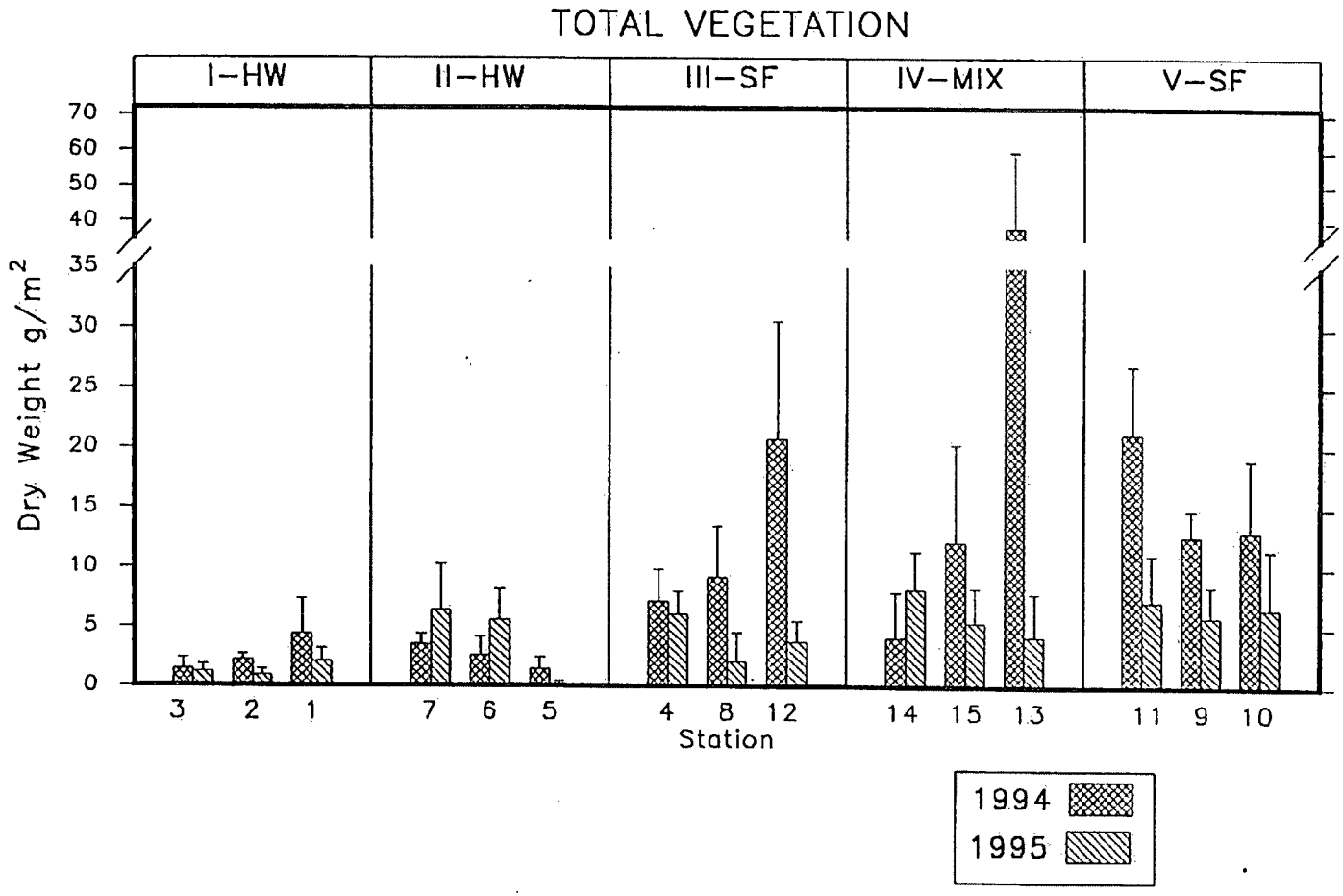

Figure 32. Dry weight biomass (g m^{-2}) of all SAV (= seagrass and rhizophytic algae) at all seagrass stations in August 1994 and 1995. Vertical error bars represent + one standard deviation.

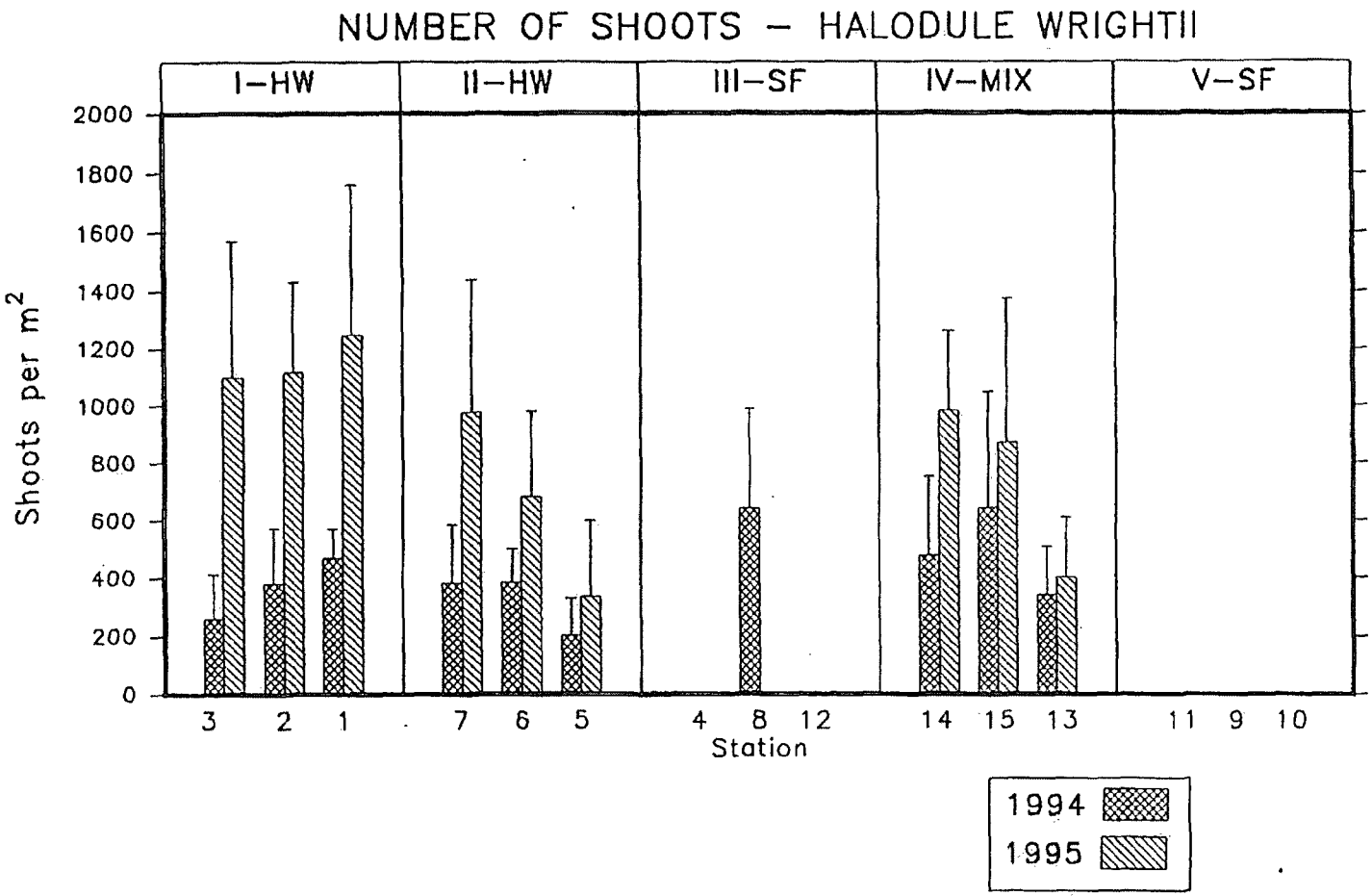

Figure 33. Shoot densities (shoots m^{-2}) of Halodule wrightii in August 1994 and 1995. Error bars represent + one standard deviation.

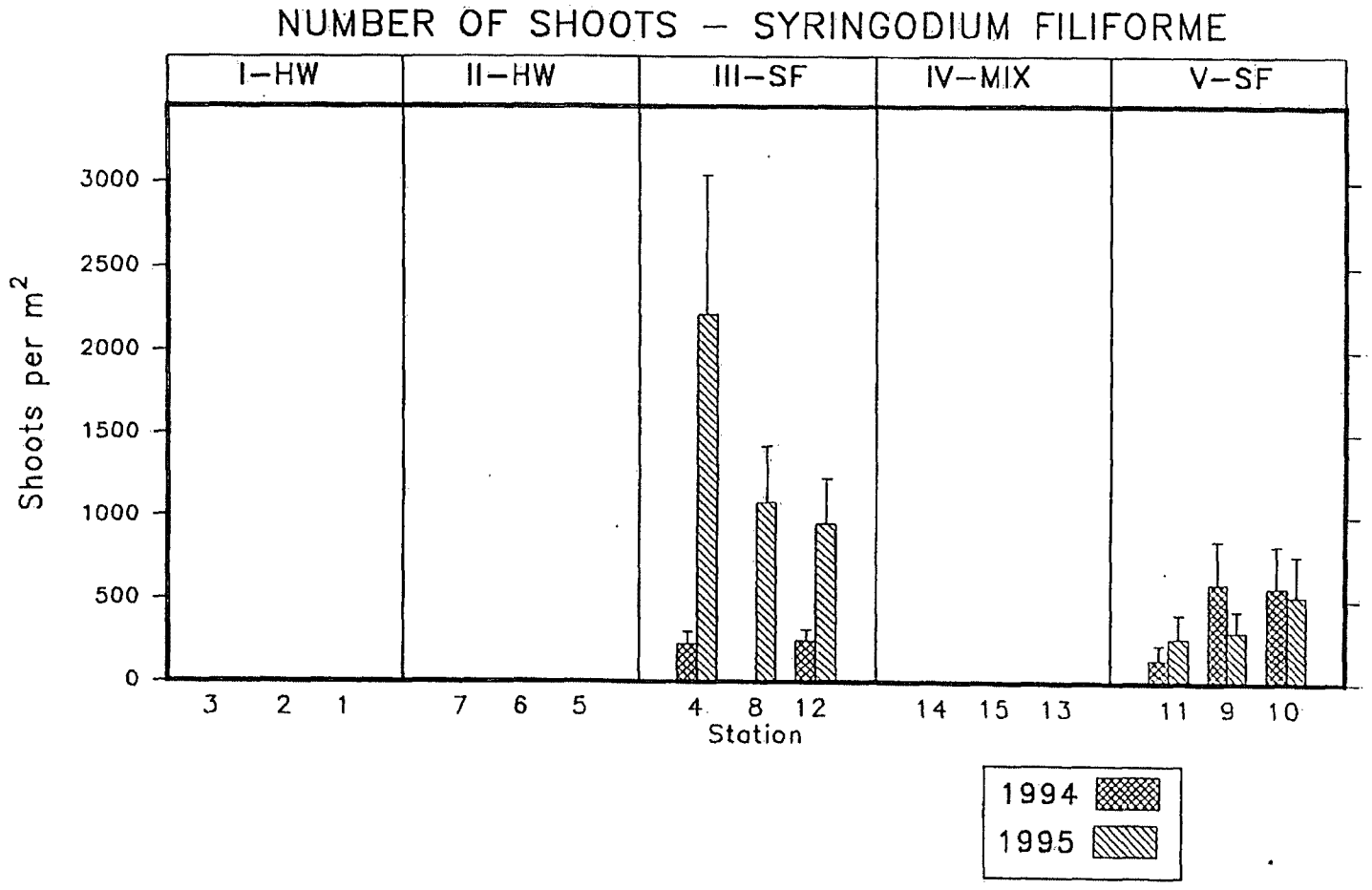

Figure 34. Shoot densities (shoots m^{-2}) of Syringodium filiforme in August 1994 and 1995. Error bars represent + one standard deviation.

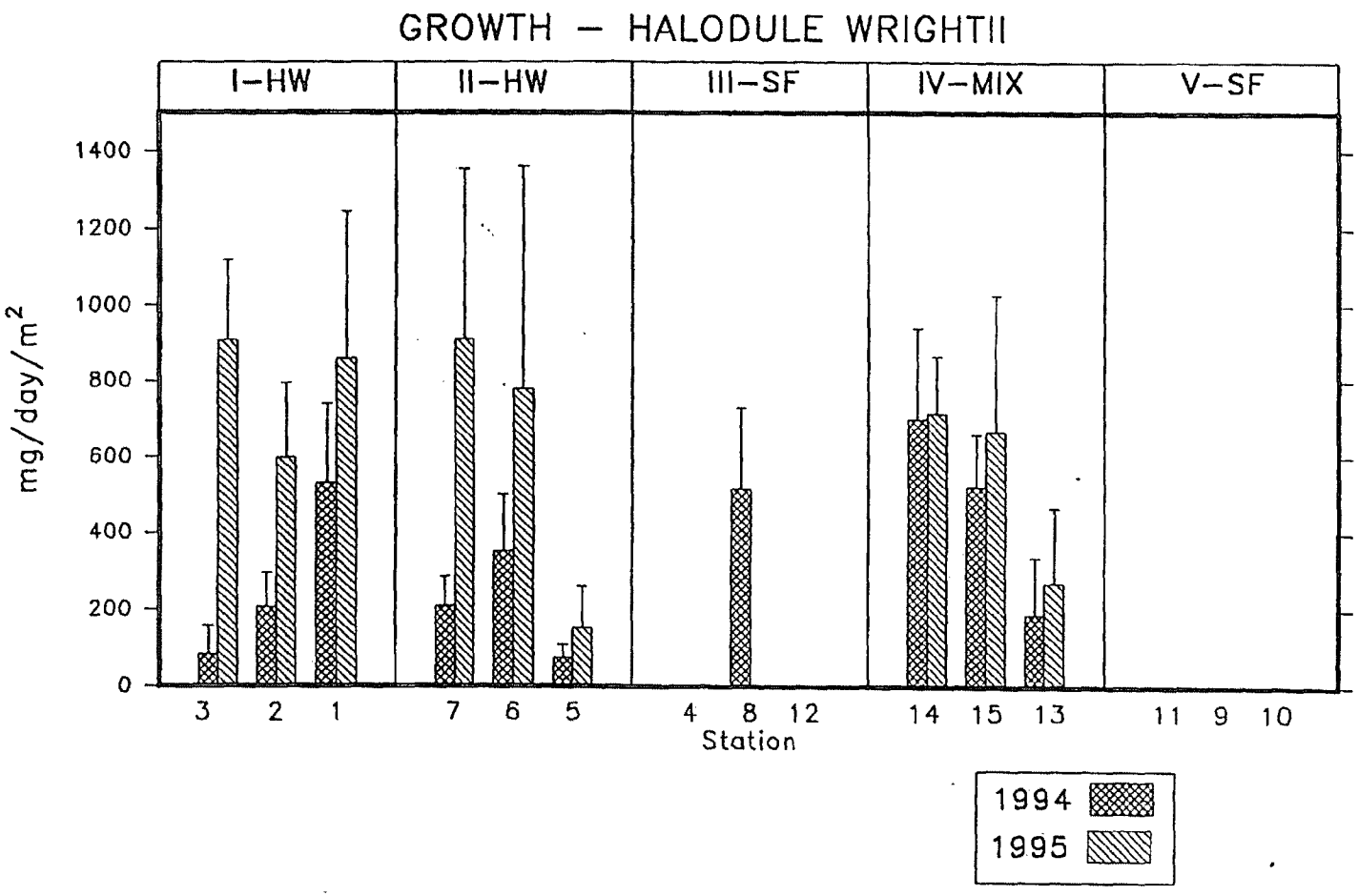

Figure 35. Dry weight biomass production (mg d^{-1} m^{-2}) for Halodule wrightii in August 1994 and 1995. Error bars represent + one standard deviation.

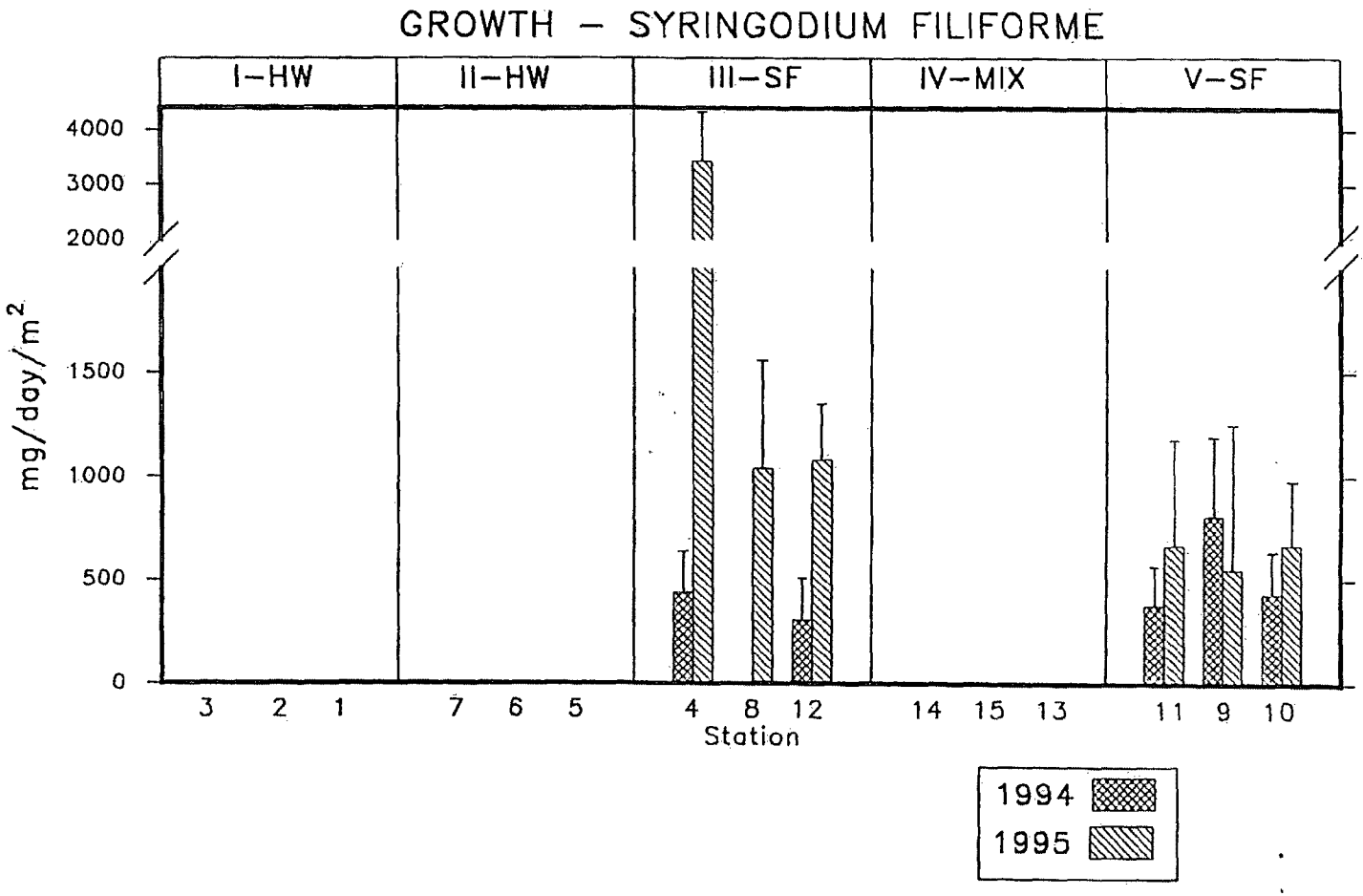

Figure 36. Dry weight biomass production (mg d^{-1} m^{-2}) for Syringodium filiforme in August 1994 and 1995. Error bars represent + one standard deviation.

Appendix Table I. Coordinates of seagrass survey transects.

Transect	Base Loran (45)	Base Loran (62)	End Loran (45)	End Loran (62)
1W	45230.38	62881.46	45230.49	62881.28
2W	45230.18	62883.19	45234.21	62883.08
3W	45232.58	62885.16	45240.93	62884.77
4W	45242.71	62886.86	45242.99	62886.69
5W	45236.43	62888.88	45241.70	62888.66
6W	45236.43	62889.10	45236.80	62889.20
7W	45233.27	62890.86	45233.29	62890.74
8W	45234.63	62892.21	45239.99	62893.91
9W	45236.71	62894.34	45247.41	62894.08
10W	45245.29	62896.76	45243.29	62896.82
11W	45254.70	62901.14	45253.71	62900.27
12W	45238.65	62896.69	45241.36	62896.41
13W	45266.69	62906.44	45271.22	62906.49
1N	45228.91	62880.74	45233.15	62884.81
2N	45255.38	62901.73	45253.71	62900.27

Appendix Table II. Water and sediment depths at the seagrass bed perimeters and differences in depths at 0, 1 and 2 meters from the bed edge.

		Water Depths (cm)					Sediment Depths (cm)				
Year	Station	0m	1m	2m	0m-1m	0m-2m	0m	1m	2m	0m-1m	0m-2m
1994	1	88	87	86	-1	-2	82	47	61	-35	-21
1994	1	86	89	85	3	-1	87	79	71	-8	-16
1994	1	89	91	87	2	-2	71	100	100	29	29
1994	1	88	88	88	0	0	100	100	48	0	-52
1994	1	90	90	89	0	-1	100	100	100	0	0
1994	1	91	91	91	0	0	100	100	82	0	-18
1994	1	93	94	95	1	2	28	70	100	42	72
1994	1	94	94	95	0	1	100	58	71	-42	-29
1994	1	90	90	90	0	0	100	100	100	0	0
1994	1	91	90	90	-1	-1	36	38	36	2	0
1994	1	89	90	89	1	0	20	18	20	-2	0
1994	1	82	80	81	-2	-1	58	60	50	2	-8
1994	1	85	85	84	0	-1	15	42	20	27	5
1995	1	42	41	42	-1	0	33	48	100	15	67
1995	1	43	48	44	5	1	21	100	64	79	43
1995	1	50	50	50	0	0	80	70	60	-10	-20
1995	1	54	53	50	-1	-4	31	66	100	35	69
1995	1	50	47	49	-3	-1	31	35	33	4	2
1994	2	80	79	80	-1	0	40	40	25	0	-15
1994	2	80	80	80	0	0	25	25	32	0	7
1994	2	80	80	81	0	1	34	33	35	-1	1
1994	2	81	81	81	0	0	26	30	28	4	2
1994	2	85	88	85	3	0	78	74	120	-4	42
1994	2	90	90	90	0	0	120	120	120	0	0
1994	2	90	90	90	0	0	71	101	71	30	0
1994	2	91	89	89	-2	-2	120	120	95	0	-25
1994	2	89	90	94	1	5	120	120	120	0	0
1994	2	90	88	90	-2	0	120	120	126	0	6
1994	2	90	90	90	0	0	90	80	99	-10	9
1994	2	88	89	90	1	2	70	43	82	-27	12
1994	2	90	90	90	0	0	76	71	94	-5	18
1994	2	90	90	89	0	-1	60	73	70	13	10
1994	2	89	89	88	0	-1	55	56	60	1	5
1995	2	82	82	80	0	-2	30	90	30	60	0
1995	2	79	80	81	1	2	76	86	91	10	15
1995	2	83	82	82	-1	-1	100	100	100	0	0
1995	2	83	81	90	-2	7	38	100	100	62	62
1995	2	84	83	85	-1	1	99	100	100	1	1
1994	3	70	70	69	0	-1	5	11	5	6	0
1994	3	68	70	70	2	2	12	8	5	-4	-7
1994	3	70	70	70	0	0	18	11	13	-7	-5
1994	3	75	70	75	-5	0	5	11	5	6	0
1994	3	70	70	70	0	0	5	12	18	7	13
1994	3	71	75	77	4	6	28	18	23	-10	-5
1994	3	70	70	75	0	5	12	12	5	0	-7
1994	3	70	72	70	2	0	3	10	7	7	4
1994	3	65	68	68	3	3	22	30	26	8	4
1995	3	62	63	64	1	2	5	4	9	-1	4
1995	3	61	65	65	4	4	13	7	1	-6	-12
1995	3	60	60	61	0	1	6	10	7	4	1

Appendix Table II. Continued.

Year	Station	Water Depths (cm) 0m	1m	2m	0m-1m	0m-2m	Sediment Depths (cm) 0m	1m	2m	0m-1m	0m-2m
1995	3	54	60	64	6	10	10	19	14	9	4
1995	3	55	56	59	1	4	18	11	61	-7	43
1994	4	82	80	80	-2	-2	2	1	0	-1	-2
1994	4	94	90	90	-4	-4	22	20	53	-2	31
1994	4	95	95	95	0	0	48	48	36	0	-12
1994	4	85	85	85	0	0	2	3	10	1	8
1994	4	90	90	86	0	-4	8	12	8	4	0
1994	4	85	85	80	0	-5	2	0	1	-2	-1
1994	4	87	80	80	-7	-7	10	0	0	-10	-10
1994	4	80	80	82	0	2	0	0	5	0	5
1994	5	125	125	130	0	5	150	160	150	10	0
1994	5	130	130	132	0	2	70	90	70	20	0
1994	5	130	140	135	10	5	100	100	90	0	-10
1994	5	130	135	135	5	5	100	100	100	0	0
1994	5	135	135	135	0	0	100	70	71	-30	-29
1994	5	130	130	135	0	5	85	65	70	-20	-15
1994	5	130	130	130	0	0	100	100	90	0	-10
1995	5	62	60	60	-2	-2	64	80	53	16	-11
1995	5	69	70	70	1	1	65	76	69	11	4
1995	5	66	65	65	-1	-1	73	73	70	0	-3
1995	5	62	64	63	2	1	87	80	83	-7	-4
1995	5	67	70	70	3	3	98	88	71	-10	-27
1994	6	105	104	105	-1	0	100	100	45	0	-55
1994	6	105	105	105	0	0	100	100	45	0	-55
1994	6	100	100	100	0	0	100	100	20	0	-80
1994	6	95	95	95	0	0	25	25	25	0	0
1994	6	95	95	95	0	0	15	17	15	2	0
1994	6	95	95	94	0	-1	50	40	52	-10	2
1994	6	100	104	100	4	0	N/A	N/A	N/A	0	0
1994	6	102	100	104	-2	2	25	48	58	23	33
1995	6	39	38	37	-1	-2	88	42	76	-46	-12
1995	6	37	36	37	-1	0	69	48	59	-21	-10
1995	6	36	36	36	0	0	34	17	24	-17	-10
1995	6	30	31	29	1	-1	9	13	4	4	-5
1995	6	34	35	35	1	1	71	20	43	-51	-28
1994	7	70	70	70	0	0	100	25	20	-75	-80
1994	7	70	70	70	0	0	22	15	25	-7	3
1994	7	70	70	70	0	0	45	40	30	-5	-15
1994	7	70	70	70	0	0	40	55	48	15	8
1994	7	100	100	95	0	-5	22	18	10	-4	-12
1994	7	90	90	100	0	10	25	15	12	-10	-13
1994	7	80	90	100	10	20	40	50	15	10	-25
1994	7	90	95	100	5	10	20	29	18	9	-2
1995	7	127	122	120	-5	-7	73	20	19	-53	-54
1995	7	123	120	123	-3	0	24	23	25	-1	1
1995	7	123	120	122	-3	-1	30	23	16	-7	-14
1995	7	122	123	122	1	0	24	25	22	1	-2
1995	7	122	126	123	4	1	23	32	30	9	7
1994	8	150	150	150	0	0	30	20	25	-10	-5
1994	8	150	150	150	0	0	30	30	20	0	-10
1994	8	150	150	150	0	0	23	27	15	4	-8
1994	8	150	150	150	0	0	20	20	15	0	-5

Appendix Table II. Continued.

Year	Station	Water Depths (cm) 0m	1m	2m	0m-1m	0m-2m	Sediment Depths (cm) 0m	1m	2m	0m-1m	0m-2m
1994	8	145	140	150	-5	5	17	16	18	-1	1
1994	8	150	150	150	0	0	7	12	12	5	5
1995	8	72	74	74	2	2	8	8	4	0	-4
1995	8	74	75	80	1	6	18	10	6	-8	-12
1995	8	73	75	78	2	5	5	21	20	16	15
1995	8	74	74	77	0	3	12	16	15	4	3
1995	8	72	71	75	-1	3	14	15	13	1	-1
1994	9	120	115	115	-5	-5	2	15	2	13	0
1994	9	128	127	125	-1	-3	10	10	18	0	8
1994	9	125	125	120	0	-5	15	2	10	-13	-5
1994	9	125	122	120	-3	-5	18	17	20	-1	2
1994	9	125	120	120	-5	-5	15	20	20	5	5
1994	9	125	122	122	-3	-3	20	6	10	-14	-10
1994	9	130	130	130	0	0	2	2	20	0	18
1994	9	130	132	130	2	0	13	12	13	-1	0
1995	9	136	137	134	1	-2	10	2	2	-8	-8
1995	9	135	135	132	0	-3	22	17	7	-5	-15
1995	9	130	132	130	2	0	11	7	4	-4	-7
1995	9	130	128	127	-2	-3	18	12	5	-6	-13
1995	9	124	122	121	-2	-3	8	11	4	3	-4
1994	10	105	105	105	0	0	14	2	2	-12	-12
1994	10	105	110	110	5	5	14	16	16	2	2
1994	10	115	115	115	0	0	5	3	6	-2	1
1994	10	120	120	120	0	0	25	13	15	-12	-10
1994	10	125	123	123	-2	-2	15	60	15	45	0
1994	10	120	120	122	0	2	20	18	7	-2	-13
1994	10	115	115	115	0	0	77	55	70	-22	-7
1994	10	113	115	115	2	2	115	120	120	5	5
1995	10	154	154	155	0	1	18	9	8	-9	-10
1995	10	158	156	156	-2	-2	28	4	11	-24	-17
1995	10	152	149	156	-3	4	20	32	29	12	9
1995	10	148	150	152	2	4	19	17	15	-2	-4
1995	10	154	152	150	-2	-4	43	100	100	57	57
1994	11	82	80	79	-2	-3	10	10	13	0	3
1994	11	80	75	78	-5	-2	8	3	1	-5	-7
1994	11	80	78	75	-2	-5	5	1	10	-4	5
1994	11	78	78	78	0	0	2	5	1	3	-1
1994	11	71	71	69	0	-2	8	4	7	-4	-1
1994	11	80	79	80	-1	0	20	1	5	-19	-15
1994	11	80	79	79	-1	-1	1	5	2	4	1
1994	11	79	80	80	1	1	5	5	5	0	0
1995	11	163	162	163	-1	0	5	0	0	-5	-5
1995	11	168	167	163	-1	-5	5	0	0	-5	-5
1995	11	164	160	166	-4	2	2	0	3	-2	1
1995	11	162	161	165	-1	3	8	0	2	-8	-6
1995	11	164	161	166	-3	2	5	5	0	0	-5
1994	12	118	115	115	-3	-3	5	7	12	2	7
1994	12	115	115	115	0	0	10	12	12	2	2
1994	12	116	120	120	4	4	6	20	10	14	4
1994	12	120	120	120	0	0	2	7	2	5	0
1994	12	118	118	115	0	-3	4	2	1	-2	-3
1994	12	112	110	110	-2	-2	4	10	8	6	4

Appendix Table II. Continued.

Year	Station	Water Depths (cm) 0m	1m	2m	0m-1m	0m-2m	Sediment Depths (cm) 0m	1m	2m	0m-1m	0m-2m
1994	12	101	105	101	4	0	9	5	5	-4	-4
1994	12	98	96	95	-2	-3	10	8	3	-2	-7
1995	12	108	111	108	3	0	11	6	8	-5	-3
1995	12	106	110	107	4	1	7	7	13	0	6
1995	12	111	113	112	2	1	11	3	2	-8	-9
1995	12	112	113	113	1	1	6	7	6	1	0
1995	12	108	108	110	0	2	4	8	1	4	-3
1994	13	80	75	80	-5	0	20	25	15	5	-5
1994	13	95	95	95	0	0	50	35	65	-15	15
1994	13	110	110	110	0	0	35	35	45	0	10
1994	13	120	120	120	0	0	22	22	25	0	3
1994	13	120	120	120	0	0	52	31	34	-21	-18
1994	13	115	115	115	0	0	75	55	60	-20	-15
1994	13	120	120	120	0	0	55	55	70	0	15
1994	13	120	120	120	0	0	56	58	65	2	9
1995	13	175	177	176	2	1	48	49	35	1	-13
1995	13	180	180	180	0	0	18	21	8	3	-10
1995	13	175	174	176	-1	1	9	9	12	0	3
1995	13	170	149	171	-21	1	7	9	14	2	7
1995	13	174	173	173	-1	-1	7	9	9	2	2
1994	14	80	80	85	0	5	20	110	45	90	25
1994	14	89	95	97	6	8	72	52	90	-20	18
1994	14	115	120	125	5	10	55	76	76	21	21
1994	14	130	140	160	10	30	140	120	130	-20	-10
1994	14	130	140	145	10	15	100	62	42	-38	-58
1994	14	130	140	145	10	15	40	30	35	-10	-5
1994	14	95	100	110	5	15	30	45	55	15	25
1994	14	80	82	82	2	2	10	5	25	-5	15
1994	14	68	72	75	4	7	19	5	5	-14	-14
1995	14	60	67	70	7	10	12	13	5	1	-7
1995	14	65	74	75	9	10	5	3	15	-2	10
1995	14	76	80	87	4	11	3	25	14	22	11
1995	14	96	103	105	7	9	43	70	35	27	-8
1995	14	130	138	138	8	8	41	63	38	22	-3
1994	15	90	90	95	0	5	5	5	5	0	0
1994	15	90	95	92	5	2	9	3	7	-6	-2
1994	15	90	95	90	5	0	8	11	8	3	0
1994	15	90	90	90	0	0	7	15	12	8	5
1994	15	90	90	90	0	0	5	8	12	3	7
1994	15	90	90	90	0	0	7	8	7	1	0
1994	15	95	90	90	-5	-5	19	8	6	-11	-13
1994	15	95	95	95	0	0	9	11	7	2	-2
1995	15	78	80	78	2	0	5	5	0	0	-5
1995	15	80	81	83	1	3	10	3	1	-7	-9
1995	15	78	78	78	0	0	9	3	9	-6	0
1995	15	74	77	77	3	3	6	10	10	4	4
1995	15	78	77	74	-1	-4	9	7	14	-2	5

Appendix Table III. Expansion or contraction of seagrass beds initially staked in December 1993. The "Perimeter and "Radius" distances identify the marker stakes.

Station	Perimeter ID	Radius ID	1994 Grass Expansion (m)	1995 Grass Expansion (m)
1	.0	15.7	3.10	-2.30
1	16.1	12.5	3.35	-1.60
1	27.2	10.2	2.10	3.30
1	40.3	8.7	2.20	4.50
1	54.0	8.5	2.20	3.10
1	73.0	10.3	-1.40	3.80
1	88.0	7.6	well inside bed	
1	99.0	7.4	well inside bed	
1	114.0	11.1	1.30	
1	130.0	14.0	3.10	5.20
1	138.7	16.6	1.60	5.00
1	149.0	18.9	4.10	4.50
1	166.5	21.5	1.50	2.00
1	184.8	19.3	.60	2.00
1	198.7	15.8	1.00	3.50
2	.0	12.7	.00	1.80
2	11.4	12.9	1.60	.40
2	21.6	14.0	.30	.00
2	32.1	11.5	3.30	.50
2	44.4	8.1	-.10	1.70
2	60.0	6.4	2.70	3.90
2	71.6	8.2	2.60	3.80
2	79.1	9.7	1.70	3.90
2	90.3	11.8	1.60	.00
2	99.2	13.9	.00	
2	105.1	13.8	.00	1.90
2	113.6	11.6	-2.30	.70
2	126.3	14.7	.00	1.20
2	139.4	15.9	.00	1.40
2	147.1	15.9	3.30	
3	.0	13.3	1.40	
3	10.7	12.3	-1.50	-1.10
3	22.8	11.1	.00	-1.20
3	34.9	9.1	.00	-3.60
3	43.1	7.3	-1.00	-5.40
3	62.2	8.4	-.30	-5.60
3	83.3	13.7	.00	-4.30
3	93.0	17.5	.02	-1.30
3	102.3	19.5	1.10	-.60
3	112.6	20.4	-.10	-.40
3	120.2	22.1	.00	-.60
3	132.6	22.6	-2.00	.00
3	141.6	22.7	-1.10	1.10
3	163.0	27.2	-1.10	3.20
3	176.2	31.3	-1.10	-3.20

Appendix Table III. Continued.

Station	Perimeter ID	Radius ID	1994 Grass Expansion (m)	1995 Grass Expansion (m)
4	.0	18.0	.50	N/A
4	9.5	15.4	-.50	N/A
4	20.4	12.5	.60	N/A
4	36.1	7.2	.10	N/A
4	50.5	4.3	-.60	N/A
4	57.5	2.1	.00	N/A
4	84.2	9.8	-.40	N/A
4	92.3	9.9	.00	N/A
4	97.8	10.4	.80	N/A
4	103.8	11.8	.40	N/A
4	108.8	12.9	.10	N/A
4	124.5	17.5	.10	N/A
4	132.3	18.4	.00	N/A
4	139.8	19.1	-.20	N/A
5	.0	9.2	.50	.00
5	5.8	8.5	.00	-2.90
5	13.5		-.50	-.90
5	21.6	10.8	.00	-1.40
5	31.6	12.5	-.20	-.90
5	38.8	11.4	.00	-.90
5	45.4	10.0	-.80	-2.90
5	52.0	8.4	-.60	-1.80
5	57.4	8.0	-.30	-3.20
5	63.5	7.3	.70	-4.30
5	70.8	8.2	-.60	-4.30
5	82.3	9.4	-1.00	
5	89.0	11.3	.00	
5	97.0	12.4	-.60	
5	102.3	14.4	-1.00	-1.20
5	111.2	14.8	.00	
6	.0	13.1	.70	-1.20
6	11.1	7.9	-.50	-5.90
6	18.6	7.9	-.70	-2.70
6	27.9	7.6	-.60	-1.40
6	33.4	7.6	2.30	-.95
6	40.6	8.1	.00	-1.00
6	54.6	10.7	.30	.00
6	66.4	13.5	2.00	1.10
6	72.8	15.4	.60	.00
6	84.5	18.9	-.40	-1.50
6	101.2	22.3	.00	.30
6	110.4	20.8	1.10	1.60
6	120.9	27.8	1.40	.00
7	.0	10.6	4.40	27.00
7	7.4	10.8	4.00	38.00
7	16.2	13.0	missing	
7	22.1	14.4	1.10	4.00

Appendix Table III. Continued.

Station	Perimeter ID	Radius ID	1994 Grass Expansion (m)	1995 Grass Expansion (m)
7	37.3	8.6	2.50	1.50
7	44.9	9.6	4.50	2.30
7	52.3	10.0	3.00	2.20
7	59.2	11.1	6.00	4.70
7	64.7	10.7	3.00	1.80
7	74.0	9.5	1.50	1.80
7	80.7	11.8	missing; not replaced	
7	93.4	14.2		2.30
7	101.0	15.4	.20	.00
7	107.0	11.9	.00	-1.10
7	116.8	18.4	.00	4.00
8	.0	11.8	14.00	.75
8	5.7	10.9	7.40	2.50
8	10.4	8.8	10.20	.70
8	13.6	N/A	--	
8	22.9	9.9	3.20	-.45
8	28.3	10.2	4.30	-1.50
8	43.9	9.8	7.20	-.45
8	48.7	9.2	7.60	-.60
8	57.6	8.6	8.50	-1.30
8	79.0	11.7	1.30	-1.10
8	86.6	11.9	1.40	
9	.0	25.5	--	
9	11.0	22.7	.20	
9	24.0	1880.0	.50	
9	37.3	15.4	.00	
9	49.6	12.4	found on leaving	
9	63.5	13.2	.00	.60
9	78.3	11.8	.60	.60
9	95.1	9.0	1.20	1.70
9	107.1	9.6	2.30	2.90
9	116.3	12.4	1.30	1.30
9	126.8	14.3	1.10	.90
9	136.9	16.3	.70	.00
9	145.1	18.1	.80	1.60
9	153.8	20.7	.80	1.80
9	160.4	22.4	1.10	1.10
9	167.4	24.1	1.00	1.40
10	.0	18.5	.40	.00
10	14.0	15.2	.25	-.10
10	25.1	12.2	.40	.00
10	36.8	9.0	.80	-2.80
10	48.2	6.3	replaced	-1.70
10	63.7	4.0	.10	-5.20
10	75.8	7.4	.30	
10	91.1	11.6	1.30	
10	101.0	14.1	.00	

Appendix Table III. Continued.

Station	Perimeter ID	Radius ID	1994 Grass Expansion (m)	1995 Grass Expansion (m)
10	118.8	18.7	.00	
10	126.0	20.2	1.20	
10	136.7	18.6	2.70	
10	149.4	15.1	.70	
10	158.0	12.8	.00	
10	166.3	10.4	1.80	
11	.0	12.8	1.00	.00
11	11.1	11.2	.50	.70
11	21.0	11.1	.40	.00
11	29.6	10.2	.70	-.40
11	40.6	12.1	.00	-.95
11	51.1	13.4	.70	-4.50
11	61.0	14.2	.30	-.25
11	81.0	8.8	.70	.50
11	87.6	8.2	.80	.50
11	97.0	8.9	.80	.70
11	104.2	8.8	.50	.80
11	115.0	12.5	.60	.90
12	.0	18.9	.00	.60
12	10.0	19.1	--	
12	18.5	20.2	.10	1.10
12	28.1	18.9	.50	.70
12	34.8	17.0	.55	.40
12	42.2	15.9	.40	1.00
12	52.5	14.3	.30	1.10
12	61.6	12.8	.40	.80
12	71.0	12.3	.80	.45
12	76.8	12.4	1.10	.50
12	85.5	12.6	-.90	3.00
12	92.6	12.6	-1.40	4.00
12	100.6	12.7	-.70	2.60
12	110.4	11.7	3.10	
12	124.3	14.8	.00	
13	.0	14.4	.00	.10
13	14.5	13.9	.00	-1.40
13	30.3	12.7	.00	.70
13	48.8	14.7	-1.40	.50
13	56.8	16.9	-4.00	2.10
13	63.9	18.8	-6.00	1.60
13	75.4	17.4	-1.30	1.30
13	80.5	17.9	-1.60	2.20
13	87.0	19.5	-1.50	
13	94.9	20.9	2.80	
13	105.5	20.6	4.40	
13	114.9	23.3	4.60	4.90
13	122.1	24.2	found on leaving	
13	127.5	24.9	4.60	8.70

Appendix Table III. Continued.

Station	Perimeter ID	Radius ID	1994 Grass Expansion (m)	1995 Grass Expansion (m)
14	.0	17.9	1.00	
14	11.9	14.4	.80	1.10
14	22.2	11.3	1.00	1.20
14	31.1	8.9	1.20	1.20
14	41.4	8.6	.80	.80
14	50.6	7.6	-.40	-1.30
14	59.1	5.0	1.40	1.20
14	69.5	4.2	.90	-.80
14	77.9	3.8	.00	.30
14	87.3	6.4	-.60	-.70
14	98.1	8.1	.00	.15
14	109.7	10.4	replaced	.00
14	119.9	13.5	.70	2.70
14	129.3	16.1	.20	.00
14	139.5	11.3	.70	1.50
14	149.2	10.6	.70	1.30
15	.0	19.0	2.70	2.30
15	9.4	17.7	.80	.40
15	19.3	15.3	.40	1.00
15	32.4	11.3	-.10	.00
15	41.4	9.2	.30	1.30
15	50.3	10.2	.00	2.00
15	62.0	6.7	1.40	2.00
15	69.8	4.3	.10	.50
15	80.2	5.0	.00	
15	90.1	6.2	.10	3.20
15	102.1	8.7	.00	1.10
15	109.4	10.8	.60	1.60
15	116.5	12.1	.35	1.40
15	125.0	14.6	.50	.00
15	133.6	17.1	1.30	1.80

Appendix Table IV. Vegetation coverage (percent) in seagrass beds for 1m2 quadrats along bed perimeters and 2 meters inside beds.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	1	1	I	43	43	0	Halodule wrightii	43
1993-12	1	2	I	93	93	0	Halodule wrightii	93
1993-12	1	2	P	74	74	0	Halodule wrightii	74
1993-12	1	3	I	85	85	0	Halodule wrightii	85
1993-12	1	3	P	89	89	0	Halodule wrightii	89
1993-12	1	4	I	97	97	0	Halodule wrightii	97
1993-12	1	4	P	79	79	0	Halodule wrightii	79
1993-12	1	5	I	71	71	0	Halodule wrightii	71
1993-12	1	5	P	79	79	0	Halodule wrightii	79
1993-12	1	6	I	96	96	0	Halodule wrightii	96
1993-12	1	6	P	82	82	0	Halodule wrightii	82
1993-12	1	7	I	94	94	0	Halodule wrightii	94
1993-12	1	7	P	87	87	0	Halodule wrightii	87
1993-12	1	8	I	96	96	0	Halodule wrightii	96
1993-12	1	8	P	73	73	0	Halodule wrightii	73
1993-12	1	9	I	90	90	0	Halodule wrightii	90
1993-12	1	9	P	73	73	0	Halodule wrightii	73
1993-12	1	10	I	35	35	0	Halodule wrightii	35
1993-12	1	10	P	80	80	0	Halodule wrightii	80
1994-08	1	1	I	100	100	0	Halodule wrightii	100
1994-08	1	1	P	100	100	0	Halodule wrightii	100
1994-08	1	2	I	100	100	0	Halodule wrightii	100
1994-08	1	2	P	100	100	0	Halodule wrightii	100
1994-08	1	3	I	100	100	0	Halodule wrightii	100
1994-08	1	3	P	100	100	0	Halodule wrightii	100
1994-08	1	4	I	100	100	0	Halodule wrightii	100
1994-08	1	4	P	100	100	0	Halodule wrightii	100
1994-08	1	5	I	100	100	0	Halodule wrightii	100
1994-08	1	5	P	100	100	0	Halodule wrightii	100
1994-08	1	6	I	100	100	0	Halodule wrightii	100
1994-08	1	6	P	100	100	0	Halodule wrightii	100
1994-08	1	7	I	100	100	0	Halodule wrightii	100
1994-08	1	7	P	100	100	0	Halodule wrightii	100
1994-08	1	8	I	100	100	0	Halodule wrightii	100
1994-08	1	8	P	100	100	0	Halodule wrightii	100
1994-08	1	9	I	100	100	0	Halodule wrightii	100
1994-08	1	9	P	100	100	0	Halodule wrightii	100
1994-08	1	10	I	100	100	0	Halodule wrightii	100
1994-08	1	10	P	100	100	0	Halodule wrightii	100
1994-10	1	1	I	54	54	0	Halodule wrightii	54
1994-10	1	1	P	71	71	0	Halodule wrightii	71
1994-10	1	2	I	99	99	0	Halodule wrightii	99
1994-10	1	2	P	100	100	0	Halodule wrightii	100
1994-10	1	3	I	77	77	0	Halodule wrightii	77
1994-10	1	3	P	96	96	0	Halodule wrightii	96
1994-10	1	4	I	97	97	0	Halodule wrightii	97
1994-10	1	4	P	100	100	0	Halodule wrightii	100
1994-10	1	5	I	99	99	0	Halodule wrightii	99
1994-10	1	5	P	99	99	0	Halodule wrightii	99
1994-10	1	6	I	100	100	0	Halodule wrightii	100
1994-10	1	6	P	96	96	0	Halodule wrightii	96
1994-10	1	7	I	100	100	0	Halodule wrightii	100
1994-10	1	7	P	100	100	0	Halodule wrightii	100
1994-10	1	8	I	99	99	0	Halodule wrightii	99
1994-10	1	8	P	99	99	0	Halodule wrightii	99

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	1	9	I	100	100	0	Halodule wrightii	100
1994-10	1	9	P	100	100	0	Halodule wrightii	100
1994-10	1	10	I	100	100	0	Halodule wrightii	100
1994-10	1	10	P	100	100	0	Halodule wrightii	100
1995-08	1	1	I	99	99	0	Halodule wrightii	99
1995-08	1	1	P	100	100	0	Halodule wrightii	100
1995-08	1	2	I	100	100	0	Halodule wrightii	100
1995-08	1	2	P	100	100	0	Halodule wrightii	100
1995-08	1	3	I	100	100	0	Halodule wrightii	100
1995-08	1	3	P	100	100	0	Halodule wrightii	100
1995-08	1	4	I	100	100	0	Halodule wrightii	100
1995-08	1	4	P	100	100	0	Halodule wrightii	100
1995-08	1	5	I	100	100	0	Halodule wrightii	100
1995-08	1	5	P	100	100	0	Halodule wrightii	100
1995-08	1	6	I	100	100	0	Halodule wrightii	100
1995-08	1	6	P	100	100	0	Halodule wrightii	100
1995-08	1	7	I	100	100	0	Halodule wrightii	100
1995-08	1	7	P	100	100	0	Halodule wrightii	100
1995-08	1	8	I	100	100	0	Halodule wrightii	100
1995-08	1	8	P	100	100	0	Halodule wrightii	100
1995-08	1	9	I	97	97	0	Halodule wrightii	97
1995-08	1	9	P	100	100	0	Halodule wrightii	100
1995-08	1	10	I	97	97	0	Halodule wrightii	97
1995-08	1	10	P	100	100	0	Halodule wrightii	100
1995-10	1	1	I	17	17	0	Halodule wrightii	17
1995-10	1	1	P	65	65	0	Halodule wrightii	65
1995-10	1	2	I	100	100	0	Halodule wrightii	100
1995-10	1	2	P	100	100	0	Halodule wrightii	100
1995-10	1	3	I	99	99	0	Halodule wrightii	99
1995-10	1	3	P	98	98	0	Halodule wrightii	98
1995-10	1	4	I	98	98	0	Halodule wrightii	98
1995-10	1	4	P	98	98	0	Halodule wrightii	98
1995-10	1	5	I	100	100	0	Halodule wrightii	100
1995-10	1	5	P	99	99	0	Halodule wrightii	99
1995-10	1	6	I	18	18	0	Halodule wrightii	18
1995-10	1	6	P	20	20	0	Halodule wrightii	20
1995-10	1	7	I	82	82	0	Halodule wrightii	82
1995-10	1	7	P	60	60	0	Halodule wrightii	60
1995-10	1	8	I	75	75	0	Halodule wrightii	75
1995-10	1	8	P	85	85	0	Halodule wrightii	85
1995-10	1	9	I	78	78	0	Halodule wrightii	78
1995-10	1	9	P	72	72	0	Halodule wrightii	72
1995-10	1	10	I	98	98	0	Halodule wrightii	98
1995-10	1	10	P	87	87	0	Halodule wrightii	87
1993-12	2	1	I	96	96	0	Halodule wrightii	96
1993-12	2	1	P	94	94	0	Halodule wrightii	94
1993-12	2	2	I	98	98	0	Halodule wrightii	98
1993-12	2	2	P	80	80	0	Halodule wrightii	80
1993-12	2	3	I	98	98	0	Halodule wrightii	98
1993-12	2	3	P	95	95	0	Halodule wrightii	95
1993-12	2	4	I	98	98	0	Halodule wrightii	98
1993-12	2	4	P	100	100	0	Halodule wrightii	100
1993-12	2	5	I	100	100	0	Halodule wrightii	100
1993-12	2	5	P	100	100	0	Halodule wrightii	100
1993-12	2	6	I	97	97	0	Halodule wrightii	97
1993-12	2	6	P	87	87	0	Halodule wrightii	87

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	2	7	I	95	95	0	Halodule wrightii	95
1993-12	2	7	P	93	93	0	Halodule wrightii	93
1993-12	2	8	I	96	96	0	Halodule wrightii	96
1993-12	2	8	P	82	82	0	Halodule wrightii	82
1993-12	2	9	I	92	92	0	Halodule wrightii	92
1993-12	2	9	P	83	83	0	Halodule wrightii	83
1993-12	2	10	I	94	94	0	Halodule wrightii	94
1993-12	2	10	P	57	57	0	Halodule wrightii	57
1994-08	2	1	I	92	92	0	Halodule wrightii	92
1994-08	2	1	P	94	94	0	Halodule wrightii	94
1994-08	2	2	I	100	100	0	Halodule wrightii	100
1994-08	2	2	P	100	100	0	Halodule wrightii	100
1994-08	2	3	I	100	100	0	Halodule wrightii	100
1994-08	2	3	P	100	100	0	Halodule wrightii	100
1994-08	2	4	I	100	100	0	Halodule wrightii	100
1994-08	2	4	P	100	100	0	Halodule wrightii	100
1994-08	2	5	I	100	100	0	Halodule wrightii	100
1994-08	2	5	P	100	100	0	Halodule wrightii	100
1994-08	2	6	I	100	100	0	Halodule wrightii	100
1994-08	2	6	P	100	100	0	Halodule wrightii	100
1994-08	2	7	I	100	100	0	Halodule wrightii	100
1994-08	2	7	P	100	100	0	Halodule wrightii	100
1994-08	2	8	I	100	100	0	Halodule wrightii	100
1994-08	2	8	P	100	100	0	Halodule wrightii	100
1994-08	2	9	I	99	99	0	Halodule wrightii	99
1994-08	2	9	P	100	100	0	Halodule wrightii	100
1994-08	2	10	I	98	98	0	Halodule wrightii	98
1994-08	2	10	P	96	96	0	Halodule wrightii	96
1994-10	2	1	I	93	93	0	Halodule wrightii	93
1994-10	2	1	P	85	85	0	Halodule wrightii	85
1994-10	2	2	I	96	96	0	Halodule wrightii	96
1994-10	2	2	P	93	93	0	Halodule wrightii	93
1994-10	2	3	I	92	92	0	Halodule wrightii	92
1994-10	2	3	P	92	92	0	Halodule wrightii	92
1994-10	2	4	I	100	100	0	Halodule wrightii	100
1994-10	2	4	P	98	98	0	Halodule wrightii	98
1994-10	2	5	I	100	100	0	Halodule wrightii	100
1994-10	2	5	P	96	96	0	Halodule wrightii	96
1994-10	2	6	I	99	99	0	Halodule wrightii	99
1994-10	2	6	P	65	65	0	Halodule wrightii	65
1994-10	2	7	I	99	99	0	Halodule wrightii	99
1994-10	2	7	P	81	81	0	Halodule wrightii	81
1994-10	2	8	I	100	100	0	Halodule wrightii	100
1994-10	2	8	P	50	50	0	Halodule wrightii	50
1994-10	2	9	I	97	97	0	Halodule wrightii	97
1994-10	2	9	P	87	87	0	Halodule wrightii	87
1994-10	2	10	I	95	95	0	Halodule wrightii	95
1994-10	2	10	P	68	68	0	Halodule wrightii	68
1995-08	2	1	I	97	97	0	Halodule wrightii	97
1995-08	2	1	P	100	100	0	Halodule wrightii	100
1995-08	2	2	I	99	99	0	Halodule wrightii	99
1995-08	2	2	P	100	100	0	Halodule wrightii	100
1995-08	2	3	I	100	100	0	Halodule wrightii	100
1995-08	2	3	P	100	100	0	Halodule wrightii	100
1995-08	2	4	I	100	100	0	Halodule wrightii	100
1995-08	2	4	P	91	91	0	Halodule wrightii	91

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	15	2	P	88	88	0	Halodule wrightii	88
1994-08	15	3	I	93	93	0	Halodule wrightii	93
1994-08	15	3	P	78	78	0	Halodule wrightii	78
1994-08	15	4	I	100	100	0	Halodule wrightii	100
1994-08	15	4	P	71	71	0	Halodule wrightii	71
1994-08	15	5	I	100	100	0	Halodule wrightii	100
1994-08	15	5	P	80	80	0	Halodule wrightii	80
1994-08	15	6	I	99	99	3	Halimeda incrassata	3
1994-08	15	6	I	99	99	3	Halodule wrightii	99
1994-08	15	6	P	99	99	3	Caulerpa prolifera	3
1994-08	15	6	P	99	99	3	Halodule wrightii	99
1994-08	15	7	I	99	99	2	Halimeda incrassata	2
1994-08	15	7	I	99	99	2	Halodule wrightii	99
1994-08	15	7	P	98	98	0	Halodule wrightii	98
1994-08	15	8	I	100	100	0	Halodule wrightii	100
1994-08	15	8	P	99	99	0	Halodule wrightii	99
1994-08	15	9	I	100	100	0	Halodule wrightii	100
1994-08	15	9	P	56	56	0	Halodule wrightii	56
1994-08	15	10	I	100	100	0	Halodule wrightii	100
1994-08	15	10	P	98	98	0	Halodule wrightii	98
1994-10	15	1	I	87	87	0	Thalassia testudinum	87
1994-10	15	1	P	87	87	0	Thalassia testudinum	87
1994-10	15	2	I	84	84	0	Thalassia testudinum	84
1994-10	15	2	P	91	91	0	Thalassia testudinum	91
1994-10	15	3	I	97	97	0	Halodule wrightii	97
1994-10	15	3	P	86	86	0	Halodule wrightii	86
1994-10	15	4	I	86	86	0	Halodule wrightii	86
1994-10	15	4	P	96	96	1	Halodule wrightii	96
1994-10	15	4	P	96	96	1	Udotea conglutinata	1
1994-10	15	5	I	100	100	0	Halodule wrightii	100
1994-10	15	5	P	100	100	0	Halodule wrightii	100
1994-10	15	6	I	100	100	0	Halodule wrightii	100
1994-10	15	6	I	100	100	0	Halophila englemannii	4
1994-10	15	6	P	91	91	0	Halodule wrightii	83
1994-10	15	6	P	91	91	0	Halophila englemannii	11
1994-10	15	7	I	100	96	22	Halimeda incrassata	22
1994-10	15	7	I	100	96	22	Halodule wrightii	96
1994-10	15	7	P	94	94	70	Halimeda incrassata	70
1994-10	15	7	P	94	94	70	Halodule wrightii	94
1994-10	15	8	I	100	65	98	Halimeda incrassata	98
1994-10	15	8	I	100	65	98	Halodule wrightii	65
1994-10	15	8	P	96	76	78	Halimeda incrassata	76
1994-10	15	8	P	96	76	78	Halodule wrightii	76
1994-10	15	8	P	96	76	78	Udotea conglutinata	2
1994-10	15	9	I	100	100	3	Halimeda incrassata	3
1994-10	15	9	I	100	100	3	Halodule wrightii	100
1994-10	15	9	P	100	95	23	Caulerpa prolifera	19
1994-10	15	9	P	100	95	23	Halimeda incrassata	2
1994-10	15	9	P	100	95	23	Halodule wrightii	95
1994-10	15	9	P	100	95	23	Udotea conglutinata	2
1994-10	15	10	I	97	97	0	Halodule wrightii	97
1994-10	15	10	P	97	95	3	Caulerpa prolifera	3
1994-10	15	10	P	97	95	3	Halodule wrightii	95
1995-08	15	1	I	58	58	0	Halodule wrightii	58
1995-08	15	1	P	92	92	0	Halodule wrightii	92
1995-08	15	2	I	95	95	0	Halodule wrightii	95

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-08	15	2	P	86	86	0	Halodule wrightii	86
1995-08	15	3	I	94	94	0	Halodule wrightii	94
1995-08	15	3	P	95	95	0	Halodule wrightii	95
1995-08	15	4	I	100	100	0	Halodule wrightii	100
1995-08	15	4	P	94	94	0	Halodule wrightii	94
1995-08	15	5	I	95	95	0	Halodule wrightii	95
1995-08	15	5	P	94	94	0	Halodule wrightii	94
1995-08	15	6	I	0	0	0	Bare	0
1995-08	15	6	P	21	21	0	Halodule wrightii	21
1995-08	15	7	I	100	100	0	Halodule wrightii	100
1995-08	15	7	P	75	75	0	Halodule wrightii	75
1995-08	15	8	I	100	100	0	Halodule wrightii	100
1995-08	15	8	P	94	94	0	Halodule wrightii	94
1995-08	15	9	I	97	97	0	Halodule wrightii	97
1995-08	15	9	P	98	98	0	Halodule wrightii	98
1995-08	15	10	I	100	100	0	Halodule wrightii	100
1995-08	15	10	P	98	98	0	Halodule wrightii	98
1995-10	15	1	I	42	42	0	Thalassia testudinum	42
1995-10	15	1	P	70	70	0	Thalassia testudinum	70
1995-10	15	2	I	88	88	0	Thalassia testudinum	88
1995-10	15	2	P	90	90	0	Thalassia testudinum	90
1995-10	15	3	I	100	100	0	Halodule wrightii	100
1995-10	15	3	I	100	100	0	Thalassia testudinum	4
1995-10	15	3	P	85	85	0	Halodule wrightii	10
1995-10	15	3	P	85	85	0	Thalassia testudinum	85
1995-10	15	4	I	100	100	0	Halodule wrightii	100
1995-10	15	4	P	100	100	0	Halodule wrightii	100
1995-10	15	5	I	99	99	0	Halodule wrightii	99
1995-10	15	5	P	99	99	0	Halodule wrightii	99
1995-10	15	6	I	98	98	0	Halodule wrightii	98
1995-10	15	6	P	80	80	0	Halodule wrightii	80
1995-10	15	7	I	25	25	0	Halodule wrightii	25
1995-10	15	7	P	93	93	0	Halodule wrightii	93
1995-10	15	8	I	20	20	0	Halodule wrightii	20
1995-10	15	8	P	88	88	0	Halodule wrightii	88
1995-10	15	9	I	0	0	0	Bare	0
1995-10	15	9	P	68	68	0	Halodule wrightii	68
1995-10	15	10	I	98	98	0	Halodule wrightii	98
1995-10	15	10	P	77	77	0	Halodule wrightii	77

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-08	2	5	I	88	88	0	Halodule wrightii	88
1995-08	2	5	P	97	97	0	Halodule wrightii	97
1995-08	2	6	I	85	85	0	Halodule wrightii	85
1995-08	2	6	P	83	83	0	Halodule wrightii	83
1995-08	2	7	I	95	95	0	Halodule wrightii	95
1995-08	2	7	P	93	93	0	Halodule wrightii	93
1995-08	2	8	I	90	90	0	Halodule wrightii	90
1995-08	2	8	P	65	65	0	Halodule wrightii	65
1995-08	2	9	I	98	98	0	Halodule wrightii	98
1995-08	2	9	P	75	75	0	Halodule wrightii	75
1995-08	2	10	I	97	97	0	Halodule wrightii	97
1995-08	2	10	P	89	89	0	Halodule wrightii	89
1995-10	2	1	I	35	35	0	Halodule wrightii	35
1995-10	2	1	P	48	48	0	Halodule wrightii	48
1995-10	2	2	I	75	75	0	Halodule wrightii	75
1995-10	2	2	P	8	8	0	Halodule wrightii	8
1995-10	2	3	I	22	22	0	Halodule wrightii	22
1995-10	2	3	P	82	82	0	Halodule wrightii	82
1995-10	2	4	I	55	55	0	Halodule wrightii	55
1995-10	2	4	P	62	62	0	Halodule wrightii	62
1995-10	2	5	I	80	80	0	Halodule wrightii	80
1995-10	2	5	P	49	49	0	Halodule wrightii	49
1995-10	2	6	I	2	2	0	Halodule wrightii	2
1995-10	2	6	P	2	2	0	Halodule wrightii	2
1995-10	2	7	I	97	97	0	Halodule wrightii	97
1995-10	2	7	P	99	99	0	Halodule wrightii	99
1995-10	2	8	I	45	45	0	Halodule wrightii	45
1995-10	2	8	P	65	65	0	Halodule wrightii	65
1995-10	2	9	I	45	45	0	Halodule wrightii	45
1995-10	2	9	P	15	15	0	Halodule wrightii	15
1995-10	2	10	I	15	15	0	Halodule wrightii	15
1995-10	2	10	P	10	10	0	Halodule wrightii	10
1993-12	3	1	I	88	88	0	Halodule wrightii	88
1993-12	3	1	P	70	70	0	Halodule wrightii	70
1993-12	3	2	I	87	87	0	Halodule wrightii	87
1993-12	3	2	P	84	84	0	Halodule wrightii	84
1993-12	3	3	I	100	100	0	Halodule wrightii	100
1993-12	3	3	P	92	92	0	Halodule wrightii	92
1993-12	3	4	I	100	100	0	Halodule wrightii	100
1993-12	3	4	P	94	94	0	Halodule wrightii	94
1993-12	3	5	I	98	98	0	Halodule wrightii	98
1993-12	3	5	P	64	64	0	Halodule wrightii	64
1993-12	3	6	I	81	81	0	Halodule wrightii	81
1993-12	3	6	P	84	84	0	Halodule wrightii	84
1993-12	3	7	I	91	91	0	Halodule wrightii	91
1993-12	3	7	P	98	98	0	Halodule wrightii	98
1993-12	3	8	I	100	100	0	Halodule wrightii	100
1993-12	3	8	P	46	46	0	Halodule wrightii	46
1993-12	3	9	I	100	100	0	Halodule wrightii	100
1993-12	3	9	P	93	93	0	Halodule wrightii	93
1993-12	3	10	I	92	92	0	Halodule wrightii	92
1993-12	3	10	P	76	76	0	Halodule wrightii	76
1994-08	3	1	I	30	30	0	Halodule wrightii	30
1994-08	3	1	P	46	46	0	Halodule wrightii	46
1994-08	3	2	I	25	25	0	Halodule wrightii	25
1994-08	3	2	P	15	15	0	Halodule wrightii	15

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	3	3	I	81	81	0	Halodule wrightii	81
1994-08	3	3	P	64	64	0	Halodule wrightii	64
1994-08	3	4	I	36	36	0	Halodule wrightii	36
1994-08	3	4	P	28	28	0	Halodule wrightii	28
1994-08	3	5	I	30	30	0	Halodule wrightii	30
1994-08	3	5	P	54	54	0	Halodule wrightii	54
1994-08	3	6	I	15	15	0	Halodule wrightii	15
1994-08	3	6	P	0	0	0	Halodule wrightii	0
1994-08	3	7	I	15	15	0	Halodule wrightii	15
1994-08	3	7	P	80	80	0	Halodule wrightii	80
1994-08	3	8	I	90	90	0	Halodule wrightii	90
1994-08	3	8	P	65	65	0	Halodule wrightii	65
1994-08	3	9	I	20	20	0	Halodule wrightii	20
1994-08	3	9	P	42	42	0	Halodule wrightii	42
1994-08	3	10	I	27	27	0	Halodule wrightii	27
1994-08	3	10	P	26	26	0	Halodule wrightii	26
1994-10	3	1	I	26	26	0	Halodule wrightii	26
1994-10	3	1	P	22	22	0	Halodule wrightii	22
1994-10	3	2	I	8	8	0	Halodule wrightii	8
1994-10	3	2	P	6	6	0	Halodule wrightii	6
1994-10	3	3	I	6	6	0	Halodule wrightii	6
1994-10	3	3	P	91	91	0	Halodule wrightii	91
1994-10	3	4	I	12	12	0	Halodule wrightii	12
1994-10	3	4	P	72	72	0	Halodule wrightii	72
1994-10	3	5	I	16	16	0	Halodule wrightii	16
1994-10	3	5	P	17	17	0	Halodule wrightii	17
1994-10	3	6	I	55	55	0	Halodule wrightii	55
1994-10	3	6	P	46	46	0	Halodule wrightii	46
1994-10	3	7	I	96	96	0	Halodule wrightii	96
1994-10	3	7	P	28	28	0	Halodule wrightii	28
1994-10	3	8	I	74	74	0	Halodule wrightii	74
1994-10	3	8	P	4	4	0	Halodule wrightii	4
1994-10	3	9	I	86	86	0	Halodule wrightii	86
1994-10	3	9	P	0	0	0	Bare	0
1994-10	3	10	I	74	74	0	Halodule wrightii	74
1994-10	3	10	P	61	61	0	Halodule wrightii	61
1995-08	3	1	I	45	45	0	Halodule wrightii	45
1995-08	3	1	P	51	51	0	Halodule wrightii	51
1995-08	3	2	I	0	0	0	Bare	0
1995-08	3	2	P	3	3	0	Halodule wrightii	3
1995-08	3	3	I	2	2	0	Halodule wrightii	2
1995-08	3	3	P	26	26	0	Halodule wrightii	26
1995-08	3	4	I	21	21	0	Halodule wrightii	21
1995-08	3	4	P	0	0	0	Halodule wrightii	0
1995-08	3	5	I	13	13	0	Halodule wrightii	13
1995-08	3	5	P	26	26	0	Halodule wrightii	26
1995-08	3	6	I	95	95	0	Halodule wrightii	95
1995-08	3	6	P	4	4	0	Halodule wrightii	4
1995-08	3	7	I	7	7	0	Halodule wrightii	7
1995-08	3	7	P	0	0	0	Bare	0
1995-08	3	8	I	1	1	0	Halodule wrightii	1
1995-08	3	8	P	0	0	0	Bare	0
1995-08	3	9	I	0	0	0	Bare	0
1995-08	3	9	P	1	1	0	Halodule wrightii	1
1995-08	3	10	I	11	11	0	Halodule wrightii	11
1995-08	3	10	P	0	0	0	Bare	0

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-10	3	1	I	0	0	0	Bare	0
1995-10	3	1	P	2	2	0	Halodule wrightii	2
1995-10	3	2	I	2	2	0	Halodule wrightii	2
1995-10	3	2	P	0	0	0	Halodule wrightii	0
1995-10	3	3	I	5	5	0	Halodule wrightii	5
1995-10	3	3	P	1	1	0	Halodule wrightii	1
1995-10	3	4	I	93	93	0	Halodule wrightii	93
1995-10	3	4	P	82	82	0	Halodule wrightii	82
1995-10	3	5	I	100	100	0	Halodule wrightii	100
1995-10	3	5	P	94	94	0	Halodule wrightii	94
1995-10	3	6	I	13	13	0	Halodule wrightii	13
1995-10	3	6	P	29	29	0	Halodule wrightii	29
1995-10	3	7	I	4	4	0	Halodule wrightii	4
1995-10	3	7	P	2	2	0	Halodule wrightii	2
1995-10	3	8	I	100	100	0	Halodule wrightii	100
1995-10	3	8	P	100	100	0	Halodule wrightii	100
1995-10	3	9	I	99	99	0	Halodule wrightii	99
1995-10	3	9	P	98	98	0	Halodule wrightii	98
1995-10	3	10	I	100	100	0	Halodule wrightii	100
1995-10	3	10	P	0	0	0	Bare	0
1993-12	4	1	I	84	84	0	Syringodium filiforme	84
1993-12	4	1	P	92	92	0	Syringodium filiforme	92
1993-12	4	2	I	74	74	0	Syringodium filiforme	74
1993-12	4	2	P	71	71	0	Syringodium filiforme	71
1993-12	4	3	I	71	71	0	Syringodium filiforme	71
1993-12	4	3	P	68	68	0	Syringodium filiforme	68
1993-12	4	4	I	87	87	0	Syringodium filiforme	87
1993-12	4	4	P	66	66	0	Halophila englemannii	1
1993-12	4	4	P	66	66	0	Syringodium filiforme	65
1993-12	4	5	I	94	94	0	Syringodium filiforme	94
1993-12	4	5	P	73	73	0	Syringodium filiforme	73
1993-12	4	6	I	96	96	0	Syringodium filiforme	96
1993-12	4	6	P	78	78	0	Syringodium filiforme	78
1993-12	4	7	I	89	87	2	Caulerpa prolifera	2
1993-12	4	7	I	89	87	2	Syringodium filiforme	87
1993-12	4	7	P	70	70	0	Syringodium filiforme	70
1993-12	4	8	I	95	95	5	Caulerpa prolifera	5
1993-12	4	8	I	95	95	5	Syringodium filiforme	90
1993-12	4	8	P	89	89	0	Syringodium filiforme	89
1993-12	4	9	I	83	83	0	Syringodium filiforme	83
1993-12	4	9	P	90	90	0	Syringodium filiforme	90
1994-08	4	1	I	100	100	0	Syringodium filiforme	100
1994-08	4	1	P	98	98	0	Syringodium filiforme	98
1994-08	4	2	I	94	94	0	Syringodium filiforme	94
1994-08	4	2	P	73	73	0	Syringodium filiforme	73
1994-08	4	3	I	58	58	0	Syringodium filiforme	58
1994-08	4	3	P	91	91	0	Syringodium filiforme	91
1994-08	4	4	I	83	83	0	Syringodium filiforme	83
1994-08	4	4	P	70	70	0	Syringodium filiforme	70
1994-08	4	5	I	58	58	0	Syringodium filiforme	58
1994-08	4	5	P	48	48	0	Syringodium filiforme	48
1994-08	4	6	I	84	84	0	Syringodium filiforme	84
1994-08	4	6	P	76	76	0	Syringodium filiforme	76
1994-08	4	7	I	95	95	0	Syringodium filiforme	95
1994-08	4	7	P	76	76	0	Syringodium filiforme	76
1994-08	4	8	I	18	18	0	Syringodium filiforme	18

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	4	8	P	80	80	0	Halophila englemannii	1
1994-08	4	8	P	80	80	0	Syringodium filiforme	80
1994-08	4	9	I	91	91	0	Syringodium filiforme	91
1994-08	4	9	P	96	96	0	Syringodium filiforme	96
1994-08	4	10	I	44	44	0	Syringodium filiforme	44
1994-08	4	10	P	21	21	0	Syringodium filiforme	21
1994-10	4	1	I	99	99	0	Syringodium filiforme	99
1994-10	4	1	P	92	92	8	Halimeda incrassata	3
1994-10	4	1	P	92	92	8	Syringodium filiforme	92
1994-10	4	1	P	92	92	8	Udotea conglutinata	5
1994-10	4	2	I	83	83	9	Halimeda incrassata	3
1994-10	4	2	I	83	83	9	Halophila englemannii	6
1994-10	4	2	I	83	83	9	Syringodium filiforme	83
1994-10	4	2	P	78	78	0	Syringodium filiforme	78
1994-10	4	3	I	87	87	0	Syringodium filiforme	87
1994-10	4	3	P	75	75	0	Syringodium filiforme	75
1994-10	4	4	I	88	88	3	Halimeda incrassata	3
1994-10	4	4	I	88	88	3	Syringodium filiforme	88
1994-10	4	4	P	91	89	2	Caulerpa prolifera	2
1994-10	4	4	P	91	89	2	Syringodium filiforme	89
1994-10	4	5	I	2	2	0	Syringodium filiforme	2
1994-10	4	5	P	57	57	0	Syringodium filiforme	57
1994-10	4	6	I	22	22	0	Syringodium filiforme	22
1994-10	4	6	P	13	13	0	Syringodium filiforme	13
1994-10	4	7	I	79	78	1	Caulerpa prolifera	1
1994-10	4	7	I	79	78	1	Syringodium filiforme	78
1994-10	4	7	P	89	89	2	Caulerpa prolifera	2
1994-10	4	7	P	89	89	2	Syringodium filiforme	89
1994-10	4	8	I	88	88	0	Syringodium filiforme	88
1994-10	4	8	P	100	100	14	Caulerpa prolifera	8
1994-10	4	8	P	100	100	14	Penicillus sp.	2
1994-10	4	8	P	100	100	14	Syringodium filiforme	4
1994-10	4	8	P	100	100	14	Syringodium filiforme	100
1994-10	4	9	I	30	30	0	Syringodium filiforme	30
1994-10	4	9	P	80	80	0	Syringodium filiforme	80
1994-10	4	10	I	94	94	0	Syringodium filiforme	94
1994-10	4	10	P	92	92	2	Caulerpa prolifera	1
1994-10	4	10	P	92	92	2	Halimeda incrassata	1
1994-10	4	10	P	92	92	2	Syringodium filiforme	92
1995-08	4	1	I	97	97	0	Syringodium filiforme	97
1995-08	4	1	P	98	98	0	Syringodium filiforme	98
1995-08	4	2	I	93	93	0	Syringodium filiforme	93
1995-08	4	2	P	96	96	0	Syringodium filiforme	96
1995-08	4	3	I	98	98	0	Syringodium filiforme	98
1995-08	4	3	P	83	83	0	Syringodium filiforme	83
1995-08	4	4	I	100	100	0	Syringodium filiforme	100
1995-08	4	4	P	98	98	0	Syringodium filiforme	98
1995-08	4	5	I	100	100	0	Syringodium filiforme	100
1995-08	4	5	P	97	97	0	Syringodium filiforme	97
1995-08	4	6	I	100	100	0	Syringodium filiforme	100
1995-08	4	6	P	97	97	0	Syringodium filiforme	97
1995-08	4	7	I	98	98	0	Syringodium filiforme	98
1995-08	4	7	P	100	100	0	Syringodium filiforme	100
1995-08	4	8	I	96	96	0	Syringodium filiforme	96
1995-08	4	8	P	97	97	0	Syringodium filiforme	97
1995-08	4	9	I	99	99	1	Caulerpa prolifera	1

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-08	4	9	I	99	99	1	Halodule wrightii	1
1995-08	4	9	I	99	99	1	Syringodium filiforme	99
1995-08	4	9	P	96	96	0	Syringodium filiforme	96
1995-08	4	10	I	98	98	0	Syringodium filiforme	98
1995-08	4	10	P	86	86	0	Syringodium filiforme	86
1993-12	5	1	I	40	40	0	Halodule wrightii	40
1993-12	5	1	P	92	92	0	Halodule wrightii	92
1993-12	5	2	I	96	96	0	Halodule wrightii	96
1993-12	5	2	P	93	93	0	Halodule wrightii	93
1993-12	5	3	I	91	91	0	Halodule wrightii	91
1993-12	5	3	P	93	93	0	Halodule wrightii	93
1993-12	5	4	I	93	93	0	Halodule wrightii	93
1993-12	5	4	P	83	83	0	Halodule wrightii	83
1993-12	5	5	I	84	84	0	Halodule wrightii	84
1993-12	5	5	P	88	88	0	Halodule wrightii	88
1993-12	5	6	I	77	77	0	Halodule wrightii	77
1993-12	5	6	P	89	89	0	Halodule wrightii	89
1993-12	5	7	I	80	80	0	Halodule wrightii	80
1993-12	5	7	P	88	88	0	Halodule wrightii	88
1993-12	5	8	I	79	79	0	Halodule wrightii	79
1993-12	5	8	P	100	100	0	Halodule wrightii	100
1993-12	5	9	I	96	96	0	Halodule wrightii	96
1993-12	5	9	P	88	88	0	Halodule wrightii	88
1993-12	5	10	I	96	96	0	Halodule wrightii	96
1993-12	5	10	P	90	90	0	Halodule wrightii	90
1994-08	5	1	I	50	50	0	Halodule wrightii	50
1994-08	5	1	P	56	56	0	Halodule wrightii	56
1994-08	5	2	I	65	65	0	Halodule wrightii	65
1994-08	5	2	P	53	53	0	Halodule wrightii	53
1994-08	5	3	I	18	18	0	Halodule wrightii	18
1994-08	5	3	P	71	71	3	Caulerpa prolifera	3
1994-08	5	3	P	71	71	0	Halodule wrightii	71
1994-08	5	4	I	9	9	0	Halodule wrightii	9
1994-08	5	4	P	48	48	0	Halodule wrightii	48
1994-08	5	5	I	16	16	0	Halodule wrightii	16
1994-08	5	5	P	37	37	0	Halodule wrightii	37
1994-08	5	6	I	74	74	0	Halodule wrightii	74
1994-08	5	6	P	50	50	0	Halodule wrightii	50
1994-08	5	7	I	98	98	0	Halodule wrightii	98
1994-08	5	7	P	85	85	0	Halodule wrightii	85
1994-08	5	8	I	85	85	0	Halodule wrightii	85
1994-08	5	8	P	74	74	0	Halodule wrightii	74
1994-08	5	9	I	4	4	0	Halodule wrightii	4
1994-08	5	9	P	55	55	0	Halodule wrightii	55
1994-08	5	10	I	78	78	0	Halodule wrightii	78
1994-08	5	10	P	57	57	0	Halodule wrightii	57
1994-10	5	1	I	24	24	0	Halodule wrightii	24
1994-10	5	1	P	46	46	0	Halodule wrightii	46
1994-10	5	2	I	29	29	0	Halodule wrightii	29
1994-10	5	2	P	52	52	0	Halodule wrightii	52
1994-10	5	3	I	60	60	0	Halodule wrightii	60
1994-10	5	3	P	14	14	0	Halodule wrightii	14
1994-10	5	4	I	51	51	0	Halodule wrightii	51
1994-10	5	4	P	15	15	0	Halodule wrightii	15
1994-10	5	5	I	53	53	0	Halodule wrightii	53
1994-10	5	5	P	22	22	0	Halodule wrightii	22

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	5	6	I	6	5	0	Halodule wrightii	5
1994-10	5	6	I	6	5	0	Halophila englemannii	1
1994-10	5	6	P	73	73	0	Halodule wrightii	73
1994-10	5	7	I	19	19	0	Halodule wrightii	19
1994-10	5	7	P	13	13	0	Halodule wrightii	13
1994-10	5	8	I	15	15	0	Halodule wrightii	15
1994-10	5	8	P	8	8	0	Halodule wrightii	8
1994-10	5	9	I	84	84	0	Halodule wrightii	84
1994-10	5	9	P	12	12	0	Halodule wrightii	12
1994-10	5	10	I	86	86	0	Halodule wrightii	86
1994-10	5	10	P	6	6	0	Halodule wrightii	6
1995-08	5	1	I	5	5	0	Halodule wrightii	5
1995-08	5	1	P	60	60	0	Halodule wrightii	60
1995-08	5	2	I	0	0	0	Bare	0
1995-08	5	2	P	16	16	0	Halodule wrightii	16
1995-08	5	3	I	17	16	1	Caulerpa mexicana	1
1995-08	5	3	I	17	16	1	Halodule wrightii	16
1995-08	5	3	P	2	1	1	Caulerpa prolifera	1
1995-08	5	3	P	2	1	1	Halodule wrightii	1
1995-08	5	4	I	7	7	0	Halodule wrightii	7
1995-08	5	4	P	6	6	0	Halodule wrightii	6
1995-08	5	5	I	3	3	0	Halodule wrightii	3
1995-08	5	5	P	1	1	0	Halodule wrightii	1
1995-08	5	6	I	5	5	0	Halodule wrightii	5
1995-08	5	6	P	0	0	0	Bare	0
1995-08	5	7	I	14	14	0	Halodule wrightii	14
1995-08	5	7	P	3	3	0	Halodule wrightii	3
1995-08	5	8	I	5	5	0	Halodule wrightii	5
1995-08	5	8	P	0	0	0	Bare	0
1995-08	5	9	I	4	4	0	Halodule wrightii	4
1995-08	5	9	P	0	0	0	Bare	0
1995-08	5	10	I	3	3	0	Halodule wrightii	3
1995-08	5	10	P	0	0	0	Bare	0
1995-10	5	1	I	1	1	0	Halodule wrightii	1
1995-10	5	1	P	3	3	0	Halodule wrightii	3
1995-10	5	2	I	13	13	0	Halodule wrightii	13
1995-10	5	2	P	0	0	0	Bare	0
1995-10	5	3	I	0	0	0	Bare	0
1995-10	5	3	P	1	1	0	Halodule wrightii	1
1995-10	5	4	I	0	0	0	Bare	0
1995-10	5	4	P	2	2	0	Halodule wrightii	2
1995-10	5	5	I	3	3	0	Halodule wrightii	3
1995-10	5	5	P	1	1	0	Halodule wrightii	1
1995-10	5	6	I	0	0	0	Bare	0
1995-10	5	6	P	10	10	0	Halodule wrightii	10
1995-10	5	7	I	4	4	0	Halodule wrightii	4
1995-10	5	7	P	4	4	0	Halodule wrightii	4
1995-10	5	8	I	29	29	0	Halodule wrightii	29
1995-10	5	8	P	3	3	0	Halodule wrightii	3
1995-10	5	9	I	1	1	0	Halodule wrightii	1
1995-10	5	9	P	5	5	0	Halodule wrightii	5
1995-10	5	10	I	6	6	0	Halodule wrightii	6
1995-10	5	10	P	2	2	0	Halodule wrightii	2
1993-12	6	1	I	100	100	0	Halodule wrightii	100
1993-12	6	1	P	100	100	0	Halodule wrightii	100
1993-12	6	2	I	97	97	0	Halodule wrightii	59

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1993-12	6	2	I	97	97	0	Halophila englemannii	38
1993-12	6	2	P	75	75	0	Halodule wrightii	75
1993-12	6	3	I	99	99	0	Halodule wrightii	99
1993-12	6	3	I	99	99	0	Halophila englemannii	1
1993-12	6	3	P	83	83	0	Halodule wrightii	83
1993-12	6	3	P	83	83	0	Halophila englemannii	10
1993-12	6	4	I	100	100	0	Halodule wrightii	100
1993-12	6	4	P	94	94	0	Halodule wrightii	92
1993-12	6	4	P	94	94	0	Halophila englemannii	2
1993-12	6	5	I	99	99	0	Halodule wrightii	99
1993-12	6	5	P	90	90	0	Halodule wrightii	90
1993-12	6	6	I	99	99	0	Halodule wrightii	99
1993-12	6	6	P	98	98	0	Halodule wrightii	97
1993-12	6	6	P	98	98	0	Halophila englemannii	1
1993-12	6	7	I	99	99	0	Halodule wrightii	99
1993-12	6	7	P	94	94	0	Halodule wrightii	94
1993-12	6	8	I	99	99	0	Halodule wrightii	99
1993-12	6	8	P	98	98	0	Halodule wrightii	98
1993-12	6	9	I	98	98	0	Halodule wrightii	98
1993-12	6	9	P	93	93	0	Halodule wrightii	93
1993-12	6	9	P	93	93	0	Halophila englemannii	15
1994-08	6	1	I	85	85	0	Halodule wrightii	85
1994-08	6	1	I	85	85	0	Halophila englemannii	4
1994-08	6	1	P	66	66	0	Halodule wrightii	66
1994-08	6	1	P	66	66	0	Halophila englemannii	3
1994-08	6	2	I	81	81	0	Halodule wrightii	81
1994-08	6	2	I	81	81	0	Halophila englemannii	1
1994-08	6	2	P	63	63	0	Halodule wrightii	63
1994-08	6	2	P	63	63	0	Halophila englemannii	1
1994-08	6	3	I	97	97	0	Halodule wrightii	97
1994-08	6	3	P	93	93	0	Halodule wrightii	93
1994-08	6	3	P	93	93	0	Halophila englemannii	7
1994-08	6	4	I	92	92	0	Halodule wrightii	92
1994-08	6	4	I	92	92	0	Halophila englemannii	6
1994-08	6	4	P	92	92	0	Halodule wrightii	92
1994-08	6	4	P	92	92	0	Halophila englemannii	5
1994-08	6	5	I	91	91	0	Halodule wrightii	91
1994-08	6	5	I	91	91	0	Halophila englemannii	1
1994-08	6	5	P	84	84	0	Halodule wrightii	84
1994-08	6	5	P	84	84	0	Halophila englemannii	6
1994-08	6	6	I	99	99	0	Halodule wrightii	99
1994-08	6	6	P	92	92	0	Halodule wrightii	92
1994-08	6	7	I	95	95	0	Halodule wrightii	95
1994-08	6	7	I	95	95	0	Halophila englemannii	5
1994-08	6	7	P	94	94	0	Halodule wrightii	94
1994-08	6	7	P	94	94	0	Halophila englemannii	3
1994-08	6	8	I	100	100	0	Halodule wrightii	100
1994-08	6	8	P	98	98	0	Halodule wrightii	98
1994-10	6	1	I	90	90	0	Halodule wrightii	90
1994-10	6	1	I	90	90	0	Halophila englemannii	6
1994-10	6	1	P	65	65	0	Halodule wrightii	65
1994-10	6	1	P	65	65	0	Halophila englemannii	8
1994-10	6	2	I	97	97	0	Halodule wrightii	97
1994-10	6	2	I	97	97	0	Halophila englemannii	1
1994-10	6	2	P	86	86	0	Halodule wrightii	86
1994-10	6	2	P	86	86	0	Halophila englemannii	4

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	6	3	I	100	100	0	Halodule wrightii	100
1994-10	6	3	I	100	100	0	Halophila englemannii	16
1994-10	6	3	P	94	94	0	Halodule wrightii	94
1994-10	6	4	I	100	100	0	Halodule wrightii	100
1994-10	6	4	I	100	100	0	Halophila englemannii	4
1994-10	6	4	P	100	100	0	Halodule wrightii	100
1994-10	6	5	I	81	81	0	Halodule wrightii	81
1994-10	6	5	P	67	67	0	Halodule wrightii	53
1994-10	6	5	P	67	67	0	Halophila englemannii	16
1994-10	6	6	I	97	97	0	Halodule wrightii	97
1994-10	6	6	P	71	71	0	Halodule wrightii	66
1994-10	6	6	P	71	71	0	Halophila englemannii	8
1994-10	6	7	I	98	98	0	Halodule wrightii	98
1994-10	6	7	P	68	68	0	Halodule wrightii	55
1994-10	6	7	P	68	68	0	Halophila englemannii	28
1994-10	6	8	I	68	68	0	Halodule wrightii	62
1994-10	6	8	I	68	68	0	Halophila englemannii	21
1994-10	6	8	P	87	87	0	Halodule wrightii	87
1994-10	6	8	P	87	87	0	Halophila englemannii	7
1994-10	6	9	I	99	99	0	Halodule wrightii	99
1994-10	6	9	P	70	70	0	Halodule wrightii	70
1994-10	6	9	P	70	70	0	Halophila englemannii	11
1994-10	6	10	I	100	100	0	Halodule wrightii	100
1994-10	6	10	P	43	43	0	Halodule wrightii	43
1995-08	6	1	I	100	100	0	Halodule wrightii	100
1995-08	6	1	P	98	98	0	Halodule wrightii	98
1995-08	6	2	I	100	100	0	Halodule wrightii	100
1995-08	6	2	P	85	85	0	Halodule wrightii	82
1995-08	6	2	P	85	85	0	Halophila englemannii	15
1995-08	6	3	I	91	91	0	Halodule wrightii	91
1995-08	6	3	P	59	59	0	Halodule wrightii	59
1995-08	6	3	P	59	59	0	Halophila englemannii	1
1995-08	6	4	I	93	93	0	Halodule wrightii	93
1995-08	6	4	P	73	69	10	Halodule wrightii	69
1995-08	6	4	P	73	69	10	Halophila englemannii	1
1995-08	6	4	P	73	69	10	Udotea conglutinata	7
1995-08	6	5	I	89	89	0	Halodule wrightii	89
1995-08	6	5	P	45	45	0	Halodule wrightii	30
1995-08	6	5	P	45	45	0	Halophila englemannii	15
1995-08	6	6	I	98	98	0	Halodule wrightii	98
1995-08	6	6	P	99	99	0	Halodule wrightii	99
1995-08	6	7	I	100	100	0	Halodule wrightii	100
1995-08	6	7	P	97	97	0	Halodule wrightii	97
1995-08	6	8	I	100	100	0	Halodule wrightii	100
1995-08	6	8	P	93	93	0	Halodule wrightii	93
1995-08	6	9	I	100	100	0	Halodule wrightii	100
1995-08	6	9	P	89	89	0	Halodule wrightii	89
1995-08	6	10	I	99	99	0	Halodule wrightii	99
1995-08	6	10	P	100	100	0	Halodule wrightii	100
1995-10	6	1	I	7	7	0	Halodule wrightii	7
1995-10	6	1	P	3	3	0	Halodule wrightii	3
1995-10	6	2	I	78	78	0	Halodule wrightii	78
1995-10	6	2	P	80	80	0	Halodule wrightii	80
1995-10	6	3	I	40	40	0	Halodule wrightii	40
1995-10	6	3	P	78	78	0	Halodule wrightii	78
1995-10	6	4	I	3	3	0	Halodule wrightii	3

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-10	6	4	P	5	5	0	Halodule wrightii	5
1995-10	6	5	I	82	82	0	Halodule wrightii	82
1995-10	6	5	P	3	3	0	Halodule wrightii	3
1995-10	6	6	I	100	100	0	Halodule wrightii	100
1995-10	6	6	P	100	100	0	Halodule wrightii	100
1995-10	6	7	I	100	100	0	Halodule wrightii	100
1995-10	6	7	P	97	97	0	Halodule wrightii	97
1995-10	6	8	I	96	96	0	Halodule wrightii	96
1995-10	6	8	P	64	64	0	Halodule wrightii	64
1995-10	6	9	I	100	100	0	Halodule wrightii	100
1995-10	6	9	P	35	35	1	Halodule wrightii	35
1995-10	6	9	P	35	35	1	Udotea conglutinata	1
1995-10	6	10	I	100	100	0	Halodule wrightii	100
1995-10	6	10	P	98	98	0	Halodule wrightii	98
1993-12	7	1	I	100	100	0	Halodule wrightii	100
1993-12	7	1	P	93	93	0	Halodule wrightii	93
1993-12	7	2	I	88	88	0	Halodule wrightii	88
1993-12	7	2	P	86	86	0	Halodule wrightii	86
1993-12	7	3	I	95	95	0	Halodule wrightii	95
1993-12	7	3	P	66	66	0	Halodule wrightii	66
1993-12	7	4	I	100	100	0	Halodule wrightii	100
1993-12	7	4	P	100	100	0	Halodule wrightii	100
1993-12	7	5	I	100	100	0	Halodule wrightii	100
1993-12	7	5	P	90	90	0	Halodule wrightii	90
1993-12	7	6	I	100	100	0	Halodule wrightii	100
1993-12	7	6	P	94	94	0	Halodule wrightii	94
1993-12	7	7	I	100	100	0	Halodule wrightii	100
1993-12	7	7	P	96	96	0	Halodule wrightii	96
1993-12	7	8	I	100	100	0	Halodule wrightii	100
1993-12	7	8	P	100	100	0	Halodule wrightii	100
1993-12	7	9	I	100	100	0	Halodule wrightii	100
1993-12	7	9	I	100	100	0	Halophila englemannii	2
1993-12	7	9	P	97	97	0	Halodule wrightii	97
1993-12	7	10	I	100	100	0	Halodule wrightii	100
1993-12	7	10	P	93	93	0	Halodule wrightii	93
1994-08	7	1	I	73	73	0	Caulerpa mexicana	2
1994-08	7	1	I	73	73	2	Halodule wrightii	73
1994-08	7	1	P	61	61	0	Halodule wrightii	61
1994-08	7	2	I	56	56	0	Halodule wrightii	56
1994-08	7	2	I	56	56	0	Halophila englemannii	10
1994-08	7	2	P	58	58	0	Halodule wrightii	58
1994-08	7	3	I	90	90	0	Halodule wrightii	90
1994-08	7	3	P	49	49	0	Halodule wrightii	49
1994-08	7	4	I	75	75	3	Halodule wrightii	75
1994-08	7	4	I	75	75	3	Halophila englemannii	3
1994-08	7	4	P	79	79	0	Halodule wrightii	79
1994-08	7	5	I	89	89	0	Halodule wrightii	89
1994-08	7	5	P	78	78	0	Halodule wrightii	78
1994-08	7	6	I	99	99	0	Halodule wrightii	99
1994-08	7	6	I	99	99	0	Halophila englemannii	15
1994-08	7	6	P	75	75	0	Halodule wrightii	75
1994-08	7	7	I	94	94	0	Halodule wrightii	94
1994-08	7	7	I	94	94	0	Halophila englemannii	3
1994-08	7	7	P	87	87	0	Halodule wrightii	87
1994-08	7	8	I	97	97	0	Halodule wrightii	97
1994-08	7	8	P	80	80	0	Halodule wrightii	80

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	7	9	I	98	98	0	Halodule wrightii	98
1994-08	7	9	I	98	98	0	Halophila englemannii	7
1994-08	7	9	P	76	76	0	Halodule wrightii	76
1994-08	7	10	I	96	96	0	Halodule wrightii	96
1994-08	7	10	I	96	96	0	Halophila englemannii	7
1994-08	7	10	P	88	88	0	Halodule wrightii	88
1994-10	7	1	I	96	96	0	Halodule wrightii	96
1994-10	7	1	P	96	96	0	Halodule wrightii	96
1994-10	7	2	I	97	97	0	Halodule wrightii	97
1994-10	7	2	P	99	99	0	Halodule wrightii	99
1994-10	7	3	I	100	100	0	Halodule wrightii	100
1994-10	7	3	P	73	73	0	Halodule wrightii	73
1994-10	7	4	I	100	100	0	Halodule wrightii	100
1994-10	7	4	P	100	100	0	Halodule wrightii	100
1994-10	7	5	I	98	98	0	Halodule wrightii	98
1994-10	7	5	P	97	97	0	Halodule wrightii	97
1994-10	7	6	I	98	98	0	Halodule wrightii	98
1994-10	7	6	P	76	76	0	Halodule wrightii	76
1994-10	7	7	I	100	100	0	Halodule wrightii	100
1994-10	7	7	P	99	99	0	Halodule wrightii	99
1994-10	7	8	I	96	96	0	Halodule wrightii	96
1994-10	7	8	I	96	96	0	Halophila englemannii	9
1994-10	7	8	P	91	91	1	Caulerpa prolifera	1
1994-10	7	8	P	91	91	1	Halodule wrightii	88
1994-10	7	8	P	91	91	1	Halophila englemannii	16
1994-10	7	9	I	100	100	0	Syringodium filiforme	100
1994-10	7	9	P	100	100	0	Syringodium filiforme	100
1994-10	7	10	I	99	99	0	Syringodium filiforme	99
1994-10	7	10	P	80	80	0	Halodule wrightii	80
1995-08	7	1	I	100	100	0	Halodule wrightii	100
1995-08	7	1	P	100	100	0	Halodule wrightii	100
1995-08	7	2	I	95	95	0	Halodule wrightii	95
1995-08	7	2	P	83	83	0	Halodule wrightii	83
1995-08	7	3	I	100	100	0	Halodule wrightii	100
1995-08	7	3	P	100	100	0	Halodule wrightii	100
1995-08	7	4	I	100	100	0	Halodule wrightii	100
1995-08	7	4	P	98	98	0	Halodule wrightii	98
1995-08	7	5	I	100	100	0	Halodule wrightii	100
1995-08	7	5	P	100	100	0	Halodule wrightii	100
1995-08	7	6	I	99	99	0	Halodule wrightii	99
1995-08	7	6	P	96	96	0	Halodule wrightii	96
1995-08	7	7	I	96	96	0	Halodule wrightii	96
1995-08	7	7	P	95	95	0	Halodule wrightii	95
1995-08	7	8	I	100	100	0	Halodule wrightii	100
1995-08	7	8	P	93	93	0	Halodule wrightii	93
1995-08	7	9	I	99	99	0	Halodule wrightii	99
1995-08	7	9	P	83	83	0	Halodule wrightii	83
1995-08	7	10	I	98	98	0	Halodule wrightii	98
1995-08	7	10	P	92	92	0	Halodule wrightii	92
1995-10	7	1	I	89	89	0	Halodule wrightii	89
1995-10	7	1	P	87	87	0	Halodule wrightii	87
1995-10	7	2	I	97	97	0	Halodule wrightii	97
1995-10	7	2	P	93	93	0	Halodule wrightii	93
1995-10	7	3	I	96	96	0	Halodule wrightii	96
1995-10	7	3	P	90	90	0	Halodule wrightii	90
1995-10	7	4	I	76	76	0	Halodule wrightii	76

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-10	7	4	P	88	88	0	Halodule wrightii	88
1995-10	7	5	I	100	100	0	Halodule wrightii	100
1995-10	7	5	P	95	95	0	Halodule wrightii	95
1995-10	7	6	I	98	98	0	Halodule wrightii	98
1995-10	7	6	P	99	99	0	Halodule wrightii	99
1995-10	7	7	I	97	97	0	Halodule wrightii	97
1995-10	7	7	P	99	99	0	Halodule wrightii	99
1995-10	7	8	I	100	100	0	Halodule wrightii	100
1995-10	7	8	P	80	80	0	Halodule wrightii	80
1995-10	7	9	I	97	97	0	Halodule wrightii	97
1995-10	7	9	P	95	95	0	Halodule wrightii	95
1995-10	7	10	I	98	98	0	Halodule wrightii	98
1995-10	7	10	P	86	86	0	Halodule wrightii	86
1993-12	8	1	I	91	91	0	Halodule wrightii	91
1993-12	8	1	I	91	91	0	Halophila englemannii	6
1993-12	8	1	P	99	99	2	Caulerpa prolifera	2
1993-12	8	1	P	99	99	2	Halodule wrightii	99
1993-12	8	1	P	99	99	2	Halophila englemannii	2
1993-12	8	2	I	97	97	0	Halodule wrightii	97
1993-12	8	2	I	97	97	0	Halophila englemannii	2
1993-12	8	2	P	94	94	0	Halodule wrightii	94
1993-12	8	3	I	98	98	0	Halodule wrightii	98
1993-12	8	3	I	98	98	0	Halophila englemannii	6
1993-12	8	3	P	100	100	0	Halodule wrightii	100
1993-12	8	4	I	100	100	0	Halodule wrightii	100
1993-12	8	4	I	100	100	0	Halophila englemannii	4
1993-12	8	4	P	95	95	0	Halodule wrightii	95
1993-12	8	5	I	94	94	0	Halodule wrightii	94
1993-12	8	5	P	94	94	0	Halodule wrightii	94
1993-12	8	5	P	94	94	0	Halophila englemannii	4
1993-12	8	6	I	90	90	0	Halodule wrightii	90
1993-12	8	6	P	76	76	0	Halodule wrightii	76
1993-12	8	7	I	75	75	0	Halodule wrightii	75
1993-12	8	7	P	100	100	0	Halodule wrightii	100
1993-12	8	8	I	86	86	0	Halodule wrightii	86
1993-12	8	8	P	96	96	0	Halodule wrightii	96
1993-12	8	9	I	94	94	0	Halodule wrightii	94
1993-12	8	9	P	90	90	0	Halodule wrightii	90
1994-08	8	1	I	100	100	0	Halodule wrightii	100
1994-08	8	1	P	99	99	0	Halodule wrightii	99
1994-08	8	2	I	96	96	0	Halodule wrightii	96
1994-08	8	2	P	100	100	0	Halodule wrightii	100
1994-08	8	3	I	60	60	0	Halodule wrightii	60
1994-08	8	3	I	60	60	0	Syringodium filiforme	6
1994-08	8	3	P	88	88	0	Halodule wrightii	88
1994-08	8	4	I	100	100	0	Halodule wrightii	100
1994-08	8	4	P	96	96	0	Halodule wrightii	96
1994-08	8	5	I	95	95	0	Halodule wrightii	95
1994-08	8	5	P	94	94	0	Halodule wrightii	94
1994-08	8	6	I	99	99	0	Syringodium filiforme	99
1994-08	8	6	P	91	91	0	Halophila englemannii	3
1994-08	8	6	P	91	91	0	Syringodium filiforme	91
1994-08	8	7	I	96	96	11	Caulerpa prolifera	1
1994-08	8	7	I	96	96	11	Halodule wrightii	96
1994-08	8	7	I	96	96	11	Udotea conglutinata	11
1994-08	8	7	P	95	95	0	Halodule wrightii	95

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	8	7	P	95	95	0	Halophila englemannii	1
1994-08	8	8	I	92	92	1	Caulerpa prolifera	1
1994-08	8	8	I	92	92	1	Halodule wrightii	55
1994-08	8	8	I	92	92	1	Syringodium filiforme	28
1994-08	8	8	P	100	100	0	Syringodium filiforme	100
1994-08	8	9	I	99	99	0	Halophila englemannii	2
1994-08	8	9	I	99	99	0	Syringodium filiforme	98
1994-08	8	9	P	98	98	0	Halodule wrightii	73
1994-08	8	9	P	98	98	0	Syringodium filiforme	83
1994-08	8	10	I	100	100	0	Syringodium filiforme	100
1994-08	8	10	P	97	97	0	Syringodium filiforme	97
1994-10	8	1	I	100	100	0	Syringodium filiforme	100
1994-10	8	1	P	86	86	0	Syringodium filiforme	86
1994-10	8	2	I	93	93	0	Halodule wrightii	40
1994-10	8	2	I	93	93	0	Syringodium filiforme	93
1994-10	8	2	P	96	96	0	Syringodium filiforme	96
1994-10	8	3	I	92	92	0	Syringodium filiforme	92
1994-10	8	3	P	94	94	0	Halodule wrightii	6
1994-10	8	3	P	94	94	0	Syringodium filiforme	94
1994-10	8	4	I	100	100	0	Syringodium filiforme	100
1994-10	8	4	P	94	94	0	Syringodium filiforme	94
1994-10	8	5	I	93	93	0	Halodule wrightii	28
1994-10	8	5	I	93	93	0	Syringodium filiforme	93
1994-10	8	5	P	92	92	0	Halodule wrightii	26
1994-10	8	5	P	92	92	0	Syringodium filiforme	92
1994-10	8	6	I	100	100	0	Syringodium filiforme	100
1994-10	8	6	P	100	100	0	Syringodium filiforme	100
1994-10	8	7	I	100	100	0	Halodule wrightii	3
1994-10	8	7	I	100	100	0	Syringodium filiforme	100
1994-10	8	7	P	95	95	0	Halodule wrightii	5
1994-10	8	7	P	95	95	0	Syringodium filiforme	95
1994-10	8	8	I	88	88	0	Halodule wrightii	3
1994-10	8	8	I	88	88	0	Syringodium filiforme	88
1994-10	8	8	P	75	75	0	Syringodium filiforme	75
1994-10	8	9	I	98	98	0	Syringodium filiforme	98
1994-10	8	9	P	100	100	0	Syringodium filiforme	100
1994-10	8	10	I	99	99	0	Syringodium filiforme	99
1994-10	8	10	P	100	100	0	Halodule wrightii	2
1994-10	8	10	P	100	100	0	Syringodium filiforme	100
1995-08	8	1	I	38	38	0	Syringodium filiforme	38
1995-08	8	1	P	2	2	0	Syringodium filiforme	2
1995-08	8	2	I	94	94	0	Syringodium filiforme	94
1995-08	8	2	P	0	0	0	Syringodium filiforme	0
1995-08	8	3	I	8	8	0	Syringodium filiforme	8
1995-08	8	3	P	10	10	0	Syringodium filiforme	10
1995-08	8	4	I	75	75	0	Syringodium filiforme	75
1995-08	8	4	P	64	64	0	Syringodium filiforme	64
1995-08	8	5	I	16	16	0	Syringodium filiforme	16
1995-08	8	5	P	9	9	0	Syringodium filiforme	9
1995-08	8	6	I	61	61	0	Syringodium filiforme	61
1995-08	8	6	P	86	86	0	Syringodium filiforme	86
1995-08	8	7	I	95	95	0	Syringodium filiforme	95
1995-08	8	7	P	83	83	0	Syringodium filiforme	83
1995-08	8	8	I	71	71	0	Syringodium filiforme	71
1995-08	8	8	P	52	52	0	Syringodium filiforme	52
1995-08	8	9	I	89	89	0	Syringodium filiforme	89

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-08	8	9	P	86	86	0	Syringodium filiforme	86
1995-08	8	10	I	99	99	0	Syringodium filiforme	99
1995-08	8	10	P	91	91	0	Halodule wrightii	91
1995-08	8	10	P	91	91	0	Syringodium filiforme	13
1995-10	8	1	I	82	82	0	Syringodium filiforme	82
1995-10	8	1	P	87	87	0	Syringodium filiforme	87
1995-10	8	2	I	76	76	0	Syringodium filiforme	76
1995-10	8	2	P	80	80	0	Syringodium filiforme	80
1995-10	8	3	I	98	98	0	Syringodium filiforme	98
1995-10	8	3	P	90	90	0	Syringodium filiforme	90
1995-10	8	4	I	92	92	0	Syringodium filiforme	92
1995-10	8	4	P	91	91	0	Syringodium filiforme	91
1995-10	8	5	I	100	100	0	Syringodium filiforme	100
1995-10	8	5	P	62	62	0	Syringodium filiforme	62
1995-10	8	6	I	10	10	0	Syringodium filiforme	10
1995-10	8	6	P	22	22	0	Syringodium filiforme	22
1995-10	8	7	I	75	75	0	Syringodium filiforme	75
1995-10	8	7	P	92	92	0	Syringodium filiforme	92
1995-10	8	8	I	2	2	0	Syringodium filiforme	2
1995-10	8	8	P	18	18	0	Syringodium filiforme	18
1995-10	8	9	I	36	36	0	Syringodium filiforme	36
1995-10	8	9	P	7	7	0	Syringodium filiforme	7
1995-10	8	10	I	68	68	0	Syringodium filiforme	68
1995-10	8	10	P	1	1	0	Syringodium filiforme	1
1993-12	9	1	I	56	56	0	Syringodium filiforme	56
1993-12	9	1	P	94	94	0	Halophila englemannii	2
1993-12	9	1	P	94	94	0	Syringodium filiforme	94
1993-12	9	2	I	94	94	0	Syringodium filiforme	94
1993-12	9	2	P	96	96	0	Syringodium filiforme	96
1993-12	9	3	I	94	94	0	Halodule wrightii	6
1993-12	9	3	I	94	94	0	Syringodium filiforme	94
1993-12	9	3	P	93	93	0	Syringodium filiforme	93
1993-12	9	4	I	85	85	0	Syringodium filiforme	85
1993-12	9	4	P	80	80	1	Caulerpa prolifera	1
1993-12	9	4	P	80	80	1	Halophila englemannii	3
1993-12	9	4	P	80	80	1	Syringodium filiforme	80
1993-12	9	5	I	93	93	0	Syringodium filiforme	93
1993-12	9	5	P	86	86	0	Syringodium filiforme	86
1993-12	9	6	I	84	84	0	Halophila englemannii	2
1993-12	9	6	I	84	84	0	Syringodium filiforme	82
1993-12	9	6	P	92	92	0	Syringodium filiforme	92
1993-12	9	7	I	28	28	0	Syringodium filiforme	28
1993-12	9	7	P	89	89	0	Halophila englemannii	11
1993-12	9	7	P	89	89	0	Syringodium filiforme	78
1993-12	9	8	I	91	91	0	Halophila englemannii	10
1993-12	9	8	I	91	91	0	Syringodium filiforme	91
1993-12	9	8	P	79	79	0	Halophila englemannii	10
1993-12	9	8	P	79	79	0	Syringodium filiforme	79
1993-12	9	9	I	67	67	0	Syringodium filiforme	67
1993-12	9	9	P	89	89	0	Halophila englemannii	7
1993-12	9	9	P	89	89	0	Syringodium filiforme	89
1993-12	9	10	I	94	94	0	Syringodium filiforme	94
1993-12	9	10	P	90	90	0	Halophila englemannii	3
1993-12	9	10	P	90	90	0	Syringodium filiforme	90
1994-08	9	1	I	73	73	1	Halophila englemannii	3
1994-08	9	1	I	73	73	1	Syringodium filiforme	73

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	9	1	I	73	73	1	Udotea conglutinata	1
1994-08	9	1	P	100	100	4	Caulerpa prolifera	4
1994-08	9	1	P	100	100	4	Halophila englemannii	8
1994-08	9	1	P	100	100	4	Syringodium filiforme	100
1994-08	9	2	I	100	100	2	Caulerpa prolifera	2
1994-08	9	2	I	100	100	2	Halophila englemannii	8
1994-08	9	2	I	100	100	2	Syringodium filiforme	100
1994-08	9	2	P	11	11	1	Caulerpa prolifera	1
1994-08	9	2	P	11	11	1	Syringodium filiforme	11
1994-08	9	3	I	97	97	0	Halophila englemannii	2
1994-08	9	3	I	97	97	0	Syringodium filiforme	97
1994-08	9	3	P	71	71	0	Halophila englemannii	5
1994-08	9	3	P	71	71	0	Syringodium filiforme	71
1994-08	9	4	I	95	95	3	Caulerpa prolifera	3
1994-08	9	4	I	95	95	3	Syringodium filiforme	95
1994-08	9	4	P	93	93	0	Syringodium filiforme	93
1994-08	9	5	I	100	100	0	Syringodium filiforme	100
1994-08	9	5	P	96	96	0	Syringodium filiforme	96
1994-08	9	6	I	98	98	0	Syringodium filiforme	98
1994-08	9	6	P	100	92	20	Caulerpa prolifera	18
1994-08	9	6	P	100	92	20	Halophila englemannii	38
1994-08	9	6	P	100	92	20	Syringodium filiforme	92
1994-08	9	6	P	100	92	20	Udotea conglutinata	2
1994-08	9	7	I	96	96	0	Syringodium filiforme	96
1994-08	9	7	P	93	93	8	Halophila englemannii	46
1994-08	9	7	P	93	93	8	Syringodium filiforme	88
1994-08	9	7	P	93	93	8	Udotea conglutinata	8
1994-08	9	8	I	100	100	0	Syringodium filiforme	100
1994-08	9	8	P	96	96	5	Caulerpa prolifera	5
1994-08	9	8	P	96	96	5	Halophila englemannii	60
1994-08	9	8	P	96	96	5	Syringodium filiforme	81
1994-08	9	9	I	100	100	3	Caulerpa prolifera	3
1994-08	9	9	I	100	100	3	Halophila englemannii	12
1994-08	9	9	I	100	100	3	Syringodium filiforme	100
1994-08	9	9	P	96	96	20	Caulerpa prolifera	15
1994-08	9	9	P	96	96	20	Halophila englemannii	32
1994-08	9	9	P	96	96	20	Syringodium filiforme	87
1994-08	9	9	P	96	96	20	Udotea conglutinata	5
1994-08	9	10	I	96	96	0	Halophila englemannii	29
1994-08	9	10	I	96	96	0	Syringodium filiforme	95
1994-08	9	10	P	98	98	13	Caulerpa prolifera	9
1994-08	9	10	P	98	98	13	Halophila englemannii	42
1994-08	9	10	P	98	98	13	Syringodium filiforme	86
1994-08	9	10	P	98	98	13	Udotea conglutinata	4
1994-10	9	1	I	98	98	0	Halophila englemannii	2
1994-10	9	1	I	98	98	0	Syringodium filiforme	98
1994-10	9	1	P	92	92	0	Syringodium filiforme	92
1994-10	9	2	I	95	95	0	Halophila englemannii	12
1994-10	9	2	I	95	95	0	Syringodium filiforme	95
1994-10	9	2	P	98	98	0	Halophila englemannii	2
1994-10	9	2	P	98	98	0	Syringodium filiforme	98
1994-10	9	3	I	100	100	0	Halophila englemannii	10
1994-10	9	3	I	100	100	0	Syringodium filiforme	100
1994-10	9	3	P	97	97	0	Syringodium filiforme	97
1994-10	9	4	I	98	98	2	Halophila englemannii	8
1994-10	9	4	I	98	98	2	Syringodium filiforme	98

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	9	4	I	98	98	2	Udotea conglutinata	2
1994-10	9	4	P	92	92	0	Syringodium filiforme	92
1994-10	9	5	I	100	100	0	Halophila englemannii	8
1994-10	9	5	I	100	100	0	Syringodium filiforme	100
1994-10	9	5	P	85	85	2	Syringodium filiforme	85
1994-10	9	5	P	85	85	2	Udotea conglutinata	2
1994-10	9	6	I	100	100	0	Syringodium filiforme	100
1994-10	9	6	P	100	100	0	Halophila englemannii	14
1994-10	9	6	P	100	100	0	Syringodium filiforme	100
1994-10	9	7	I	97	97	0	Syringodium filiforme	97
1994-10	9	7	P	95	95	0	Halophila englemannii	2
1994-10	9	7	P	95	95	0	Syringodium filiforme	95
1994-10	9	8	I	100	100	0	Halophila englemannii	4
1994-10	9	8	I	100	100	0	Syringodium filiforme	100
1994-10	9	8	P	97	97	0	Halodule wrightii	5
1994-10	9	8	P	97	97	0	Halophila englemannii	8
1994-10	9	8	P	97	97	0	Syringodium filiforme	89
1994-10	9	9	I	99	99	0	Syringodium filiforme	99
1994-10	9	9	P	80	80	0	Halophila englemannii	1
1994-10	9	9	P	80	80	0	Syringodium filiforme	80
1994-10	9	10	I	98	98	0	Syringodium filiforme	98
1994-10	9	10	P	84	84	0	Halophila englemannii	5
1994-10	9	10	P	84	84	0	Syringodium filiforme	84
1995-08	9	1	I	100	100	0	Syringodium filiforme	100
1995-08	9	1	P	100	100	0	Syringodium filiforme	100
1995-08	9	2	I	100	100	0	Syringodium filiforme	100
1995-08	9	2	P	90	90	0	Syringodium filiforme	90
1995-08	9	3	I	99	99	0	Syringodium filiforme	99
1995-08	9	3	P	98	98	0	Syringodium filiforme	98
1995-08	9	4	I	98	98	0	Syringodium filiforme	98
1995-08	9	4	P	92	92	0	Halophila englemannii	2
1995-08	9	4	P	92	92	0	Syringodium filiforme	90
1995-08	9	5	I	98	98	0	Syringodium filiforme	98
1995-08	9	5	P	100	100	0	Syringodium filiforme	100
1995-08	9	6	I	99	99	0	Syringodium filiforme	99
1995-08	9	6	P	86	86	0	Syringodium filiforme	86
1995-08	9	7	I	100	100	0	Halodule wrightii	4
1995-08	9	7	I	100	100	0	Syringodium filiforme	98
1995-08	9	7	P	100	100	0	Syringodium filiforme	100
1995-08	9	8	I	97	97	0	Syringodium filiforme	97
1995-08	9	8	P	92	92	0	Syringodium filiforme	92
1995-08	9	9	I	98	98	0	Syringodium filiforme	98
1995-08	9	9	P	98	98	0	Syringodium filiforme	98
1995-08	9	10	I	99	99	0	Halophila englemannii	3
1995-08	9	10	I	99	99	0	Syringodium filiforme	96
1995-08	9	10	P	100	100	0	Syringodium filiforme	100
1995-10	9	1	I	98	98	0	Syringodium filiforme	98
1995-10	9	1	P	92	92	0	Syringodium filiforme	92
1995-10	9	2	I	100	100	0	Syringodium filiforme	100
1995-10	9	2	P	97	97	0	Syringodium filiforme	97
1995-10	9	3	I	100	100	0	Syringodium filiforme	100
1995-10	9	3	P	100	100	0	Syringodium filiforme	100
1995-10	9	4	I	89	89	0	Syringodium filiforme	89
1995-10	9	4	P	100	100	0	Syringodium filiforme	100
1995-10	9	5	I	100	100	0	Syringodium filiforme	100
1995-10	9	5	P	97	97	0	Syringodium filiforme	97

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-10	9	6	I	95	95	0	Syringodium filiforme	95
1995-10	9	6	P	96	96	0	Syringodium filiforme	96
1995-10	9	7	I	100	100	0	Syringodium filiforme	100
1995-10	9	7	P	96	96	0	Syringodium filiforme	96
1995-10	9	8	I	92	92	0	Syringodium filiforme	92
1995-10	9	8	P	100	100	0	Syringodium filiforme	100
1995-10	9	9	I	100	100	0	Syringodium filiforme	100
1995-10	9	9	P	88	88	0	Syringodium filiforme	88
1995-10	9	10	I	91	91	0	Syringodium filiforme	91
1995-10	9	10	P	97	97	0	Syringodium filiforme	97
1993-12	10	1	I	24	24	0	Halophila englemannii	17
1993-12	10	1	I	24	24	0	Syringodium filiforme	7
1993-12	10	1	P	90	90	4	Caulerpa prolifera	4
1993-12	10	1	P	90	90	4	Syringodium filiforme	90
1993-12	10	2	I	78	78	0	Syringodium filiforme	78
1993-12	10	2	P	77	77	8	Caulerpa prolifera	8
1993-12	10	2	P	77	77	8	Syringodium filiforme	77
1993-12	10	3	I	84	84	4	Caulerpa prolifera	4
1993-12	10	3	I	84	84	4	Syringodium filiforme	84
1993-12	10	3	P	84	68	16	Caulerpa prolifera	16
1993-12	10	3	P	84	68	16	Syringodium filiforme	84
1993-12	10	4	I	59	59	0	Syringodium filiforme	59
1993-12	10	4	P	80	80	0	Syringodium filiforme	80
1993-12	10	5	I	68	68	6	Caulerpa prolifera	6
1993-12	10	5	I	68	68	6	Syringodium filiforme	68
1993-12	10	5	P	77	77	0	Syringodium filiforme	77
1993-12	10	6	I	60	58	2	Caulerpa prolifera	2
1993-12	10	6	I	60	58	2	Syringodium filiforme	58
1993-12	10	6	P	6	6	0	Syringodium filiforme	6
1993-12	10	7	I	0	0	0	Bare	0
1993-12	10	7	P	13	13	0	Syringodium filiforme	13
1993-12	10	8	I	19	19	0	Syringodium filiforme	19
1993-12	10	8	P	87	87	5	Caulerpa prolifera	5
1993-12	10	8	P	87	87	5	Syringodium filiforme	87
1993-12	10	9	I	76	76	0	Syringodium filiforme	76
1993-12	10	9	P	100	100	0	Halophila englemannii	3
1993-12	10	9	P	100	100	0	Syringodium filiforme	100
1993-12	10	10	I	94	94	0	Syringodium filiforme	94
1993-12	10	10	P	100	100	0	Syringodium filiforme	100
1994-08	10	1	I	52	30	22	Caulerpa prolifera	22
1994-08	10	1	I	52	30	22	Syringodium filiforme	30
1994-08	10	1	P	74	42	32	Caulerpa prolifera	32
1994-08	10	1	P	74	42	32	Syringodium filiforme	42
1994-08	10	2	I	100	100	7	Caulerpa prolifera	7
1994-08	10	2	I	100	100	7	Syringodium filiforme	100
1994-08	10	2	P	92	55	40	Caulerpa prolifera	40
1994-08	10	2	P	92	55	40	Syringodium filiforme	55
1994-08	10	3	I	96	89	9	Caulerpa prolifera	9
1994-08	10	3	I	96	89	9	Syringodium filiforme	89
1994-08	10	3	P	99	6	99	Caulerpa prolifera	99
1994-08	10	3	P	99	6	99	Syringodium filiforme	6
1994-08	10	4	I	100	36	66	Caulerpa prolifera	66
1994-08	10	4	I	100	36	66	Syringodium filiforme	35
1994-08	10	4	P	100	47	96	Caulerpa prolifera	96
1994-08	10	4	P	100	47	96	Syringodium filiforme	47
1994-08	10	5	I	100	100	0	Syringodium filiforme	100

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	10	5	P	100	64	36	Caulerpa prolifera	36
1994-08	10	5	P	100	64	36	Syringodium filiforme	64
1994-08	10	6	I	100	100	8	Caulerpa prolifera	8
1994-08	10	6	I	100	100	8	Syringodium filiforme	100
1994-08	10	6	P	100	74	90	Caulerpa prolifera	90
1994-08	10	6	P	100	74	90	Syringodium filiforme	74
1994-08	10	6	P	100	74	90	Udotea conglutinata	2
1994-08	10	7	I	100	100	46	Caulerpa prolifera	46
1994-08	10	7	I	100	100	46	Syringodium filiforme	100
1994-08	10	7	P	100	50	80	Caulerpa prolifera	80
1994-08	10	7	P	100	50	80	Syringodium filiforme	50
1994-08	10	7	P	100	50	80	Udotea conglutinata	2
1994-08	10	8	I	100	94	89	Caulerpa prolifera	89
1994-08	10	8	I	100	94	89	Syringodium filiforme	94
1994-08	10	8	I	100	94	89	Udotea conglutinata	5
1994-08	10	8	P	99	11	99	Caulerpa prolifera	99
1994-08	10	8	P	99	11	99	Syringodium filiforme	11
1994-08	10	9	I	100	99	10	Caulerpa prolifera	10
1994-08	10	9	I	100	99	10	Syringodium filiforme	99
1994-08	10	9	P	99	0	99	Caulerpa prolifera	99
1994-08	10	10	I	100	98	86	Caulerpa prolifera	86
1994-08	10	10	I	100	98	86	Syringodium filiforme	98
1994-08	10	10	P	99	40	89	Caulerpa prolifera	89
1994-08	10	10	P	99	40	89	Syringodium filiforme	40
1995-08	10	1	I	92	92	0	Syringodium filiforme	92
1995-08	10	1	P	38	20	18	Caulerpa prolifera	18
1995-08	10	1	P	38	20	18	Syringodium filiforme	20
1995-08	10	2	I	52	52	1	Caulerpa prolifera	1
1995-08	10	2	I	52	52	1	Syringodium filiforme	52
1995-08	10	2	P	40	32	8	Caulerpa prolifera	8
1995-08	10	2	P	40	32	8	Syringodium filiforme	32
1995-08	10	3	I	36	36	0	Syringodium filiforme	36
1995-08	10	3	P	21	18	3	Caulerpa prolifera	3
1995-08	10	3	P	21	18	3	Syringodium filiforme	18
1995-08	10	4	I	26	26	0	Syringodium filiforme	26
1995-08	10	4	P	38	38	0	Syringodium filiforme	38
1995-08	10	5	I	20	20	0	Syringodium filiforme	20
1995-08	10	5	P	44	44	0	Syringodium filiforme	44
1995-08	10	6	I	32	32	0	Syringodium filiforme	32
1995-08	10	6	P	12	12	0	Syringodium filiforme	12
1995-08	10	7	I	76	76	0	Syringodium filiforme	76
1995-08	10	7	P	52	52	0	Syringodium filiforme	52
1995-08	10	8	I	96	4	96	Caulerpa prolifera	96
1995-08	10	8	I	96	4	96	Halodule wrightii	1
1995-08	10	8	I	96	4	96	Halophila englemannii	1
1995-08	10	8	P	60	60	0	Halodule wrightii	1
1995-08	10	8	P	60	60	0	Syringodium filiforme	59
1995-08	10	9	I	87	87	0	Halodule wrightii	1
1995-08	10	9	I	87	87	0	Syringodium filiforme	87
1995-08	10	9	P	88	88	0	Syringodium filiforme	88
1995-08	10	10	I	75	75	0	Syringodium filiforme	75
1995-08	10	10	P	95	95	0	Halodule wrightii	1
1995-08	10	10	P	95	95	0	Syringodium filiforme	95
1995-10	10	1	I	0	0	0	Bare	0
1995-10	10	1	P	0	0	0	Bare	0
1995-10	10	2	I	65	65	0	Syringodium filiforme	65

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-10	10	2	P	21	21	0	Syringodium filiforme	21
1995-10	10	3	I	53	53	0	Syringodium filiforme	53
1995-10	10	3	P	45	45	0	Syringodium filiforme	45
1995-10	10	4	I	28	28	0	Syringodium filiforme	28
1995-10	10	4	P	60	60	0	Syringodium filiforme	60
1995-10	10	5	I	58	58	0	Syringodium filiforme	58
1995-10	10	5	P	38	38	0	Syringodium filiforme	38
1995-10	10	6	I	95	95	0	Syringodium filiforme	95
1995-10	10	6	P	50	50	0	Syringodium filiforme	50
1995-10	10	7	I	23	23	0	Syringodium filiforme	23
1995-10	10	7	P	64	64	0	Syringodium filiforme	64
1995-10	10	8	I	72	72	0	Syringodium filiforme	72
1995-10	10	8	P	95	95	0	Syringodium filiforme	95
1995-10	10	9	I	78	78	0	Syringodium filiforme	78
1995-10	10	9	P	24	24	0	Syringodium filiforme	24
1995-10	10	10	I	82	82	0	Syringodium filiforme	82
1995-10	10	10	P	17	17	0	Syringodium filiforme	17
1993-12	11	1	I	100	100	0	Syringodium filiforme	100
1993-12	11	1	P	99	99	0	Syringodium filiforme	99
1993-12	11	2	I	100	100	0	Syringodium filiforme	100
1993-12	11	2	P	100	100	0	Halophila englemannii	1
1993-12	11	2	P	100	100	0	Syringodium filiforme	100
1993-12	11	3	I	99	99	0	Syringodium filiforme	99
1993-12	11	3	P	97	97	0	Syringodium filiforme	97
1993-12	11	4	I	100	100	0	Syringodium filiforme	100
1993-12	11	4	P	98	98	0	Syringodium filiforme	98
1993-12	11	5	I	94	94	0	Syringodium filiforme	94
1993-12	11	5	P	100	100	0	Syringodium filiforme	100
1993-12	11	6	I	95	95	0	Syringodium filiforme	95
1993-12	11	6	P	93	93	0	Halophila englemannii	2
1993-12	11	6	P	93	93	0	Syringodium filiforme	93
1993-12	11	7	I	95	95	0	Syringodium filiforme	95
1993-12	11	7	P	100	100	0	Syringodium filiforme	100
1993-12	11	8	I	100	100	0	Syringodium filiforme	100
1993-12	11	8	P	100	100	0	Syringodium filiforme	100
1993-12	11	9	I	100	100	0	Syringodium filiforme	100
1993-12	11	9	P	100	100	0	Syringodium filiforme	100
1993-12	11	10	I	100	100	0	Syringodium filiforme	100
1993-12	11	10	P	96	96	0	Syringodium filiforme	96
1994-08	11	1	I	100	100	0	Syringodium filiforme	100
1994-08	11	1	P	98	98	0	Halophila englemannii	2
1994-08	11	1	P	98	98	0	Syringodium filiforme	98
1994-08	11	2	I	100	100	0	Syringodium filiforme	100
1994-08	11	2	P	100	100	0	Syringodium filiforme	100
1994-08	11	3	I	100	100	0	Syringodium filiforme	100
1994-08	11	3	P	100	100	0	Syringodium filiforme	100
1994-08	11	4	I	100	100	0	Syringodium filiforme	100
1994-08	11	4	P	100	100	0	Syringodium filiforme	100
1994-08	11	5	I	100	100	0	Syringodium filiforme	100
1994-08	11	5	P	100	100	0	Syringodium filiforme	100
1994-08	11	6	I	100	100	0	Syringodium filiforme	100
1994-08	11	6	P	100	100	0	Syringodium filiforme	100
1994-08	11	7	I	100	100	0	Syringodium filiforme	100
1994-08	11	7	P	100	100	0	Syringodium filiforme	100
1994-08	11	8	I	100	100	0	Syringodium filiforme	100
1994-08	11	8	P	100	100	0	Syringodium filiforme	100

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	11	9	I	100	100	0	Syringodium filiforme	100
1994-08	11	9	P	100	100	0	Syringodium filiforme	100
1994-08	11	10	I	100	100	0	Syringodium filiforme	100
1994-08	11	10	P	100	100	0	Syringodium filiforme	100
1994-10	11	1	I	100	100	0	Syringodium filiforme	100
1994-10	11	1	P	100	100	0	Syringodium filiforme	100
1994-10	11	2	I	100	100	0	Syringodium filiforme	100
1994-10	11	2	P	100	100	0	Syringodium filiforme	100
1994-10	11	3	I	100	100	0	Syringodium filiforme	100
1994-10	11	3	P	100	100	0	Syringodium filiforme	100
1994-10	11	4	I	100	100	0	Syringodium filiforme	100
1994-10	11	4	P	99	99	0	Syringodium filiforme	99
1994-10	11	5	I	100	100	0	Syringodium filiforme	100
1994-10	11	5	P	100	100	0	Syringodium filiforme	100
1994-10	11	6	I	100	100	0	Syringodium filiforme	100
1994-10	11	6	P	100	100	0	Syringodium filiforme	100
1994-10	11	7	I	100	100	0	Syringodium filiforme	100
1994-10	11	7	P	99	99	0	Syringodium filiforme	99
1994-10	11	8	I	100	100	0	Syringodium filiforme	100
1994-10	11	8	P	100	100	0	Syringodium filiforme	100
1994-10	11	9	I	100	100	0	Syringodium filiforme	100
1994-10	11	9	P	100	100	0	Syringodium filiforme	100
1994-10	11	10	I	100	100	0	Syringodium filiforme	100
1994-10	11	10	P	100	100	0	Syringodium filiforme	100
1995-08	11	1	I	90	90	0	Syringodium filiforme	90
1995-08	11	1	P	100	100	0	Syringodium filiforme	100
1995-08	11	2	I	100	100	0	Syringodium filiforme	100
1995-08	11	2	P	100	100	0	Syringodium filiforme	100
1995-08	11	3	I	100	100	0	Syringodium filiforme	100
1995-08	11	3	P	100	100	0	Syringodium filiforme	100
1995-08	11	4	I	100	100	0	Syringodium filiforme	100
1995-08	11	4	P	100	100	0	Syringodium filiforme	100
1995-08	11	5	I	100	100	0	Syringodium filiforme	100
1995-08	11	5	P	100	100	0	Syringodium filiforme	100
1995-08	11	6	I	100	100	0	Syringodium filiforme	100
1995-08	11	6	P	99	99	0	Syringodium filiforme	99
1995-08	11	7	I	100	100	0	Syringodium filiforme	100
1995-08	11	7	P	100	100	0	Syringodium filiforme	100
1995-08	11	8	I	98	98	0	Syringodium filiforme	98
1995-08	11	8	P	99	99	0	Syringodium filiforme	99
1995-08	11	9	I	100	100	0	Syringodium filiforme	100
1995-08	11	9	P	100	100	0	Syringodium filiforme	100
1995-08	11	10	I	100	100	0	Syringodium filiforme	100
1995-08	11	10	P	100	100	0	Syringodium filiforme	100
1995-10	11	1	I	95	95	0	Syringodium filiforme	95
1995-10	11	1	P	80	80	0	Syringodium filiforme	80
1995-10	11	2	I	96	96	0	Syringodium filiforme	96
1995-10	11	2	P	100	100	0	Syringodium filiforme	100
1995-10	11	3	I	100	100	0	Syringodium filiforme	100
1995-10	11	3	P	100	100	0	Syringodium filiforme	100
1995-10	11	4	I	100	100	0	Syringodium filiforme	100
1995-10	11	4	P	100	100	0	Syringodium filiforme	100
1995-10	11	5	I	96	96	0	Syringodium filiforme	96
1995-10	11	5	P	100	100	0	Syringodium filiforme	100
1995-10	11	6	I	97	97	0	Syringodium filiforme	97
1995-10	11	6	P	96	96	0	Syringodium filiforme	96

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-10	11	7	I	100	100	0	Syringodium filiforme	100
1995-10	11	7	P	100	100	0	Syringodium filiforme	100
1995-10	11	8	I	100	100	0	Syringodium filiforme	100
1995-10	11	8	P	100	100	0	Syringodium filiforme	100
1995-10	11	9	I	100	100	0	Syringodium filiforme	100
1995-10	11	9	P	100	100	0	Syringodium filiforme	100
1995-10	11	10	I	100	100	0	Syringodium filiforme	100
1995-10	11	10	P	97	97	0	Syringodium filiforme	97
1993-12	12	1	I	100	100	0	Halodule wrightii	100
1993-12	12	1	I	100	100	0	Syringodium filiforme	100
1993-12	12	1	P	88	88	0	Syringodium filiforme	88
1993-12	12	2	I	98	92	6	Caulerpa prolifera	6
1993-12	12	2	I	98	92	6	Syringodium filiforme	92
1993-12	12	2	P	88	88	0	Syringodium filiforme	88
1993-12	12	3	I	70	68	2	Caulerpa prolifera	2
1993-12	12	3	I	70	68	2	Halodule wrightii	34
1993-12	12	3	I	70	68	2	Syringodium filiforme	34
1993-12	12	3	P	89	88	1	Caulerpa prolifera	1
1993-12	12	3	P	89	88	1	Syringodium filiforme	88
1993-12	12	4	I	100	80	20	Caulerpa prolifera	20
1993-12	12	4	I	100	80	20	Syringodium filiforme	80
1993-12	12	4	P	88	66	12	Caulerpa prolifera	12
1993-12	12	4	P	88	66	12	Syringodium filiforme	66
1993-12	12	5	I	97	97	0	Syringodium filiforme	97
1993-12	12	5	P	94	93	1	Caulerpa prolifera	1
1993-12	12	5	P	94	93	1	Syringodium filiforme	93
1993-12	12	6	I	100	99	1	Caulerpa prolifera	1
1993-12	12	6	I	100	99	1	Syringodium filiforme	99
1993-12	12	6	P	96	96	0	Syringodium filiforme	96
1993-12	12	7	I	97	97	0	Syringodium filiforme	97
1993-12	12	7	P	95	95	0	Syringodium filiforme	95
1993-12	12	8	I	89	89	0	Syringodium filiforme	89
1993-12	12	8	P	95	95	0	Syringodium filiforme	95
1993-12	12	9	I	96	96	0	Syringodium filiforme	96
1993-12	12	9	P	78	78	0	Syringodium filiforme	78
1993-12	12	10	I	98	98	0	Syringodium filiforme	98
1993-12	12	10	P	92	92	0	Syringodium filiforme	92
1994-08	12	1	I	100	100	0	Syringodium filiforme	100
1994-08	12	1	P	100	100	0	Syringodium filiforme	100
1994-08	12	2	I	100	100	0	Syringodium filiforme	100
1994-08	12	2	P	100	100	0	Syringodium filiforme	100
1994-08	12	3	I	99	99	0	Syringodium filiforme	99
1994-08	12	3	P	99	99	0	Syringodium filiforme	99
1994-08	12	4	I	90	90	0	Syringodium filiforme	90
1994-08	12	4	P	90	90	0	Syringodium filiforme	90
1994-08	12	5	I	70	70	0	Syringodium filiforme	70
1994-08	12	5	P	100	100	0	Syringodium filiforme	100
1994-08	12	6	I	100	100	0	Syringodium filiforme	100
1994-08	12	6	P	100	100	0	Syringodium filiforme	100
1994-08	12	7	I	100	100	0	Syringodium filiforme	100
1994-08	12	7	P	100	100	0	Syringodium filiforme	100
1994-08	12	8	I	100	100	0	Syringodium filiforme	100
1994-08	12	8	P	100	100	0	Syringodium filiforme	100
1994-08	12	9	I	100	100	0	Syringodium filiforme	100
1994-08	12	9	P	100	100	0	Syringodium filiforme	100
1994-08	12	10	I	96	96	0	Syringodium filiforme	96

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	12	10	P	100	100	0	Syringodium filiforme	100
1994-10	12	1	I	100	100	0	Syringodium filiforme	100
1994-10	12	1	P	98	98	0	Syringodium filiforme	98
1994-10	12	2	I	100	100	0	Syringodium filiforme	100
1994-10	12	2	P	99	99	0	Syringodium filiforme	99
1994-10	12	3	I	93	93	3	Caulerpa prolifera	3
1994-10	12	3	I	93	93	3	Syringodium filiforme	93
1994-10	12	3	P	92	92	2	Caulerpa prolifera	2
1994-10	12	3	P	92	92	2	Halodule wrightii	25
1994-10	12	3	P	92	92	2	Syringodium filiforme	65
1994-10	12	4	I	90	90	0	Syringodium filiforme	90
1994-10	12	4	P	100	100	0	Syringodium filiforme	100
1994-10	12	5	I	100	100	0	Syringodium filiforme	100
1994-10	12	5	P	100	100	0	Syringodium filiforme	100
1994-10	12	6	I	100	100	0	Syringodium filiforme	100
1994-10	12	6	P	100	100	0	Syringodium filiforme	100
1994-10	12	7	I	100	100	2	Caulerpa prolifera	2
1994-10	12	7	I	100	100	2	Syringodium filiforme	100
1994-10	12	7	P	100	100	3	Caulerpa prolifera	3
1994-10	12	7	P	100	100	3	Syringodium filiforme	100
1994-10	12	8	I	100	100	0	Syringodium filiforme	100
1994-10	12	8	P	100	100	0	Syringodium filiforme	100
1994-10	12	9	I	100	100	0	Syringodium filiforme	100
1994-10	12	9	P	21	21	0	Syringodium filiforme	21
1994-10	12	10	I	100	100	0	Syringodium filiforme	100
1994-10	12	10	P	100	100	0	Syringodium filiforme	100
1995-08	12	1	I	81	81	0	Syringodium filiforme	81
1995-08	12	1	P	88	88	0	Syringodium filiforme	88
1995-08	12	2	I	100	100	0	Syringodium filiforme	100
1995-08	12	2	P	92	92	0	Syringodium filiforme	92
1995-08	12	3	I	100	100	0	Syringodium filiforme	100
1995-08	12	3	P	98	98	0	Syringodium filiforme	98
1995-08	12	4	I	98	98	0	Syringodium filiforme	98
1995-08	12	4	P	100	100	0	Syringodium filiforme	100
1995-08	12	5	I	97	97	0	Syringodium filiforme	97
1995-08	12	5	P	94	94	0	Syringodium filiforme	94
1995-08	12	6	I	92	92	0	Syringodium filiforme	92
1995-08	12	6	P	94	94	0	Syringodium filiforme	94
1995-08	12	7	I	92	92	0	Syringodium filiforme	92
1995-08	12	7	P	100	100	0	Syringodium filiforme	100
1995-08	12	8	I	97	97	0	Syringodium filiforme	97
1995-08	12	8	P	92	92	0	Syringodium filiforme	92
1995-08	12	9	I	96	96	0	Syringodium filiforme	96
1995-08	12	9	P	97	97	0	Syringodium filiforme	97
1995-08	12	10	I	96	96	0	Syringodium filiforme	96
1995-08	12	10	P	97	97	0	Syringodium filiforme	97
1995-10	12	1	I	90	90	0	Syringodium filiforme	90
1995-10	12	1	P	80	80	0	Syringodium filiforme	80
1995-10	12	2	I	92	92	1	Caulerpa prolifera	1
1995-10	12	2	I	92	92	1	Syringodium filiforme	92
1995-10	12	2	P	30	30	1	Caulerpa prolifera	1
1995-10	12	2	P	30	30	1	Syringodium filiforme	30
1995-10	12	3	I	96	96	1	Caulerpa prolifera	1
1995-10	12	3	I	96	96	1	Syringodium filiforme	96
1995-10	12	3	P	100	100	0	Syringodium filiforme	100
1995-10	12	4	I	100	100	0	Syringodium filiforme	100

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-10	12	4	P	100	100	0	Syringodium filiforme	100
1995-10	12	5	I	97	97	0	Syringodium filiforme	97
1995-10	12	5	P	94	94	0	Syringodium filiforme	94
1995-10	12	6	I	97	97	0	Syringodium filiforme	97
1995-10	12	6	P	100	100	0	Syringodium filiforme	100
1995-10	12	7	I	95	95	0	Syringodium filiforme	95
1995-10	12	7	P	85	85	0	Syringodium filiforme	85
1995-10	12	8	I	88	88	0	Syringodium filiforme	88
1995-10	12	8	P	92	92	0	Syringodium filiforme	92
1995-10	12	9	I	95	95	0	Syringodium filiforme	95
1995-10	12	9	P	94	94	0	Syringodium filiforme	94
1995-10	12	10	I	98	98	0	Syringodium filiforme	98
1995-10	12	10	P	91	91	0	Syringodium filiforme	91
1993-12	13	1	I	96	96	15	Caulerpa prolifera	15
1993-12	13	1	I	96	96	15	Halodule wrightii	96
1993-12	13	1	I	96	96	15	Thalassia testudinum	5
1993-12	13	1	P	82	76	6	Caulerpa prolifera	6
1993-12	13	1	P	82	76	6	Halodule wrightii	78
1993-12	13	2	I	94	10	84	Caulerpa mexicana	78
1993-12	13	2	I	94	10	84	Caulerpa prolifera	6
1993-12	13	2	I	94	10	84	Thalassia testudinum	10
1993-12	13	2	P	68	55	13	Caulerpa mexicana	13
1993-12	13	2	P	68	55	13	Halodule wrightii	55
1993-12	13	2	P	68	55	13	Thalassia testudinum	3
1993-12	13	3	I	53	16	37	Caulerpa mexicana	37
1993-12	13	3	I	53	16	37	Thalassia testudinum	16
1993-12	13	3	P	55	0	55	Caulerpa mexicana	55
1993-12	13	4	I	97	0	97	Caulerpa mexicana	27
1993-12	13	4	I	97	0	97	Caulerpa prolifera	70
1993-12	13	4	P	100	0	100	Caulerpa mexicana	20
1993-12	13	4	P	100	0	100	Caulerpa prolifera	80
1993-12	13	5	I	50	0	50	Caulerpa mexicana	30
1993-12	13	5	I	50	0	50	Caulerpa prolifera	20
1993-12	13	5	P	72	0	72	Caulerpa mexicana	72
1993-12	13	6	I	90	0	90	Caulerpa mexicana	10
1993-12	13	6	I	90	0	90	Caulerpa prolifera	80
1993-12	13	6	P	60	0	60	Caulerpa mexicana	60
1993-12	13	7	I	70	0	70	Caulerpa prolifera	70
1993-12	13	7	P	70	0	70	Caulerpa prolifera	70
1993-12	13	8	I	42	0	42	Caulerpa prolifera	42
1993-12	13	8	P	40	0	40	Caulerpa mexicana	40
1993-12	13	9	I	95	0	95	Caulerpa mexicana	95
1993-12	13	9	P	60	20	40	Caulerpa mexicana	40
1993-12	13	9	P	60	20	40	Halodule wrightii	20
1993-12	13	10	I	90	0	90	Caulerpa mexicana	90
1993-12	13	10	P	85	75	10	Caulerpa prolifera	10
1993-12	13	10	P	85	75	10	Halodule wrightii	75
1994-08	13	1	P/I	99	0	99	Caulerpa prolifera	99
1994-08	13	2	P/I	65	1	66	Caulerpa prolifera	65
1994-08	13	2	P/I	65	1	66	Thalassia testudinum	1
1994-08	13	3	P/I	74	74	0	Thalassia testudinum	74
1994-08	13	4	P/I	95	7	88	Caulerpa prolifera	88
1994-08	13	4	P/I	95	7	88	Thalassia testudinum	7
1994-08	13	5	P/I	28	0	28	Caulerpa mexicana	7
1994-08	13	5	P/I	28	0	28	Caulerpa prolifera	21
1994-08	13	6	P/I	65	31	34	Caulerpa mexicana	16

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	13	6	P/I	65	31	34	Caulerpa prolifera	18
1994-08	13	6	P/I	65	31	34	Halophila englemannii	21
1994-08	13	6	P/I	65	31	34	Thalassia testudinum	10
1994-08	13	7	P/I	87	0	87	Caulerpa mexicana	87
1994-08	13	8	P/I	56	0	56	Caulerpa mexicana	56
1994-08	13	9	P/I	97	0	97	Caulerpa prolifera	97
1994-08	13	10	P/I	94	0	94	Caulerpa prolifera	94
1994-08	13	11	P/I	96	96	18	Caulerpa prolifera	18
1994-08	13	11	P/I	96	96	18	Halodule wrightii	41
1994-08	13	11	P/I	96	96	18	Thalassia testudinum	55
1994-08	13	12	P/I	100	61	65	Caulerpa mexicana	8
1994-08	13	12	P/I	100	61	65	Caulerpa prolifera	57
1994-08	13	12	P/I	100	61	65	Thalassia testudinum	61
1994-08	13	13	P/I	87	67	16	Caulerpa mexicana	9
1994-08	13	13	P/I	87	67	16	Caulerpa prolifera	7
1994-08	13	13	P/I	87	67	16	Halodule wrightii	15
1994-08	13	13	P/I	87	67	16	Thalassia testudinum	42
1994-08	13	14	P/I	100	0	100	Caulerpa mexicana	100
1994-08	13	14	P/I	100	0	100	Caulerpa prolifera	29
1994-08	13	15	P/I	100	0	100	Caulerpa mexicana	100
1994-08	13	15	P/I	100	0	100	Caulerpa prolifera	2
1994-10	13	1	I	99	81	18	Caulerpa mexicana	18
1994-10	13	1	I	99	81	18	Halodule wrightii	1
1994-10	13	1	I	99	81	18	Thalassia testudinum	81
1994-10	13	1	P	99	90	77	Caulerpa prolifera	77
1994-10	13	1	P	99	90	77	Halodule wrightii	90
1994-10	13	2	I	96	96	8	Caulerpa mexicana	8
1994-10	13	2	I	96	96	8	Thalassia testudinum	96
1994-10	13	2	P	96	80	69	Caulerpa mexicana	60
1994-10	13	2	P	96	80	69	Caulerpa prolifera	9
1994-10	13	2	P	96	80	69	Halodule wrightii	8
1994-10	13	2	P	96	80	69	Thalassia testudinum	72
1994-10	13	3	I	72	8	64	Caulerpa mexicana	64
1994-10	13	3	I	72	8	64	Thalassia testudinum	8
1994-10	13	3	P	94	23	84	Caulerpa mexicana	52
1994-10	13	3	P	94	23	84	Caulerpa prolifera	32
1994-10	13	3	P	94	23	84	Halodule wrightii	11
1994-10	13	3	P	94	23	84	Thalassia testudinum	12
1994-10	13	4	I	68	57	11	Caulerpa mexicana	1
1994-10	13	4	I	68	57	11	Caulerpa prolifera	10
1994-10	13	4	I	68	57	11	Halodule wrightii	57
1994-10	13	4	P	92	0	92	Caulerpa mexicana	78
1994-10	13	4	P	92	0	92	Caulerpa prolifera	16
1994-10	13	5	P	25	25	5	Caulerpa prolifera	5
1994-10	13	5	P	25	25	5	Halodule wrightii	25
1994-10	13	6	P	70	60	19	Caulerpa mexicana	4
1994-10	13	6	P	70	60	19	Caulerpa prolifera	15
1994-10	13	6	P	70	60	19	Halodule wrightii	59
1994-10	13	6	P	70	60	19	Halophila englemannii	1
1994-10	13	7	I	40	40	7	Caulerpa mexicana	1
1994-10	13	7	I	40	40	7	Caulerpa prolifera	6
1994-10	13	7	I	40	40	7	Halodule wrightii	40
1994-10	13	7	P	70	70	6	Caulerpa mexicana	6
1994-10	13	7	P	70	70	6	Halodule wrightii	70
1994-10	13	7	P	70	70	6	Halophila englemannii	1
1994-10	13	8	I	20	20	10	Caulerpa mexicana	10

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-10	13	8	I	20	20	10	Halodule wrightii	20
1994-10	13	8	P	80	80	10	Caulerpa mexicana	5
1994-10	13	8	P	80	80	10	Caulerpa prolifera	5
1994-10	13	8	P	80	80	10	Halodule wrightii	80
1994-10	13	9	I	30	30	0	Halodule wrightii	30
1994-10	13	9	I	30	30	0	Halophila englemannii	5
1994-10	13	9	P	83	83	0	Halodule wrightii	83
1994-10	13	10	I	50	50	1	Caulerpa mexicana	1
1994-10	13	10	I	50	50	1	Halodule wrightii	40
1994-10	13	10	I	50	50	1	Halophila englemannii	10
1994-10	13	10	P	20	20	10	Caulerpa prolifera	10
1994-10	13	10	P	20	20	10	Halodule wrightii	20
1995-08	13	1	I	100	100	29	Caulerpa mexicana	9
1995-08	13	1	I	100	100	29	Caulerpa prolifera	20
1995-08	13	1	I	100	100	29	Halodule wrightii	100
1995-08	13	1	P	100	100	33	Caulerpa mexicana	8
1995-08	13	1	P	100	100	33	Caulerpa prolifera	29
1995-08	13	1	P	100	100	33	Halodule wrightii	100
1995-08	13	2	I	99	99	21	Caulerpa mexicana	1
1995-08	13	2	I	99	99	21	Caulerpa prolifera	21
1995-08	13	2	I	99	99	21	Halodule wrightii	99
1995-08	13	2	P	86	86	68	Caulerpa mexicana	8
1995-08	13	2	P	86	86	68	Caulerpa prolifera	60
1995-08	13	2	P	86	86	68	Halodule wrightii	86
1995-08	13	3	I	93	9	93	Caulerpa prolifera	93
1995-08	13	3	I	93	9	93	Halophila englemannii	9
1995-08	13	3	P	51	3	51	Caulerpa prolifera	51
1995-08	13	3	P	51	3	51	Halodule wrightii	3
1995-08	13	4	I	100	3	100	Caulerpa mexicana	2
1995-08	13	4	I	100	3	100	Caulerpa prolifera	100
1995-08	13	4	I	100	3	100	Halodule wrightii	3
1995-08	13	4	P	84	6	84	Caulerpa mexicana	3
1995-08	13	4	P	84	6	84	Caulerpa prolifera	84
1995-08	13	4	P	84	6	84	Halodule wrightii	6
1995-08	13	5	I	87	4	85	Caulerpa prolifera	85
1995-08	13	5	I	87	4	85	Halodule wrightii	4
1995-08	13	5	P	88	9	88	Caulerpa mexicana	14
1995-08	13	5	P	88	9	88	Caulerpa prolifera	88
1995-08	13	5	P	88	9	88	Halodule wrightii	9
1995-08	13	6	I	74	4	70	Caulerpa mexicana	60
1995-08	13	6	I	74	4	70	Caulerpa prolifera	10
1995-08	13	6	I	74	4	70	Halophila englemannii	4
1995-08	13	6	P	90	0	90	Caulerpa prolifera	90
1995-08	13	7	I	66	5	61	Caulerpa prolifera	61
1995-08	13	7	I	66	5	61	Halodule wrightii	5
1995-08	13	7	P	30	5	25	Caulerpa mexicana	5
1995-08	13	7	P	30	5	25	Caulerpa prolifera	20
1995-08	13	7	P	30	5	25	Halodule wrightii	5
1995-08	13	8	I	96	0	96	Caulerpa prolifera	96
1995-08	13	8	P	90	90	90	Caulerpa prolifera	90
1995-08	13	8	P	90	90	90	Halodule wrightii	90
1995-08	13	9	I	73	2	71	Caulerpa prolifera	71
1995-08	13	9	I	73	2	71	Halodule wrightii	2
1995-08	13	9	P	41	0	41	Caulerpa mexicana	3
1995-08	13	9	P	41	0	41	Caulerpa prolifera	38
1995-08	13	10	I	35	5	30	Caulerpa mexicana	30

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-08	13	10	I	35	5	30	Thalassia testudinum	5
1995-08	13	10	P	66	8	58	Caulerpa mexicana	50
1995-08	13	10	P	66	8	58	Caulerpa prolifera	8
1995-08	13	10	P	66	8	58	Halodule wrightii	5
1995-08	13	10	P	66	8	58	Halophila englemannii	3
1995-10	13	1	I	2	0	2	Caulerpa prolifera	2
1995-10	13	1	P	20	16	4	Caulerpa mexicana	4
1995-10	13	1	P	20	16	4	Halodule wrightii	16
1995-10	13	2	I	18	0	18	Caulerpa mexicana	15
1995-10	13	2	I	18	0	18	Caulerpa prolifera	3
1995-10	13	2	P	40	0	40	Caulerpa mexicana	30
1995-10	13	2	P	40	0	40	Caulerpa prolifera	10
1995-10	13	3	I	74	0	74	Caulerpa prolifera	74
1995-10	13	3	P	30	0	30	Caulerpa prolifera	30
1995-10	13	4	I	79	0	79	Caulerpa mexicana	14
1995-10	13	4	I	79	0	79	Caulerpa prolifera	79
1995-10	13	4	P	20	0	20	Caulerpa prolifera	20
1995-10	13	5	I	85	0	85	Caulerpa mexicana	83
1995-10	13	5	I	85	0	85	Caulerpa prolifera	2
1995-10	13	5	P	96	77	71	Caulerpa prolifera	71
1995-10	13	5	P	96	77	71	Halodule wrightii	77
1995-10	13	6	I	26	3	23	Caulerpa prolifera	23
1995-10	13	6	I	26	3	23	Halodule wrightii	3
1995-10	13	6	P	32	0	32	Caulerpa prolifera	32
1995-10	13	7	I	86	3	86	Caulerpa prolifera	86
1995-10	13	7	I	86	3	86	Halodule wrightii	3
1995-10	13	7	P	90	0	90	Caulerpa prolifera	90
1995-10	13	8	I	89	0	89	Caulerpa prolifera	89
1995-10	13	8	P	90	18	72	Caulerpa prolifera	72
1995-10	13	8	P	90	18	72	Thalassia testudinum	18
1995-10	13	9	I	76	0	76	Caulerpa prolifera	76
1995-10	13	9	P	100	20	80	Caulerpa mexicana	2
1995-10	13	9	P	100	20	80	Caulerpa prolifera	80
1995-10	13	9	P	100	20	80	Halodule wrightii	20
1993-12	14	1	I	69	69	0	Halodule wrightii	69
1993-12	14	1	P	100	100	0	Halodule wrightii	100
1993-12	14	2	I	98	98	0	Halodule wrightii	98
1993-12	14	2	P	100	100	0	Halodule wrightii	100
1993-12	14	3	I	95	95	0	Halodule wrightii	95
1993-12	14	3	P	82	82	0	Halodule wrightii	82
1993-12	14	4	I	97	97	0	Halodule wrightii	97
1993-12	14	4	P	73	73	0	Halodule wrightii	73
1993-12	14	5	I	95	95	0	Halodule wrightii	95
1993-12	14	5	P	95	95	0	Halodule wrightii	95
1993-12	14	6	I	93	93	2	Caulerpa prolifera	2
1993-12	14	6	I	93	93	2	Halodule wrightii	91
1993-12	14	6	P	97	97	0	Halodule wrightii	97
1993-12	14	7	I	93	93	0	Halodule wrightii	93
1993-12	14	7	P	96	96	0	Halodule wrightii	96
1993-12	14	8	I	95	95	0	Halodule wrightii	95
1993-12	14	8	P	89	89	0	Halodule wrightii	89
1993-12	14	9	I	83	83	0	Halodule wrightii	3
1993-12	14	9	I	83	83	0	Thalassia testudinum	83
1993-12	14	9	P	77	77	0	Thalassia testudinum	77
1993-12	14	10	I	100	100	0	Halodule wrightii	100
1993-12	14	10	P	98	98	0	Halodule wrightii	98

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1994-08	14	1	I	97	97	4	Halimeda incrassata	4
1994-08	14	1	I	97	97	4	Halodule wrightii	97
1994-08	14	1	P	91	91	0	Halodule wrightii	89
1994-08	14	1	P	91	91	0	Thalassia testudinum	2
1994-08	14	2	I	77	77	0	Halodule wrightii	77
1994-08	14	2	P	92	92	0	Halodule wrightii	92
1994-08	14	3	I	85	85	0	Halodule wrightii	85
1994-08	14	3	P	90	90	0	Halodule wrightii	90
1994-08	14	4	I	97	97	0	Halodule wrightii	97
1994-08	14	4	P	81	81	0	Halodule wrightii	81
1994-08	14	5	I	13	13	0	Halodule wrightii	13
1994-08	14	5	P	93	93	0	Halodule wrightii	93
1994-08	14	6	I	100	100	0	Halodule wrightii	100
1994-08	14	6	P	100	100	0	Halodule wrightii	100
1994-08	14	7	I	100	100	0	Halodule wrightii	100
1994-08	14	7	P	100	100	0	Halodule wrightii	100
1994-08	14	8	I	100	100	0	Halodule wrightii	100
1994-08	14	8	P	100	100	0	Halodule wrightii	100
1994-08	14	9	I	100	100	0	Halodule wrightii	100
1994-08	14	9	P	90	90	0	Thalassia testudinum	90
1994-08	14	10	I	100	100	0	Halodule wrightii	100
1994-08	14	10	P	11	11	0	Thalassia testudinum	89
1994-10	14	1	I	84	84	0	Halodule wrightii	84
1994-10	14	1	P	96	96	0	Halodule wrightii	96
1994-10	14	2	I	72	72	0	Halodule wrightii	72
1994-10	14	2	I	72	72	0	Thalassia testudinum	2
1994-10	14	2	P	91	91	0	Thalassia testudinum	91
1994-10	14	3	I	84	84	0	Halodule wrightii	84
1994-10	14	3	P	67	67	0	Halodule wrightii	67
1994-10	14	4	I	99	99	0	Halodule wrightii	99
1994-10	14	4	P	96	96	0	Halodule wrightii	96
1994-10	14	5	I	97	97	0	Halodule wrightii	97
1994-10	14	5	P	99	99	0	Halodule wrightii	99
1994-10	14	6	I	98	98	0	Halodule wrightii	98
1994-10	14	6	P	95	95	0	Halodule wrightii	95
1994-10	14	7	I	97	97	0	Halodule wrightii	97
1994-10	14	7	P	76	76	0	Halodule wrightii	76
1994-10	14	8	I	86	86	0	Halodule wrightii	86
1994-10	14	8	P	87	88	1	Caulerpa prolifera	1
1994-10	14	8	P	87	88	1	Halodule wrightii	87
1994-10	14	9	I	88	88	0	Halodule wrightii	88
1994-10	14	9	P	88	88	0	Halodule wrightii	88
1994-10	14	10	I	91	91	0	Halodule wrightii	91
1994-10	14	10	P	79	79	0	Halodule wrightii	79
1995-08	14	1	I	63	63	0	Halodule wrightii	63
1995-08	14	1	P	72	72	0	Halodule wrightii	72
1995-08	14	2	I	99	99	0	Halodule wrightii	99
1995-08	14	2	P	90	90	0	Halodule wrightii	90
1995-08	14	3	I	98	98	0	Halodule wrightii	98
1995-08	14	3	P	89	89	0	Halodule wrightii	89
1995-08	14	4	I	100	100	0	Halodule wrightii	100
1995-08	14	4	P	98	98	0	Halodule wrightii	98
1995-08	14	5	I	99	99	0	Halodule wrightii	99
1995-08	14	5	P	100	100	0	Halodule wrightii	100
1995-08	14	6	I	100	100	0	Halodule wrightii	100
1995-08	14	6	P	86	86	0	Halodule wrightii	86

Appendix Table IV. Continued.

Date	Station	Rep.	Perimeter/ Interior (P/I)	Total Vegetation	Total Seagrass	Total Algae	Species	Cover
1995-08	14	7	I	96	96	0	Halodule wrightii	96
1995-08	14	7	P	88	88	0	Halodule wrightii	88
1995-08	14	8	I	91	91	0	Halodule wrightii	42
1995-08	14	8	I	91	91	0	Thalassia testudinum	69
1995-08	14	8	P	99	99	0	Halodule wrightii	82
1995-08	14	8	P	99	99	0	Thalassia testudinum	22
1995-08	14	9	I	94	94	0	Thalassia testudinum	94
1995-08	14	9	P	95	95	0	Thalassia testudinum	95
1995-08	14	10	I	93	93	0	Thalassia testudinum	93
1995-08	14	10	P	95	95	0	Thalassia testudinum	95
1995-10	14	1	I	100	100	0	Halodule wrightii	100
1995-10	14	1	P	100	100	0	Halodule wrightii	100
1995-10	14	2	I	98	98	0	Halodule wrightii	98
1995-10	14	2	I	98	98	0	Thalassia testudinum	1
1995-10	14	2	P	94	94	0	Halodule wrightii	94
1995-10	14	3	I	98	98	0	Halodule wrightii	98
1995-10	14	3	P	100	100	0	Halodule wrightii	100
1995-10	14	4	I	30	30	0	Halodule wrightii	30
1995-10	14	4	P	0	0	0	Bare	0
1995-10	14	5	I	86	86	0	Halodule wrightii	86
1995-10	14	5	P	20	20	0	Halodule wrightii	20
1995-10	14	6	I	95	95	0	Halodule wrightii	95
1995-10	14	6	P	93	93	0	Halodule wrightii	93
1995-10	14	7	I	93	93	0	Halodule wrightii	93
1995-10	14	7	P	90	90	0	Halodule wrightii	90
1995-10	14	8	I	75	75	0	Halodule wrightii	40
1995-10	14	8	I	75	75	0	Thalassia testudinum	35
1995-10	14	8	P	75	75	0	Thalassia testudinum	75
1995-10	14	9	I	77	77	0	Halodule wrightii	77
1995-10	14	9	P	58	58	0	Halodule wrightii	58
1995-10	14	10	I	96	96	0	Halodule wrightii	96
1995-10	14	10	P	86	86	0	Halodule wrightii	86
1993-12	15	1	I	95	95	0	Thalassia testudinum	95
1993-12	15	1	P	90	90	0	Thalassia testudinum	90
1993-12	15	2	I	95	95	0	Thalassia testudinum	95
1993-12	15	2	P	88	88	0	Thalassia testudinum	88
1993-12	15	3	I	89	89	0	Halodule wrightii	18
1993-12	15	3	I	89	89	0	Thalassia testudinum	86
1993-12	15	3	P	28	28	0	Thalassia testudinum	28
1993-12	15	4	I	100	100	0	Halodule wrightii	100
1993-12	15	4	P	89	89	0	Halodule wrightii	89
1993-12	15	5	I	100	100	0	Halodule wrightii	100
1993-12	15	5	P	100	100	0	Halodule wrightii	100
1993-12	15	6	I	100	100	0	Halodule wrightii	100
1993-12	15	6	P	78	78	0	Halodule wrightii	78
1993-12	15	7	I	100	100	0	Halodule wrightii	100
1993-12	15	7	P	100	100	0	Halodule wrightii	100
1993-12	15	8	I	100	100	0	Halodule wrightii	100
1993-12	15	8	P	75	75	15	Caulerpa prolifera	15
1993-12	15	8	P	75	75	15	Halodule wrightii	75
1993-12	15	9	I	100	100	0	Halodule wrightii	100
1993-12	15	9	P	100	100	0	Halodule wrightii	100
1993-12	15	10	I	98	98	0	Halodule wrightii	98
1993-12	15	10	P	100	100	0	Halodule wrightii	100
1994-08	15	1	P	90	90	0	Halodule wrightii	90
1994-08	15	2	I	94	94	0	Halodule wrightii	94

Appendix Table V. Dry weight biomass from .25cmX.25cm quadrats.

Date	Station	Rep.	Spp.	Biomass (g)
1994	1	1	Halodule wrightii	1.53
1994	1	2	Halodule wrightii	1.66
1994	1	3	Halodule wrightii	.55
1994	1	4	Halodule wrightii	1.37
1994	1	5	Halodule wrightii	.98
1994	1	6	Halodule wrightii	3.74
1995	1	1	Halodule wrightii	.61
1995	1	2	Halodule wrightii	.26
1995	1	3	Halodule wrightii	1.05
1995	1	4	Halodule wrightii	1.43
1995	1	5	Halodule wrightii	.53
1995	1	6	Halodule wrightii	.67
1994	2	1	Halodule wrightii	.63
1994	2	2	Halodule wrightii	1.06
1994	2	3	Halodule wrightii	.70
1994	2	4	Halodule wrightii	.97
1994	2	5	Halodule wrightii	.87
1994	2	6	Halodule wrightii	.67
1995	2	1	Halodule wrightii	.30
1995	2	2	Halodule wrightii	.51
1995	2	3	Halodule wrightii	.08
1995	2	4	Halodule wrightii	.27
1995	2	5	Halodule wrightii	.53
1995	2	6	Halodule wrightii	.24
1994	3	1	Halodule wrightii	.48
1994	3	2	Halodule wrightii	.12
1994	3	3	Halodule wrightii	.56
1994	3	4	Halodule wrightii	.40
1994	3	5	Halodule wrightii	1.18
1994	3	6	Halodule wrightii	.39
1995	3	1	Halodule wrightii	.73
1995	3	2	Halodule wrightii	.19
1995	3	3	Halodule wrightii	.43
1995	3	4	Halodule wrightii	.61
1995	3	5	Halodule wrightii	.09
1995	3	6	Halodule wrightii	.49
1994	4	1	Drift Algae	4.96
1994	4	1	Syringodium filiforme	4.14
1994	4	2	Syringodium filiforme	1.51
1994	4	3	Syringodium filiforme	1.90
1994	4	4	Drift Algae	5.30
1994	4	4	Syringodium filiforme	2.76
1994	4	5	Syringodium filiforme	2.27
1994	4	6	Syringodium filiforme	3.49
1995	4	1	Halimeda	.43
1995	4	1	Syringodium filiforme	1.12
1995	4	2	Drift Algae	.63
1995	4	2	Syringodium filiforme	1.84
1995	4	3	Drift Algae	.05
1995	4	3	Syringodium filiforme	3.29

Appendix Table V. Continued.

Date	Station	Rep.	Spp.	Biomass (g)
1995	4	4	Syringodium filiforme	2.47
1995	4	5	Drift Algae	.08
1995	4	5	Syringodium filiforme	2.86
1995	4	6	Halimeda	.01
1995	4	6	Syringodium filiforme	1.62
1994	5	1	Halodule wrightii	.50
1994	5	2	Halodule wrightii	.16
1994	5	3	Halodule wrightii	1.13
1994	5	4	Halodule wrightii	.29
1994	5	5	Halodule wrightii	.35
1994	5	6	Halodule wrightii	.75
1995	5	1	None	.00
1995	5	2	Caulerpa mexicana	.15
1995	5	3	Caulerpa mexicana	.03
1995	5	4	Halodule wrightii	.06
1995	5	5	Halodule wrightii	.11
1995	5	6	Halodule wrightii	.05
1994	6	1	Halodule wrightii	1.15
1994	6	2	Halodule wrightii	.43
1994	6	3	Drift Algae	1.96
1994	6	3	Halodule wrightii	.70
1994	6	4	Halodule wrightii	2.04
1994	6	5	Halodule wrightii	.51
1994	6	6	Halodule wrightii	.83
1995	6	1	Drift Algae	.23
1995	6	1	Halodule wrightii	1.75
1995	6	2	Halodule wrightii	1.16
1995	6	3	Drift Algae	.85
1995	6	3	Halodule wrightii	3.77
1995	6	4	Halodule wrightii	1.24
1995	6	5	Halodule wrightii	2.22
1995	6	6	Drift Algae	.44
1995	6	6	Halodule wrightii	2.18
1995	6	6	Halophila englemannii	.15
1994	7	1	Halodule wrightii	.83
1994	7	2	Halodule wrightii	1.31
1994	7	3	Halodule wrightii	1.51
1994	7	4	Halodule wrightii	1.55
1994	7	4	Halophila englemannii	.19
1994	7	5	Halodule wrightii	.73
1994	7	5	Halophila englemannii	.69
1994	7	6	Halodule wrightii	.94
1995	7	1	Halodule wrightii	2.39
1995	7	2	Halodule wrightii	4.40
1995	7	3	Halodule wrightii	1.49
1995	7	4	Drift Algae	.51
1995	7	4	Halodule wrightii	1.92
1995	7	4	Halophila englemannii	.02
1995	7	5	Drift Algae	.36
1995	7	5	Halodule wrightii	.48

Appendix Table V. Continued.

Date	Station	Rep.	Spp.	Biomass (g)
1995	7	6	Drift Algae	.19
1995	7	6	Halodule wrightii	3.64
1994	8	1	Drift Algae	.56
1994	8	1	Halodule wrightii	1.25
1994	8	1	Halophila englemannii	.21
1994	8	1	Syringodium filiforme	3.66
1994	8	2	Drift Algae	.08
1994	8	2	Syringodium filiforme	5.74
1994	8	3	Drift Algae	2.23
1994	8	3	Halodule wrightii	1.18
1994	8	3	Halophila englemannii	.32
1994	8	3	Syringodium filiforme	.73
1994	8	4	Drift Algae	.18
1994	8	4	Halodule wrightii	2.03
1994	8	4	Halophila englemannii	.09
1994	8	5	Drift Algae	6.08
1994	8	5	Halodule wrightii	2.02
1994	8	5	Syringodium filiforme	.94
1994	8	6	Halodule wrightii	.99
1994	8	6	Halophila englemannii	.04
1994	8	6	Syringodium filiforme	1.44
1995	8	1	Drift Algae	1.05
1995	8	1	Syringodium filiforme	.54
1995	8	2	Drift Algae	1.65
1995	8	2	Syringodium filiforme	2.00
1995	8	3	Drift Algae	.68
1995	8	3	Syringodium filiforme	1.86
1995	8	4	None	.00
1995	8	5	Syringodium filiforme	.01
1995	8	6	Drift Algae	17.77
1995	8	6	Syringodium filiforme	.13
1994	9	1	Halophila englemannii	.11
1994	9	1	Syringodium filiforme	3.29
1994	9	2	Drift Algae	.11
1994	9	2	Halodule wrightii	.17
1994	9	2	Halophila englemannii	.56
1994	9	2	Syringodium filiforme	4.09
1994	9	3	Halophila englemannii	.38
1994	9	3	Syringodium filiforme	3.85
1994	9	4	Drift Algae	1.40
1994	9	4	Syringodium filiforme	5.52
1994	9	5	Drift Algae	.31
1994	9	5	Syringodium filiforme	5.58
1994	9	6	Halophila englemannii	.21
1994	9	6	Syringodium filiforme	4.61
1995	9	1	Caulerpa prolifera	.02
1995	9	1	Drift Algae	1.74
1995	9	1	Syringodium filiforme	2.05
1995	9	2	Caulerpa prolifera	.06
1995	9	2	Drift Algae	2.94

Appendix Table V. Continued.

Date	Station	Rep.	Spp.	Biomass (g)
1995	9	2	Halodule wrightii	.24
1995	9	2	Syringodium filiforme	.77
1995	9	3	Caulerpa prolifera	.01
1995	9	3	Drift Algae	1.24
1995	9	3	Syringodium filiforme	1.69
1995	9	4	Syringodium filiforme	1.81
1995	9	5	Drift Algae	1.34
1995	9	5	Syringodium filiforme	3.79
1995	9	6	Syringodium filiforme	2.84
1994	10	1	Caulerpa prolifera	.61
1994	10	1	Syringodium filiforme	4.41
1994	10	2	Caulerpa prolifera	.78
1994	10	2	Drift Algae	14.16
1994	10	2	Syringodium filiforme	5.23
1994	10	3	Caulerpa prolifera	2.80
1994	10	3	Syringodium filiforme	5.85
1994	10	4	Caulerpa prolifera	.52
1994	10	4	Syringodium filiforme	2.77
1994	10	5	Caulerpa prolifera	3.67
1994	10	5	Drift Algae	14.42
1994	10	5	Halophila englemannii	.24
1994	10	6	Caulerpa prolifera	.38
1994	10	6	Syringodium filiforme	2.06
1995	10	1	Caulerpa prolifera	1.65
1995	10	1	Drift Algae	5.99
1995	10	1	Halophila englemannii	.49
1995	10	1	Syringodium filiforme	1.86
1995	10	1	Udotea	.59
1995	10	2	Caulerpa prolifera	1.28
1995	10	2	Drift Algae	5.54
1995	10	2	Syringodium filiforme	3.29
1995	10	3	Drift Algae	17.06
1995	10	3	Syringodium filiforme	.86
1995	10	4	Drift Algae	19.32
1995	10	4	Syringodium filiforme	2.39
1995	10	5	Drift Algae	71.90
1995	10	5	Syringodium filiforme	.19
1995	10	6	Caulerpa prolifera	.36
1995	10	6	Drift Algae	10.28
1995	10	6	Syringodium filiforme	1.84
1994	11	1	Syringodium filiforme	9.12
1994	11	2	Syringodium filiforme	7.84
1994	11	3	Syringodium filiforme	6.77
1994	11	4	Syringodium filiforme	11.45
1994	11	5	Syringodium filiforme	6.97
1994	11	6	Syringodium filiforme	5.37
1995	11	1	Syringodium filiforme	3.42
1995	11	2	Syringodium filiforme	4.20
1995	11	3	Syringodium filiforme	3.44
1995	11	4	Drift Algae	2.96

Appendix Table V. Continued.

Date	Station	Rep.	Spp.	Biomass (g)
1995	11	4	Syringodium filiforme	.65
1995	11	5	Syringodium filiforme	1.10
1995	11	6	Syringodium filiforme	3.36
1994	12	1	Caulerpa prolifera	.02
1994	12	1	Syringodium filiforme	5.96
1994	12	2	Caulerpa prolifera	.04
1994	12	2	Syringodium filiforme	8.36
1994	12	3	Drift Algae	13.16
1994	12	3	Halodule wrightii	4.97
1994	12	3	Syringodium filiforme	1.45
1994	12	4	Caulerpa prolifera	.17
1994	12	4	Drift Algae	32.31
1994	12	4	Syringodium filiforme	9.63
1994	12	5	Caulerpa prolifera	.31
1994	12	5	Drift Algae	5.62
1994	12	5	Syringodium filiforme	2.25
1994	12	6	Caulerpa prolifera	.06
1994	12	6	Drift Algae	17.30
1994	12	6	Syringodium filiforme	13.30
1995	12	1	Caulerpa prolifera	.17
1995	12	1	Drift Algae	.66
1995	12	1	Syringodium filiforme	1.31
1995	12	2	Syringodium filiforme	.33
1995	12	3	Caulerpa mexicana	.04
1995	12	3	Drift Algae	1.40
1995	12	3	Syringodium filiforme	2.10
1995	12	4	Caulerpa prolifera	.06
1995	12	4	Drift Algae	1.44
1995	12	4	Syringodium filiforme	.77
1995	12	5	Caulerpa prolifera	.01
1995	12	5	Drift Algae	2.08
1995	12	5	Syringodium filiforme	1.66
1995	12	6	Drift Algae	.29
1995	12	6	Syringodium filiforme	1.86
1994	13	1	Caulerpa prolifera	2.58
1994	13	1	Drift Algae	2.34
1994	13	1	Thalassia testudinum	7.34
1994	13	2	Caulerpa mexicana	20.91
1994	13	2	Drift Algae	2.11
1994	13	3	Caulerpa prolifera	2.15
1994	13	3	Drift Algae	3.19
1994	13	3	Thalassia testudinum	3.14
1994	13	4	Caulerpa mexicana	18.84
1994	13	4	Caulerpa prolifera	.86
1994	13	4	Drift Algae	32.43
1994	13	4	Thalassia testudinum	1.70
1994	13	5	Caulerpa mexicana	19.90
1994	13	5	Caulerpa prolifera	.70
1994	13	5	Drift Algae	1.74
1994	13	5	Thalassia testudinum	1.56

Appendix Table V. Continued.

Date	Station	Rep.	Spp.	Biomass (g)
1994	13	6	Caulerpa mexicana	4.78
1994	13	6	Caulerpa prolifera	.59
1994	13	6	Drift Algae	4.68
1994	13	6	Thalassia testudinum	.66
1995	13	1	Caulerpa mexicana	.33
1995	13	1	Caulerpa prolifera	1.15
1995	13	1	Drift Algae	.37
1995	13	1	Halodule wrightii	2.34
1995	13	1	Halophila englemannii	.26
1995	13	2	Caulerpa prolifera	.72
1995	13	3	Caulerpa mexicana	.02
1995	13	3	Caulerpa prolifera	.19
1995	13	4	Caulerpa mexicana	.26
1995	13	4	Halodule wrightii	.66
1995	13	5	Caulerpa prolifera	1.55
1995	13	5	Halophila englemannii	.06
1995	13	6	Caulerpa prolifera	1.55
1995	13	6	Drift Algae	.01
1995	13	6	Halodule wrightii	.24
1995	13	6	Thalassia testudinum	.07
1994	14	1	Drift Algae	1.34
1994	14	1	Halodule wrightii	.85
1994	14	1	Syringodium filiforme	.37
1994	14	2	Drift Algae	3.01
1994	14	2	Halodule wrightii	.86
1994	14	3	Halodule wrightii	.41
1994	14	3	Syringodium filiforme	.53
1994	14	4	Drift Algae	4.13
1994	14	4	Halodule wrightii	.37
1994	14	4	Syringodium filiforme	.30
1994	14	5	Drift Algae	.32
1994	14	5	Halodule wrightii	.95
1994	14	6	Drift Algae	10.23
1994	14	6	Halodule wrightii	.55
1994	14	6	Syringodium filiforme	3.92
1995	14	1	Halodule wrightii	2.45
1995	14	2	Halodule wrightii	3.56
1995	14	3	Halodule wrightii	5.16
1995	14	4	Halodule wrightii	2.96
1995	14	5	Halodule wrightii	2.43
1995	14	6	Halodule wrightii	1.78
1994	15	1	Halodule wrightii	1.06
1994	15	1	Thalassia testudinum	.21
1994	15	2	Drift Algae	.09
1994	15	2	Halodule wrightii	1.39
1994	15	3	Halodule wrightii	8.35
1994	15	4	Drift Algae	4.56
1994	15	4	Halodule wrightii	7.63
1994	15	5	Drift Algae	.79
1994	15	5	Halodule wrightii	5.27

Appendix Table V. Continued.

Date	Station	Rep.	Spp.	Biomass (g)
1994	15	6	Halodule wrightii	2.20
1994	15	6	Thalassia testudinum	1.03
1995	15	1	Drift Algae	.80
1995	15	1	Halodule wrightii	2.38
1995	15	1	Syringodium filiforme	.01
1995	15	1	Thalassia testudinum	.01
1995	15	2	Caulerpa prolifera	.09
1995	15	2	Drift Algae	2.87
1995	15	2	Halodule wrightii	3.05
1995	15	2	Thalassia testudinum	.04
1995	15	3	Halodule wrightii	.65
1995	15	3	Syringodium filiforme	.01
1995	15	4	Drift Algae	.81
1995	15	4	Halodule wrightii	3.23
1995	15	5	Halodule wrightii	1.07
1995	15	6	Drift Algae	.53
1995	15	6	Halodule wrightii	1.47

Appendix Table VI. Biomass data and productivity (mg/m2/day) of grass clip samples.

Year	Station	Rep.	Species	Productivity (mg/m2/day)	Shoots/m2	Growth Days	Wt./Shoot (µg)	Sample Wt. (µg)
1994	1	1	Halodule wrightii	196	299	14	92	275
1994	1	2	Halodule wrightii	543	499	14	152	762
1994	1	3	Halodule wrightii	604	499	14	170	848
1994	1	4	Halodule wrightii	627	499	14	176	881
1994	1	5	Halodule wrightii	403	399	14	142	566
1994	1	6	Halodule wrightii	803	598	14	188	1128
1995	1	1	Halodule wrightii	1225	1595	14	108	1720
1995	1	2	Halodule wrightii	964	1196	14	113	1353
1995	1	3	Halodule wrightii	508	798	14	89	713
1995	1	4	Halodule wrightii	266	499	14	75	374
1995	1	5	Halodule wrightii	1008	1795	14	79	1416
1995	1	6	Halodule wrightii	1182	1595	14	104	1660
1994	2	1	Halodule wrightii	274	299	14	128	385
1994	2	2	Halodule wrightii	121	199	14	85	170
1994	2	3	Halodule wrightii	325	698	14	65	456
1994	2	4	Halodule wrightii	154	299	14	72	216
1994	2	5	Halodule wrightii	153	399	14	54	215
1995	2	1	Halodule wrightii	278	598	14	65	390
1995	2	2	Halodule wrightii	574	1097	14	73	806
1995	2	3	Halodule wrightii	613	1196	14	72	861
1995	2	4	Halodule wrightii	781	1296	14	84	1096
1995	2	6	Halodule wrightii	736	1396	14	74	1034
1994	3	1	Halodule wrightii	55	299	14	26	77
1994	3	2	Halodule wrightii	64	199	14	45	90
1994	3	3	Halodule wrightii	22	100	14	31	31
1994	3	4	Halodule wrightii	210	499	14	59	295
1994	3	5	Halodule wrightii	66	199	14	47	93
1995	3	1	Halodule wrightii	770	798	14	135	1081
1995	3	2	Halodule wrightii	667	1196	14	78	937
1995	3	3	Halodule wrightii	1102	997	14	155	1548
1995	3	4	Halodule wrightii	1102	1196	14	129	1547
1995	3	5	Halodule wrightii	1085	1894	14	80	1524
1995	3	6	Halodule wrightii	716	499	14	201	1005

Appendix Table VI. Continued.

Year	Station	Rep.	Species	Productivity (mg/m2/day)	Shoots/m2	Growth Days	Wt./Shoot (µg)	Sample Wt. (µg)
1994	4	1	Syringodium filiforme	466	320	14	204	1428
1994	4	2	Syringodium filiforme	714	274	14	365	2190
1994	4	3	Syringodium filiforme	417	183	14	320	1279
1994	4	4	Syringodium filiforme	428	228	14	262	1312
1994	4	5	Syringodium filiforme	147	137	14	150	451
1995	4	1	Syringodium filiforme	2212	1196	11	203	2441
1995	4	3	Syringodium filiforme	2837	1595	11	196	3130
1995	4	4	Syringodium filiforme	4148	2493	11	183	4577
1995	4	5	Syringodium filiforme	3516	2493	11	155	3879
1995	4	6	Syringodium filiforme	4373	3290	11	146	4825
1994	5	1	Halodule wrightii	86	299	15	43	130
1994	5	2	Halodule wrightii	60	100	15	90	90
1994	5	3	Halodule wrightii	68	100	15	103	103
1994	5	4	Halodule wrightii	33	100	15	49	49
1994	5	5	Halodule wrightii	58	199	15	44	88
1994	5	6	Halodule wrightii	134	399	15	50	201
1995	5	1	Halodule wrightii	266	499	13	69	347
1995	5	2	Halodule wrightii	54	100	13	71	71
1995	5	3	Halodule wrightii	122	199	13	80	159
1995	5	4	None	0	0	13	N/A	0
1995	5	5	Halodule wrightii	230	598	13	50	300
1995	5	6	Halodule wrightii	232	598	13	50	302
1994	6	1	Halodule wrightii	352	499	14	99	494
1994	6	2	Halodule wrightii	571	299	14	267	802
1994	6	3	Halodule wrightii	306	399	14	108	430
1994	6	4	Halodule wrightii	110	199	14	77	154
1994	6	5	Halodule wrightii	354	399	14	124	497
1994	6	6	Halodule wrightii	409	499	14	115	575
1995	6	1	Halodule wrightii	551	698	13	103	719
1995	6	2	Halodule wrightii	1045	1196	13	114	1362
1995	6	3	Halodule wrightii	449	598	13	98	586
1995	6	4	Halodule wrightii	630	399	13	205	821
1995	6	5	Halodule wrightii	1818	798	13	296	2371
1995	6	6	Halodule wrightii	182	399	13	59	237

Appendix Table VI. Continued.

Year	Station	Rep.	Species	Productivity (mg/m2/day)	Shoots/m2	Growth Days	Wt./Shoot (µg)	Sample Wt. (µg)
1994	7	1	Halodule wrightii	216	199	14	152	304
1994	7	2	Halodule wrightii	111	199	14	78	156
1994	7	3	Halodule wrightii	324	598	14	76	455
1994	7	4	Halodule wrightii	210	598	14	49	295
1994	7	5	Halodule wrightii	175	299	14	82	246
1995	7	2	Halodule wrightii	847	798	13	138	1105
1995	7	3	Halodule wrightii	893	798	13	146	1165
1995	7	4	Halodule wrightii	1251	1496	13	109	1631
1995	7	5	Halodule wrightii	212	399	13	69	277
1995	7	6	Halodule wrightii	1340	1396	13	125	1747
1994	8	1	Halodule wrightii	214	199	12	129	258
1994	8	2	Halodule wrightii	422	399	12	127	508
1994	8	3	Halodule wrightii	660	798	12	99	794
1994	8	4	Halodule wrightii	520	1097	12	57	626
1994	8	5	Halodule wrightii	764	698	12	131	919
1995	8	1	Syringodium filiforme	534	499	11	118	589
1995	8	2	Halodule wrightii	1216	1196	11	112	1342
1995	8	3	Halodule wrightii	834	1396	11	66	920
1995	8	4	Syringodium filiforme	1078	1097	11	108	1189
1995	8	5	Syringodium filiforme	1951	1396	11	154	2153
1995	8	6	Halodule wrightii	609	897	11	75	672
1994	9	1	Syringodium filiforme	1115	776	14	201	3420
1994	9	2	Syringodium filiforme	670	411	14	228	2054
1994	9	3	Syringodium filiforme	633	411	14	216	1941
1994	9	4	Syringodium filiforme	1285	959	14	188	3940
1994	9	5	Syringodium filiforme	334	411	14	114	1023
1995	9	1	Syringodium filiforme	198	274	13	94	565
1995	9	2	Syringodium filiforme	283	228	13	161	806
1995	9	3	Syringodium filiforme	1967	548	13	467	5601
1995	9	4	Syringodium filiforme	414	320	13	168	1178
1995	9	5	Syringodium filiforme	314	274	13	149	894
1995	9	6	Syringodium filiforme	130	183	13	92	369
1994	10	1	Syringodium filiforme	348	365	14	133	1066
1994	10	2	Syringodium filiforme	642	822	14	109	1968

Appendix Table VI. Continued.

Year	Station	Rep.	Species	Productivity (mg/m2/day)	Shoots/m2	Growth Days	Wt./Shoot (µg)	Sample Wt. (µg)
1994	10	3	Syringodium filiforme	604	868	14	97	1851
1994	10	4	Syringodium filiforme	141	365	14	54	433
1994	10	5	Syringodium filiforme	431	457	14	132	1322
1995	10	2	Syringodium filiforme	404	274	13	192	1149
1995	10	3	Syringodium filiforme	840	548	13	199	2392
1995	10	4	Syringodium filiforme	803	685	13	152	2287
1995	10	5	Syringodium filiforme	293	274	13	139	834
1995	10	6	Syringodium filiforme	1011	822	13	160	2879
1994	11	1	Syringodium filiforme	182	91	12	239	478
1994	11	2	Syringodium filiforme	311	91	12	409	818
1994	11	3	Syringodium filiforme	635	274	12	278	1668
1994	11	4	Syringodium filiforme	375	91	12	493	986
1995	11	1	Syringodium filiforme	479	228	14	294	1469
1995	11	2	Syringodium filiforme	1388	320	14	608	4257
1995	11	3	Syringodium filiforme	1145	411	14	390	3510
1995	11	4	Syringodium filiforme	386	365	14	148	1183
1995	11	5	None	0	0	14	N/A	0
1995	11	6	Syringodium filiforme	598	274	14	306	1835
1994	12	1	Syringodium filiforme	80	137	14	82	246
1994	12	2	Syringodium filiforme	575	228	14	353	1764
1994	12	3	Syringodium filiforme	348	274	14	178	1068
1994	12	4	Syringodium filiforme	385	320	14	169	1181
1994	12	5	Syringodium filiforme	135	274	14	69	413
1995	12	1	Syringodium filiforme	1100	822	14	187	3372
1995	12	2	Syringodium filiforme	810	731	14	155	2484
1995	12	3	Syringodium filiforme	1213	1324	14	128	3720
1995	12	4	Syringodium filiforme	931	822	14	159	2855
1995	12	5	Syringodium filiforme	872	731	14	167	2673
1995	12	6	Syringodium filiforme	1543	1279	14	169	4732
1994	13	1	Halodule wrightii	383	598	14	90	538
1994	13	2	Halodule wrightii	283	299	14	133	398
1994	13	3	Halodule wrightii	51	199	14	36	72
1994	13	4	Halodule wrightii	175	399	14	62	246
1994	13	5	Halodule wrightii	36	199	14	26	51

Appendix Table VI. Continued.

Year	Station	Rep.	Species	Productivity (mg/m2/day)	Shoots/m2	Growth Days	Wt./Shoot (µg)	Sample Wt. (µg)
1995	13	1	Halodule wrightii	182	399	13	59	237
1995	13	2	Halodule wrightii	281	399	13	92	367
1995	13	3	None	0	0	13	N/A	0
1995	13	4	Halodule wrightii	589	598	13	128	768
1995	13	5	Halodule wrightii	221	499	13	58	288
1995	13	6	Halodule wrightii	346	499	13	90	451
1994	14	1	Halodule wrightii	617	598	12	124	743
1994	14	2	Halodule wrightii	714	299	12	286	859
1994	14	3	Halodule wrightii	1022	798	12	154	1230
1994	14	4	Halodule wrightii	449	199	12	270	540
1995	14	1	Halodule wrightii	824	798	13	134	1074
1995	14	2	Halodule wrightii	826	1196	13	90	1077
1995	14	3	Halodule wrightii	557	499	13	145	726
1995	14	4	Halodule wrightii	864	1097	13	102	1127
1995	14	5	Halodule wrightii	703	1196	13	76	916
1995	14	6	Halodule wrightii	508	1097	13	60	662
1994	15	1	Halodule wrightii	443	299	12	178	533
1994	15	2	Halodule wrightii	389	598	12	78	468
1994	15	3	Halodule wrightii	572	1296	12	53	688
1994	15	4	Halodule wrightii	739	698	12	127	889
1994	15	5	Halodule wrightii	469	299	12	188	565
1995	15	1	Halodule wrightii	352	365	14	135	1078
1995	15	2	Halodule wrightii	256	274	14	131	785
1995	15	3	Halodule wrightii	1080	1370	14	110	3310
1995	15	4	Halodule wrightii	427	639	14	94	1310
1995	15	5	Halodule wrightii	970	1370	14	99	2974
1995	15	6	Halodule wrightii	911	1187	14	107	2792

RAI 3-4 Crystal River November 2001 Seagrass Survey

3/05/02

Seagrass Survey: November 2001 Resurvey at the Florida Power Crystal River Generating Facility.

Revisit to Area last surveyed in 1995 by MML.

Finalized March 7, 2002

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Introduction

Mote Marine Laboratory (MML) surveyed seagrasses at the Florida Power Corporation (FPC) Crystal River facility in 1993, 1994 and 1995 (Estevez and Marshall, 1993; 1994; and 1995) in an attempt to determine the effect of newly installed helper cooling towers on the distribution of Submerged Aquatic Vegetation (SAV) in the discharge area and within the adjacent estuarine environment. Earlier Mattson et al. (1988) surveyed seagrasses in the thermally impacted area and found that standing crop, productivity, and growth rates were lower than at sites away from the Point of Discharge (POD). MML found several trends in their 3 years of study; 1) several new beds of SAV appeared along transects which were largely completely barren in 1993; 2) recruitment of seagrass into barren areas was not extensive; 3) 8 of the 15 surveyed beds showed some expansion beyond their original boundaries 4) percent coverage of SAV declined at 10 of 15 sites. FPC contracted the Coastal Seas Consortium, Inc., to resurvey the same area in November 2001 in order to determine if SAV beds have changed since the 1995 MML survey.

Our goal in the 2001 resurvey was not to revisit all of the sites but to select several in the areas considered to be most strongly impacted by the thermal effluent and to compare those to the MML (1993 through1995) results. Unfavorable weather conditions (rain and strong winds) limited us to surveys of basins 1, 2, and part of 3 (Figure 1). Basin 4 was not surveyed due to poor visibility. Observations were made in areas where visibility allowed and during low tides when we could walk the flats.

Methods

Station surveys

Our methods were much the same as those used by MML. A recent model Garmin GPS Map 76 was used to relocate the beds from location data given in the MML reports. After arriving at a station we attempted to find the original SAV boundary markers used by MML to delineate the seagrass bed edges in the first year of the MML studies (Estevez and Marshall, 1993). In 2001 we tried to find the markers by dragging a weighted rope through the previously marked beds. MML used the same method in its three years of monitoring. We found no markers at Stations 1 and 3 and two markers at Station 2. We therefore were not able to make the boundary measurements reported by MML. We relied upon MML's recorded GPS location data to find the approximate center of each bed. The Garmin GPS map 76 uses a Wide Area Augmentation System to improve accuracy of measurements and while we tried to find the SAV bed centers we were probably off by some unknown distance as a result of recent changes in the GPS navigational system. Finding two of the original markers at Station 2 at least confirmed that we had found

the original study site. Michael Marshall's (a participant in and co-author of the MML studies) memory of the MML study sites coincided with the GPS-found locations.

We used the GPS unit to locate the shoreward and seaward edges of the study sites. We stopped the width measurements when we reached 100 meters beyond the inside edge of each seagrass bed. The beds at each of the basin 1 sites extended well beyond the 1995 boundaries.

We used a 1-m^2 quadrat divided into 100 subunits (10X10 cm squares) to determine % cover within each bed (Figure 2). Our % cover observations were taken at a series of haphazardly selected points by tossing the quadrat in front of us as we walked or swam through the study sites.

Transect Surveys

We used a similar quadrat technique to determine SAV bottom cover percentages along MML transects 1W, IN, 2W, 3W, 4W and 5W. We attempted to do more transects but poor water visibility limited this effort. . Instead of towing divers along the entire length of each transect we used a bounce diving method by which our observation points along each transect were spaced at 100m intervals (see Figure 3, transect 5W as an example of the dive point spacing). Upon arrival at a site a diver would determine SAV cover within 5 replicated 1m^2 quadrats and the boat operator would record those observations and depth, bottom type, and GPS determined location data. We used the MML location data again to find the transects. In most cases there were no markers left from the MML studies but we did find, through GPS navigation, two wooden stakes at the exact MML reported starting location at the northern most point of transect 5.

Results and Discussion

The seagrass bed begins at a point 74.6 meters away from the point of discharge (POD) and continues across Basin 1 to the saltmarsh on Basin 1's northern boundary. Transect seagrass observations (Table 1) from Transects 1N, 1W,and 2W (Fig.3) which traverse Basin 1 show seagrass % coverages range, as an average of the series of points checked on each transect, from 32% on Transect 1N to 39% on Transect 2W. *Halodule* was found at 50% of the points checked on transect 1N, at 62.5% of the points on Transect 2W, 75% of the points on Transect 3W, and at 55.6% of the points on Transect 1W (not including the 2A points). The 2A points were an extension of transect 1W into Rocky Creek. *Halodule* was found at several points inside the creek on its banks until a point was reached where rocky substrate replaced the soft sediments found at the creek mouth.

MML found a "new" seagrass bed on Transect 1N in 1995 with an average percent over of <5% mean cover. The bed was irregularly shaped. By November 2001, percent cover at the 14 spots surveyed on this transect reached 100% based

on the mean of bottom coverage from 5, 1 M^2 quadrats. Thus on this transect seagrasses are much more widely distributed and bottom coverage is much higher than when last observed in 1995.

The same is true of the other Basin 1 transects, 1W, 2W, and 3W. No large beds of seagrass were found on these transects in 1993, 1994, or 1995(MML 1993, 1994,1995- see Figure 3). The only seagrass found on these transects in the MML study were centered around the black dot points shown in Figure 3. In our survey, November (2001) we found an extensive bed of seagrass with an overall average for all observed points of 39.19 % for Transect 2W, 38% for Transect 1W and 34.5% for Transect 3W. Seagrass cover reached 100% (as shown in Figure 1) for several points on these three transects.

Intensive monitoring stations.

Basin 1 Stations.

We visited all three of the Basin 1 stations (Stations 1, 2, and 3) which were originally located and monitored by MML in 1993. We were not able to find the iron and concrete parking stone markers that were set out in 1993. We relied upon the MML GPS derived latitude and longitude data to find the beds. We searched for but could not find the center point markers at any of the sites we visited. We did find two re-bar edge markers at Station 2. Our bed width measurements were therefore made from the GPS located center of each bed to the outside edge or to a point not exceeding 100 meters past the shoreward point. The 1995 Station 1 measurements (MML, 1995) showed that the bed width was not much greater than when it had been first measured in 1993: it averaged 2.88 feet wider than the original 1993 measurement of 13.17 feet from the approximate center to the seaward edge. In 2001 we stopped our survey on Station 1 at 217 feet from the approximate position of the center marker. The *Halodule* in this area continued much further toward the discharge channel.

Halodule coverage in the shoreward side of Station 1 averaged 88.9% (Table2). In 2001 seagrass in the outer area beyond the position of the edge in 1995 averaged 97.9%. These % cover data are similar to those reported by MML (1995;). MML reported an interior cover by *Halodule* of 76.5%. The perimeter seagrass in the MML 1995 report was 78.4%. *Halodule wrightii* was the only seagrass present in the Station 1 area in all of the MML reports and in our 2001 survey.

The interior area of Station 2 had a mean of 30% *Halodule* cover in 2001. After swimming beyond the southern edge of the vegetated area we found a sandy patch with 0% seagrass cover. Beyond that patch to the south seagrasses started up again and continued toward the discharge channel. *Halodule* in that area averaged

74% cover. MML reported an interior %cover of 47.1% and a perimeter % cover of 44.0% in 1995. Their 1994 report showed higher percent cover in the interior, 96.4% and perimeter, 89.3% bed areas. The sandy patch seen in 2001 was approximately 114' wide so the seagrass beyond that area should be considered a new bed. The bed was determined to be 136' wide from the north edge to the beginning of the sand patch. This is considerably wider than reported in MML (1995). *Halodule wrightii* was the only seagrass observed at Station 3 and within the surrounding area. The decline in cover at Station 2 suggests a gradual loss of seagrass over time.

Station 3 SAV followed a similar pattern. *Halodule* covered an average 89.75% of the bottom near the original center. It covered 89.2% of the bottom in the newly colonized area beyond the edge of the bed where no seagrasses were found in 1995. MML reported a total cover of 51.6% in 1995. Station 3 seagrasses now extend well beyond 100 meters past the center marker. This is much expanded from the dimensions reported by MML (1995). *Halodule* was the only seagrass species in this area.

We attempted to survey Stations 5,6, and 7 but low visibility in the area at the time of our study, November 13-16, 2001, prevented us from being able to see the bottom and seagrass if it existed.

We did resurvey stations 11 and 12 in Rocky Cove. Station 12 had a mix of Syringodium (11.5% cover) and *Halodule* (55.5% cover). Estevez and Marshall (see Table 6 in MML 1995;) reported a bottom cover of 94%. Visibility at Station 12 was also very poor. These results are similar to that reported in MML (1995). The seagrasses at Station 12 are bounded by oyster bars and a deep channel making further expansion of this bed impossible.

Station 11, located deep in Rocky Cove, had 100% in 2001 and 98.8% in 19995,cover by *Syringodium filiforme.* The only other SAV species, the green alga, *Halophila engelmanni* was found there in 1993 but was not seen in 1995. Poor visibility during our 2001 survey prevented us from seeing if the alga was present.

Summary and Conclusions

Since the last MML survey (Estevez and Marshall, 1995) The seagrass *Halodule wrightii* has spread throughout Basin 1 and 2. Our results (Table 1) demonstrate that this species covers most of the area. It is only limited from covering the entirety of these two basins by rocky bars, shelly bottom inappropriate for seagrass growth and water depths considered to be either too shallow or too deep for *Halodule*. There is such extensive growth that prop scars (Fig.4) are now a

problem in some areas. During our survey manatees were seen over the seagrass beds presumably feeding on the seagrass.

Basin 1 is now up to 50% covered by a large bed of relatively dense *Halodule* bordered by oyster bars, within a mosaic of exposed rock, shallow sandy bars, and a few deep channels. Basin 1 is probably the area most impacted by the thermal effluent from the discharge canal. Thus it appears that the helper cooling towers have apparently altered the thermal regime to achieve suitable conditions for seagrass survival, bed expansion, and reproduction.

Seagrass beds, in Basin 1, at the last MML survey in 1995 had not expanded more than 2.75 meters from the original boundaries established in 1993. On our survey we found that the boundaries of beds 1, 2, and 3 were now located more than 35 meters from the original approximate center of each site. In fact, the beds have now grown into a more or less continuous bed of seagrass throughout Basin 1. Only inappropriate substrate types and depths presumably limiting to *Halodule* growth under the water clarity regime typical of this area break the bed in this area into large patches. There is a barren muddy/sandy band parallel to the discharge channel but it contained small, sparse patches of *Halodule* on our survey dates. These patches may indicate that this channel-side area is now being colonized by seagrass.

The large sand patch adjacent to Station 2 is an area that may not yet been colonized by seagrass. Seagrass adjacent to the seaward and shoreward borders of the sand patch is flourishing and the bed has expanded well beyond the limits of the Station 2 seagrass observed by MML.

Our observations in Basin 1 suggest that it might be possible for other seagrass species to grow in this area. *Halodule wrightii* is generally considered to be a fast growing early colonizer of shallow, barren areas within seagrass beds. Colonization by *Thalassia* and *Syringodium* would be expected to occur at a slower rate. The current mosaic-like arrangement of marsh, seagrass, rocky bars, oyster bars and shallow flats is ideal juvenile habitat for a large number of fish and invertebrate species. Fish can find shelter in the marshes and seagrasses at high tides and feed on the mud flats, oyster bars and rocky outcrops when tides are appropriate. We observed several large schools of small fishes while wading across our transects and at each station. Dolphins were also observed feeding on larger fish at numerous locations around the study site during our fieldwork.

Literature Cited

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Mattson, R.A., J.R. Derrenbacker, Jr., R. R. Lewis, III. 1986. Effects of thermal addition from the Crystal River generating complex on the submergent macrophyte communities in Crystal Bay, Florida. In Mahadevan, K, Rhoda Evans, Paul Behrens, Thomas Biffar, and Lawrence Olsen (editors) Proceedings of the southeastern workshop on aquatic ecological effects of power generation. MML report 124, Sarasota, Florida.

Figures

1-4

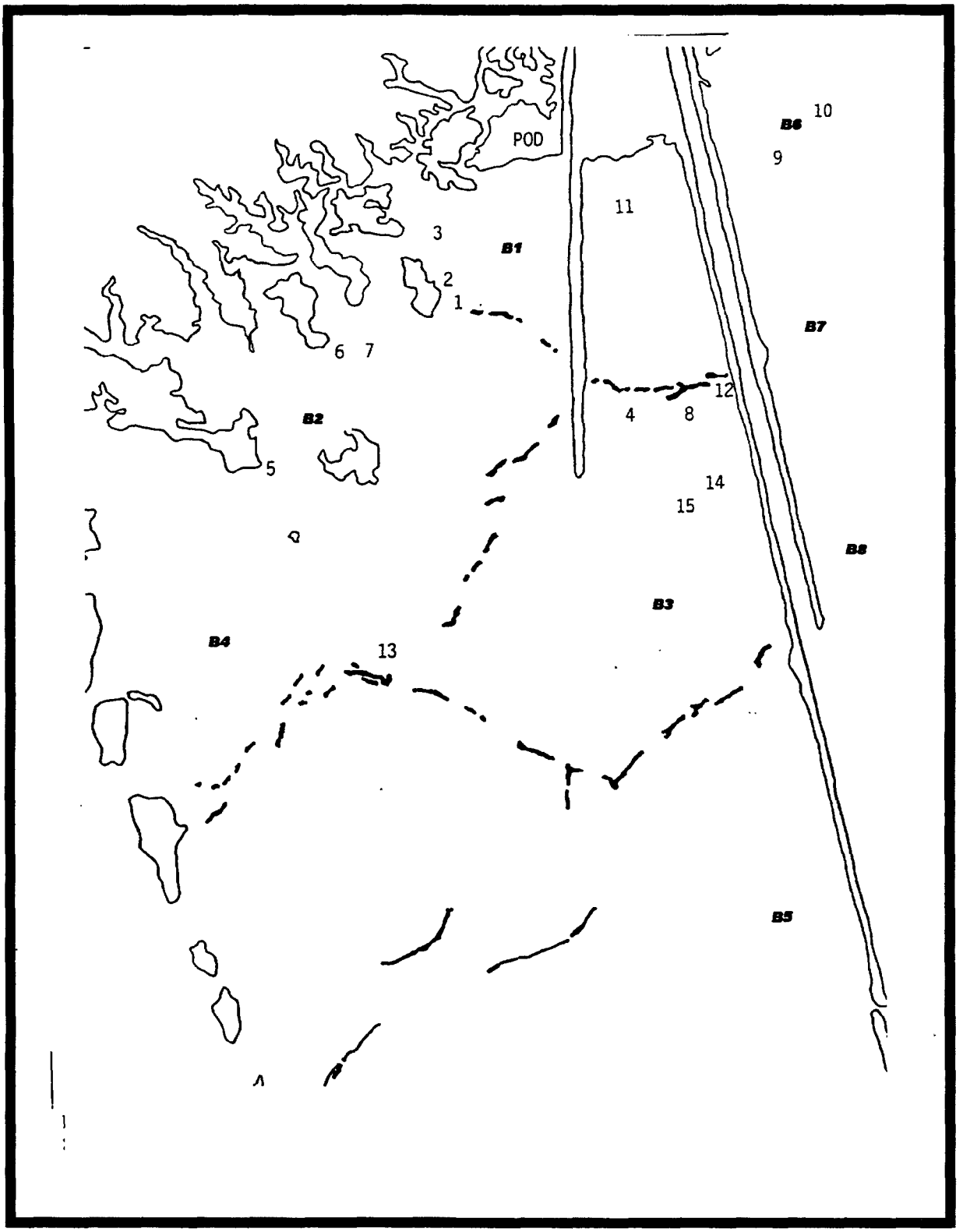


Figure 1. Map of basins as defined in Estevez and Marshall (1993) for MML's seagrass studies. Seagrass beds are numbered 1-15. Basins are identified by codes **B1-B5.**

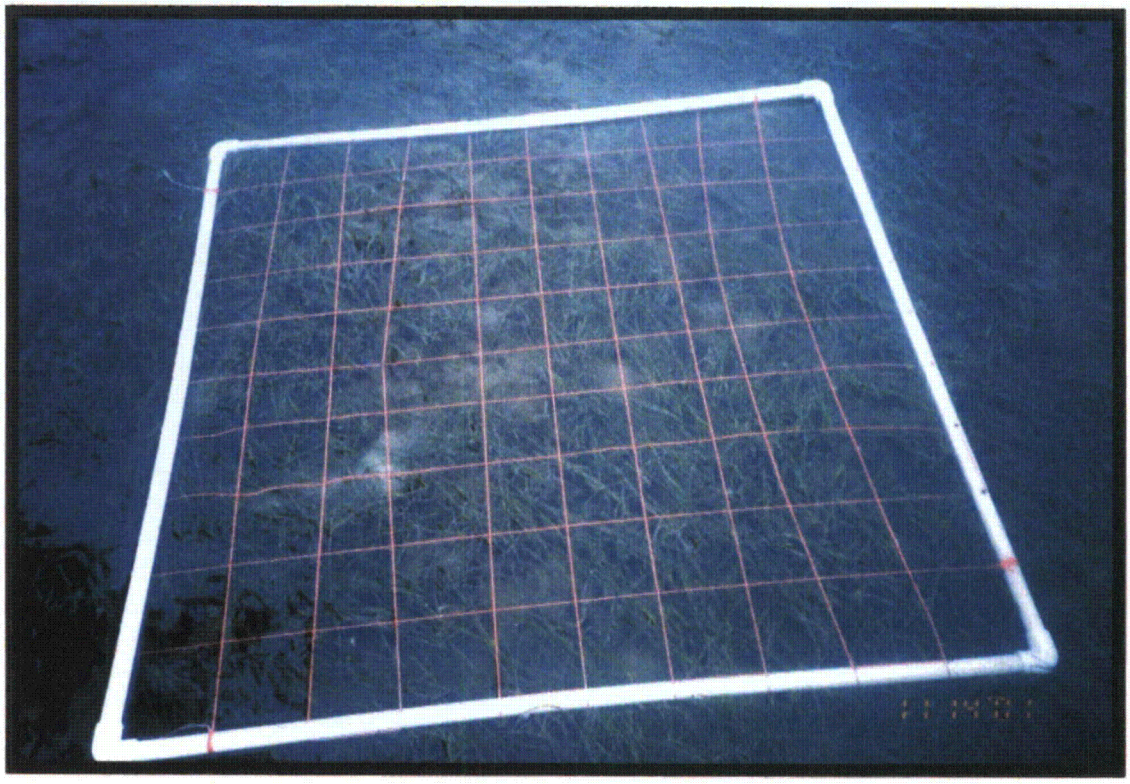


Figure 2. 1m x 1m quadrat used for this study. Photo shows the typical density of the seagrass, *Halodule*, at a location within 100m of the POD.

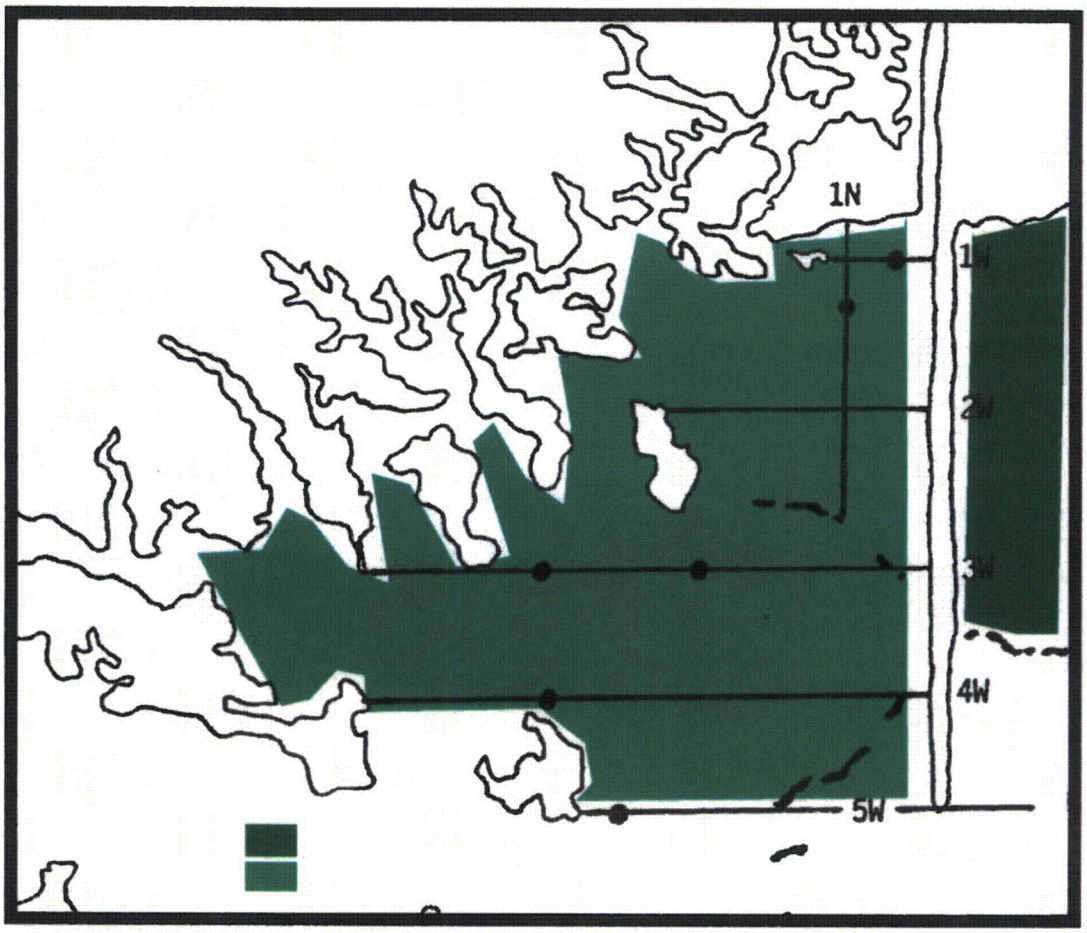


Figure 3. Transects monitored by MML. Black dots are locations where seagrass patches were located during the MML studies. The green area represents the current (November 2001) area which is largely covered by *Halodul*e. Dark green on the south side of the discharge canal represents the distribution of *Syringodium*.

Figure 4. Prop scars in basin 1 during November 2001.

Appendix

Tables 1 and 2

Appendix Table 1. November 2001 Transect Data Florida Power Corporation Seagrass Survey

Transect Data Florida Power Corporation Seagrass Survey

Table 1A — **Transect 1N** — **Mean of 5 quads**

Date	Transect	Station	Latitude	Longitude	Depth(Ft.)	SAV % Cover	Seagrass or Bottom Type
11/15/01	1N	1	N28 57 41.0	W82 43 25.1	0	0	oyster bar
11/15/01	1N	2	N28 57 40.9	W82 43 25.6	0	0	edge of seagrass
11/15/01	1N	3	N28 57 40.9	W82 43 27.2	0.2	100	Halodule
11/15/01	1N	4	N28 57 41.6	W82 43 30.5	2	0	tidal channel
11/15/01	1N	5	N28 57 41.9	W82 43 32.1	0.5	99.4	Halodule
11/15/01	1N	6	N28 57 42.2	W82 43 32.6	0	0	oyster bar
11/15/01	1N	7	N28 57 42.4	W82 43 34.3	0	0	edge of bar
11/15/01	1N	8	N28 5742.7	W82 43 35.8	0.5	83.4	Halodule
11/15/01	1N	9	N28 57 43.3	W82 43 39.6	0.5	8.4	Halodule
11/15/01	1N	10	N28 57 44.0	W82 43 43.4	3.5	36	Halodule
11/15/01	1N	11	N28 57 44.9	W82 43 46.9	3	0	barren
11/15/01	1N	12	N28 57 45.5	W82 43 50.8	3.1	42	Halodule
11/15/01	1N	13	N28 57 46.3	W82 43 55.0	3.5	0	rock
11/15/01	1N	14	N28 57 46.1	W82 43 57.0	3.1	80	Halodule
				AVERAGE	1.42	32.09	

Table 1 B — **Transect 2W**

Date	Transect	Station	Latitude	Longitude	Depth(Ft.)	SAV % Cover	Seagrass or Bottom Type
11/15/01	2W	1	N28 58 02.5	W82 43 49.2	1.5	0	sand/mud
11/15/01	2W	2	N28 57 58.6	W82 43 49.1	2.5	86	Halodule
11/15/01	2W	3	N28 57 55.4	W82 43 49.0	2.7	24	Halodule
11/15/01	2W	4	N28 57 52.5	W82 43 49.1	2.7	65.5	Halodule
11/15/01	2W	5a	N28 57 49.2	W82 43 49.8	3	0	sand/mud
11/15/01	2W	6	N28 57 46.1	W82 43 49.9	3.3	90	Halodule
11/15/01	2W	7	N28 57 42.5	W82 43 50.8	2.8	48	Halodule
11/15/01	2W	8	N28 57 39.2	W82 43 49.5	2.7	0	sand/mud
			AVERAGE		2.65	39.19	

Table 1C

Transect 3W							
Date	Transect	Station	Latitude	Longitude	Depth(Ft.)	SAV % Cover	Seagrass or Bottom Type
11/15/01	3W	1	N28 57 40.6	W82 44 04.7	2	0	sand/mud
11/15/01	3W	2	N28 58 01.0	W82 44 01.2	2	47	Halodule
11/15/01	3W	3	N28 57 59.7	W82 44 01.3	2.5	2	Halodule
11/15/01	3W	4	N28 57 54.1	W82 44 01.9	2.6	95.4	Halodule
11/15/01	3W	5	N28 57 50.7	W82 44 02.3	3	58	Halodule
11/15/01	3W	6	N28 57 47.9	W82 44 02.3	3	0	rock
11/15/01	3W	7	N28 57 44.1	W82 44 02.7	2.9	37	Halodule
11/15/01	3W	8	N28 57 40.7	W82 44 02.3	2.7	0.8	Halodule
11/15/01	3W	9	N28 58 04.4	W82 44 01.1	2.5	100	Halodule
11/15/01	3W	10	N28 58 06.7	W82 43 59.8	2.6	38	Halodule
11/15/01	3W	11	N28 58 10.6	W82 44 03.2	2.5	36	Halodule
11/15/01	3W	12	N28 58 28.9	W82 44 07.3	2	0	sand/mud
			AVERAGE		2.53	34.52	

Table 1D

Transect 4w							
Date	Transect	Station	Latitude	Longitude	Depth(Ft.)	SAV % Cover	Seagrass or Bottom Type
11/16/01	4w	1	N28 58 32.5	W82 44 19.0	3	0	edge of marsh/soft black mud
11/16/01	4W	2	N 28 58 36.2	W82 44 19.1	4.8	0	muck
11/16/01	4W	3	N 28 58 14.0	W82 44 16.9	3.9	0	mud
11/16/01	4W	4	N28 58 03.6	W82 44 16.2	2.9	25	Halodule
11/16/01	4W	5	N28 58 00.4	W82 44 16.6	4.9	1.4	rocky
			AVERAGE		3.9	5.28	

Appendix Table 1 (continued):

Table 1E

Transect 5w

Date	Transect	Station	Latitude	Longitude	Depth(Ft.)	SAV % Cover	Seagrass or Bottom Type
11/16/01	5W	1	N28 58 08.5	W82 44 36.3	3.4	2	
11/16/01	5W	2	N28 58 04.6	W82 44 37.4	3.6	0	barren
11/16/01	5W	3	N28 58 02.0	W82 44 36.9	4.4	0	barren
11/16/01	5W	4	N28 57 57.9	W82 44 37.0	5.6	0	barren
11/16/01	5W	5	N28 57 55.0	W82 44 36.6	6.6	0	barren
11/16/01	5W	6	N28 57 51.6	W82 44 36.1	6.2	0	barren
11/16/01	5W	7	N28 57 48.8	W82 44 36.1	3	0	shell
11/16/01	5W	8	n28 57 45.8	W82 44 35.3	5.8	0	barren
			AVERAGE		4.825	0.25	

Table 1F

Transect 1W (2A stations not in MML surveys)

11/14/01	**1W**	**1**	N28 57 38.0	W82 43 29.5			**POD**
11/14/01	1W	2	N28 57 38.5	W82 43 29.5	0.1	88	Halodule start
11/14/01	1W	3	N28 57 38.9	W82 43 29.5	0.1	100	Halodule
11/14/01	1W	4	n28 57 40.2	W 82 43 29.5	0.1	100	Halodule
11/14/01	1W	5	N28 57 41.2	W 82 43 29.5	0.1	26	Halodule
11/14/01	1W	6	N28 57 41.0	W 82 43 29.5	0.1	0	rocky bar
11/14/01	1W	7	N28 57 42.0	W82 43 29.5	0	0	rocky bar
11/14/01	1W	8	N 28 57 43.6	W82 43 29.5	0	0	rocky bar
11/14/01	1W	9	N28 57 44.5	W82 43 29.5	0.5	100	shallow channel
11/14/01	1W	10	N 28 57 47.1	W82 43 29.5	0.5	0	marsh edge
11/14/01	2A	1	N28 57 45.9	W82 43 28.3	1	0	creek entrance
11/14/01	2A	2	N28 57 45.8	W 82 43 26.4	1	1	Halodule
11/14/01	2A	3	N28 57 45.5	W82 43 24.6	1	80	Halodule
11/14/01	**2A**	**4**	N28 57 45.5	W 82 43 22.7	0.375	0	rocky bar
			AVERAGE			38.08	

Appendix -Table 2. **Intensive monitoring FPC Station Data - 2001 Survey. All** location data is given in degrees/minutes/seconds. Center locations are approximations of center positions established by MML.

Station 1

Center at: N 28 57 58.1
W 82 43 56.6

Quad #	% Cover	Bed Position	Species	Quad#	Bed Position	%Cover	Species
1	100	interior	*Halodule*	11	outer	100	*Halodule*
2	97	interior	*Halodule*	12	outer	98	*Halodule*
3	95	interior	*Halodule*	13	outer	99	*Halodule*
4	98	interior	*Halodule*	14	outer	100	*Halodule*
5	83	interior	*Halodule*	15	outer	96	*Halodule*
6	89	interior	*Halodule*	16	outer	100	*Halodule*
7	95	interior	*Halodule*	17	outer	99	*Halodule*
8	99	interior	*Halodule*	18	outer	98	*Halodule*
9	34	interior	*Halodule*	19	outer	100	*Halodule*
10	99	interior	*Halodule*	20	outer	89	*Halodule*
avg	**88.9**					**97.9**	
S.D.	**20.00**					**3.38**	
	Seaward edge of bed		N28 57 56.3				
			W82 43 57.7				

note: Extends beyond 217+ feet from original center.

Station 2

Center at: N28 58 00.8
W82 43 51.0

Quad #	%Cover	Bed Position	Species	Quad #	% Cover	Bed Position	Species
1	0	inner	sand				
2	0	inner	sand	18	0	Outer	sand patch
3	0	inner	sand	19	0	outer	sand patch
4	0	inner	sand	20	0	outer	sand patch
5	14	inner	Halodule	21	0	Outer	sand patch
6	75	inner	Halodule	22	0	outer	sand patch
7	7	inner	Halodule	23	0	outer	sand patch
8	0	inner	sand	24	0	Outer	sand patch
9	8	inner	Halodule	25	0	outer	sand patch
10	8	inner	Halodule	26	0	outer	sand patch
11	35	inner	Halodule	27	0	Outer	sand patch
12	23	inner	Halodule	28	0	outer	sand patch
13	95	inner	Halodule	29	0	outer	sand patch
14	87	inner	Halodule	30	0	Outer	sand patch
15	95	inner	Halodule	31	0	outer	sand patch
16	63	inner	Halodule	32	0	outer	sand patch
17	0	inner	Halodule	33	25	Outer	Halodule
				34	95	outer	Halodule
				35	90		Halodule
				36	86		Halodule
Avg.	30.00				15.58		
SD	37.11				33.78		

Appendix -Table 2. **Intensive monitoring FPC Station Data - 2001 Survey. All** location data is given in degrees/minutes/seconds. Center locations are approximations of center positions established by MML.

Station 1

Center at: **N 28 57 58.1**
W 82 43 56.6

Quad #	% Cover	Bed Position	Species	Quad#	Bed Position	%Cover	Species
1	100	interior	*Halodule*	11	outer	100	*Halodule*
2	97	interior	*Halodule*	12	outer	98	*Halodule*
3	95	interior	*Halodule*	13	outer	99	*Halodule*
4	98	interior	*Halodule*	14	outer	100	*Halodule*
5	83	interior	*Halodule*	15	outer	96	*Halodule*
6	89	interior	*Halodule*	16	outer	100	*Halodule*
7	95	interior	*Halodule*	17	outer	99	*Halodule*
8	99	interior	*Halodule*	18	outer	98	*Halodule*
9	34	interior	*Halodule*	19	outer	100	*Halodule*
10	99	interior	*Halodule*	20	outer	89	*Halodule*
avg	**88.9**					**97.9**	
S.D.	**20.00**					**3.38**	
	Seaward edge of bed		N28 57 56.3 W82 43 57.7				

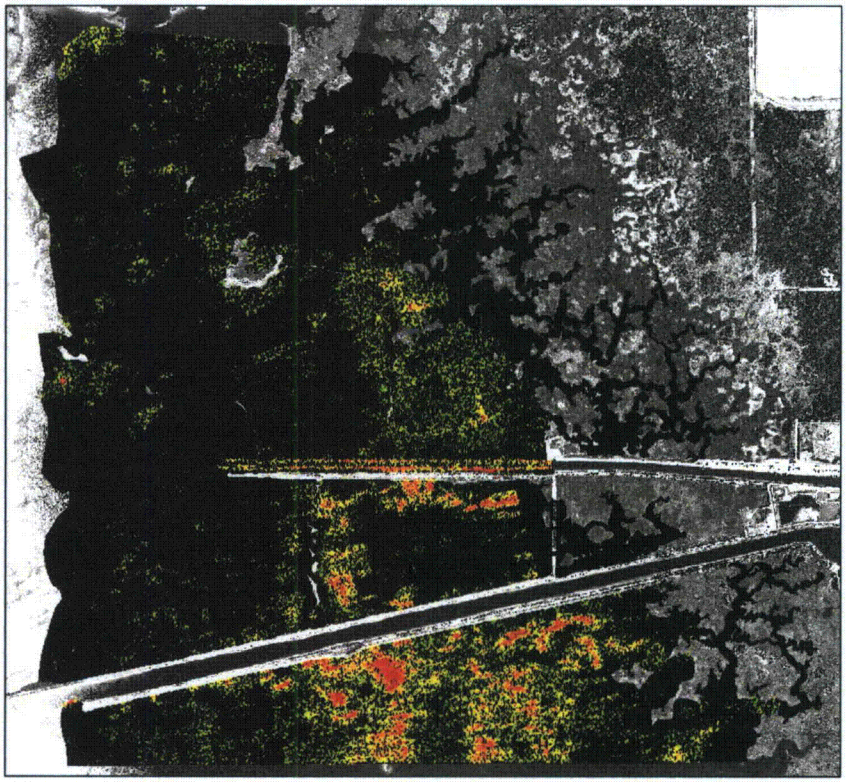
note: Extends beyond 217+ feet from original center.

Station 2

Center at: **N28 58 00.8**
W82 43 51.0

Quad #	%Cover	Bed Position	Species	Quad #	% Cover	Bed Position	Species
1	0	inner	sand				
2	0	inner	sand	18	0	Outer	sand patch
3	0	inner	sand	19	0	outer	sand patch
4	0	inner	sand	20	0	outer	sand patch
5	14	inner	Halodule	21	0	Outer	sand patch
6	75	inner	Halodule	22	0	outer	sand patch
7	7	inner	Halodule	23	0	outer	sand patch
8	0	inner	sand	24	0	Outer	sand patch
9	8	inner	Halodule	25	0	outer	sand patch
10	8	inner	Halodule	26	0	outer	sand patch
11	35	inner	Halodule	27	0	Outer	sand patch
12	23	inner	Halodule	28	0	outer	sand patch
13	95	inner	Halodule	29	0	outer	sand patch
14	87	inner	Halodule	30	0	Outer	sand patch
15	95	inner	Halodule	31	0	outer	sand patch
16	63	inner	Halodule	32	0	outer	sand patch
17	0	inner	Halodule	33	25	Outer	Halodule
				34	95	outer	Halodule
				35	90		Halodule
				36	86		Halodule
Avg.	30.00				15.58		
SD	37.11				33.78		

RAI 3-4 Seagrass Quantification Report_4-24-08



Seagrass Quantification Report for the Area Adjacent to the Crystal River Power Generation Facility, Florida

Data collected: Nov-Dec, 2007
Report: Apr 24, 2008

Prepared for:
Progress Energy Florida, Inc.
515 Independence Highway
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Table of Contents

A. Introduction/Project Goals

Progress Energy is a power generating facility that discharges coolant water into a marine costal area containing submerged aquatic vegetation (SAV). The purpose of this study was to estimate the area covered by various species of seagrass, various species of macro algae, and areas with no plant cover, and to compare these results, if possible, to the conclusions of previous studies done in the same area from previous years.

To address these goals, ReMetrix employed several methods of data collection including hydroacoustic transect sampling, point-intercept rake sampling, SCUBA diver random point surveys, and several underwater video random samples. Each method had unique advantages and limitations, but each contributed to an accurate overall estimation of SAV.

B. Study Area Description

The study area encompassed 3,522 acres although 688 acres were inaccessible due to oyster beds, shoals, or very shallow water. A total of 2,842 acres was analyzed for SAV cover. The area had many challenging navigational obstacles such as, sensitive vegetation and corals, shoals, oyster beds, shallow water areas, and manatee. Other challenges of this study area included tide fluctuations greater than three feet, areas with high winds, and water with low visibility.

During data collection, there were several manatee, dolphin and stingray sightings. The majority of these sightings occurred in the area labeled on the map.

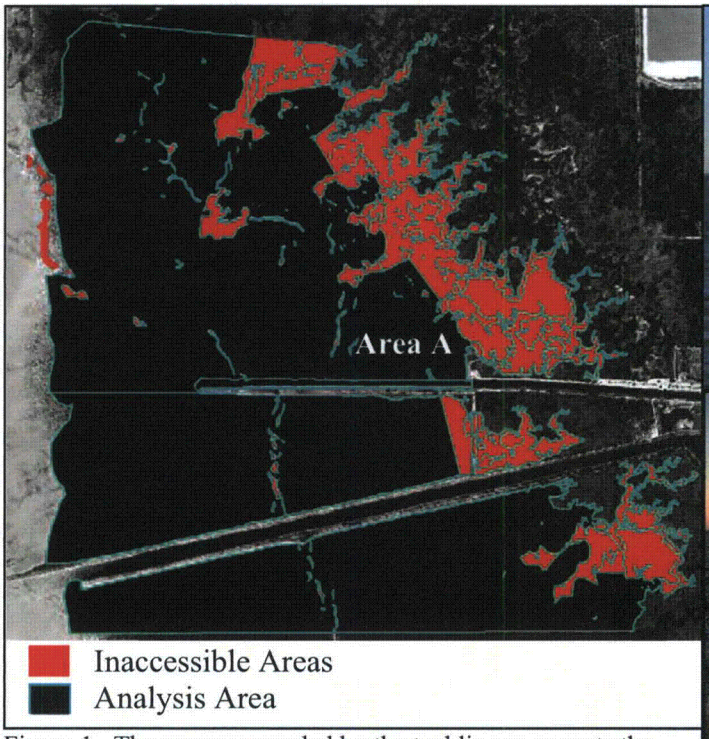


Figure 1. The area surrounded by the teal line represents the study area for this project.

C. Water Quality Sampling

Water quality information was collected at five of the ten diver sites at the same time the diver was in the water. Two sites representative of the average depths found throughout the study area were monitored every other day for the remainder of the study period. Five parameters were collected : water temperature, salinity, turbidity, light transmittance, and water depth.

Water temperature and salinity were measured using a YSI 556 multi-probe system (www.ysilifesciences.com, Figure 2a), turbidity was measured using a LaMotte 2020e portable turbidity meter (www.lamotte.com, Figure 2b); all three measurements were taken 1 foot below the water surface. Light transmittance was measured using a Secchi disk (Figure 2c) and water depth was measured by using a graduated lead line (Figure 2d). Table 1 below shows the breakout of water quality monitoring sites by depth. The full dataset of water quality information can be found in the Appendix.

Table 1. Water Quality Monitoring Sites

Water depth range (meters)	WQ sites sampled
0.5-1.5	1*
1.5-2	1*
2-3	1*
3-4	1*
4-5	1*
Total	**5***

*Sites were sampled every other day throughout the data collection period.

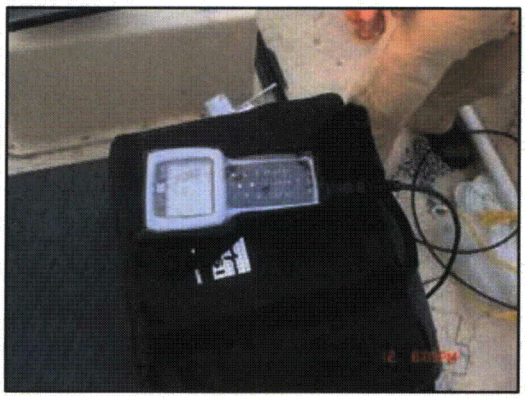


Figure 2a. YSI 556 multi-probe system.

Figure 2b. LaMotte 2020c turbidity meter.

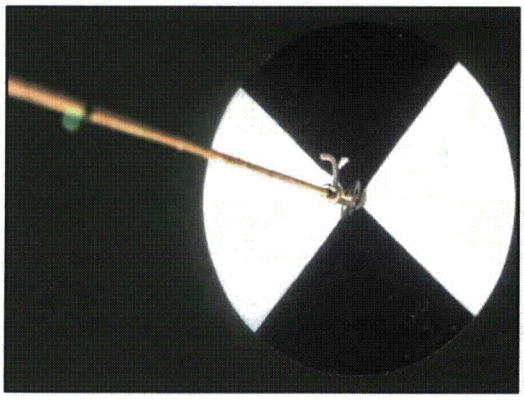


Figure 2c. Secchi disk

Figure 2d. Graduated lead line

D. Hydroacoustic Methodology (Background)

Hydroacoustic data is collected using a digital 420kH BioSonics (www.biosonicsinc.com) transducer mounted on a boat actively linked to DGPS. Transects are driven across the study area while the transducer pings the water column approximately five-to-ten times per second. The data from each ping are linked to a geographic coordinate via the DGPS beacon. Figure 3a depicts this process.

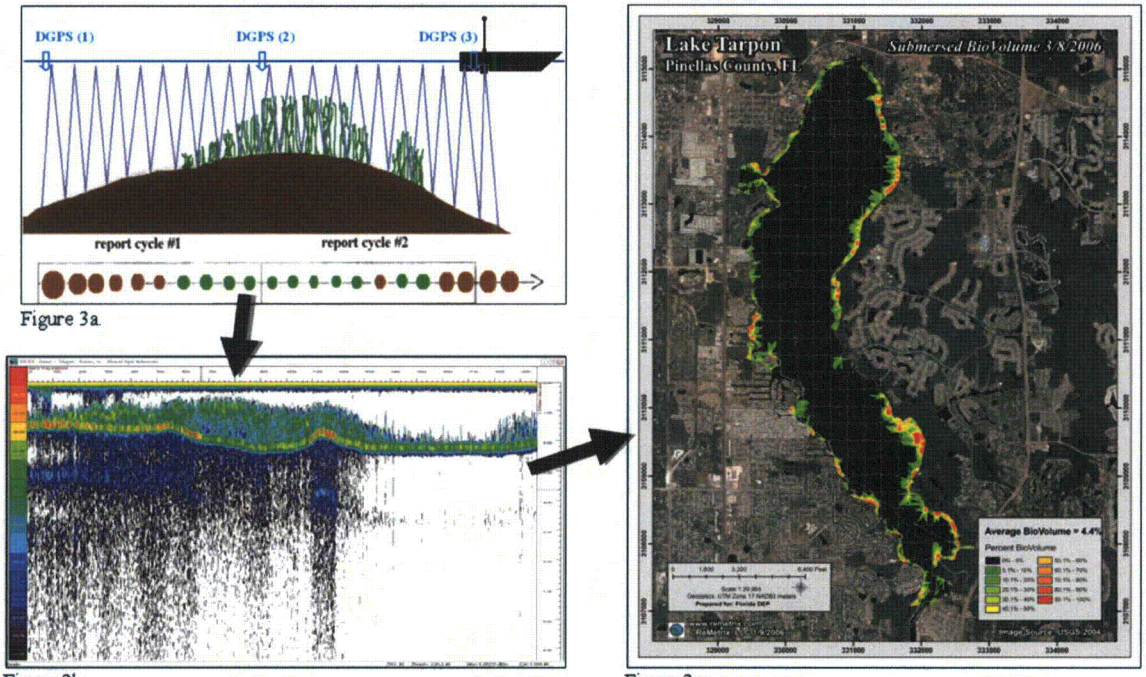


Figure 3a. Figure 3b. Figure 3c.

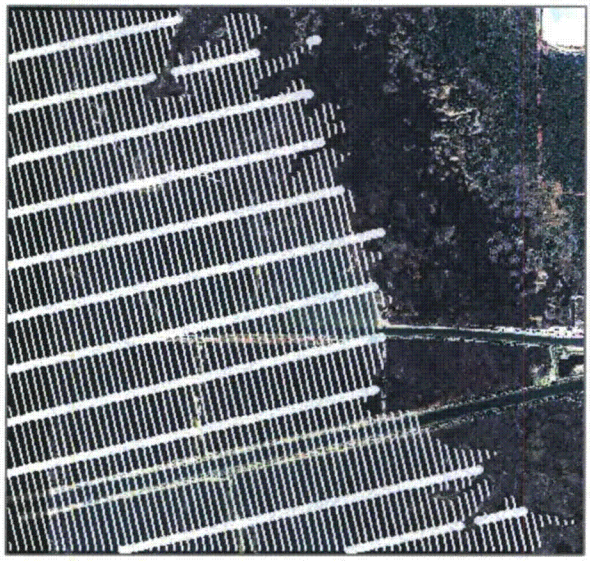
Figures 3a-c. General depiction of the hydroacoustic mapping process. See text for explanations.

The data from each ping contains submerged plant cover and height information as well as the depth to the sediment layer. BioSonics Inc, testing indicates that the hydroacoustic system returns digital samples with greater than 0.013% accuracy every 1.8 centimeters. Figure 3b (above) shows an example of raw acoustic data collected along a sample transect.

Raw acoustic data are processed to filter out noise and calculate statistics, and then exported for viewing in a geographic information system (GIS). Data from all transects is combined in GIS and modeled using a geostatistical GIS extension to produce a vegetative cover estimate, (biocover) maps for the entire study area. Biocover is an estimate of the percentage of the bottom covered with plants. Figure 3c above shows a whole-site biocover model.

ReMetrix collected data from crossing transects oriented WSW to ENE spaced 400-meters apart and SSE to NNW spaced 60-meters apart. This totaled approximately 140 miles of transects collected over the 2,842-acre site. Figure 4 represents the proposed crossing transects used for hydroacoustic sampling of this site.

Figure 4. Crossing transects planned for hydroacoustic data collection totaled approximately 140-miles within the 2,842-acre study area. Closely spaced transects (oriented roughly north-south) were 60-meters apart, and widely spaced transects (oriented roughly east-west) were 400-meters apart.



E. Species Sampling Methodology

Hydroacoustic vegetation sampling alone cannot currently explicitly determine species by their acoustic signatures. For this reason, supplemental physical sampling must be used in order to determine species. ReMetrix used three methods for collecting physical samples: rake samples, underwater video and SCUBA diver surveys.

Rake Sampling Methodology

In areas deeper than three feet, a physical plant sample was collected by throwing a double-sided thatch rake toward the shoreline at each sampling site. A rake tethered to a 25-foot rope was tossed into the water and allowed to sink until it made contact with the bottom. The rake was then slowly dragged along the bottom back toward the boat, (Figure 5a).

In areas shallower than three feet, a rake with a handle was dipped into the water until it made contact with the bottom. Steady pressure was put on the rake handle as it was scraped along the bottom (Figure 5b,c).

Figure 5a.

Figure 5b.

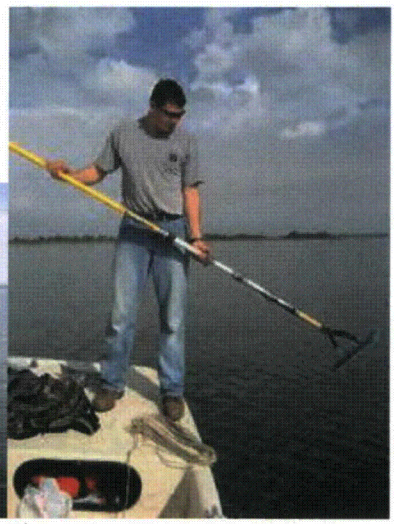


Figure 5c.

Figures 5a-c. A double-sided thatch rake was used to sample submerged vegetation at 109 sample points.

At least two rake samples were taken at each of 109 sample points (Figure 6). Ninety-one point-intercept sites were located at hydroacoustic transect crossings and 18 off-transect sites were selected randomly to facilitate biocover model accuracy assessment. The data recorded about each sample included species name, relative abundance, density, and latitude and longitude (Table 2). If no plant was found, then "no plant" was recorded as the species name. Photos were taken at most sampling sites where vegetation was found.

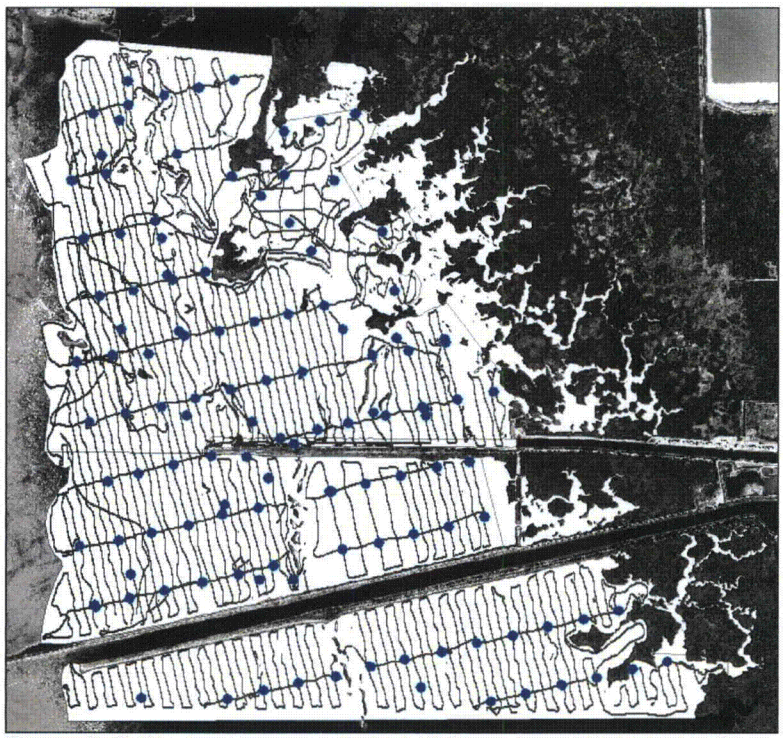


Figure 6. Rake samples were taken at 109 locations (blue points); 91 points were collected at hydroacoustic transect crossings and 18 points were collected off-transects. Point numbers can be found on the Monitoring Sites map in the Appendix.

Relative abundance

Relative abundance is a visual estimation of the proportion of the two rake samples combined for a site that each species represents. For example, if two species were found during a rake sample, one may have represented 75% of the sample and the other may have only represented 25% of the sample. In order to make this estimation quickly in the field, each species' relative abundance was assigned a score placing them in one of five easily discernable ranges. The ranges used in this study are listed in Table 2.

Table 2. Relative abundance scores from two rake samples at each of 109 sample sites were placed into five visually discernable ranges for cover.

Score	% Cover	Description
1	100%	Present as ~100% of sample†
2	75%	Present as ~75% of sample†
3	50%	Present as ~50% of sample†
4	25%	Present as ~25% of sample†
5	5%	Present as ~5% of sample† or less

†sample in this context refers to an aggregate of both samples per physical sample site

Density

Density is the percent of the immediate sample area represented by each species. For example, if only a few stems of a plant were pulled up by the rake, the density would be considered sparse. This estimation was made by gently compressing the combined vegetation sample and placing each species onto a one sided garden rake with graduated tines (Figure 7). The relative density of each species was estimated using four categories representative of the percent of the tines each species covered. Table 3 lists the categories and scale used for this estimation.

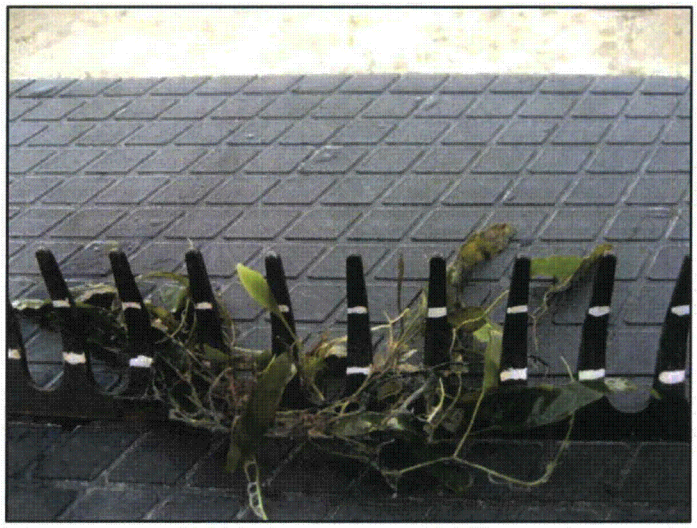


Figure 7. Species density was estimated by gently compressing the sample onto a one-sided garden rake with graduated tines. The white stripes on the tines mark 20% and 60% of the total tine length.

Table 3. Density scale for species found during rake sampling at each of the 109 sample sites estimated from the percent of the rake tines each species covered.

Scale	Name	Description
D	Dense	>60% of rake tines
C	Moderate	20%-60% of rake tines
B	Minor	Up to 20% of rake tines
A	Sparse	1-5 stems

Video Sampling Methodology

A video camera specifically designed for underwater use was affixed to a 12-foot long pole and carefully lowered into the water until it was just above the sediment layer. It was then panned around to find vegetation. When vegetation was observed, the camera was maneuvered to a range where the plants could be identified and held stationary for several seconds (Figure 8a). Thirty-one videos where taken at seventeen different random sampling locations (Figure 8b). ReMetrix encountered adverse environmental conditions that yielded mixed results when attempting to use video sampling as a reliable physical sampling method at some sample site locations.

Figure 8a. When vegetation was found, the video camera was maneuvered to a range where plant identification was possible.

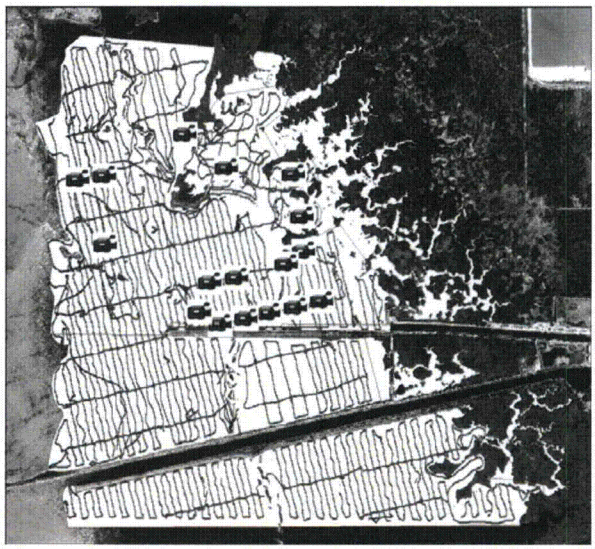


Figure 8b. Thirty-one video clips were made from seventeen random sampling locations (black videocamera symbols), all located north of the discharge canal. Site numbers can be found on the Monitoring Sites map in the Appendix.

SCUBA Diver Survey Methodology

To verify the plant type and growing conditions, a SCUBA diver survey was used. Prior to the diver entering the water, a hydroacoustic pass was made over the site, a DGPS point was taken over the specific diver entry site and a water quality sample was taken. Divers then entered the water to locate submerged plant beds, identify vegetative species present, measure plant heights, estimate percent bottom cover, and characterize overall bed density. Ten diver sites were surveyed (Figure 9).

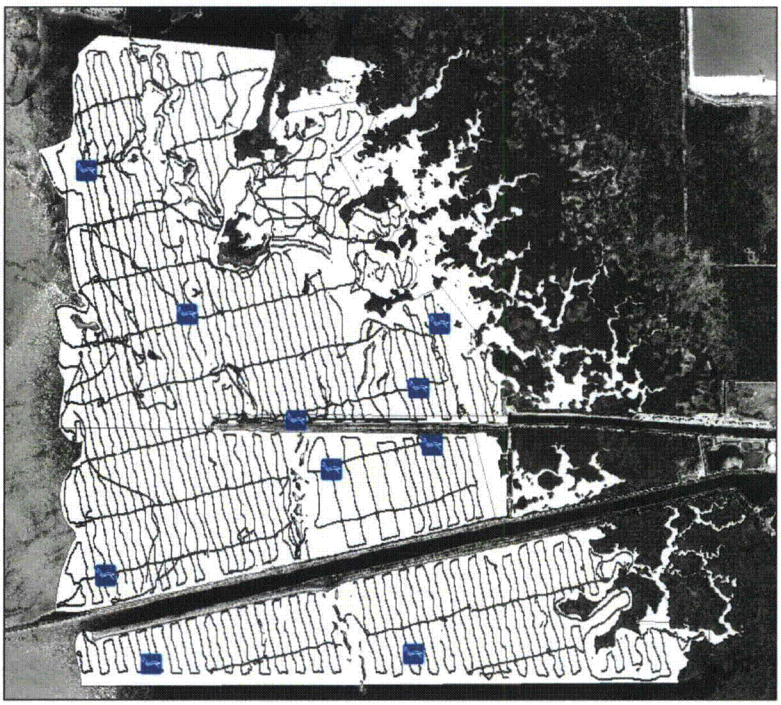


Figure 9. Ten randomly selected SCUBA diver survey points (blue symbols) were sampled between 11/15/2007 and 11/16/2007. Site numbers can be found on the Monitoring Sites map in the Appendix.

Density

Bed density was visually estimated as sparse, low, medium, or high density.

Cover

Percent bottom cover and species composition was measured using the quadrat-cell methodology described by Estevez and Marshal (1995). Once a plant bed was found, a 1-m^2 quadrat subdivided into one hundred 100-cm^2 cells was positioned two to three meters inside the bed's edge (Figure 10). Species name and number of 100 cm^2 cells each species occupied was recorded. A cell was considered populated by a species if at least one rooted stem was found within a cell. The number of populated cells out of 100 is the percent bottom cover for the species. An example of a diver site cover table can be found in Table 4.

Table 4. Genus and number of populated 100 cm^2 cells data from a sample diver site.

	Halodule	*Thalassia*	*Caulerpa* spp.	total seagrass	total rooted SAV
Total count	30	42	27	51	72

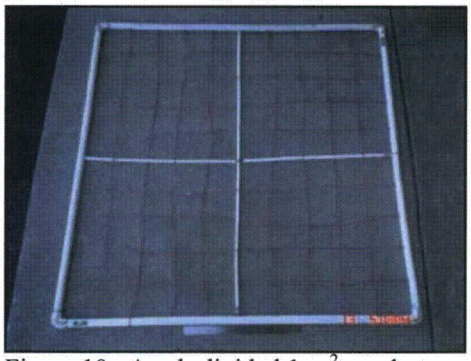


Figure 10. A sub-divided 1-m^2 quadrat assisted divers in estimating species cover.

F. Methodology Discussion

The goal for each of these methods was to help determine species type and cover. Although each successfully accomplished the goal of determining species presence/absence, they each had unique strengths and challenges.

The most time effective method to determine vegetation presence/absence was hydroacoustics. The challenge to using hydroacoustics is that it does not provide species information.

Diver sites were an excellent way to obtain accurate cover and species type without disturbing the vegetation. The drawback to diver sites was time. Diver surveys were too time consuming to sample the entire study area.

Video sample methods were an excellent way to determine if vegetation was growing on the bottom. It had the advantage of providing species identification and the exact latitude and longitude on screen. It was not as time consuming as a diver site, yet seagrass presence/absence could still be confirmed. The primary challenge with this method was determining the exact species due to cloudy or obscured water conditions. Furthermore, since the area the camera could view was small, there were times when the bottom was scanned for several minutes before any plants were detected.

The rake sample method could successfully capture the species type, relative density, and estimate relative abundance. Additionally, this method could be employed while collecting the hydroacoustics making this the least time consuming of all the methods. Another advantage was photos could be taken to document the species and abundance, which could be linked back to a precise spatial location. The primary challenge involved while sampling with the rake method was retrieving a plant sample from the sediment. The only way to verify if the rake sample was missing vegetation was to check the hydroacoustics. If the hydroacoustics indicated plant while rake samples showed no plant, additional rake samples were attempted. Certain seagrass species were missed by rake sampling simply due to plant physiology. Long narrow leaf blades, dense root mats and un-branched structure allowed the rake to "comb" through sparsely populated seagrass stands rather than hooking or snagging the vegetation. For sites where this was true, vegetation was typically pulled up by the anchor, which dug into the soil like a shovel (Figure 11). Anchor samples were recorded as rake samples when these situations arose.

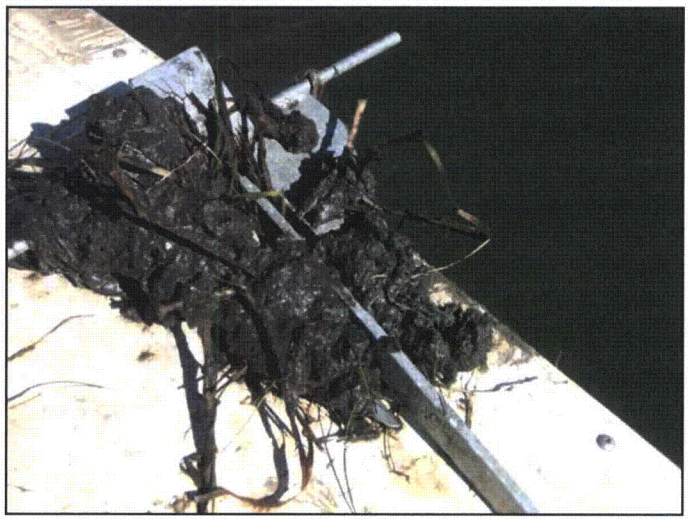


Figure 11. The anchor would occasionally capture vegetation samples in seagrass beds when rake sampling did not.

G. Data Analysis

In order to calculate the area of the project and define an extent for all the data, a study area polygon was created by tracing the water-land interface. This interface was based on digital ortho-rectified quarter-quadrangle (DOQQ) imagery dated 2004 and obtained from the USGS seamless data website (http://seamless.usgs.gov). Islands and obstructions were also isolated from the analysis area in a similar manor. The hydroacoustic data were processed though software that analyzes the return signature to determine the percent biocover.

Continuous and Dot-Density Representations

After processing the hydroacoustic data, spatial data models were made to estimate biocover by interpolating between measured hydroacoustic samples and unsampled areas (Figures 12a and 12b). Both figures communicate slightly different informational contexts about estimated biocover, so both figures are included for discussion. Figure 12a shows the biocover model as a continuous surface, with color gradations indicating the percent biocover at each given location. A continuous biocover surface is the typical map output because the model estimates biocover

values for all geographic space between data transects. However, the seagrass and macroalgae beds within this study area typically occur as patchy cover, not large contiguous beds. For that reason, Figure 12b was created to more intuitively communicate the patchy nature of the beds. Figure 12b shows the exact same biocover model as seen in Figure 12a, but shows it as a gradational dot-density surface instead. Areas of high percentage biocover (reds and oranges on the map) have dots (a.k.a., "beds") spaced very closely together, as one might expect to naturally observe in a high biocover area. Areas of lower percentage biocover (yellows and greens) have dots (beds) spaced further apart, as one might expect to naturally observe in a low biocover area. It is important to note that the coverage statistics for both types of maps are the same; only the display techniques are different. Other figures using the dot-density technique are included in the Appendix.

After the model was completed, assessments for model accuracy were conducted by checking the model against rake samples, diver surveys, and video samples to calculate errors of omission and commission (see Section H).

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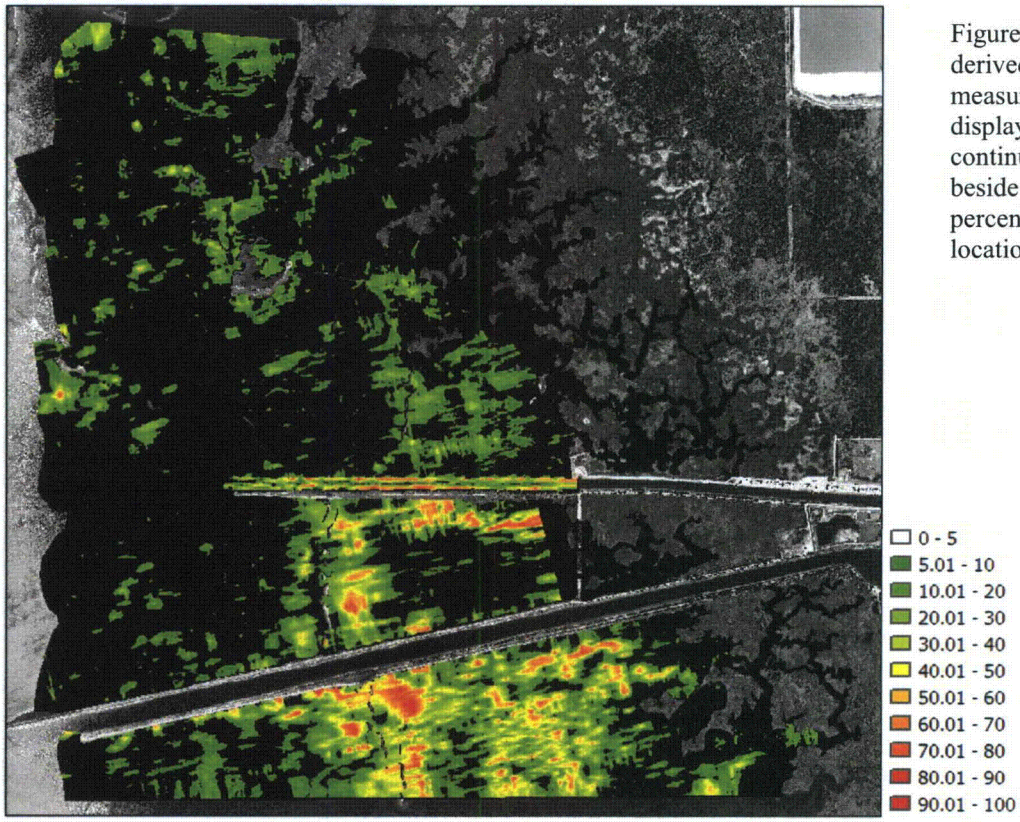

Figure 12a. BioCover model derived from hydroacoustic measures of vegetative cover, displayed as a gradational continuous surface (the legend beside the figure indicates percent biocover at a given location).

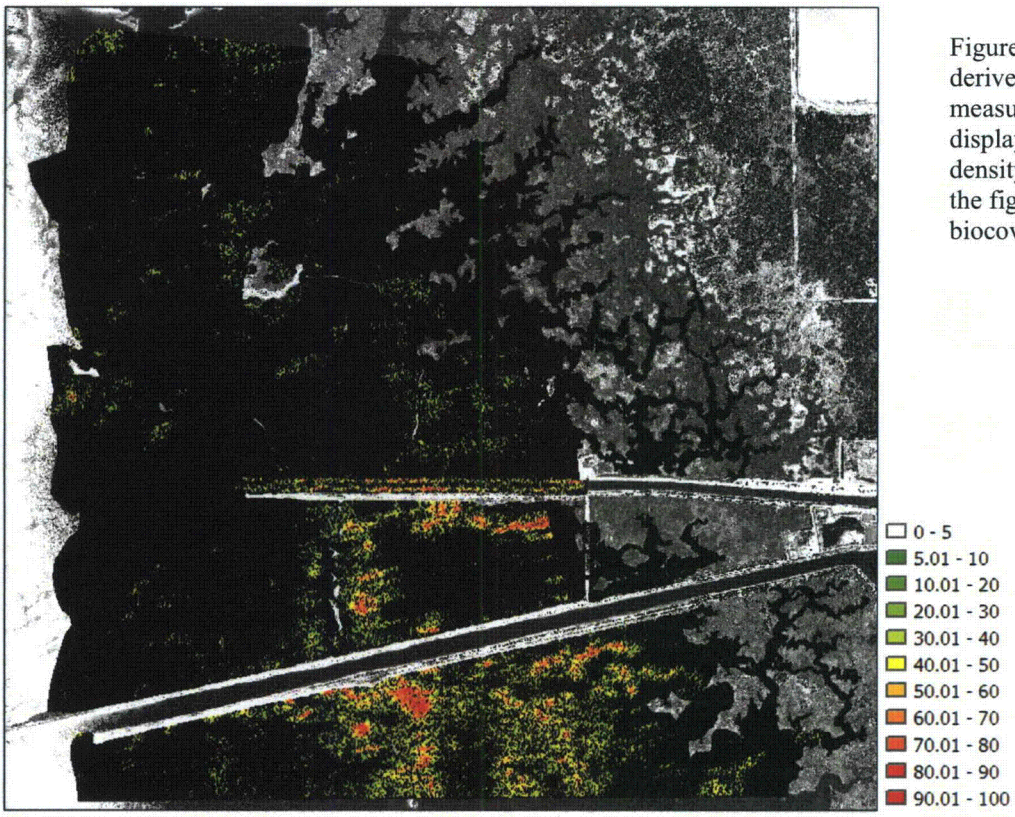

Figure 12b. BioCover model derived from hydroacoustic measures of vegetative cover, displayed as a gradational dot-density surface (the legend beside the figure indicates percent biocover at a given location).

Endpoints of Noise Threshold Settings
A patented software algorithm is used to interpret the amount of submerged vegetation along each hydroacoustic transect. Examples of this process can be seen in the figures labeled "Transect Line 2007*x*" found in Appendix (these show the raw transect data with corresponding interpretations). Noise threshold settings influence how conservatively the algorithm filters noise within the hydroacoustic signal responses. The noise threshold settings are based on established ranges and can be adjusted by the data analyst during data processing. As processing proceeds, the data analyst compares the amount of submerged vegetation interpreted by the algorithm with visual inspection of raw transect data and other field data types. Noise threshold settings are considered acceptable when the data types are in agreement.

For any project, noise threshold settings can fall within an acceptable range based on a variety of environmental and physical factors related to the data collection (e.g., surface noise during data collection, water depth, physical structure and density of the target vegetation, etc.). The acceptable noise threshold settings in this project fell within a small range primarily due to the short, spindly nature of the seagrass blades. The endpoints of the acceptable range are termed 'conservative' settings and 'less conservative' settings. The data models obtained using results within the acceptable range are considered by ReMetrix to be realistic models of the actual submerged vegetation cover in the project area. For that reason, cover models produced from each endpoint of the acceptable range are provided for comparison in Figures 13a ('conservative' thresholds) and 13b ('less conservative' thresholds).

The total biocover for the conservative noise threshold settings is 7.6%. The total biocover for the less conservative noise threshold settings is 10.4%. Table 7 in Section I provides greater detail of specific biocover types for the threshold endpoints.

The total biocover results obtained by the conservative noise threshold settings are used in the statistical calculations discussed in Section H and elsewhere in this report, unless noted otherwise.

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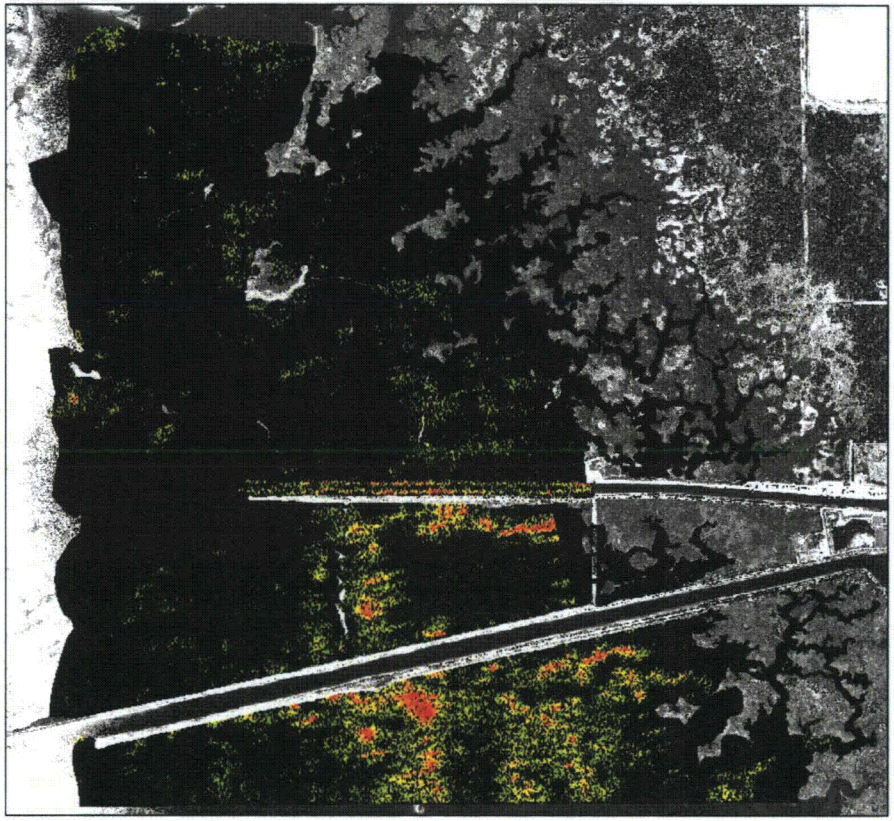


Figure 13a. Map showing the 'conservative' interpretation of total biocover (7.6%) within the project area. (See above section for explanation.)

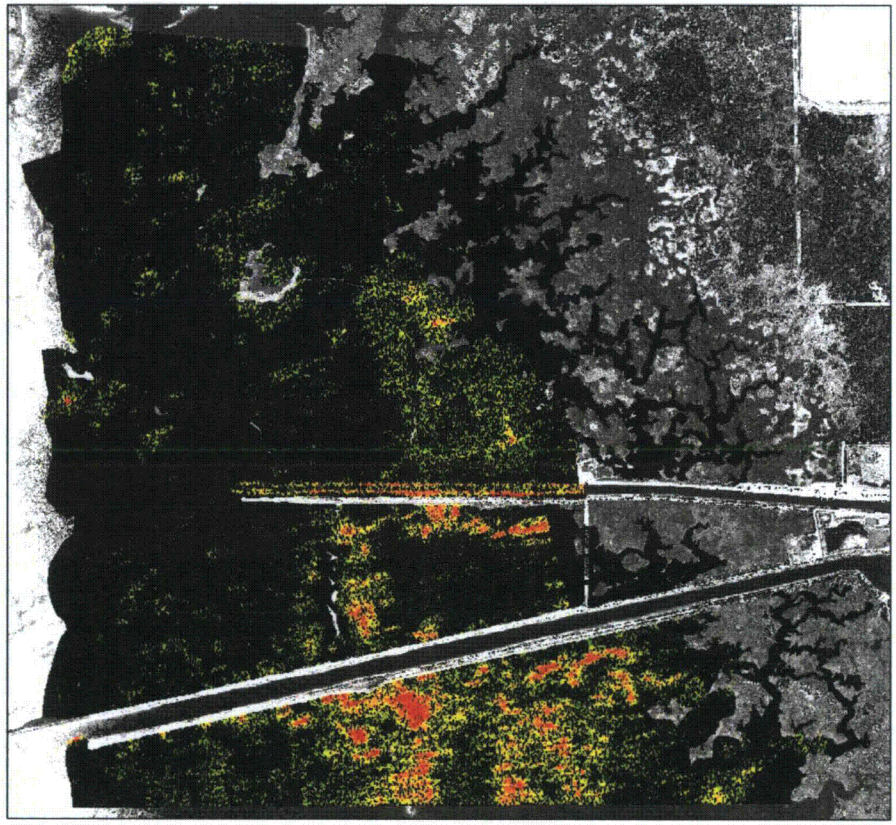


Figure 13b. Map showing the 'less conservative' interpretation of total biocover (10.4%) within the project area. (See above section for explanation.)

H. Accuracy Assessment of the Model

Typical measures for error in models are *omission* and *commission* error. These measures estimate how well a model correlates with actual sample data at the same location. For this analysis, ReMetrix compared all three types of physical sampling results (both as a whole and individually) to the biocover model derived from hydroacoustic transect data as a means for determining model correlation.

We used two 'classes' to develop the error estimate: '*plant*', for where a rake sample or biocover model indicated plant was present, or '*no plant*', where a rake sample or biocover model indicated no plants were present. As a means for explaining a particularly difficult concept we will follow just one comparison through the description, however error was calculated for both 'classes' and both types of error. In the following example, we will use 'plant' rake samples and 'no plant' areas in the model.

Calculating omission error: Of all the physical sampling points indicating plant was found, what proportion of these points lie within a 'no plant' area in the model? In this scenario, a high omission error suggests that the model could be underestimating the amount of plant that is truly present at that location.

Calculating commission error: Of all physical sampling points ('plant' or 'no plant') that lie within a 'no plant' area in the model, what proportion are 'plant' physical sample points? In this scenario, a high commission error suggests that the model could be overestimating the amount of 'no plant' that is truly present at that location.

Table 5 shows omission and commission errors of the model compared to all physical sampling methods combined. The higher 'no plant' omission error would suggest the model may not account for all the non-plant areas that were actually present, however some factors should be taken into consideration. Rake samples were taken from the bow of the boat while the hydroacoustic equipment and GPS antenna were located near the stern of the boat (approximately 18-feet of separation). The typical rake sample was made approximately 20-feet away from the boat. Combining these two distances results in a margin of error up to 38-feet between the nearest hydroacoustic point and the site of rake collection (depending upon the orientation of the boat and the actual rake sample distance at each site). Additionally, the boat may have drifted with currents while video of the bottom was taken so the actual position of the GPS antenna may have not coincided precisely with the location of the video sample or the hydroacoustic sample. Similarly, divers did not necessarily remain directly under the boat (or GPS antenna) while counting plants and therefore diver reference points may not directly relate to hydroacoustic estimates. These positional errors can account for a majority of the error when evaluating the omission and commission statistics (Table 6).

Table 5. Study area-wide BioCover model accuracy estimate without consideration of positional error (38-feet) due to GPS antenna location on the boat relative to the physical sampling location.

			Raster Classification	
		omission error ↓	plant	no plant
All physical samples	plant	17%	62	13
	no plant	62%	36	22
		commission error →	37%	37%

Table 6. Study area-wide BioCover model accuracy estimate after consideration of positional error (38 feet) due to GPS antenna location on the boat relative to the physical sampling location.

			Raster Classification	
		omission error ↓	plant	no plant
All physical samples	plant	0%	75	0
	no plant	62%	36	22
		commission error →	32%	0%

The patchiness or randomness of aquatic vegetation beds, and the characteristics of very low-density vegetation might explain the remaining error. A majority of the areas where the model indicated there was "plant" but physical sampling indicated "no plant" occurred in areas of very low-density vegetation (69% in < 5% cover, 86% in < 10% cover), where the probability of a physical sampling method contacting vegetation was low. No adjustments were made to the model for these areas since the number of hydroacoustic samples (1,116,900) vastly out-numbers the number of physical samples (139 total). After reviewing the hydroacoustic data for many of these areas, ReMetrix confirmed that these zones have low-density plant populations where a limited number of physical samples may have easily missed patchy or sparsely populated plant beds.

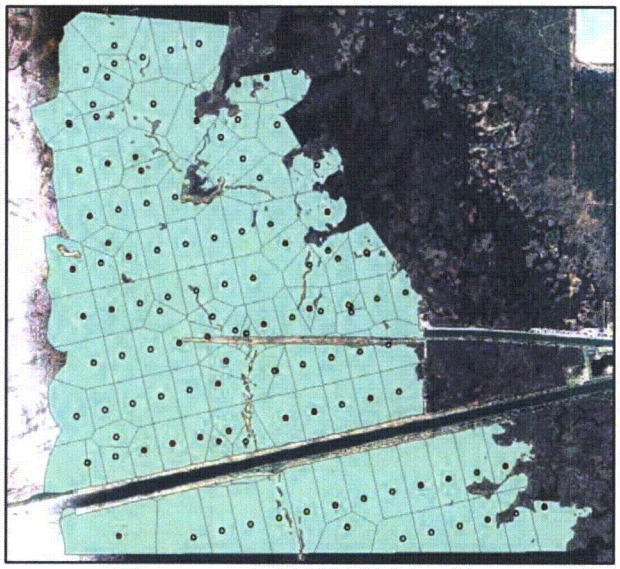
Results of additional error estimates comparing each physical sampling method individually can be found in the Appendix.

I. Vegetation Area Determination

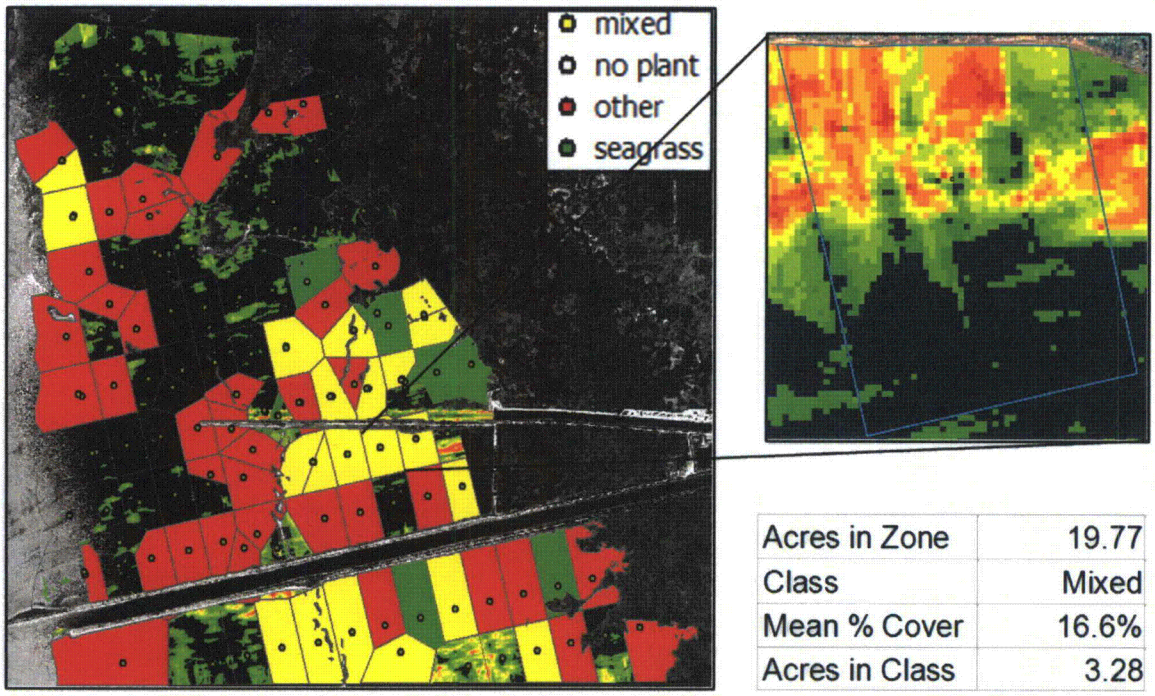
The overarching goal of this project was to determine the number of acres of seagrass. Using the physical samples as a guide, ReMetrix separated vegetated areas in the study area into four classes: seagrass, other, mixed and no plant. Sample sites where *Halodule spp., Syringodium filiforme, Thalassia testudinum,* or *Halophila engelmannii* were found exclusively were placed in the 'seagrass' class. Sample sites where vegetation other than seagrass, e.g. *Caulerpa* or *Udotea*, was found exclusively were classed as 'other'. Sites where both seagrass and other species were found together were classified as 'mixed', and sites where no plants were collected during the rake sample, diver survey, or video sample, were placed into the 'no plant' class.

The second step in this process was to divide the study area into zones which could be labeled one of the four predefined classes. Zone boundaries were made using a method called Thiessen polygons. Thiessen polygons are mathematically defined by the intersections of perpendicular bisectors of the lines between all the sampling sites (Figure 14). Each zone was assigned the class of its corresponding sample site's classification, and the area of vegetation within that zone was calculated.

Figure 14. The study area was divided into Thiessen-polygon-defined zones based upon the spatial location of the sampling sites.



The percent cover within each zone was calculated from the biocover map derived from the hydroacoustic sampling method. The product of the zone area and the mean percent cover within that zone returns the number of acres of vegetation in that zone. Figure 15 shows an example of one zone with tabulated results.



Acres in Zone	19.77
Class	Mixed
Mean % Cover	16.6%
Acres in Class	3.28

Figure 15. Acres of vegetation in a class were calculated from the area of the zone and the mean percent biocover from the hydroacoustic model.

Acres of each vegetation class by zone were summed to determine the number of acres of seagrass, other, mixed, and no plant classes (Table 7).

Table 7. Vegetation class areas were summed from the acres in class calculated in each zone and percent of the total project acreage was calculated.

Conservative Noise Threshold

Category	Acres	Percent Total Area
seagrass	**16**	**0.56%**
mixed	**81**	**2.85%**
seagrass	*46*	*1.62%*
other	*35*	*1.23%*
other	**65**	**2.29%**
unclassified	**58**	**2.04%**
No plant	**2622**	**92.26%**
Total Area	**2842**	

Less Conservative Noise Threshold

Category	Acres	Percent Total Area
seagrass	**27**	**0.95%**
mixed	**101**	**3.55%**
seagrass	*58*	*2.04%*
other	*43*	*1.51%*
other	**85**	**2.99%**
unclassified	**80**	**2.81%**
no plant	**2549**	**89.70%**
Total Area	**2842**	

It was possible to subdivide the 'mixed' class acres into percent 'seagrass' and 'other' since relative abundance of individual species was recorded. The product of the area of a mixed zone and the corresponding relative abundance for each species yielded the acres of each class (seagrass and other). The model indicated plants were present in a number of 'no plant' zones. Acres of vegetation found within a no plant zone were assigned to a new class named 'unclassified'. The unclassified acreage represented 29% of the total vegetated area so it is important to understand where these unclassified zones occurred. Fifty percent of the unclassified vegetation occurred in just 10% of the no plant classified zones. This means the bulk of the unclassified data occurred in a relatively small number of zones. All six of these zones were surrounded by zones of a defined vegetation type. Based on the classification of adjoining zones, many were likely mixed stands of seagrass (Figure 16). Most likely, the rake sampling was not representative of the whole zone.

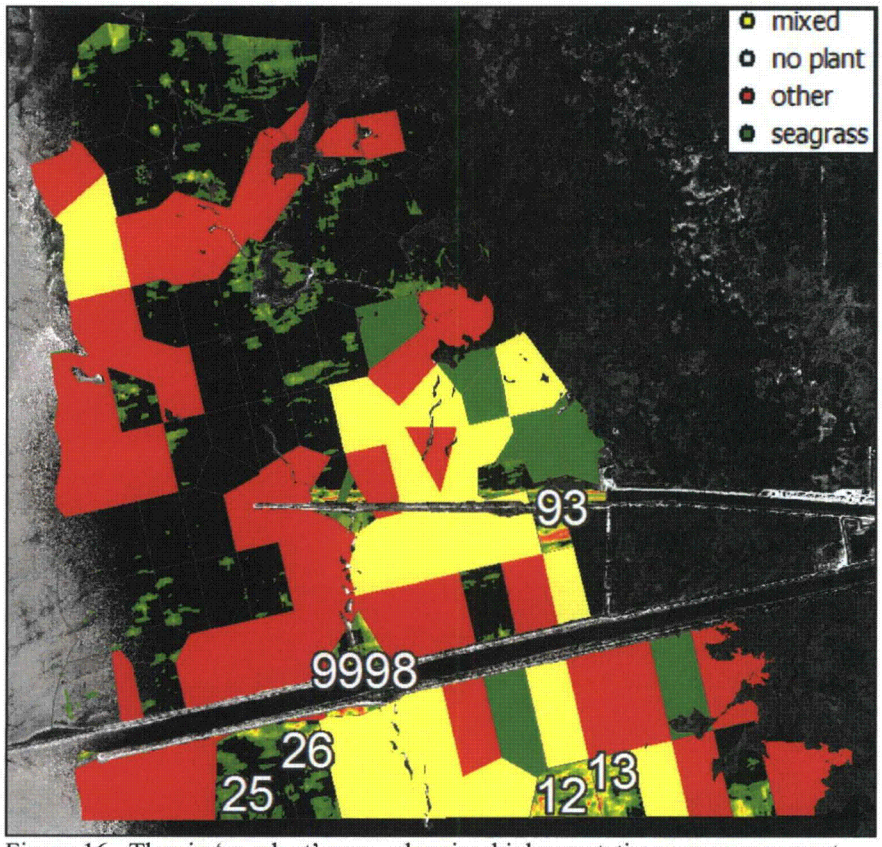


Figure 16. The six 'no plant' zones showing high vegetative cover were most likely 'mixed' zones where a physical sampling method was unable to locate vegetation.

J. Comparison to Previous Work

Broad comparisons were made between 2007 data and the transect data reported in Marshall (2001). The data from 2001 was loaded into a GIS and transects were drawn between the sampling points. Average biocover was calculated from the current model along the 2001 transects in an attempt to compare the same areas. Average cover was tabulated for both 2001 and 2007 (Table 8). There could be several reasons the 2007 results were lower than the 2001 results. First, 2007 data were not sampled along the exact same transects, rather they were based on a segment laid over a model of hydroacoustic data. Both transects 2a and 3w each had two data points that were more than 50 meters from any 2007 sampling locations.

Table 8. Comparisons were made for average cover between 2001 and 2007 along similar transect lines.

Name	2001 Mean	2007 Mean
1N	32.09	6.01
1W	46	1.70
2a	20.25	0.15
2W	39.19	4.90
3W	34.52	4.83
4W	5.28	3.04
5W	0.25	1.66

Another concern when comparing these two sample methods is simply the difference in the sampling methodology used to calculate cover. Comparing quadrats sampled along a transect to a model derived from hydroacoustic transect sampling should be done with careful consideration of how each method calculates percent cover. The 2001 quadrat method estimated plant cover as 1% per 100 cm^2, even if it was very sparsely distributed and repeated every 100 meters along the transect. A transect's average biocover was then calculated by averaging over all cover estimates for that transect. Hydroacoustic sampling records 10 pings per second of plant or no plant and computes an average across 10 pings to make one sample estimate of biocover. This equals one sample per second or roughly one sample per 2.5 meters. These samples are then used to create a model, thereby interpolating a 5-meter grid between samples in all directions. As a example, we investigated video point 9992 located less than 300 ft from a 2001 reported sampling location along transect 4w (Figure 17). The 2001 sample listed *Halodule* at 86% cover, while the 2007 model estimated it at 11% cover.

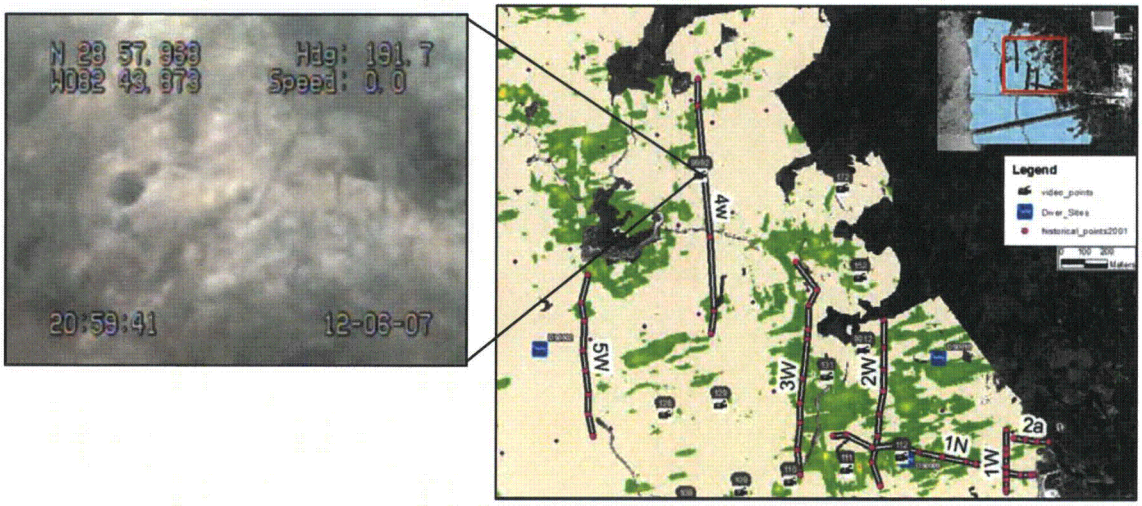


Figure 17. Screen capture of digital underwater video sample (left) showing sparse vegetative cover, with corresponding sample location (right).

<*continued on the next page...*>

The following illustration (Figure 18) may describe why the average cover comparison from 2001 to 2007 differs so greatly. In the following diagram, a green cell represents a 'plant' cell.

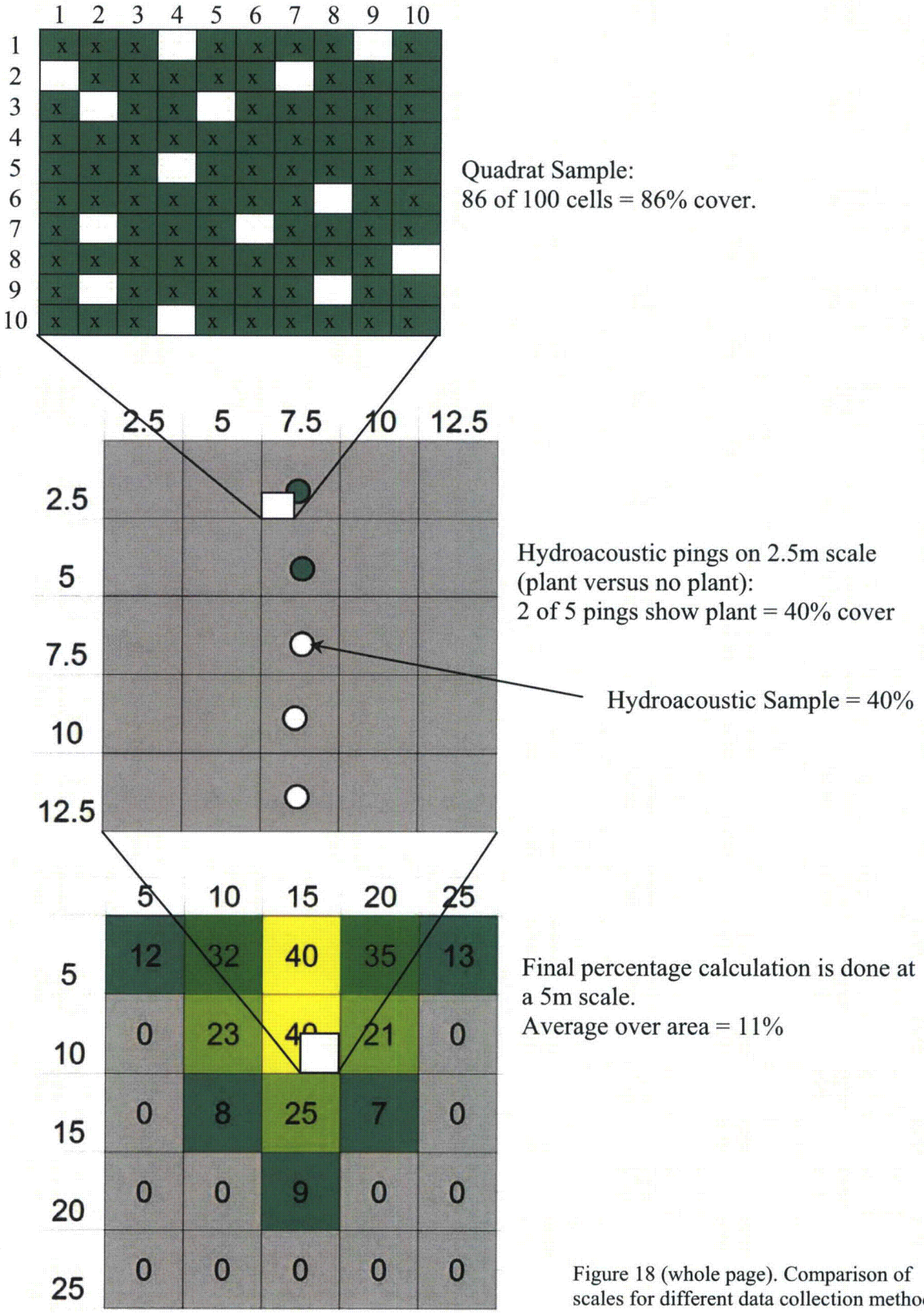


Figure 18 (whole page). Comparison of scales for different data collection methods.

Furthermore, transects 1W, 1N, 3W, and 4W don't appear to be sampled on 100-meter intervals. This indicates there may have been some post-directed sampling used for the 2001 data, which may have greatly influenced the average cover for the transect.

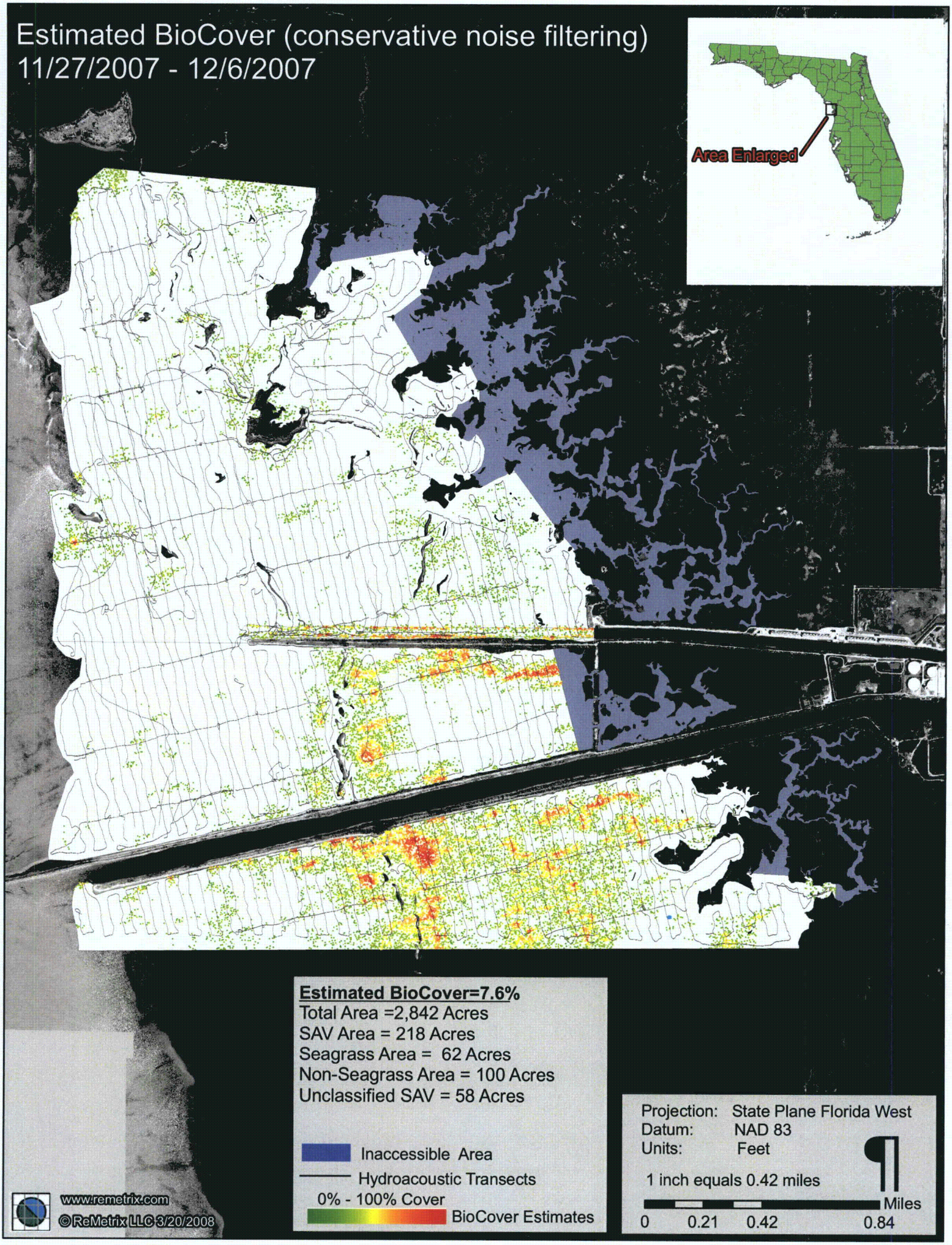
REFERENCES CITED

Estevez, E.D., and Marshal, M. J., 1995. *1995 Summary Report for: Crystal River 3 Year NPDES Monitoring Project*, Mote Marine Laboratory, Sarasota, FL, 131 p.

Marshall, M.J., 2001. *Seagrass Survey: November 2001 Resurvey at the Florida Power Crystal River Generating Facility*, Coastal Seas Consortium, Inc., Bradenton, FL, 19 p.

Appendix

Estimated BioCover (conservative noise filtering)
11/27/2007 - 12/6/2007



Estimated BioCover (less conservative noise filtering)
11/27/2007 - 12/6/2007

Estimated BioCover=10.4%
Total Area =2,842 Acres
SAV Area = 295 Acres
Seagrass Area = 85 Acres
Non-Seagrass Area = 128 Acres
Unclassified SAV = 80 Acres

Inaccessible Area
Hydroacoustic Transects
0% - 100% Cover
BioCover Estimates

Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 0.42 miles

Miles
0 0.21 0.42 0.84

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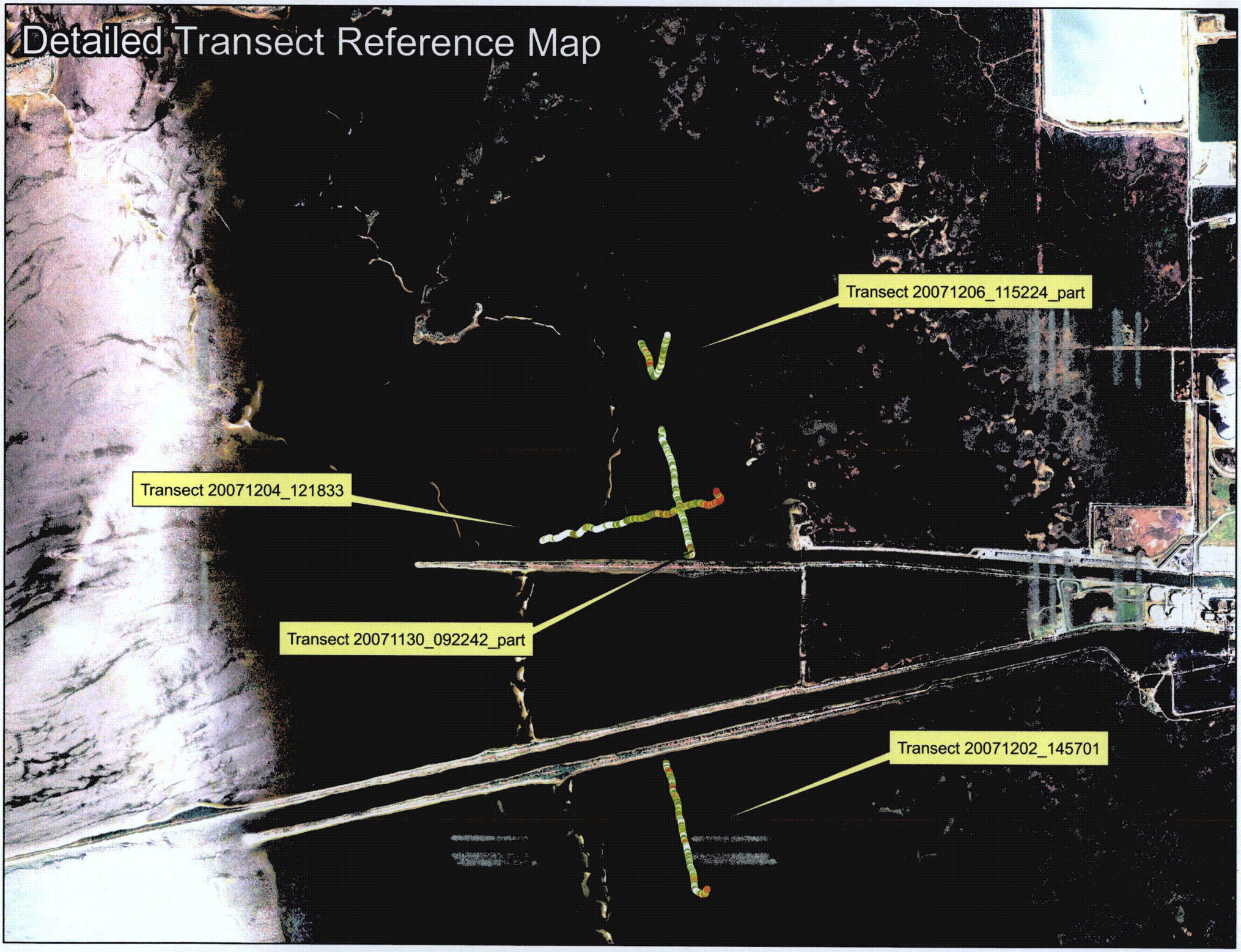
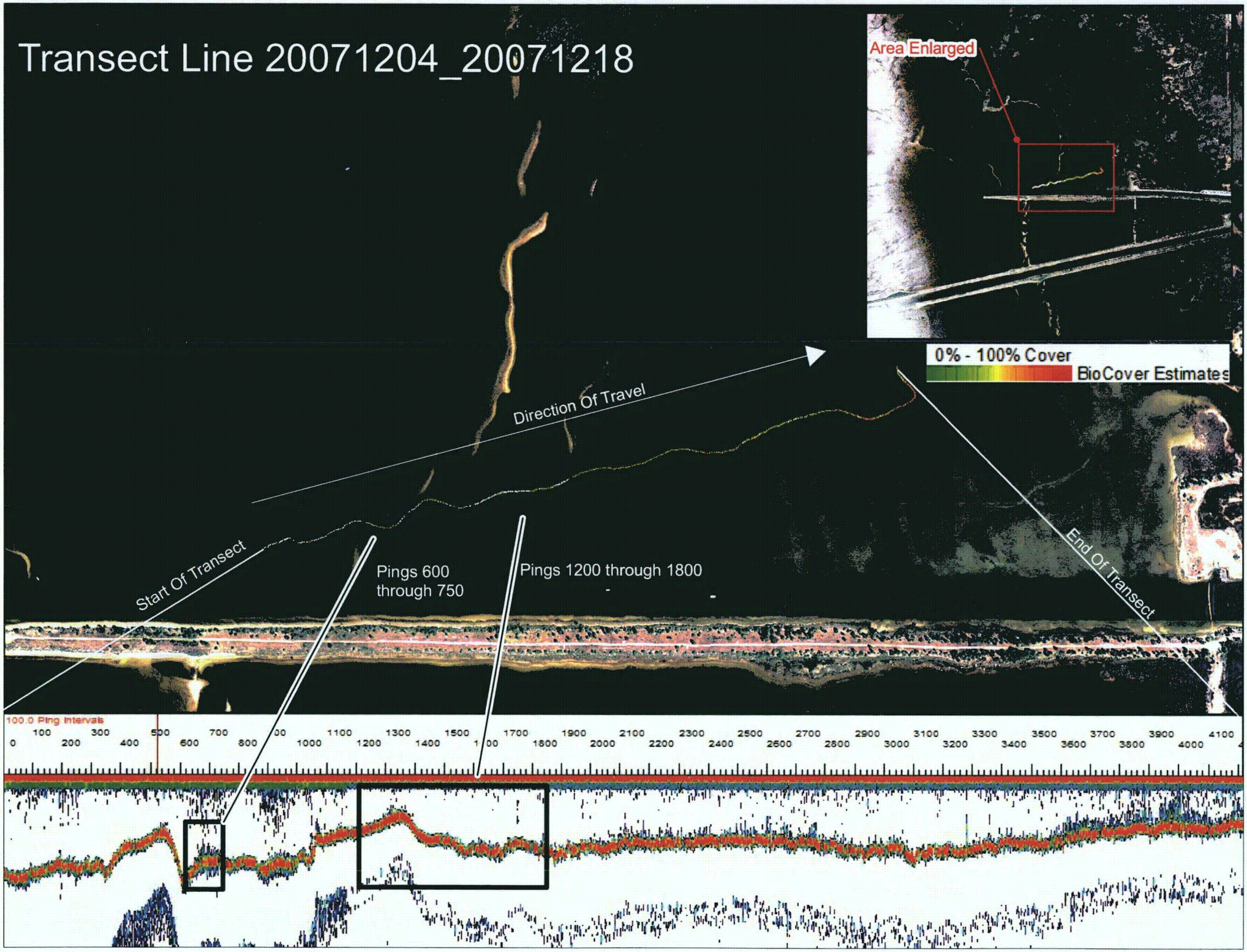
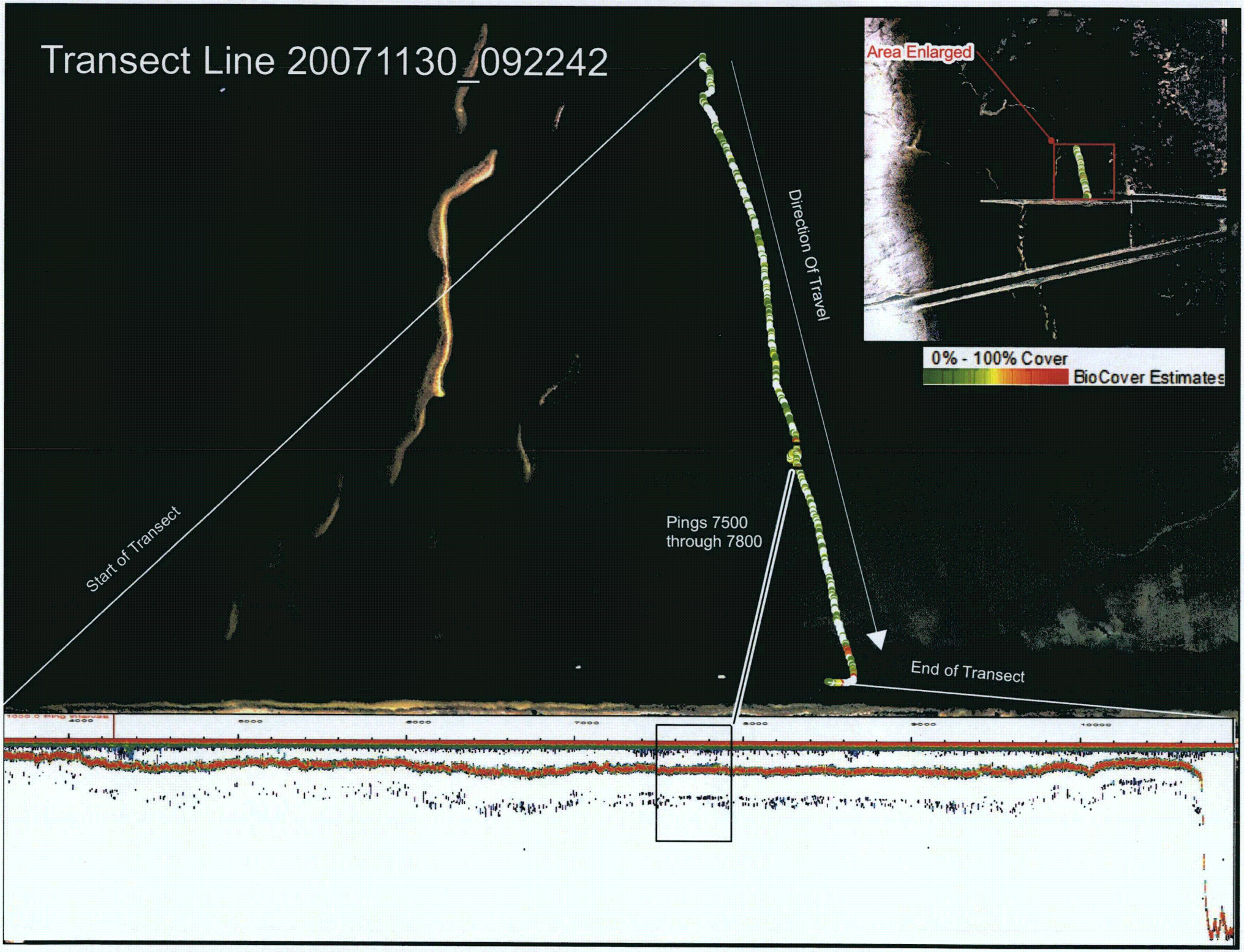
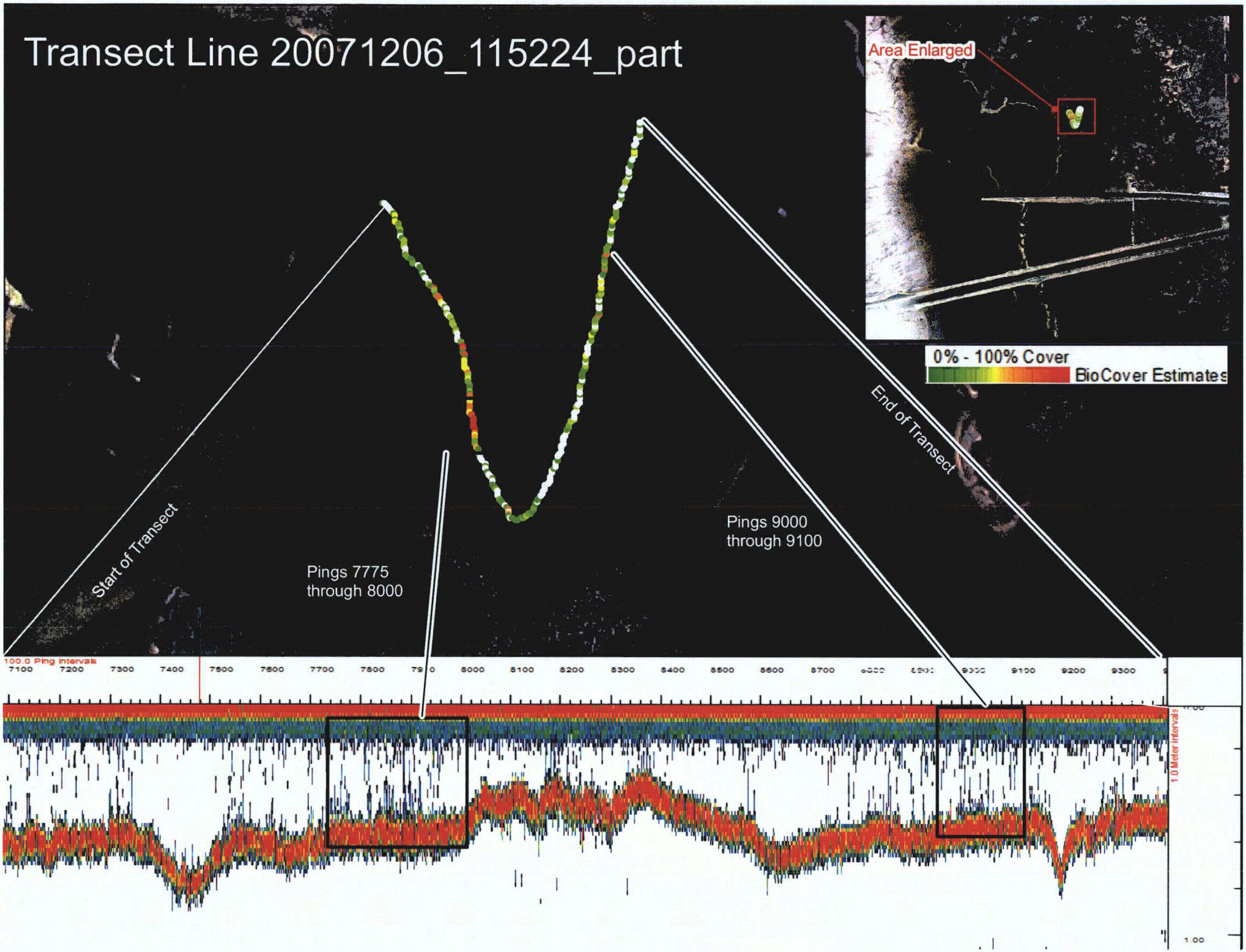
Detailed Transect Reference Map

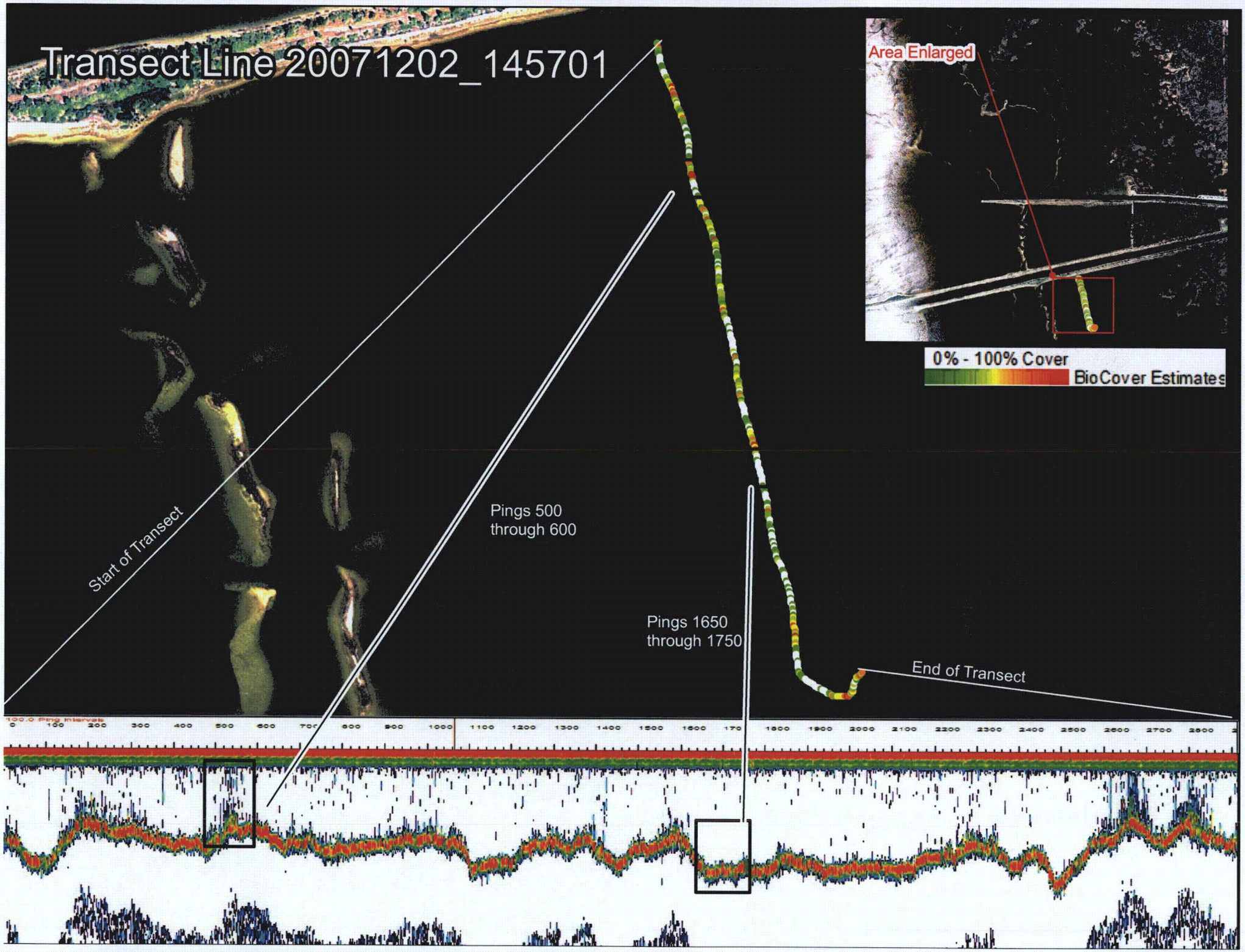



Transect Line 20071204_20071218
Area Enlarged
0% - 100% Cover
BioCover Estimates
Direction Of Travel
Start Of Transect
Pings 600
through 750
Pings 1200 through 1800
End Of Transect
100.0 Ping Intervals


Transect Line 20071130_092242
Start of Transect
Direction Of Travel
Pings 7500
through 7800
End of Transect
Area Enlarged
0% - 100% Cover
BioCover Estimates

Transect Line 20071206_115224_part




Transect Line 20071202_145701
Area Enlarged
0% - 100% Cover
BioCover Estimates
Start of Transect
Pings 500
through 600
Pings 1650
through 1750
End of Transect

Monitoring Sites
11/27/2007 - 12/6/2007

Scientific Name	# Sites	Frequency
no plant	64	53%
Gracilaria tikvahiae	22	18%
Sargassum natans	21	17%
Syringodium filiforme	19	16%
Caulerpa sertularoides	15	12%
Caulerpa prolifera	14	12%
Halodule wrightii	13	11%
Sargassum fluitans	13	11%
Caulerpa mexicana	8	7%
Penicillus spp fragments	7	6%
Udotea conglutinata	7	6%
Cladophora spp	5	4%
Halophila engelmannii	3	2%
Thalassia testudinum	3	2%
Halimeda incrassata	2	2%
Leptogorgia virgulata	2	2%
Caulerpa spp	1	1%
Dictyota spp	1	1%

Legend

Video Sites

Diver Site Location

Rake Toss

0% - 100% Cover

BioCover Estimates

Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 0.42 miles

Miles

0 0.21 0.42 0.84

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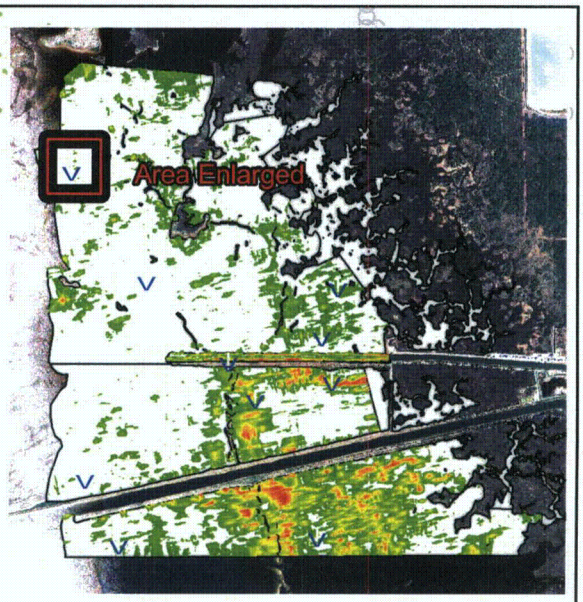
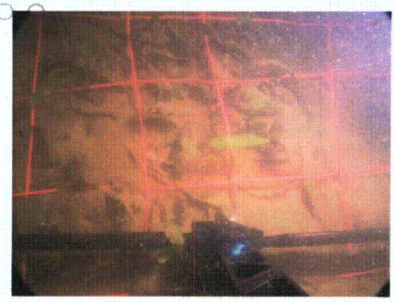
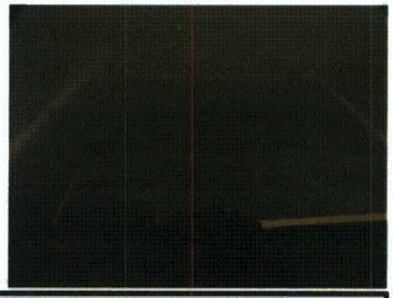
Sample Method Comparison
Diver Site I / Rake Toss #204







Water Quality Information	
NAME	DS0001
Water Temp (deg C)	22.9
Sample Date	11/15/2007
Sample Time	12:25PM
Turbidity (ntu)	5.09
Salinity (ppt)	25.9
Secchi Depth (ft)	5
Physical Depth (ft)	5
Tide Level	L2:25PM
Water Depth (m)	1.5-2m

Bed Characteristics	
Size	Not defined; scattered
Plant Height	6 inches
Bottom Coverage	23%
Bed Density	Sparse

Species Chart		
Sample Method	Cover	Species Present
Diver Sample	3 cells	*Gracilaria tikvhiae*
Diver Sample	20 cells	*Caulerpa prolifera*
Rake Toss	>60% of rake tines	*Caulerpa prolifera*
Hydroacoustic Model	5%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

Hydroacousitc Points

Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 59 feet

0 29.5 59 118 Feet

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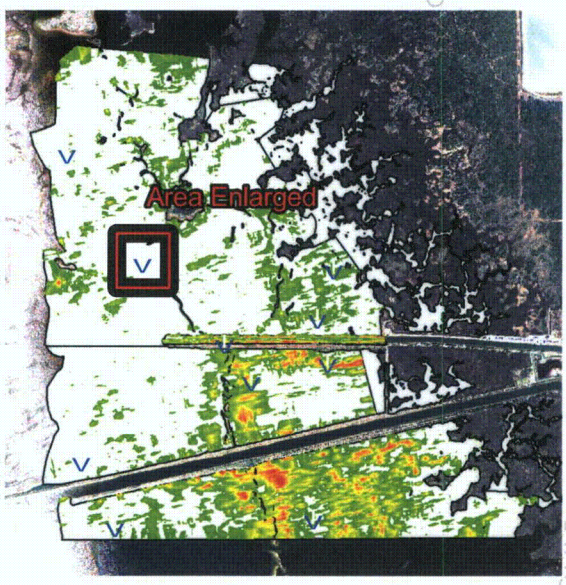
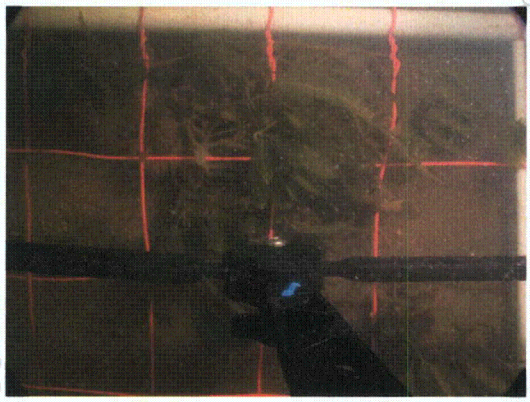
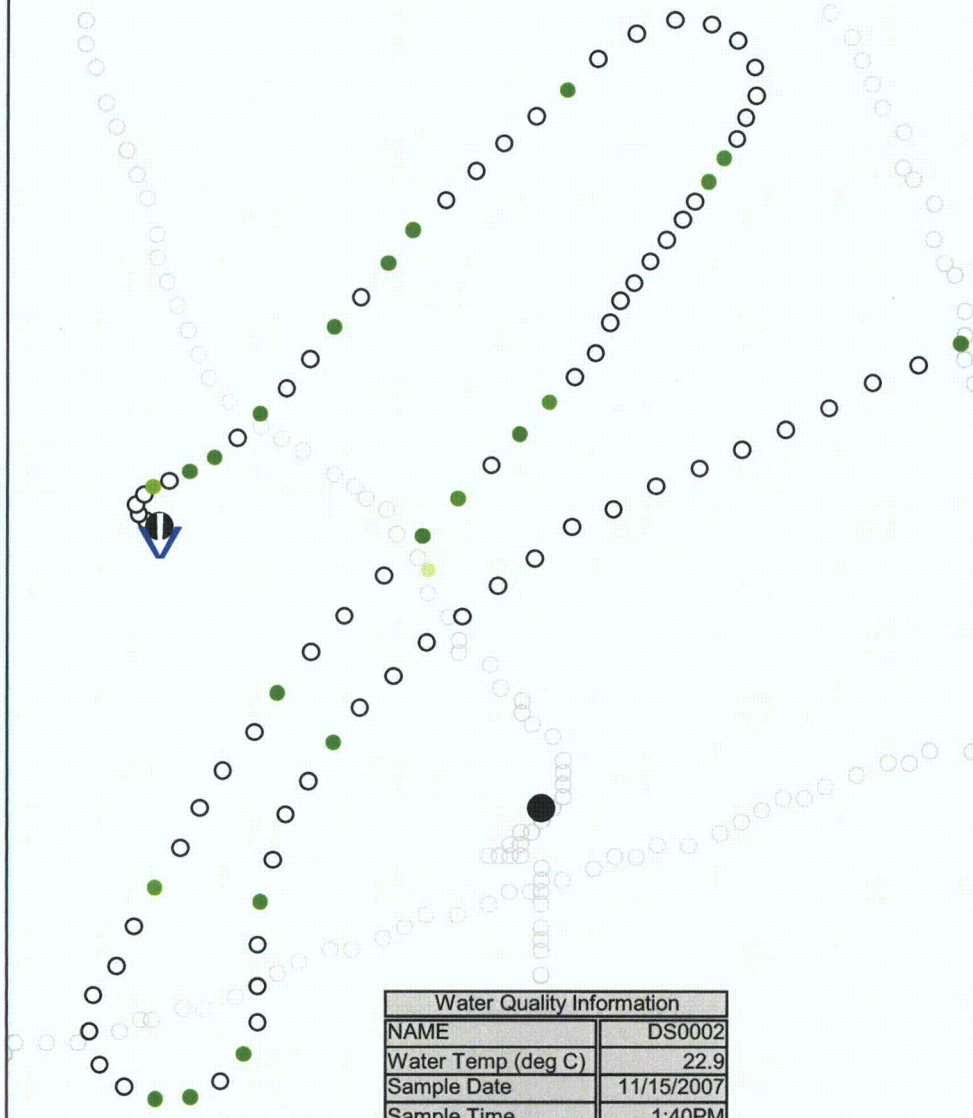
Sample Method Comparison
Diver Site II / Rake Toss #146







Water Quality Information	
NAME	DS0002
Water Temp (deg C)	22.9
Sample Date	11/15/2007
Sample Time	1:40PM
Turbidity (ntu)	3.94
Salinity (ppt)	29.1
Secchi Depth (ft)	3.6
Physical Depth (ft)	3.9
Tide Level	L2:25PM
Water Depth (m)	1-1.5m

Bed Characteristics	
Size	Not defined; scattered
Plant Height	1 foot
Bottom Coverage	22%
Bed Density	Sparse

Species Chart		
Sample Method	Cover	*Species Present*
Diver Sample	22 cells	*Caulerpa sertularoides*
Rake Toss	0%	*No Plant*
Hydroacoustic Model	0%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

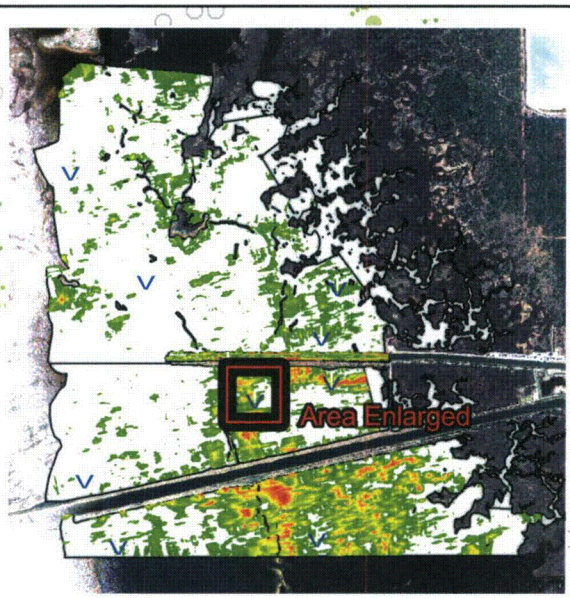
Hydroacousitc Points

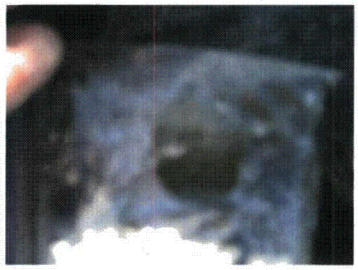
Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

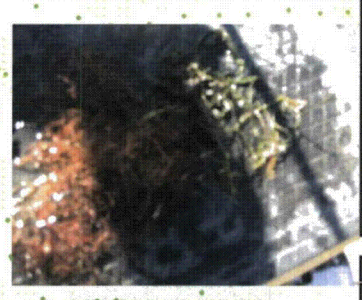
1 inch equals 59 feet

0 29.5 59 118 Feet

Sample Method Comparison
Diver Site III / Rake Toss #89







Water Quality Information	
NAME	DS0003
Water Temp (deg C)	22.4
Sample Date	11/15/2007
Sample Time	3:43PM
Turbidity (ntu)	9.44
Salinity (ppt)	29.9
Secchi Depth (ft)	2.7
Physical Depth (ft)	3.8
Tide Level	L2:25PM
Water Depth (m)	1-1.5m

Bed Characteristics	
Size	Large
Plant Height	1 foot
Bottom Coverage	100%
Bed Density	High

Species Chart		
Sample Method	Cover	*Species Present*
Diver Sample	68 cells	*Syringodium filiforme*
Diver Sample	51 cells	*Gracilaria tikvahiae*
Rake Toss	>60% of rake tines	*Gracilaria tikvahiae*
Rake Toss	>60% of rake tines	*Caulerpa sertularoides*
Rake Toss	>60% of rake tines	*Udotea conglutinata*
Rake Toss	20%-60% of rake tines	*Syringodium filiforme*
Rake Toss	>60% of rake tines	*Caulerpa sertularoides*
Rake Toss	>60% of rake tines	*Sargassum natans*
Hydroacoustic Model	37%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

Hydroacousitc Points

Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 59 feet

0 29.5 59 118 Feet

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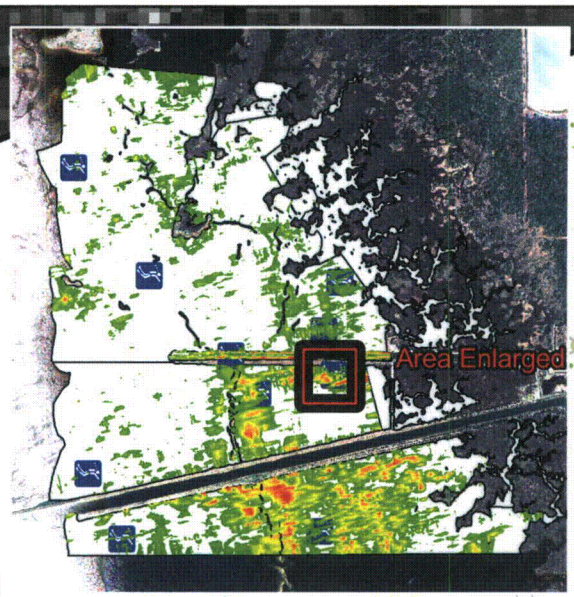
Sample Method Comparison
Diver Site IV / No Rake Toss



NAME	DS0004
Water Temp (deg C)	23.2
Sample Date	11/15/2007
Sample Time	4:38PM
Turbidity (ntu)	9.37
Salinity (ppt)	29.9
Secchi Depth (ft)	1.5
Physical Depth (ft)	1.8
Tide Level	L2:25PM
Water Depth (m)	0.5-1m

Bed Characteristics	
Size	Large
Plant Height	1 foot
Bottom Coverage	100%
Bed Density	High

Species Chart

Sample Method	Cover	*Species Present*
Diver Sample	86 cells	*Syringodium filiforme*
Diver Sample	24 cells	*Caulerpa mexicana*
Diver Sample	10 cells	*Gracilaria tikvahiae*
Diver Sample	7 cells	*Halimeda incrassata*
Diver Sample	4 cells	*Swargassum fluitans*
Hydroacoustic Model	23%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

Hydroacousitc Points

Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 59 feet

Feet

0 29.5 59 118

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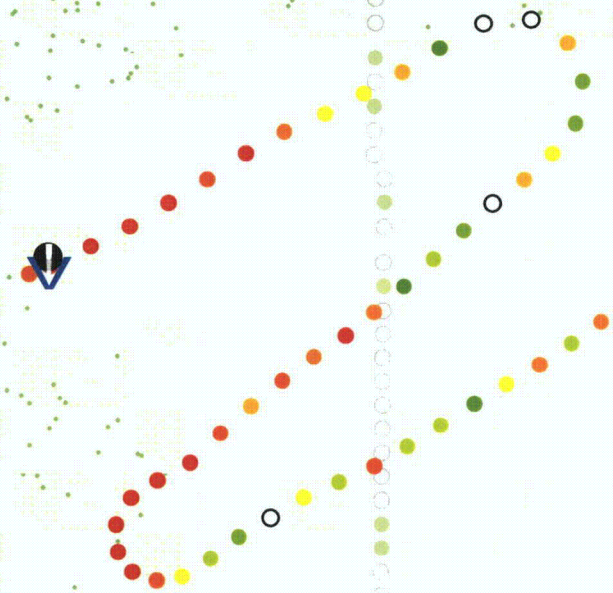
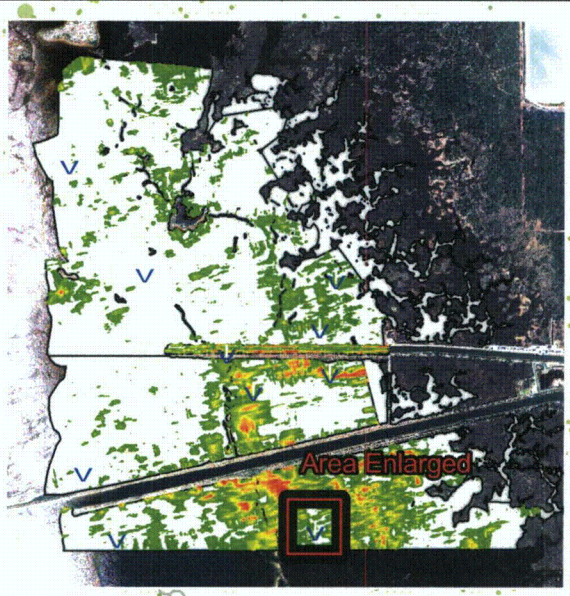
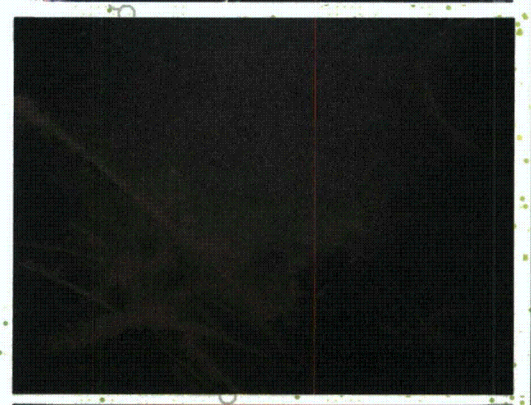
Sample Method Comparison
Diver Site V / No Rake Toss







NAME	DS0005
Water Temp (deg C)	16.2
Sample Date	11/16/2007
Sample Time	12:05PM
Turbidity (ntu)	3.62
Salinity (ppt)	27.6
Secchi Depth (ft)	0.9
Physical Depth (ft)	0.9
Tide Level	L3:20PM
Water Depth (m)	0.5-1m

Bed Characteristics	
Size	Not defined; scattered
Plant Height	1 foot
Bottom Coverage	95%
Bed Density	Medium

Species Chart		
Sample Method	Cover	Species Present
Diver Sample	61 cells	*Syringodium filiforme*
Diver Sample	34 cells	*Gracilaria tikvahiae*
Hydroacoustic Model	5.00%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

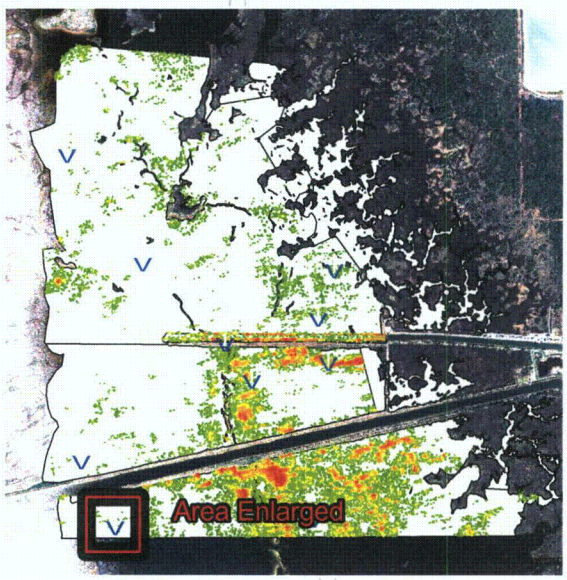
Hydroacousitc Points

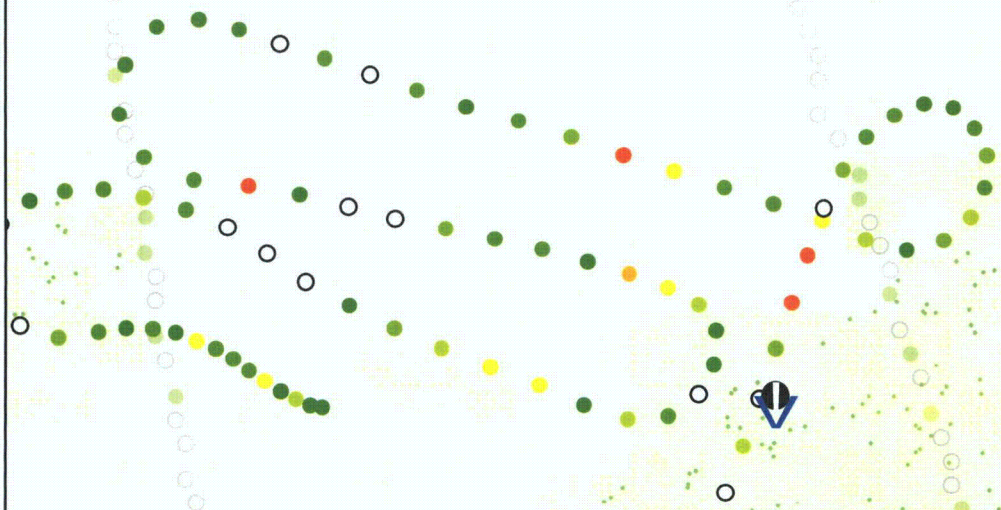
Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

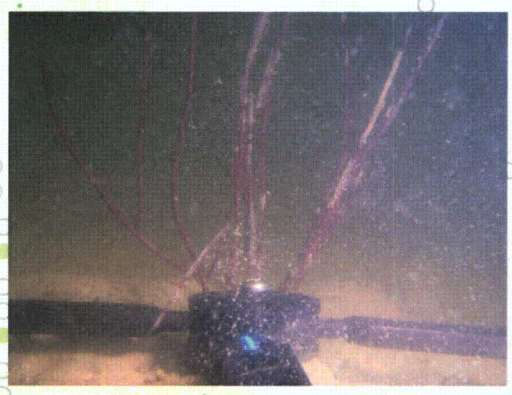
1 inch equals 59 feet

0 29.5 59 118 Feet

Sample Method Comparison
Diver Site VI / No Rake Toss







NAME	DS0006
Water Temp (deg C)	16.9
Sample Date	11/16/2007
Sample Time	1:22PM
Turbidity (ntu)	2.55
Salinity (ppt)	30.9
Secchi Depth (ft)	3.6
Physical Depth (ft)	3.6
Tide Level	L3:20PM
Water Depth (m)	1-1.5m

Bed Characteristics	
Size	Not defined; scattered
Plant Height	1 foot
Bottom Coverage	100%
Bed Density	Medium

Species Chart		
Sample Method	Cover	Species Present
Diver Sample	2 cells	*Dictyota sp.*
Diver Sample	7 cells	*Halimeda incrassata*
Diver Sample	6 cells	*Udotea conglutinata*
Diver Sample	45 cells	*Sargassum natans*
Diver Sample	8 cells	*Leptogorgia virgulata*
Diver Sample	47 cells	*Caulerpa mexicana*
Diver Sample	7 cells	*Caulerpa sertularoides*
Hydroacoustic Model	8%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

Hydroacousitc Points

Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 59 feet

0 29.5 59 118 Feet

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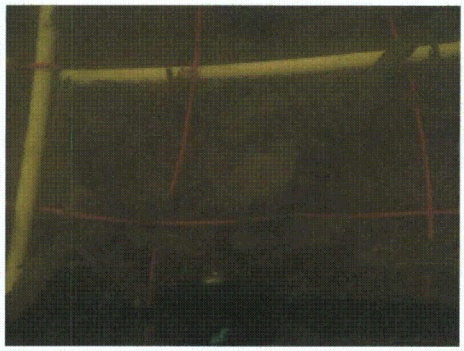
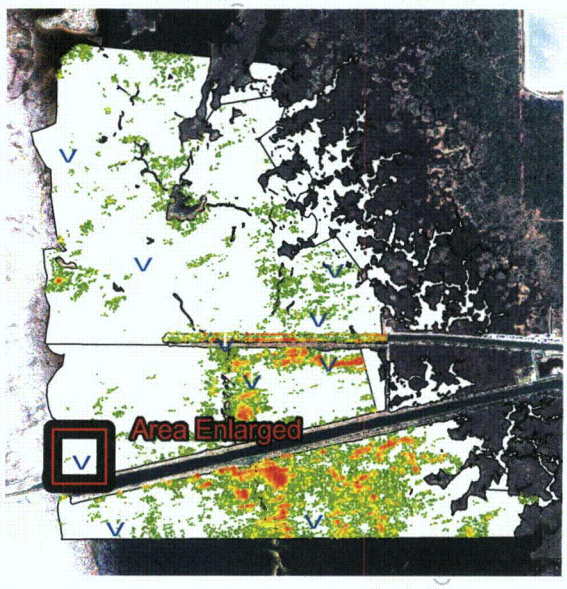
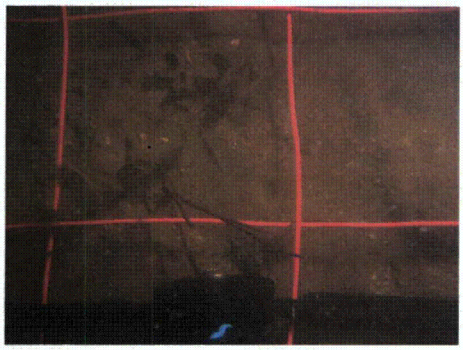
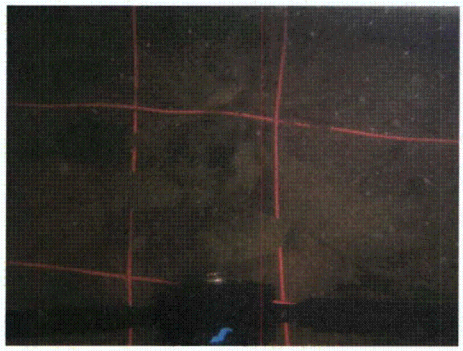
Sample Method Comparison
Diver Site VII / Rake Toss #62









NAME	DS0007
Water Temp (deg C)	19.3
Sample Date	11/16/2007
Sample Time	2:55PM
Turbidity (ntu)	4.09
Salinity (ppt)	29.8
Secchi Depth (ft)	3.9
Physical Depth (ft)	5.5
Tide Level	L3:20PM
Water Depth (m)	1.5-2m

Bed Characteristics	
Size	No defined; scattered
Plant Height	6 inches
Bottom Coverage	65%
Bed Density	Medium

Species Chart

Sample Method	Cover	Species Present
Diver Sample	62 cells	*Caulerpa mexicana*
Diver Sample	2 cells	*Leptogorgia virgulata*
Diver Sample	2 cells	*Sargassum natans*
Rake Toss	0%	*No Plant*
Hydroacoustic Model	8%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

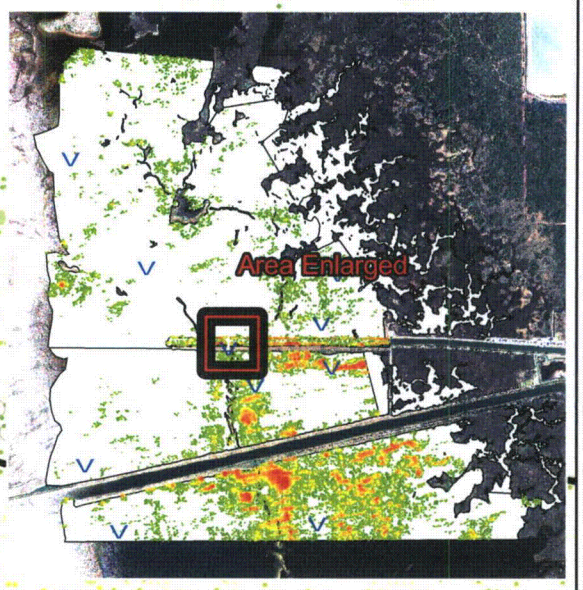
Hydroacousitc Points

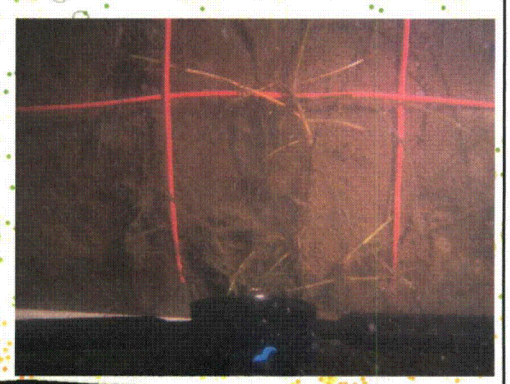
Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 59 feet

0 29.5 59 118 Feet

Sample Method Comparison
Diver Site VIII / Rake Toss #9996





NAME	DS0008
Water Temp (deg C)	18.3
Sample Date	11/16/2007
Sample Time	3:38PM
Turbidity (ntu)	5.42
Salinity (ppt)	27.6
Secchi Depth (ft)	3.9
Physical Depth (ft)	11.7
Tide Level	L3:20PM
Water Depth (m)	3-4m

Bed Characteristics	
Size	Not defined; scattered
Plant Height	6 inches
Bottom Coverage	42%
Bed Density	Medium

Species Chart		
Sample Method	Cover	Species Present
Diver Sample	42 cells	*Halodule wrightii*
Rake Toss	0%	*No Plant*
Hydroacoustic model	16%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

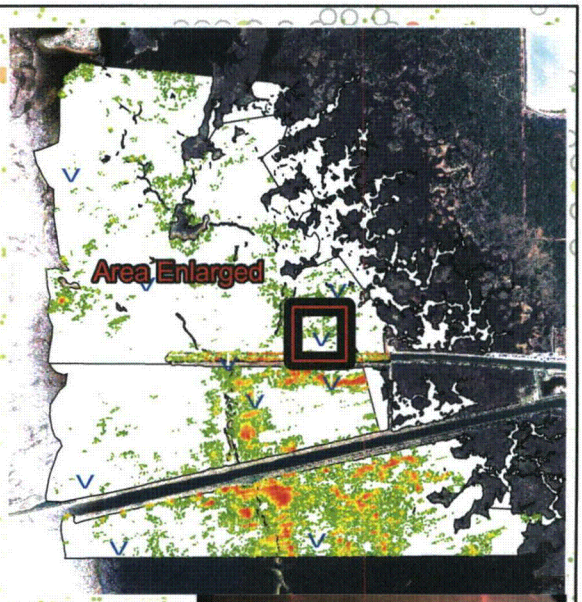
Hydroacousitc Points

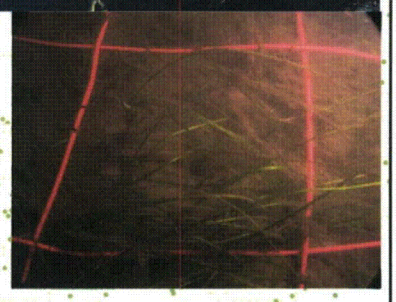
Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

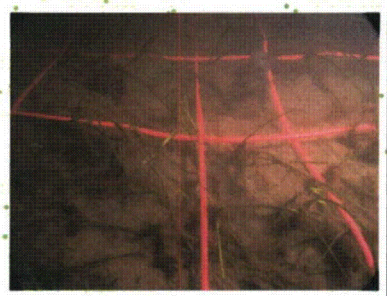
1 inch equals 59 feet

0 29.5 59 118 Feet

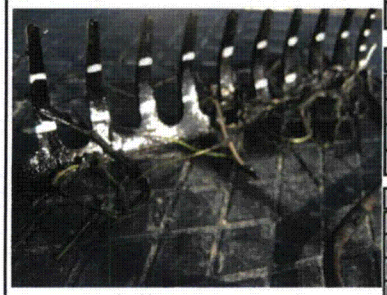
Sample Method Comparison
Diver Site IX / Rake Toss #9913; Video 112 / Rake Toss 112







NAME	DS0009
Water Temp (deg C)	26.9
Sample Date	11/16/2007
Sample Time	4:19PM
Turbidity (ntu)	7.62
Salinity (ppt)	31.8
Secchi Depth (ft)	1.8
Physical Depth (ft)	2
Tide Level	L3:20PM
Water Depth (m)	0.5-1m



Bed Characteristics	
Size	Large
Plant Height	6 inches
Bottom Coverage	100%
Bed Density	High

Species Chart		
Sample Method	Cover	Species Present
Diver Sample	100 cells	*Halodule wrightii*
Rake Toss 9913	0%	*No Plant*
Rake Toss 112	5 stems- 20%	*Syringodium filiforme*
Video Site	20% - 40%	*Syringodium filiforme*
Video Site	1 - 5 stems	*Caulerpa sertularoides*
Hydroacoustic Model	19%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

Hydroacousitc Points

Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 59 feet

0 29.5 59 118 Feet

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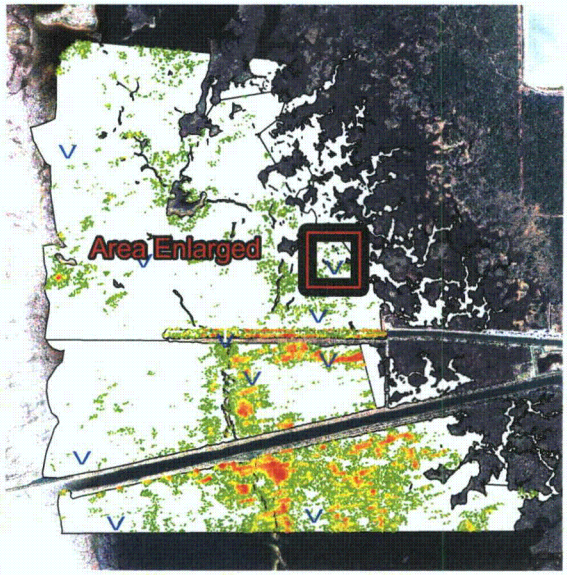
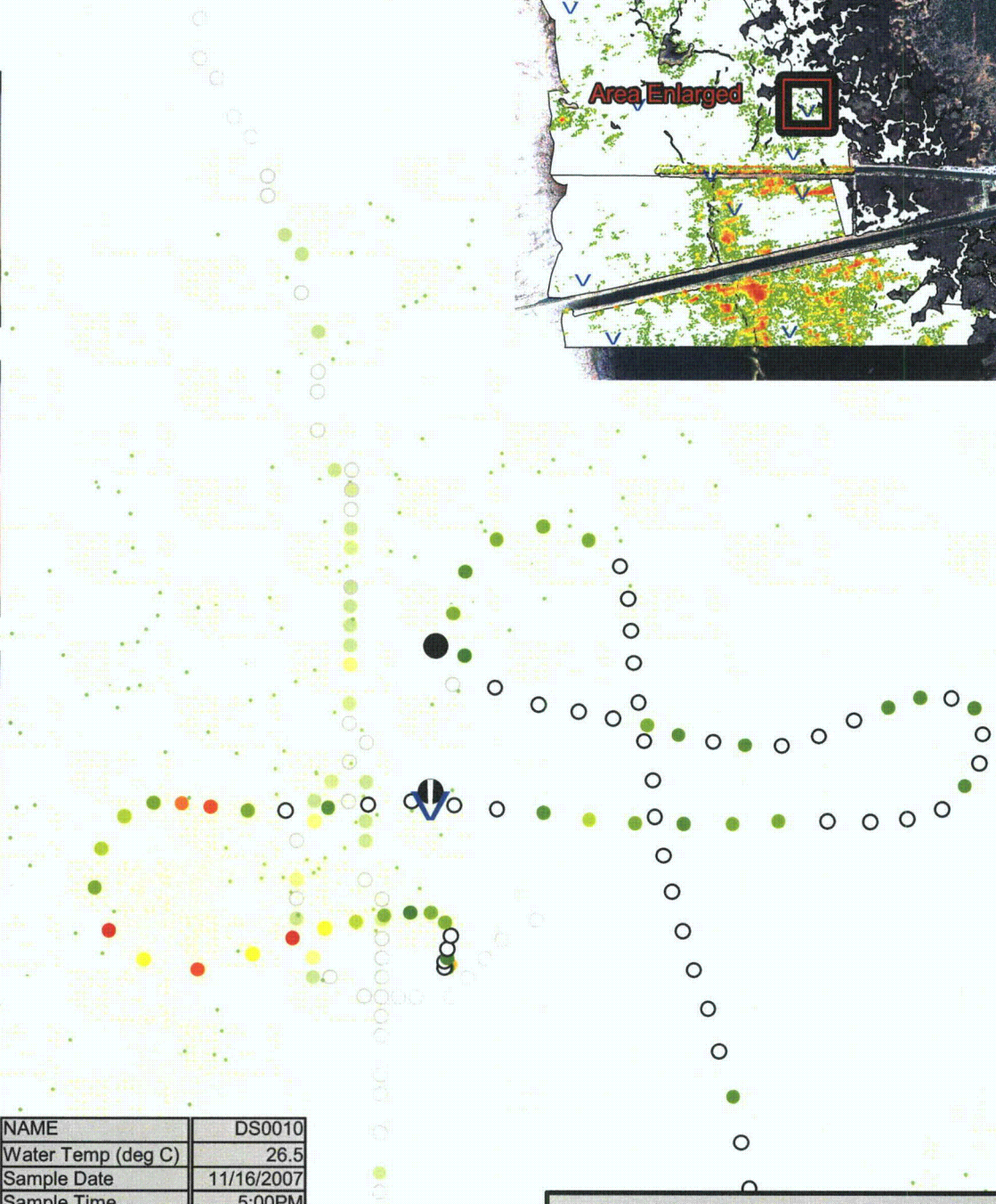
Sample Method Comparison
Diver Site X / Rake Toss #133





NAME	DS0010
Water Temp (deg C)	26.5
Sample Date	11/16/2007
Sample Time	5:00PM
Turbidity (ntu)	13.6
Salinity (ppt)	31.9
Secchi Depth (ft)	1.7
Physical Depth (ft)	1.7
Tide Level	L3:20PM
Water Depth (m)	0.5-1m

Bed Characteristics	
Size	Large
Plant Height	1 foot
Bottom Coverage	100%
Bed Density	Dense

Species Chart

Sample Method	Cover	Species Present
Diver Sample	98 cells	*Halodule wrightii*
Diver Sample	2 cells	*Sargassum fluitans*
Rake Toss	5 stems - 20%	Halodule wrightii
Rake Toss	5 stems - 20%	Sargassum natans
Hydroacoustic Model	7%	

Legend

Diver Site Location

Rake Toss

0% - 100% Cover

Hydroacousitc Points

Projection: State Plane Florida West
Datum: NAD 83
Units: Feet

1 inch equals 32 feet

0 16 32 64 Feet

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APPENDIX – Calculations of Biocover Model Accuracy

BioCover model error estimates for combined physical sampling points and comparisons of the three different physical sampling methods individually. The total physical sample point count does not match the sum of the individual sampling methods points since there were a number of cases where two or more methods were used for sampling a single location and the results did not match, (one indicated 'plant' the other indicated 'no plant'). In these instances only the sample where 'plant' was found was used in the 'all' analysis since 'plant' was indeed found at the location. *See Section H of the report for a discussion of interpreting these tables.*

All types without 38 foot margin of error			Raster	
		omission error ↓	plant	no plant
all	plant	17.3%	62	13
	no plant	62.1%	36	22
		commission error →	36.7%	37.1%

Rake only without 38 foot margin of error			Raster	
		omission error ↓	plant	no plant
Rake	plant	14.8%	46	8
	no plant	61.0%	36	23
		commission error →	43.9%	25.8%

All types with 38 foot margin of error			Raster	
		omission error ↓	plant	no plant
all	plant	0.0%	75	0
	no plant	62.1%	36	22
		commission error →	32.4%	0.0%

Rake only with 38 foot margin of error			Raster	
		omission error ↓	plant	no plant
Rake	plant	0.0%	54	0
	no plant	61.0%	36	23
		commission error →	40.0%	0.0%

APPENDIX – Calculations of Biocover Model Accuracy (continued)

Diver only
without 38 foot
margin of error

			Raster	
		omission error ↓	plant	no plant
Diver	plant	0.0%	9	0
	no plant		0	0
		commission error →	0.0%	

Video only
without 38 foot
margin of error

			Raster	
		omission error ↓	plant	no plant
Video	plant	41.7%	7	5
	no plant	80.0%	4	1
		commission error →	36.4%	83.3%

Diver only
with 38 foot
margin of error

			Raster	
		omission error ↓	plant	no plant
Diver	plant	0.0%	9	0
	no plant		0	0
		commission error →	0.0%	

Video only
with 38 foot
margin of error

			Raster	
		omission error ↓	plant	no plant
Video	plant	0.0%	12	0
	no plant	80.0%	4	1
		commission error →	25.0%	0.0%

APPENDIX – Calculations of Biocover Model Accuracy (continued)

off-transect only without 38 foot margin of error			Raster	
		omission error ↓	plant	no plant
off-transect only	plant	16.7%	10	2
	no plant	60.0%	6	4
		commission error →	37.5%	33.3%

off-transect only with 38 foot margin of error			Raster	
		omission error ↓	plant	no plant
off-transect only	plant	0.0%	12	0
	no plant	60.0%	6	4
		commission error →	33.3%	0.0%

Site Name	LAT	LON	WaterTemp (C)	Sample Date	Sample Time	Turbidity (ntu)	Salinity ppm	Secchi Depth (ft)	Physical Depth (ft)	Tide Level	Water Depth
DS0001	+28.9754524	-82.7532661	22.9	11152007	12:25PM	5.09	25.9	5	5	L2:25PM	1.5-2m
DS0002	+28.9661273	-82.7455230	22.9	11152007	1:40PM	3.94	29.1	3.6	3.9	L2:25PM	1-1.5m
DS0003	+28.9569691	-82.7355315	22.4	11152007	3:43PM	9.44	29.9	2.7	3.8	L2:25PM	1-1.5m
DS0004	+28.9584628	-82.7283993	23.2	11152007	4:38PM	9.37	29.9	1.5	1.8	L2:25PM	0.5-1m
DS0005	+28.9453151	-82.7293885	16.2	11162007	12:05PM	3.62	27.6	0.9	0.9	L3:20PM	0.5-1m
DS0006	+28.9445241	-82.7487268	16.9	11162007	1:22PM	2.55	30.9	3.6	3.6	L3:20PM	1-1.5m
DS0007	+28.9500012	-82.7514686	19.3	11162007	2:55PM	4.09	29.8	3.9	5.5	L3:20PM	1.5-2m
DS0008	+28.9597790	-82.7380978	18.3	11162007	3:38PM	5.42	27.6	3.9	11.7	L3:20PM	3-4m
DS0009	+28.9619191	-82.7292325	26.9	11162007	4:19PM	7.62	31.8	1.8	2	L3:20PM	0.5-1m
DS0010	+28.9658914	-82.7278804	26.5	11162007	5:00PM	13.6	31.9	1.7	1.7	L3:20PM	0.5-1m
DS0002	+28.9661273	-82.7455230	22.1	11282007	3:47PM	2.40	31.6	3.2	4.9	L1:46PM	1-1.5m
DS0008	+28.9597790	-82.7380978	23.9	11282007	4:55PM	3.11	33.8	4.1	10.4	L1:46PM	3-4m
DS0002	+28.9661273	-82.7455230	23.8	11302007	5:18PM	3.03	31.4	3.2	5	L3:27PM	1-1.5m
DS0008	+28.9597790	-82.7380978	25.3	11302007	5:11PM	2.34	31.4	3.6	5.5	L3:27PM	3-4m
DS0002	+28.9661273	-82.7455230	23.8	12022007	4:48PM	2.65	32.4	3.8	4.5	L5:12PM	1-1.5m
DS0008	+28.9597790	-82.7380978	25.7	12022007	4:40PM	2.22	32.4	3.5	6.5	L5:12PM	3-4m
DS0002	+28.9661273	-82.7455230	19.0	12042007	4:38PM	2.10	27.9	3.4	4.1	L6:53PM	1-1.5m
DS0008	+28.9597790	-82.7380978	21.7	12042007	5:03PM	2.89	34.1	3.2	3.6	L6:53PM	3-4m
DS0002	+28.9661273	-82.7455230	21.9	12062007	4:53PM	2.22	33.8	4.0	4.2	L8:04PM	1-1.5m
DS0008	+28.9597790	-82.7380978	23.2	12062007	3:14pm	3.58	33.9	3.2	5.1	L8:04PM	3-4m

Site	Scientific Name	Common Name	Date	Abundance	Injury	Density	Notes	Latitude	Longitude
2	*no plant*	no plant	12/4/2007	.	.	.		28.975850	-82.738910
12	*no plant*	no plant	12/5/2007	.	.	.	na	28.944482	-82.724638
13	*no plant*	no plant	12/6/2007	.	.	.	na	28.944981	-82.722238
14	*Gracilaria tikvahiae*	edible drift alga	12/5/2007	2	1	2	na	28.945496	-82.719842
14	*Sargassum natans*	gulfweed drift alga	12/5/2007	2	1	2	na	28.945496	-82.719842
14	*Halophila engelmannii*	stargrass	12/5/2007	5	1	3	na	28.945496	-82.719842
15	*Gracilaria tikvahiae*	edible drift alga	12/5/2007	1	1	4	na	28.945980	-82.717438
16	*no plant*	no plant	12/5/2007	.	.	.	na	28.946479	-82.715038
17	*Gracilaria tikvahiae*	edible drift alga	12/5/2007	5	1	1	na	28.946978	-82.712638
25	*no plant*	no plant	11/29/2007	.	.	.		28.944540	-82.742460
26	*no plant*	no plant	11/29/2007	.	.	.		28.945060	-82.740040
27	*Caulerpa sertularoides*	feather caulerpa	12/2/2007	3	.	2		28.945530	-82.737650
27	*Sargassum natans*	gulfweed drift alga	12/2/2007	2	.	2		28.945530	-82.737650
27	*Sargassum fluitans*	gulfweed drift alga	12/2/2007	4	.	2		28.945530	-82.737650
27	*Caulerpa prolifera*	grass caulerpa	12/2/2007	5	.	0		28.945530	-82.737650
27	*Syringodium filiforme*	manatee grass	12/2/2007	1	.	4		28.945530	-82.737650
28	*Gracilaria tikvahiae*	edible drift alga	12/2/2007	4	.	1		28.945910	-82.735130
28	*Syringodium filiforme*	manatee grass	12/2/2007	1	.	1		28.945910	-82.735130
28	*Syringodium filiforme*	manatee grass	12/2/2007	3	.	0		28.945910	-82.735130
28	*Sargassum fluitans*	gulfweed drift alga	12/2/2007	5	.	1		28.945910	-82.735130
29	*Gracilaria tikvahiae*	edible drift alga	12/2/2007	2	.	2		28.946510	-82.732750
29	*Syringodium filiforme*	manatee grass	12/2/2007	3	.	3		28.946510	-82.732750
30	*Caulerpa mexicana*	feather calulerpa	12/2/2007	1	.	2		28.946970	-82.730450
31	*Syringodium filiforme*	manatee grass	12/2/2007	1	1	3		28.947490	-82.727970
32	*Gracilaria tikvahiae*	edible drift alga	12/5/2007	1	1	1	na	28.947986	-82.725588
32	*Thalassia testudinum*	turtle grass	12/5/2007	4	1	5	na	28.947986	-82.725588
33	*Sargassum natans*	gulfweed drift alga	12/5/2007	2	1	2	na	28.948486	-82.723188
33	*Gracilaria tikvahiae*	edible drift alga	12/5/2007	2	1	2	na	28.948486	-82.723188
33	*Sargassum fluitans*	gulfweed drift alga	12/5/2007	2	1	2	na	28.948486	-82.723188
34	*Gracilaria tikvahiae*	edible drift alga	12/5/2007	1	1	4	na	28.948985	-82.720788
35	*Syringodium filiforme*	manatee grass	12/5/2007	2	1	4	na	28.949484	-82.718388
35	*Thalassia testudinum*	turtle grass	12/5/2007	2	1	4	na	28.949484	-82.718388
36	*Caulerpa prolifera*	grass caulerpa	12/5/2007	.	.	.	na	28.949984	-82.715988
36	*Gracilaria tikvahiae*	edible drift alga	12/5/2007	.	.	.	na	28.949984	-82.715988
62	*no plant*	no plant	11/28/2007	.	.	.		28.950140	-82.751500
63	*no plant*	no plant	11/28/2007	.	.	.		28.950530	-82.749110
64	*Caulerpa sertularoides*	feather caulerpa	11/28/2007	3	.	2		28.951030	-82.746770
64	*Sargassum natans*	gulfweed drift alga	11/28/2007	3	.	2		28.951030	-82.746770
64	*Sargassum fluitans*	gulfweed drift alga	11/28/2007	3	.	0		28.951030	-82.746770
65	*Sargassum fluitans*	gulfweed drift alga	11/28/2007	2	.	2		28.951540	-82.744190
66	*Caulerpa sertularoides*	feather caulerpa	11/28/2007	3	.	2		28.952040	-82.741770
66	*Penicillus sp. fragments*	shaving brush plant	11/28/2007	3	.	4		28.952040	-82.741770
67	*Sargassum natans*	gulfweed drift alga	11/28/2007	3	.	2		28.952530	-82.739410
67	*Sargassum fluitans*	gulfweed drift alga	11/28/2007	2	.	1		28.952530	-82.739410
67	*Gracilaria tikvahiae*	edible drift alga	11/28/2007	4	.	1		28.952530	-82.739410
67	*Caulerpa mexicana*	feather calulerpa	11/28/2007	.	.	.		28.952530	-82.739410
69	*Penicillus sp. fragments*	shaving brush plant	12/4/2007	1	.	2		28.953540	-82.734740
70	*Caulerpa sertularoides*	feather caulerpa	12/4/2007	3	.	1		28.953930	-82.732290
70	*Penicillus sp. fragments*	shaving brush plant	12/4/2007	2	.	2		28.953930	-82.732290
71	*no plant*	no plant	12/4/2007	.	.	.		28.954500	-82.729920
72	*no plant*	no plant	12/4/2007	.	.	.		28.954960	-82.727570

Site	Scientific Name	Common Name	Date	Abundance	Injury	Density	Notes	Latitude	Longitude
72	*Caulerpa sertularoides*	feather caulerpa	12/4/2007	3	.	2		28.954960	-82.727570
73	*Gracilaria tikvahiae*	edible drift alga	12/4/2007	4	.	1		28.955580	-82.725150
73	*Syringodium filiforme*	manatee grass	12/4/2007	5	.	1		28.955580	-82.725150
73	*Sargassum natans*	gulfweed drift alga	12/4/2007	2	.	1		28.955580	-82.725150
73	*Gracilaria tikvahiae*	edible drift alga	12/4/2007	4	.	1		28.955580	-82.725150
82	*no plant*	no plant	11/28/2007	.	.	.		28.953610	-82.752540
83	*no plant*	no plant	11/29/2007	.	.	.		28.953950	-82.749940
84	*no plant*	no plant	11/29/2007	.	.	.		28.954440	-82.747680
85	*no plant*	no plant	11/29/2007	.	.	.		28.954940	-82.745200
86	*no plant*	no plant	11/28/2007	.	.	.		28.955560	-82.742890
87	*Caulerpa sertularoides*	feather caulerpa	11/29/2007	2	.	2		28.955990	-82.740440
87	*Sargassum natans*	gulfweed drift alga	11/29/2007	5	.	2		28.955990	-82.740440
87	*Caulerpa mexicana*	feather calulerpa	11/29/2007	4	.	2		28.955990	-82.740440
89	*Gracilaria tikvahiae*	edible drift alga	12/4/2007	2	.	1		28.956960	-82.735630
89	*Caulerpa sertularoides*	feather caulerpa	12/4/2007	2	.	1		28.956960	-82.735630
89	*Udotea conglutinata*	Udotea spp	12/4/2007	5	.	1		28.956960	-82.735630
89	*Syringodium filiforme*	manatee grass	12/4/2007	5	.	2		28.956960	-82.735630
89	*Caulerpa sertularoides*	feather caulerpa	12/4/2007	5	.	1		28.956960	-82.735630
89	*Sargassum natans*	gulfweed drift alga	12/4/2007	5	.	1		28.956960	-82.735630
90	*Syringodium filiforme*	manatee grass	12/4/2007	3	.	2		28.957460	-82.733210
90	*Caulerpa sertularoides*	feather caulerpa	12/4/2007	3	.	3		28.957460	-82.733210
91	*Syringodium filiforme*	manatee grass	12/4/2007	5	.	1		28.957920	-82.730880
91	*Gracilaria tikvahiae*	edible drift alga	12/4/2007	3	.	2		28.957920	-82.730880
91	*Caulerpa mexicana*	feather calulerpa	12/4/2007	3	.	2		28.957920	-82.730880
93	*no plant*	no plant	12/4/2007	.	.	.		28.958770	-82.726200
103	*no plant*	no plant	11/29/2007	.	.	.		28.957480	-82.750690
103	*no plant*	no plant	12/4/2007	.	.	.		28.957430	-82.750990
104	*no plant*	no plant	11/29/2007	.	.	.		28.957950	-82.748600
105	*no plant*	no plant	11/29/2007	.	.	.		28.958460	-82.746260
106	*Sargassum natans*	gulfweed drift alga	11/29/2007	.	.	4		28.959010	-82.743640
107	*Sargassum natans*	gulfweed drift alga	11/29/2007	1	.	4		28.958970	-82.741270
108	*no plant*	no plant	11/29/2007	.	.	.		28.960000	-82.738950
108	*no plant*	no plant	12/6/2007	.	.	.	too deep, but I couldn't really see bottom to verify	28.960083	-82.739000
109	*no plant*	no plant	11/29/2007	.	.	.		28.960600	-82.736490
109	*Caulerpa prolifera*	grass caulerpa	12/6/2007	1	1	4	not a whole lot here, but enough to see on video	28.960583	-82.736583
110	*Halodule wrightii*	shoal grass	11/29/2007	1	.	3		28.960990	-82.734290
110	*Sargassum natans*	gulfweed drift alga	11/29/2007	4	.	4		28.960990	-82.734290
110	*Halodule wrightii*	shoal grass	11/29/2007	1	1	1		28.961000	-82.734400
111	*Halodule wrightii*	shoal grass	11/29/2007	1	.	4		28.961460	-82.731800
111	*Halodule wrightii*	shoal grass	12/6/2007	2	.	3		28.961478	-82.731900
111	*Sargassum natans*	gulfweed drift alga	12/6/2007	4	8	3		28.961478	-82.731900
111	*Gracilaria tikvahiae*	edible drift alga	12/6/2007	4	.	4		28.961478	-82.731900
112	*Syringodium filiforme*	manatee grass	11/29/2007	1	.	3		28.962060	-82.729410

Site	Scientific Name	Common Name	Date	Abundance	Injury	Density	Notes	Latitude	Longitude
112	*Syringodium filiforme*	manatee grass	12/6/2007	2	.	2	mostly manatee or shoal grass	28.962000	-82.729483
112	*Caulerpa sertularoides*	feather caulerpa	12/6/2007	5	.	4		28.962000	-82.729483
113	*Syringodium filiforme*	manatee grass	12/2/2007	1	.	4		28.962520	-82.727030
114	*Syringodium filiforme*	manatee grass	12/3/2007	1	.	4		28.962980	-82.724600
123	*no plant*	no plant	11/29/2007	.	.	.		28.960860	-82.751770
123	*Caulerpa sertularoides*	feather caulerpa	12/4/2007	2	.	2		28.961010	-82.751990
123	*Sargassum natans*	gulfweed drift alga	12/4/2007	5	.	2		28.961010	-82.751990
124	*Sargassum natans*	gulfweed drift alga	11/29/2007	2	.	2		28.961512	-82.749540
124	*Cladophora spp*	filamentous algae	11/29/2007	4	.	1		28.961512	-82.749540
124	*Caulerpa prolifera*	grass caulerpa	11/29/2007	4	.	1		28.961512	-82.749540
125	*no plant*	no plant	11/29/2007	.	.	.		28.961950	-82.747110
126	*no plant*	no plant	11/28/2007	.	.	.		28.962490	-82.744790
127	*no plant*	no plant	11/30/2007	.	.	.		28.963030	-82.742460
128	*no plant*	no plant	11/29/2007	.	.	.		28.963560	-82.739900
128	*no plant*	no plant	12/6/2007	.	.	.		28.963550	-82.739967
129	*Udotea conglutinata*	Udotea spp	11/29/2007	2	.	1		28.964040	-82.737530
129	*Udotea conglutinata*	Udotea spp	12/6/2007	2	0	0		28.963950	-82.737500
129	*Halodule wrightii*	shoal grass	12/6/2007	2	0	0		28.963950	-82.737500
129	*Sargassum fluitans*	gulfweed drift alga	12/6/2007	2	0	0		28.963950	-82.737500
131	*Halodule wrightii*	shoal grass	11/29/2007	2	.	1		28.965040	-82.732800
131	*Sargassum fluitans*	gulfweed drift alga	11/29/2007	2	.	4		28.965040	-82.732800
131	*Halodule wrightii*	shoal grass	12/6/2007	1	1	1	site looked to be mostly dominated by shoal grass on video	28.965100	-82.732817
131	*Thalassia testudinum*	turtle grass	12/6/2007	4	1	3	saw a few blades of what looked like turtle grass on video	28.965100	-82.732817
132	*Syringodium filiforme*	manatee grass	11/29/2007	1	.	3		28.965330	-82.730380
133	*Halodule wrightii*	shoal grass	12/2/2007	3	.	3		28.966040	-82.727930
133	*Sargassum natans*	gulfweed drift alga	12/2/2007	3	.	4		28.966040	-82.727930
143	*Caulerpa sertularoides*	feather caulerpa	11/29/2007	4	.	1		28.964550	-82.752890
143	*Udotea conglutinata*	Udotea spp	11/29/2007	4	.	1		28.964550	-82.752890
143	*Caulerpa prolifera*	grass caulerpa	11/29/2007	4	.	0		28.964550	-82.752890
143	*Sargassum natans*	gulfweed drift alga	11/29/2007	3	.	1		28.964550	-82.752890
143	*Gracilaria tikvahiae*	edible drift alga	11/29/2007	3	.	1		28.964550	-82.752890
143	*Caulerpa mexicana*	feather calulerpa	11/29/2007	3	.	1		28.964550	-82.752890
143	*Caulerpa prolifera*	grass caulerpa	11/29/2007	4	.	1		28.964550	-82.752890
144	*no plant*	no plant	11/29/2007	.	.	.		28.964960	-82.750460
145	*Sargassum natans*	gulfweed drift alga	11/29/2007	1	.	0		28.965050	-82.747990
146	*no plant*	no plant	11/28/2007	.	.	.		28.966180	-82.745590
147	*no plant*	no plant	11/29/2007	.	.	.		28.966410	-82.743210
148	*no plant*	no plant	11/29/2007	.	.	.		28.967030	-82.740820
149	*no plant*	no plant	11/29/2007	.	.	.		28.967490	-82.738530
150	*Syringodium filiforme*	manatee grass	12/2/2007	1	.	3		28.968020	-82.736100

Site	Scientific Name	Common Name	Date	Abundance	Injury	Density	Notes	Latitude	Longitude
152	*Caulerpa spp*	caulerpa	12/6/2007	1	.	4	hardly any plant only one small sprig. Video point	28.969000	-82.731367
152	*no plant*	no plant	12/6/2007	.	.	.		28.969000	-82.731367
164	*Caulerpa sertularoides*	feather caulerpa	11/29/2007	2	.	1		28.968560	-82.751350
164	*Sargassum natans*	gulfweed drift alga	11/29/2007	3	.	1		28.968560	-82.751350
164	*Gracilaria tikvahiae*	edible drift alga	11/29/2007	3	.	1		28.968560	-82.751350
164	*Gracilaria tikvahiae*	edible drift alga	11/29/2007	4	.	1		28.968560	-82.751350
165	*no plant*	no plant	11/29/2007	.	.	.		28.968880	-82.749020
166	*no plant*	no plant	11/28/2007	.	.	.		28.969780	-82.746740
166	*no plant*	no plant	11/29/2007	.	.	.		28.969570	-82.746370
167	*no plant*	no plant	11/29/2007	.	.	.		28.970010	-82.744210
170	*no plant*	no plant	12/2/2007	.	.	.		28.971320	-82.736980
172	*no plant*	no plant	12/6/2007	.	.	.	no plant rake toss	28.972518	-82.732240
172	*no plant*	no plant	12/6/2007	.	.	.	no plant video sample point	28.972483	-82.732200
184	*Halophila engelmannii*	stargrass	11/30/2007	2	.	3		28.972010	-82.752440
184	*Caulerpa prolifera*	grass caulerpa	11/30/2007	1	.	3		28.972010	-82.752440
184	*Halophila engelmannii*	stargrass	11/20/2007	4	.	4	stargrass maybe from video	28.971950	-82.752483
184	*Cladophora spp*	filamentous algae	11/20/2007	4	.	4	hairy plant	28.971950	-82.752483
184	*Sargassum fluitans*	gulfweed drift alga	11/20/2007	4	.	4		28.971950	-82.752483
184	*Caulerpa prolifera*	grass caulerpa	11/20/2007	4	.	4		28.971950	-82.752483
185	*no plant*	no plant	11/29/2007	.	.	.		28.972280	-82.749930
185	*Udotea conglutinata*	Udotea spp	12/6/2007	1	1	4	video Sample Point 185 Hardly any veg at all	28.972250	-82.749967
186	*Penicillus sp. fragments*	shaving brush plant	11/28/2007	1	.	4		28.973050	-82.747590
189	*no plant*	no plant	12/2/2007	.	.	.		28.974560	-82.740450
191	*no plant*	no plant	12/2/2007	.	.	.		28.975510	-82.735520
204	*Caulerpa prolifera*	grass caulerpa	11/30/2007	1	.	1		28.975420	-82.753330
205	*no plant*	no plant	11/29/2007	.	.	.		28.975820	-82.750970
207	*no plant*	no plant	12/4/2007	.	.	.		28.977040	-82.746160
210	*Cladophora spp*	filamentous algae	12/2/2007	.	.	0		28.978460	-82.738910
211	*Cladophora spp*	filamentous algae	12/2/2007	.	.	.		28.979040	-82.736500
212	*no plant*	no plant	12/2/2007	.	.	.		28.979530	-82.734150
225	*no plant*	no plant	11/29/2007	.	.	.		28.979400	-82.751850
226	*no plant*	no plant	11/28/2007	.	.	.		28.979930	-82.749520
227	*no plant*	no plant	11/29/2007	.	.	.		28.980510	-82.747100
228	*no plant*	no plant	11/29/2007	.	.	.		28.981030	-82.744730
229	*no plant*	no plant	11/29/2007	.	.	.		28.981480	-82.742320
9910	*no plant*	no plant	12/6/2007	.	.	.	na	28.951983	-82.749051
9911	*Sargassum fluitans*	gulfweed drift alga	12/6/2007	.	.	.	na	28.966620	-82.734857
9912	*Halodule wrightii*	shoal grass	12/6/2007	.	.	.	na	28.966114	-82.731204
9912	*Halodule wrightii*	shoal grass	12/6/2007	1	1	3	very sparse vegetation	28.966133	-82.731217
9913	*no plant*	no plant	12/6/2007	.	.	.	na	28.961489	-82.729168

Site	Scientific Name	Common Name	Date	Abundance	Injury	Density	Notes	Latitude	Longitude
9914	*Sargassum fluitans*	gulfweed drift alga	12/6/2007	.	.	.	na	28.961709	-82.732746
9915	*Penicillus sp. fragments*	shaving brush plant	12/6/2007	.	.	.	na	28.961050	-82.740933
9915	*no plant*	no plant	12/6/2007	.	.	.		28.961050	-82.740933
9916	*Cladophora spp*	filamentous algae	12/6/2007	.	.	.	na	28.971991	-82.747158
9917	*no plant*	no plant	12/6/2007	.	.	.	na	28.976953	-82.751248
9918	*no plant*	no plant	12/6/2007	.	.	.	na	28.979026	-82.750109
9919	*no plant*	no plant	12/6/2007	.	.	.	na	28.981367	-82.749518
9992	*no plant*	no plant	12/6/2007	.	.	.	no plant video site	28.972970	-82.738483
9992	*no plant*	no plant	12/6/2007	.	.	0	plant toss no plant	28.972970	-82.738483
9993	*Caulerpa prolifera*	grass caulerpa	12/6/2007	.	.	.		28.975756	-82.742440
9993	*Caulerpa prolifera*	grass caulerpa	12/6/2007	.	.	.	video sample no plant on rake	28.956170	-82.742717
9994	*Penicillus sp. fragments*	shaving brush plant	12/6/2007	.	.	.	na	28.966532	-82.749896
9994	*Penicillus sp. fragments*	shaving brush plant	12/6/2007	1	.	44		28.966567	-82.749850
9995	*no plant*	no plant	12/6/2007	.	.	.	noplant	28.961437	-82.745408
9996	*no plant*	no plant	12/6/2007	.	.	.	na	28.959769	-82.738068
9997	*Sargassum natans*	gulfweed drift alga	12/6/2007	.	.	.	na	28.957730	-82.739777
9997	*Udotea conglutinata*	Udotea spp	12/6/2007	.	.	.	na	28.957730	-82.739777
9997	*Caulerpa prolifera*	grass caulerpa	12/6/2007	.	.	.	na	28.957730	-82.739777
9998	*no plant*	no plant	12/6/2007	.	.	.	na	28.951697	-82.738041
9999	*Caulerpa prolifera*	grass caulerpa	12/6/2007	.	.	.	na	28.951717	-82.740340
ds0001	*Caulerpa prolifera*	grass caulerpa	11/15/2007	.	.	.	20%	28.975452	-82.753266
ds0001	*Gracilaria tikvahiae*	edible drift alga	11/15/2007	.	.	.	3%	28.975452	-82.753266
ds0002	*Caulerpa sertularoides*	feather caulerpa	11/15/2007	.	.	.	22%	0.000000	0.000000
ds0003	*Syringodium fiiliforme*	manatee grass	11/15/2007	.	.	.	68%	28.956969	-82.735532
ds0003	*Gracilaria tikvahiae*	edible drift alga	11/15/2007	.	.	.	51%	28.956969	-82.735532
ds0004	*Syringodium fiiliforme*	manatee grass	11/15/2007	.	.	.	86%	28.958463	-82.728399
ds0004	*Caulerpa mexicana*	feather caulerpa	11/15/2007	.	.	.	24%	28.958463	-82.728399
ds0004	*Gracilaria tikvahiae*	edible drift alga	11/15/2007	.	.	.	10%	28.958463	-82.728399
ds0004	*Halimeda incrassata*	Halimeda spp	11/15/2007	.	.	.	7%	28.958463	-82.728399
ds0004	*Sargassum fluitans*	gulfweed drift alga	11/15/2007	.	.	.	4%	28.958463	-82.728399
ds0005	*Syringodium fiiliforme*	manatee grass	11/16/2007	.	.	.	34%	28.945315	-82.729389
ds0007	*Caulerpa mexicana*	feather calulerpa	11/16/2007	.	.	.	65%	28.950001	-82.751469
ds0007	*Leptogorgia virgulata*	sea whip	11/16/2007	.	.	.	2	28.950001	-82.751469
ds0007	*Sargassum natans*	gulfweed drift alga	11/16/2007	.	.	.	2	28.950001	-82.751469
ds0008	*Halodule wrightii*	shoal grass	11/16/2007	.	.	.	42%	28.959779	-82.738098
ds0009	*Halodule wrightii*	shoal grass	11/16/2007	.	.	.	100%	28.961919	-82.729233
ds0010	*Halodule wrightii*	shoal grass	11/16/2007	.	.	.	100%	28.965891	-82.727880
ds0010	*Sargassum fluitans*	gulfweed drift alga	11/16/2007	.	.	.	2%	28.965891	-82.727880
ds0005	*Gracilaria tikvahiae*	edible drift alga	11/16/2007	.	.	.	61%	28.945315	-82.729389
ds0006	*Dictyota sp.*		11/16/2007	.	.	.	2cells	0.000000	0.000000
ds0006	*Halimeda incrassata*	Halimeda spp	11/16/2007	.	.	.	7 cells	0.000000	0.000000
ds0006	*Udotea conglutinata*	Udotea spp	11/16/2007	.	.	.	6 cells	0.000000	0.000000
ds0006	*Sargassum natans*	gulfweed drift alga	11/16/2007	.	.	.	45 cells	0.000000	0.000000
ds0006	*Caulerpa mexicana*	feather caulerpa	11/16/2007	.	.	.	47 cells	0.000000	0.000000
ds0006	*Caulerpa sertularoides*	feather caulerpa	11/16/2007	.	.	.	7 cells	0.000000	0.000000
ds0006	*Leptogorgia virgulata*	sea whip	11/16/2007	.	.	.	8 cells	0.000000	0.000000