The
Midnight Pass
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POST OFFICE BOX 38865
SARASOTA, FLORIDA 34231

ROBERT D. MEADOR, PRESIDENT (813) 349-1825
JAMES P. HERBERT, EXECUTIVE DIRECTOR (813) 923-3817

MIDNIGHT PASS POSITION PAPER

RESEARCH COMMITTEE
Dr. John B. Morrill
James P. Herbert

February 19, 1990

THE SEAGRASSES OF LITTLE SARASOTA BAY

SYNOPSIS

Seagrasses are the framework, the foundation upon which the very life of a bay is built. A thriving seagrass community supports an abundance and diversity of marine life. As a habitat, a food source, a refuge from predators... seagrass meadows are an integral, essential element of every bay's ecosystem. In fact the vast majority of marine animals count on seagrasses for their very survival during at least a part of their life cycle. As a local fishing guide so succinctly put it... "If you've got grass, you get fish; no grass, no fish!"

Historically, Little Sarasota Bay was blessed with an abundance of seagrasses. Our other local bays were, too. However, while all of these waters were being assaulted by the pressures of population growth, this embayment, Little Sarasota Bay, was quite unique in that its seagrass acreage may actually have INCREASED!

Then, in 1983, Midnight Pass was artificially closed. The delicate environmental balance was upset. Even with lower-than-average rainfall the past six years, salinity regimes have been depressed... at times substantially so. Dissolved oxygen levels have periodically plummeted. Turbidity has increased. Nutrients trapped in the null zone of the Bay enrich the waters and promote the growth of macroalgae, epiphytic microalgae and phytoplankton blooms. Every year the Bay gets a little bit worse.

The environmental changes associated with the closure of Midnight Pass have killed much of the Bay's seagrass community. The Turtle grass is gone. The Manatee grass is gone. Cuban Shoal weed's been substantially reduced as to both coverage and density. What remains is quite stressed. While some marine animals are absent because the doorway to the Gulf is gone, most are no longer here because the seagrass is no longer here.

The ambient environmental conditions of Little Sarasota Bay were changed by the closing of Midnight Pass. A once living, vibrant inter-related community of marine plants and animals has been turned into a vegetative desert with a paucity of marine life... compared to what once was. The ecological well-being of Little Sarasota Bay depends upon thriving, viable meadows of seagrass. The seagrasses can only be restored by restoring Midnight Pass. It really is that simple.

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THE SEAGRASSES OF LITTLE SARASOTA BAY

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INTRODUCTION

Seagrasses are just like land-based plants except they grow underwater. They have roots and stems; they flower and produce oxygen. Like land plants, they need light to survive; thus, water clarity limits the depths at which they can grow. Seagrass beds are widely recognized as among the richest and most efficient of ecosystems. A viable, functioning seagrass community is the very framework upon which the life of a bay is built.

Seagrass beds contribute in many ways to the ecosystem of an embayment:

* As a habitat. The complex physical structure provides excellent shelter from predators for small crabs, shrimp, fish and their fry. Seagrass beds play a critical role as a nursery area for the juveniles of a wide range of finfish and shellfish that are commercially and recreationally significant.
* As a substratum. An entire community of marine organisms attach themselves to the blades of grass. This epiphytic population includes microalgae, tiny invertebrates, protozoa and diatoms.
* As a food source. Herbivores who graze directly on the grass blades include fishes, Manatees, Sea Turtles and Sea Urchins. Other marine animals make the epiphytic growth upon the grass blades their primary diet... crabs, shrimp and snails for example. Dead leaves and epiphytic growth falling to the bay bottom make up the majority of the material in the detrital food web. See Exhibit #1 for a representative food web.
* As a sediment trap. The seagrass leaves slow the water current and promote the deposition of organic and inorganic particles in the water column. Their presence also inhibits the resuspension of sediments. The roots, runners and rhizomes form an interlocking grid which tends to lock in the accumulated sediments and retard erosion of the bay bottom.
* As an energy buffer. The physical energy of waves and currents tends to be dissipated by the presence of the seagrass leaves, helping to protect adjoining shorelines from erosion.
* As an oxygen producer. With their photosynthetic capability, seagrasses produce oxygen like land plants. Seagrasses are a major contributor of dissolved oxygen in the water column.
* As a nutrient consumer. Seagrasses play a most important part in the nutrient cycle. Through their leaves they utilize the dissolved nutrients in the water column; their roots take up and store nutrients from the bottom sediments. The removal of excess nutrients improves the water quality with respect to light penetration.

Seagrasses are unique in that they're the only organisms that can encourage, support and sustain the complex marine community that surrounds them. When they disappear, the community disappears. The mobile animals search for alternate habitat. The epiphytes are either carried away with the seagrass leaves or become part of the bottom litter and, ultimately, the bottom sediments. In the absence of

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seagrass roots, rhizomes and leaves, wave and current energies are unchecked. Bottom sediments become resuspended, creating turbid water conditions and increasing the release of nutrients (i.e., Ammonia, NO_3 and NO_2) into the water column. The bay bottom is subject to erosion. A vibrant, living seascape is reduced to a vegetative desert of unstable, shifting sand and sediment. This is the scenario when the foundation of the marine community in our bays is destroyed. The point isn't to alarm but to emphasize the point that seagrasses are the very basis of the marine ecosystem that we count on in so many ways.

NATURAL HISTORY

Little Sarasota Bay was favored with an abundance of seagrasses. Turtle grass and Cuban Shoal weed were the dominant seagrasses and Manatee grass, though less plentiful, was also commonly found. Turtle grass, the most common in Florida, has large, wide leaves and a relatively deep root structure. Cuban Shoal weed is considered a pioneer species for its opportunistic ability to colonize disturbed bay bottoms. Compared to Turtle grass, cuban Shoal weed is a smaller plant as to both size and blade width; its root surface is also nearer the surface. It does, however, develop far more leaves per square meter of grass bed. Manatee grass is typified by thin, spaghetti-like leaves of intermediate size. While the three grasses are often found to overlap within the same embayment, each has set tolerances to certain environmental conditions.

Spatial zonation. The different seagrasses tend to be found growing at different depths. Several factors come into play to cause this zonation but the most important limiting factor is the available light regime. The clearer the water, the deeper the grasses can grow. The ever-decreasing clarity of bay waters over the years has caused the seagrasses to be confined to ever-shallower depths in order to survive. While our waters tend to be clear during the winter and spring dry season, turbid water conditions are the norm during the rainy season, primarily due to runoff. Water clarity can easily differ by 50%... you might be able to see six feet to the bottom in December but only three feet down in July.

To determine the current local growing zones for the three seagrasses, the Midnight Pass Society sponsored a study of these spatial ranges. The field procedures employed are described in the Society's **SEAGRASS FIELD STUDY** paper. Following are the results:

Cuban Shoal weed... MLW to -18MLW. Then Turtle grass.
Turtle grass....... -12"MLW to -30"MLW (Cuban Shoal sparse @ -24").
Manatee grass...... -16"MLW first appearance. Extended as solid stand from -24" to -42"MLW.

While there is definite overlap as to growing area, Turtle and Manatee grasses are often intermixed, a specific zone is identifiable for each type. Confirming its opportunistic nature, Cuban Shoal weed grows in the shallowest waters and can even survive after exposure to the air for short periods of time.

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Temperature. Local seagrasses are far more likely to be stressed or killed by severe cold than severe heat. The temperature range for Turtle grass is 68° to 86°F (20° to 30°C), with the optimum temperature toward the top of the range. Manatee grass would appear to share this temperature range but is less tolerant of chilly conditions. Cuban Shoal weed also prefers the range of 68° to 86°F, but is more tolerant of temperature extremes and of variations within these parameters. This eurythermal capacity supports its predilection for shallower waters where thermal variations tend to be greatest.

Salinity. The degree of saltiness of bay waters is critical to seagrass survival. Salinities outside their tolerance ranges can destroy them. This is especially important in urbanized areas where excessive amounts of freshwater runoff are diverted to the bays temporarily reducing the salinity of the water. The salinity range for Turtle grass is between 20 and 35ppt, with an optimum level of 30ppt. Turtle grass will begin to lose its leaves when water salinity falls under 20ppt for even a short period of time. Manatee grass does best in waters with salinities of 20 to 25ppt; they were reported to disappear at salinities below 17ppt. Cuban Shoal weed grows over the widest salinity tolerance range, 20 to 60ppt, but tends to thrive at salinity levels around 30ppt.

While all three seagrasses can survive short salinity fluctuations, a low salinity regime that persists for, say, several tide cycles can kill them. Cuban Shoal weed is the most tolerant of adverse salinity conditions with Manatee grass the least tolerant and Turtle grass falls in between.

Sediments. The three local seagrasses are most often found in sandy or sand-mud bottoms. Turtle grass has the largest root system and often grows in coarse sand sediments. Cuban Shoal Weed, with its smaller root system does not do well in coarse sediment bottoms. In character with its pioneer reputation, Cuban Shoal weed tends to be first in colonizing disturbed bay bottoms. In our **SEAGRASS STUDY** we found examples of it doing fairly well in a bay bottom comprised of 12" of fine clay muck.

The character of the sediments surrounding seagrasses are also a function of their size and shape. The tall, broad leaves of Turtle grass will naturally tend to trap the larger, coarser sediment particles. The thinner blades of the other two will tend to trap finer particles of sediment.

Dissolved oxygen. Producers of oxygen during the day, seagrasses like other plants become consumers of oxygen at night... and during storm events when "the lights are out." Seagrasses can become net users of oxygen during prolonged storm events, further depleting the dissolved oxygen in the water column. Seagrasses then become competitors for rather than contributors of the supply of dissolved oxygen. If the oxygen depression degrades to the point of anoxia, the seagrasses will die.

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Current. The full effects of current velocity on seagrass meadows is not well understood. Clearly they can affect where a seagrass bed will be located. Strong currents that scour the bay bottom will make the area uninhabitable. But currents may well enhance the nutrient absorption ability of seagrass leaves. The plants may be made more productive, enhancing oxygen generation and removing additional dissolved nutrients from the water column. Conversely, the absence of current, or low velocities, may make seagrasses less productive. While the leaf surface remains the same, there's less water interacting with the surface. In addition, low or no current would permit excess epiphytic growth and would not remove settled sediments from the plant leaves. If this situation persisted, the photosynthetic ability of the seagrasses would most certainly be diminished.

Several factors influence how well seagrasses grow as well as where and when they will grow. Of the three local seagrasses, Cuban Shoal weed is clearly the most tolerant of adverse conditions... shallow waters, high temperatures, low salinities, high turbidity and soft, mucky sediments. It deserves its reputation as the pioneer species of seagrass; first to colonize an area. It is important to keep in mind, however, that the reverse is equally true: Cuban Shoal weed would be the last seagrass to survive an altered ecosystem where environmental conditions had become hostile to the survival of rooted plant life.

THE BAY THAT WAS

By all accounts, anecdotal and otherwise, Little Sarasota Bay was once blessed with abundant acreage of different seagrasses supporting a diverse community of marine life. The seagrasses grew in deeper water and the beds were lush and dense. An ideal habitat for all manner of aquatic life. The other bays in the area were equally rich in these marine assets.

A study done by Sarasota County's Environmental Services Dept. for the Mosquito Control division compared seagrass bed acreage in 1948 to what it was in 1974. As expected, the pressures of population growth had substantially diminished the seagrass beds in most areas. On average, the bays lost 25% of their seagrass coverage. Except for Little Sarasota Bay... the study reported a 9% INCREASE in seagrass acreage! Ironically, the Report suggested the increased seagrasses may have been due to improved conditions associated with the Intracoastal Waterway. The study did take heart from the positive statistic for Little Sarasota Bay in that it suggests that seagrass communities are capable of colonizing new areas "... if improvements in habitat quality occur."

A later comparison study of aerial bay photos for a 1948 to 1972 period reported that seagrass acreage had declined in Little Sarasota Bay during this time frame. The difficulty lies in attempting to interpret an aerial photo without the ability to go into the field to check the

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assumptions made... what is called groundtruthing. Without the ability to groundtruth, interpretations and assumptions can't be verified and errors corrected.

Whether the seagrass beds increased a bit in coverage or decreased, **both** studies agreed there had been considerable seagrasses in Little Sarasota Bay. Other dated studies of local waters reported an abundance of Turtle grass, Cuban Shoal weed and Manatee grass with the first two predominant. A year-long sampling effort in local waters during 1980 included a report on seagrass shoot density. Turtle grass beds averaged 500 to 900 blades per square meter. Cuban Shoal weed densities averaged 6,000 to 9,000 blades per meter^2... in one instance more than 13,000 blades/meter^2! The Society-developed density scale for Cuban Shoal weed (see **SEAGRASS FIELD STUDY**) typifies a dense bed as containing more than 5,000 blades/meter^2... a bit below the averages of ten years ago! See Exhibit #2.

All the preceding leads us to the clear conclusion that seagrass beds are critical to the efficient operation of the marine community... even essential. Little Sarasota Bay, like the other local bays, had abundant seagrass coverage... both diverse and lush. What caused these seagrasses to so markedly decline in acreage and density...and two of the three species to disappear?

CAUSES FOR THE DECLINE OF LITTLE SARASOTA BAY SEAGRASSES

Seawalls. Much shoreline of Little Sarasota Bay, especially the eastern shore, has been dredged & filled and/or seawalled. Some seagrass habitat was lost to filling activity. Far more was lost due to wave-generated turbulence off solid, vertical seawalls. The downward-directed wave energy tends to continually resuspend areal sediments harming seagrass communities in several ways, but especially by limiting light penetration through increased turbidity.

Navigation channels. Boat channels dredged from the ICW to docks and canals often lower the channel bottom below the light tolerance level for seagrasses. Spoil negligently dumped along channel margins can cover existing seagrasses and elevate the bay bottom **above** the tolerance level for seagrasses.

Channel marking is another problem. Many navigation channels are too casually marked, causing boaters to stray in error into the shallower seagrass beds. Except for the ICW, **most** channels in Little Sarasota Bay are poorly marked. Good examples of major unmarked channels are the north and south channels to Midnight Pass.

Power boats. Hull marks have little effect and blade cropping may even foster seagrass growth, but prop scars through a seagrass bed into the root system can take years to mend. While Cuban Shoal weed is the first to colonize an area, its root system is also closest to the surface and the most susceptible to prop scarring.

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Commercial fishermen. Most commercial fishermen appreciate and respect seagrass beds. They're well aware of their critical importance in the life cycle of the fish they harvest for a living. But just a couple of negligent commercial fishermen can really do damage through improper use of their boats and equipment... the effects are magnified by their frequency on the water. While bay bait shrimp roller trawling operations have done significant harm to the seagrass beds in other embayments, little, if any, such activity has taken place in Little Sarasota Bay.

Stormwater runoff. A lot of storm water runs off into Little Sarasota Bay. Naturally. It's an essential element creating the estuarine environment of Little Sarasota Bay. But ever-higher volumes of runoff are concomitant with population growth. From our homes, our driveways, our lawns, streets and parking lots. From farm lands. This excess runoff carries with it herbicides, fertilizers, organics, metals suspended solids and other pollutants into Little Sarasota Bay. The excess nutrients upset the delicate balance of nature causing first overgrowth, then rapid die-off of flora. The suspended solids settle out of the water to contaminate bottom sediments. The excess fresh water from runoff is itself a pollutant in the Bay when it lowers salinity levels below natural, historic minimums.

The excess runoff is delivered to the Bay by channelized outfalls from the uplands. By outfalls to channelized creeks leading to the Bay. By storm sewers. By direct outfalls into the Bay. By septic systems from shoreline residences. The northern portion of Little Sarasota Bay is chronically influenced by the outflow from Phillippi Creek.

The largest threat to seagrass beds from stormwater runoff lies in its potential to depress salinity levels below historic and tolerance levels. The excess fresh water pollutes the Bay by "over-diluting" Bay water volume, making it fresher than normal. Just ten years ago average bay salinities were reported as 32.5 ppt with a range of just 7 ppt. A year-long 1980 study reported the range as from 32 to 39 ppt. While these results were on area bays in general, Little Sarasota Bay salinity levels were in the same range. Subsequent to the closing of Midnight Pass in 1983, the salinity balance was upset. Without the tidal exchange through the inlet, the fresh water was trapped; its effects were no longer mitigated and salinities plummeted. The effects are covered later in this paper and in the **SALINITY** section of this presentation.

The other major effect of runoff is the turbidity and color change it causes and the resultant loss of light attenuation. This factor is primarily responsible for limiting the depths at which our seagrasses presently grow. They can no longer survive the historic depths at which they were once found due to insufficient light. While this factor limits the growing of seagrasses, it does not kill them as low salinity regimes so easily can.

Dredging of the ICW, 1962-1963. The deepening of the Intracoastal Waterway had a profound effect on the seagrasses of Little Sarasota

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Bay. The larger channel likely increased water circulation initially, providing improved seagrass growing conditions. The dredging of the channel itself had little direct effect because the existing channel was, in large measure, already deeper than the seagrass-growing zone. The 1962-1963 dredging may have increased seagrass habitat in several locales: submerged spoils and channel berms elevated the Bay bottom to a level that would permit seagrass colonization. Such areas were likely colonized by Cuban Shoal weed.

However, most of the emergent spoil areas were not diked. This allowed the fine sediments to run off into surrounding areas of the spoil site. The runoff of these fine, often clay, sediments frequently buried exisitng seagrass beds and decreased the water depth relative to MLW so that grasses could no longer inhabit the area. In other areas, Turtle and Manatee grass standing crops were wiped out with the shallower, disturbed Bay bottom recolonized by Cuban shoal weed. While several examples of this problem remain evident today, the primary instance is at the shallows surrounding the Bird Islands in the Midnight Pass area.

Approximately 200,000 cubic yards of material were placed at two sites on the Bird Islands during the initial 1962-63 dredging of the ICW. The spoil sites were about fourteen acres in total. The undiked spoil "mountain" eroded in a relatively short time with the clay fines spreading out over the historic seagrass beds surrounding the Bird Islands. The spreading spoil covered over the seagrasses, believed to be mainly Turtle grass, with several inches of sediment. Even today you will find nearly a foot of this thick, sticky clay in many areas. The higher, softer bottom was recolonized by Cuban Shoal weed.

The altered conditions of the area surrounding the Bird Islands actually created a new and unique habitat. Initially, the dissolved oxygen and salinity levels were quite favorable. The bottom had been changed to one best characterized as a soft, thick and marly mud. These conditions were ideal habitat for the relatively rare Angel Wing clam and the Macoma Constricta.

Closing Midnight Pass. This action had by far the **greatest adverse impact** on the seagrass beds of Little Sarasota Bay. Closure did **not** happen overnight. It was caused by a multiplicity of factors... but all the responsibility or the negligence of "Man." The deeper ICW diverted historic water flow away from the Pass. The improper deposition of the spoils from the ICW dredging also diverted waters that historically flowed through the Pass. The spoils began to shoal up the north channel. And nothing was done. The Pass began to migrate. Nothing was done. Australian Pines fell into the north channel creating a dam. Nothing was done. The water flow of the Pass became less and less. Nothing was done. Then, in 1983, when the Pass threatened the property of two homeowners, something was done. the governmental agencies permitted the closure of Midnight Pass on the promise these two citizens would relocate this natural resource south of their homes on County land and keep it open for at least two years. Well, they closed the Pass but didn't keep their promise. See the **SAFETY VALVE** and **INTRACOASTAL** papers for additional relevant history.

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SEAGRASS BEDS TODAY

The seagrasses remaining in Little Sarasota Bay today are but a faint, faint shadow of the lush beds that once grew here. Of the three types of seagrass that once were abundant, only Cuban Shoal weed remains. The Turtle grass, once predominant, is gone. The Manatee grass is gone. Cuban Shoal weed, the pioneer species, is hanging on due to its ability to tolerate to a degree the adverse environmental conditions created. Not that its found in lush, healthy beds. There are no grass beds. All you'll find, if you can see the bottom, are some sparse plants and a few patches intermixed with Red Drift Algae. The Cuban Shoal weed remaining appears unhealthy. It's often covered with sediments and epiphytic growth, the roots and shoots soft and grey rather than firm and white. See the **SEAGRASS FIELD STUDY** paper for a complete assessment.

THE PAST SIX YEARS

With Midnight Pass closed, Little Sarasota Bay is denied the tidal exchange and flushing action that it historically enjoyed. All the environmental problems harming our other embayments harm this body of water as well. But, without the tidal exchange the other bays receive, these environmental stresses are magnified many times over in Little Sarasota Bay. Excess stormwater runoff is trapped in the large null zone of water in the Bay. The solids fall out contaminating the bottom sediments. The excess nutrients cause algal and phytoplankton blooms, then remain within the ecosystem. The trapped fresh water reduces salinity far below historic levels... and below the tolerance levels of many of the marine plants and animals that historically inhabited this embayment.

In the County's early study of the effects of closing Midnight Pass, they projected the creation of a large null zone of little water exchange. It is within this range, obviously, that the worst effects of Pass closure are experienced. The Society's research and field efforts confirmed the existence of this null zone but estimate its size as somewhat larger than the County projection. We see the zone of major influence as lying between Point Crisp to the north and the Blackburn Point bridge. See the **FISH KILLS** paper.

In Sarasota County's Ecological Status of Little Sarasota Bay Report, February, 1985, significant losses of seagrass cover were reported at two of five permanent reference stations. The losses were attributed to displacement of the grasses by floating mats of macroalgae. It's important to keep in mind that this sampling was done the year following the closing of the Pass... a time period during which rainfall (just 33.3" for the year) was well below average.

In a Figure and supporting tables that were apparently prepared for, but never included in, the Ecological Status Report (See Exhibit #3), the results of twelve sampling efforts taking place between 5-31-84 and 12-19-84 were reported. The tables disclose that the Turtle grass and Manatee grass found at the permanent reference quadrats, while most meager, survived the first year of Pass closure unscathed. The Cuban

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Shoal weed did not fare so well. At four of the five sampling sites, the number of blades per meter² dramatically declined: 94%... 69%... 96%... 97%! Only station #2 showed little change in shoot density between May and December, 1984. While some of this may have been due to winter die-off, the monthly trends clearly show the decline was well on its way by mid-summer. And stations #4 and #5 are located well south and north, respectively, of the Midnight Pass/Bird Islands area... suggesting the wide range of Pass closure influence.

These unpublished tables contain additional relevant data. The 1980 sampling effort, see Exhibit #2, reported that the average shoot density/meter² for Cuban Shoal weed ranged from 6,000 to 9,000. But, at the beginning of the 1984 sampling study, the shoot densities were reported by reference quadrat as 1,363, 1,638, 2,080, 4,012 and 4,211... all **well below** the reported average range. The 1984 sampling effort began six months **after** the closure of Midnight Pass. The low blade counts in May, 1984, suggest that the seagrass had already been subjected to severe stress. It probably began three or four years prior to Pass closure when tidal flow had become significantly lessened. 1983 was a year of heavy rainfall (70.0"). With greatly reduced flow through Midnight Pass, the salinity levels in Little Sarasota Bay may well have been depresseed below the levels of tolerance of the Cuban Shoal weed. This might also explain the meager amounts of Turtle and Manatee grass found at these stations in 1984.

In conversations with the people who frequent the environs of Little Sarasota Bay, they clearly associate the seagrass decline with Pass closure. In 1984 there were wide-ranging reports of dead seagrasses washing ashore. While some was likely macroalgae rather than seagrass, most reported sightings were probably seagrass. Declines in seagrass coverage were reported in 1985 and 1986 as well. In 1987, the first year since Pass closure with average rainfall (57.1"), huge losses in seagrasses were reported all up and down Little Sarasota Bay... from Stickney Point to Southbay.

These anecdotal data are confirmed by a Sarasota County memo to Commissioner McElmurray from the Natural Resources Department dated October 20, 1987. The memo reports on a field survey conducted that month which found the seagrass cover within the sampling quadrats had substantially declined **from 1984 levels** (which were already well below average). The memo reported that similar decline was evidenced throughout the Bird Key shoal area.

The memorandum came to an initial conclusion that a prolonged salinity depression in late July of that year may have stressed the seagrasses beyond their tolerance. The report ended with the forecast that the declines can be expected to persist if they're due to the change in "...ambient conditions associated with inlet closure."

The salinity depression referred to in the 10-20-87 memo was also the subject of a longer Sarasota County Natural Resources Department memo dated 7-31-87 on "Fish Kills in Little Sarasota Bay." While the memo concentrates on fish kills, it does report the results of water samples

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taken. A Blackburn Point sample, well south of Midnight Pass, showed a salinity level of 11°/°°, transparency of 6" and a dissolved oxygen reading of 2.3 mg/l (they do not report the time at which the sample was taken... if not near dawn, the D.O. level was likely even lower). Similar poor readings occurred at South Creek. They had to go 1½ miles south of South Creek before the water quality readings significantly improved. In Blind Pass lagoon the samples revealed a salinity level of between 10 and 12°/°°, dissolved oxygen levels between 0.2 and 1.0 mg/l, depending on depth. A D.O. reading below 4.0 mg/l is considered a violation. Bay-wide sampling on July 30th disclosed the persistence of low dissolved oxygen levels... salinities were not reported.

The water samples taken in Little Sarasota Bay during and subsequent to the heavy rainfall event of July, 1987, show that salinity levels were depressed below the recognized tolerance levels of the seagrasses that used to cover the Bay bottom. Exposure to salinities below their tolerance level will kill seagrasses. It would appear, from all accounts, that it did.

As part of the Midnight Pass permit application, Sarasota County submitted to the Department of Environmental Regulation (DER) a large bathymetry-habitat map identified as coming from Coastal Planning & Engineering, Inc. Also submitted were two pages of explanatory text. Investigation revealed that the bathymetry data did come from CP&E but that the habitat information was prepared by Sarasota County.

The large habitat map indicates the seagrass habitat areas around Midnight Pass in 1983. The map also shows seagrass habitat extant in 1986 with "hatching" running opposite to 1983. Thus, a cross-hatched area would indicate seagrass habitat existing in both 1983 and 1986.

The map shows that seagrass habitat **INCREASED** between 1983, when the inlet was open, and 1986, when it was closed. The apparent rationale was that the inlet channels would not support grasses while open and flowing, but would in the absence of strong tidal current. In fact, some colonization by Cuban shoal weed has occurred.

The explanatory text explains that the inlet area is in a transitional and **catastrophe-oriented** phase; that seagrass coverage has become limited by transparency and salinity. The text describes the hostile environment and indicates that areas formerly covered with dense beds are now typified as of extreme patchiness and low abundance.

However, the map as a visual is misleading in that it clearly suggests there is **MORE** seagrass coverage since Pass closure. The mis-impression this map caused was verified in a discussion with a DER representative in late 1989.

In fact, the map discloses only **POTENTIAL** seagrass habitat and is in error in at least three respects:

1. Several channel areas indicated as NEW habitat really aren't... the depths are too low for Cuban Shoal weed, the only seagrass capable of colonizing the area.
2. Certain areas cross-hatched are, in fact, at elevations which

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would not support the colonization of any seagrass.

3. The newly-indicated habitat in the throat of the inlet was artificially created when the inlet mouth was closed. The bulldozed material winnowed eastward into this area and raised the elevation of the old channel to a Cuban Shoal weed-supportable depth. However, continued winnowing of this material will eventually raise the controlling depth above the colonization level for Cuban Shoal weed. The area is, accordingly, only a **transitory** seagrass habitat.

The important point ignored by the habitat map is that the adverse environmental conditions created by stopping the inlet tidal flow will not, long-term, allow for seagrass growth **at all**. So, the area designated as seagrass habitat is, in actuality, **POTENTIAL HABITAT**, but only if tidal flow through Midnight Pass is restored. Otherwise, there is no seagrass habitat in the area at all.

The December, 1989, Society-sponsored **SEAGRASS STUDY** assessed the seagrasses around the Bird Islands. It included teams of volunteers and the taking of a comprehensive series of low level aerial photos. Other field work considered the condition of the seagrasses in a broader area of Little Sarasota Bay.

The Society found no Turtle or Manatee grass in the study area, including those referenced County quadrats where they had been previously reported. The complete absence of Turtle grass, once abundant, is a potent indicator of the changed conditions of Little Sarasota Bay.

Most of the study area was devoid of Cuban Shoal weed. When it was found, it was almost always sparse. The few patches observed appeared severely stressed. At half the sampling sites blade densities/meter^2 were under 1,500. The other stations were in the mid-2,000 blades/meter^2 range. Compare the samples today with the average blade densities reported in Exhibit #2 of 6,000 to 9,000/meter^2!

<u>SUMMARY</u>

The seagrasses of Little Sarasota Bay were subjected to the same stresses as the seagrasses in the other local embayments. Dredging, filling, seawalls, prop scars, runoff, pollution... the price paid by the environment for our "progress." The single difference is the elimination of tidal exchange when Midnight Pass was artificially closed in 1983. Stormwater runoff is trapped in a null zone encompassing a good portion of Little Sarasota Bay. The historical balance of nature has been upset as to nutrients, sediments, dissolved oxygen and salinity levels. The adverse impacts of runoff have been greatly magnified. Salinity depressions during prolonged rainfall events have been created that are beyond the tolerance of the seagrasses that historically grew in Little Sarasota Bay.

Most grasses are gone, killed by the hostile environment created. The remaining seagrasses are of the most tolerant species... and even they're in poor health. With the collapse of the seagrass beds comes the collapse of the entire marine community that **WAS** the ecosystem of

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Little Sarasota Bay. Without seagrass leaves, wind-driven currents proceed unchecked to exacerbate shoreline erosion. Without seagrass roots, bottom sediments can resuspend in the water; erosion is unchecked. Instead of lush seagrass meadows and a vital marine community, we have a vegetative desert of unstable shifting sands, silt and mud.

Man can direct his attentions toward solving the environmental problems he caused seagrass communities. Hopefully, someday we'll be well on our way to managing our environment. But the seagrass beds of Little Sarasota Bay and the marine community that depends thereon can't return unless and until tidal circulation is restored through Midnight Pass!

CONCLUSIONS

1. Lush, dense seagrass beds are the foundation of the marine community in any embayment.
2. An embayment WITH seagrass has a much greater diversity and abundance of marine plants and animals than an unvegetated embayment.
3. Manatee and Turtle grasses which historically grew in Little Sarasota Bay, are no longer found here. Cuban Shoal weed, the pioneer species, while still existing in the embayment, covers far less area than before inlet closure, is far less dense and appears in poor health.
4. The disappearance of two species of seagrass from Little Sarasota Bay and the stressed condition of the seagrass remaining are the result of altered environmental conditions associated with the artificial closing of Midnight Pass.
5. If no action is taken with respect to restoring historic tidal flow, the adverse conditions affecting the remaining seagrass in Little Sarasota Bay will likely worsen with the return of average rainfall to the area. The remaining seagrasses in this embayment will likely not survive.
6. The destruction of the seagrass community in Little Sarasota Bay will result in a great reduction in numbers and diversity of marine plants and animals found in this embayment. **The process is already well on its way.**
7. The only way to reverse the negative trends experienced for the past six plus years is to restore Midnight Pass.

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MIDNIGHT PASS POSITION PAPER

THE SEAGRASSES OF

LITTLE SARASOTA BAY

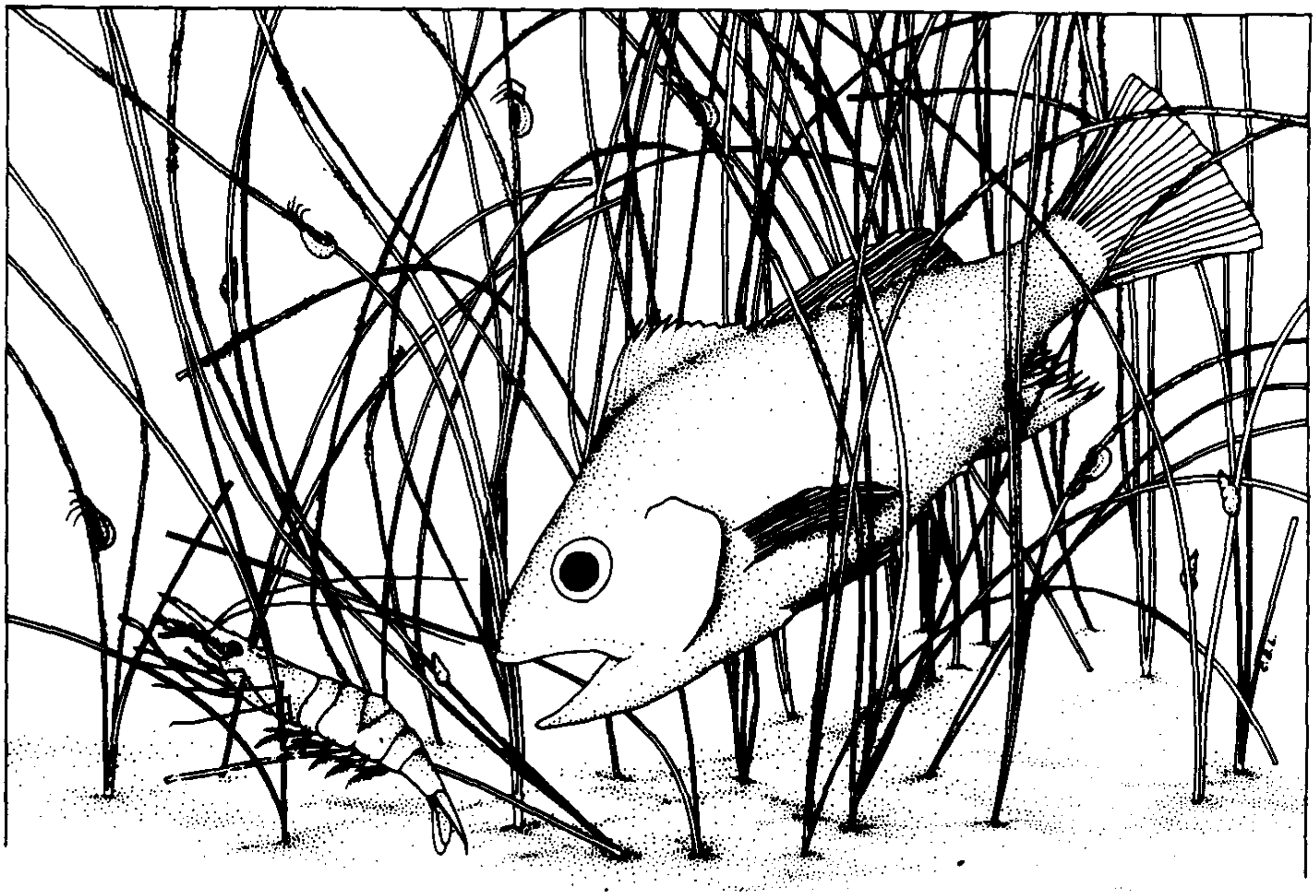


Figure 3. A proposed major food web for seagrass beds, based on organisms dominant in Indian River lagoon, Florida. Depicted: (I) the grazing epifaunal amphipod *Cymadusa compta* about to be preyed upon by (II) *Palaemonetes intermedius*, which is about to be preyed upon by (III) *Bairdiella chrysoura* (from Virnstein et al., 1983). In other seagrass systems, other genera may occur in these trophic positions.

THE DEPICTION OF A MAJOR FOOD WEB ASSOCIATED WITH A CUBAN SHOAL WEED MEADOW. AS SHOWN, EPIPHYTES RATHER THAN DETRITUS OR ACTUAL SEAGRASS BIOMASS PROVIDE THE MAJOR SOURCE OF FOOD FOR THE INVERTEBRATES.

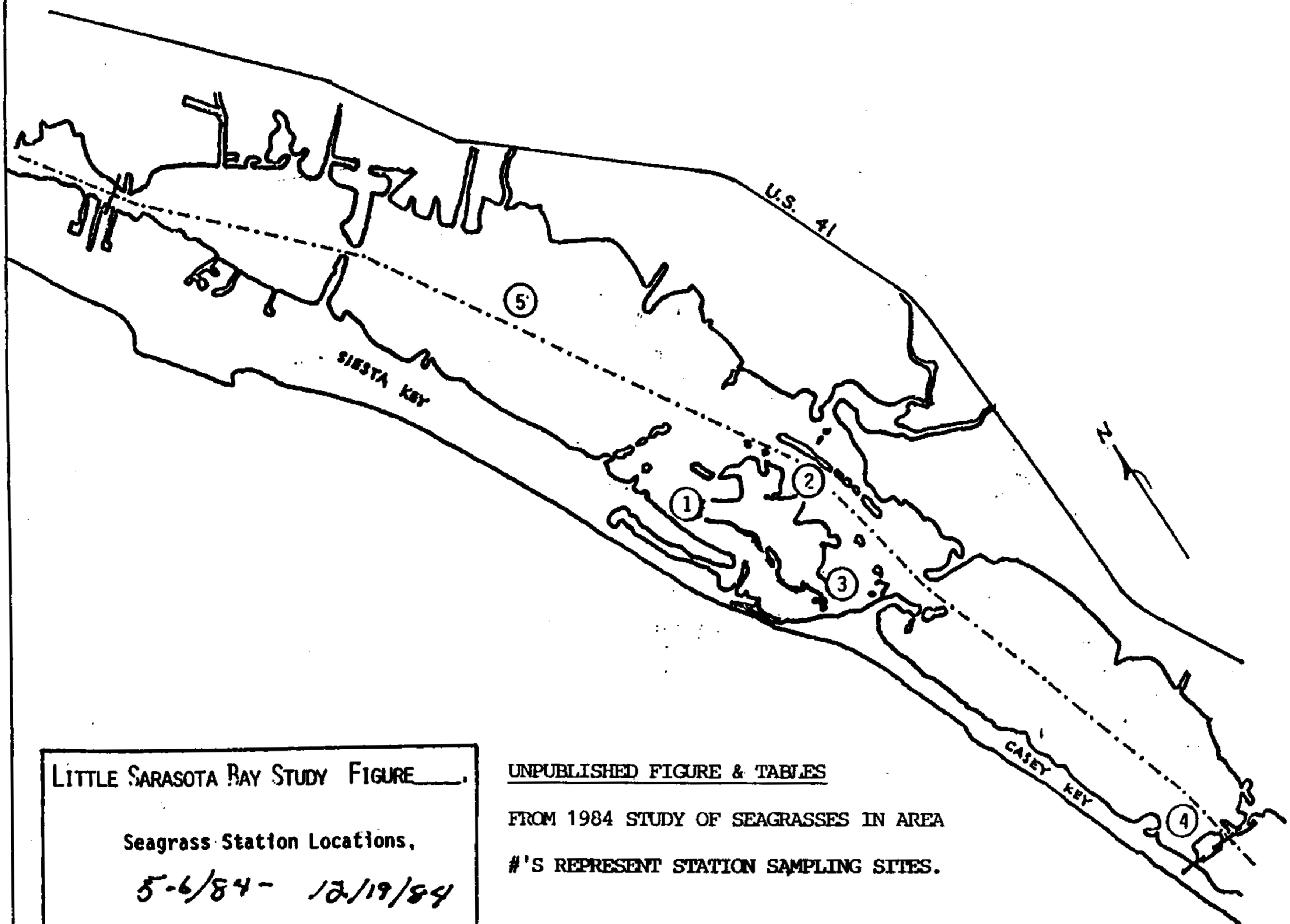
Graphic as it appeared in a June, 1987 article by Robert W. Virnstein: Seagrass-associated Invertebrate communities of the Southeastern U.S.A.

SEAGRASSES

Table 2. Seasonal changes in shoot density and biomass of *Halodule wrightii* in Sarasota Bay, Florida at three locations sampled at approximately 3-4 week intervals, March, 1979–March, 1980. Shoot density in number of shoots per square meter. Biomass in grams dry weight per square meter. Data reported as means of n=3 replicates with standard error in parentheses.

Sample in Series	Date	Shoot Density	Aboveground Biomass	Belowground Biomass	Total Biomass
			Long Bar Pt. Station		
1	3/21	5503 (1219)	31.5 (9.4)	244.5 (28.2)	325.0 (37.6)
2	4/11	11953 (3861)	69.6 (23.2)	285.2 (86.2)	354.8 (109.0)
3	5/4	13040 (1889)	131.3 (9.3)	380.1 (15.1)	511.4 (23.9)
4	5/23	13268 (576)	171.7 (9.1)	331.6 (7.5)	503.3 (12.6)
5	6/12	8745 (833)	142.6 (7.7)	330.7 (28.5)	469.3 (23.5)
6	7/6	7296 (735)	148.9 (14.2)	336.9 (31.5)	485.8 (19.3)
7	8/9	6978 (709)	106.5 (4.0)	254.0 (9.2)	360.6 (12.0)
8	8/30	3689 (446)	104.4 (4.8)	252.5 (20.3)	356.9 (24.3)
9	9/19	9250 (1224)	94.2 (8.9)	268.7 (46.6)	362.9 (53.3)
10	10/16	8533 (110)	77.6 (3.9)	216.9 (12.4)	294.5 (11.1)
11	11/15	6696 (874)	85.3 (3.2)	249.8 (19.9)	335.1 (19.8)
12	12/12	3286 (141)	71.6 (8.2)	220.2 (22.0)	291.5 (30.0)
13	1/16	6908 (1290)	43.6 (6.3)	187.3 (29.6)	230.9 (34.0)
14	3/5	6590 (138)	29.2 (2.7)	153.3 (18.3)	183.0 (17.0)
	Mean (SE) n=14	3624 (648)	97.0 (10.8)	263.2 (16.8)	361.9 (26.7)
			South Lido Station		
1	3/27	6276 (329)	42.6 (9.3)	163.0 (14.1)	205.6 (22.6)
2	4/17	5895 (376)	41.8 (6.8)	150.8 (12.3)	192.6 (13.1)
3	5/9	5352 (2246)	43.5 (17.2)	110.8 (64.6)	154.3 (81.5)
4	5/28	5954 (363)	32.0 (5.4)	136.7 (10.6)	238.7 (10.2)
5	6/19	6978 (695)	80.4 (5.2)	176.7 (22.0)	257.0 (25.6)
6	7/10	7190 (637)	113.1 (19.0)	201.9 (39.5)	315.0 (58.3)
7	8/14	8657 (489)	126.3 (3.6)	246.8 (13.8)	373.1 (17.2)
8	9/5	5794 (1220)	75.1 (19.2)	133.9 (43.2)	259.0 (62.4)
9	9/26	5159 (460)	72.4 (8.4)	165.9 (19.3)	238.3 (27.2)
10	10/25	7208 (162)	101.2 (12.8)	284.6 (18.4)	385.8 (30.3)
11	11/21	7738 (239)	52.0 (5.9)	295.9 (22.7)	357.9 (27.2)
12	12/19	6731 (522)	48.1 (2.3)	236.4 (19.6)	284.4 (21.8)
13	1/23	3498 (421)	32.3 (2.4)	131.6 (19.2)	164.5 (20.0)
14	3/20	5300 (662)	39.4 (3.5)	178.6 (38.3)	218.0 (40.2)
	Mean (SE) n=14	6266 (343)	68.6 (7.9)	191.7 (14.8)	260.3 (19.9)
			Horton Flats Station		
1	4/4	3014 (1313)	58.1 (9.7)	140.2 (29.7)	198.3 (39.3)
2	4/30	10921 (571)	93.7 (3.3)	395.5 (46.2)	489.3 (46.7)
3	5/16	7137 (827)	75.6 (3.4)	221.0 (43.3)	296.6 (40.4)
4	6/6	5229 (116)	83.0 (3.2)	307.9 (10.6)	391.0 (7.9)
5	7/3	6678 (462)	111.1 (9.2)	330.5 (52.0)	441.7 (57.4)
6	8/1	5918 (383)	115.7 (5.6)	295.6 (20.2)	411.3 (15.8)
7	8/22	7773 (630)	125.6 (8.3)	301.0 (10.6)	426.6 (2.7)
8	9/12	9593 (509)	106.4 (3.9)	292.9 (18.0)	399.3 (21.9)
9	10/4	5918 (418)	91.7 (2.4)	252.1 (7.3)	343.8 (9.3)
10	10/31	8379 (919)	74.7 (1.9)	230.6 (27.0)	305.3 (28.9)
11	11/29	7014 (611)	55.3 (5.4)	280.9 (18.2)	336.2 (23.5)
12	12/26	4735 (1197)	43.1 (7.3)	223.0 (39.0)	266.1 (45.4)
13	1/30	5300 (706)	25.3 (3.1)	179.3 (5.6)	205.4 (5.1)
14	3/5	5623 (1372)	36.0 (4.9)	180.6 (30.9)	216.5 (35.2)

From a paper by Steven C. Sauers on two local seagrasses published in ENVIRONMENTAL STATUS OF SARASOTA BAY: SELECTED STUDIES. Edited by William J. Tiffany III, 1980.



LITTLE SARASOTA BAY STUDY FIGURE____.

Seagrass Station Locations.

5-6/84 - 12/19/84

SCALE: 1:40,000 miles 0 ½ 1

UNPUBLISHED FIGURE & TABLES

FROM 1984 STUDY OF SEAGRASSES IN AREA

#'S REPRESENT STATION SAMPLING SITES.

Cuhar shoalward

Table . Comparisons of Halodule wrightii shoot density, greatest blade length, and average blade length at five locations.

	Station No.	5/31/84 6/01/84	6/19/84	7/05/84	7/19/84	8/02/84	8/21/84	9/07/84	9/21/84	10/05/84	10/24/84	11/08/84	12/19/84
Shoot Density ($\#/m^2$)	1	1363.2	1017.6	774.4	646.4	563.2	518.4	467.2	236.8	236.8	172.8	76.8	76.8
	2	1638.4	1184.0	1932.8	1907.2	1344.0	2131.2	2521.6	2387.2	2438.4	2246.4	2028.8	1600.0
	3	2080.0	1977.6	1510.4	1561.6	1440.0	1113.6	524.8	563.2	934.4	614.4	345.6	640.0
	4	4012.8	No Data	1702.4	979.2	953.6	947.2	697.6	825.6	812.8	345.6	320.0	153.6
	5	4211.2	No Data	2720.0	2201.6	1779.2	1776.4	2022.4	1747.2	2092.8	1881.6	135.5	88.0
Greatest Blade Length (mm)	1	215	250	310	430	335	270	260	215	220	180	120	180
	2	330	305	410	390	450	410	360	410	380	365	320	300
	3	320	320	335	620	420	430	310	340	310	300	260	260
	4	275	No Data	400	340	370	360	330	380	320	270	205	140
	5	230	No Data	290	290	290	270	225	190	200	180	180	135
Average Blade Length (mm)	1	177.5	190.0	231.0	322.9	235.0	172.1	205.7	154.2	113.6	108.8	100.0	90.0
	2	252.5	232.5	295.0	268.0	381.0	286.0	274.5	303.0	309.0	286.5	278.0	220.0
	3	271.7	279.4	316.0	397.5	365.0	325.0	274.3	271.4	224.4	252.2	195.0	186.0
	4	218.3	No Data	319.0	317.0	345.5	275.0	238.1	269.5	244.4	171.7	160.0	110.0
	5	190.0	No Data	229.0	245.0	251.1	209.0	171.0	138.0	143.5	141.0	135.5	88.0

Table . Comparisons of *Thalassia testudinum* shoot density, blade density, and blade area at five locations.

	Station No.	5/31/84 6/01/84	6/19/84	7/05/84	7/19/84	8/02/84	8/21/84	9/07/84	9/21/84	10/05/84	10/24/84	11/08/84	12/19/84
Shoot Density $(\#/m^2)$	1	25.6	38.4	51.2	32.0	12.8	25.6	19.2	12.8	25.6	25.6	19.2	25.6
	2	0	0	0	0	0	0	0	0	0	0	0	0
	3	32.0	32.0	25.6	38.4	12.8	12.8	64.0	70.4	32.0	64.0	70.4	121.6
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0
Blade Density $(\#/m^2)$	1	115.2	153.6	198.4	147.2	44.8	108.8	70.4	44.8	89.6	115.2	70.4	76.8
	2	0	0	0	0	0	0	0	0	0	0	0	0
	3	147.2	128.0	108.8	115.2	44.8	44.8	217.6	230.4	102.4	204.8	256.0	307.2
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0
Blade Area (cm^2/m^2)	1	2289.6	3909.1	5115.8	4283.5	1140.5	2383.4	837.8	1449.6	1008.3	1945.0	833.7	1021.4
	2	0	0	0	0	0	0	0	0	0	0	0	0
	3	2947.8	2737.9	2699.7	3027.2	1131.5	979.2	4889.9	4172.8	1115.8	2706.9	4193.3	3184.3
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0

Manatee Cross

Table . Comparisons of Syringodium filiforme shoot density, greatest blade length, and average blade length at five locations and Halophila engelmanni shoot density at Station # 2.

	Station No.	5/31/84 6/01/84	6/19/84	7/05/84	7/19/85	8/02/84	8/21/84	9/07/84	9/21/84	10/05/84	10/24/84	11/08/84	12/19/84
Syringodium Shoot Density ($\#/m^2$)	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	19.2	0	0	0	6.4	0	32.0	0	6.4
	3	339.2	480.0	441.6	332.8	268.8	454.4	825.6	371.2	537.6	576.0	544.0	339.2 ?
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0
Greatest Blade Length (mm)	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	370	0	0	0	170	0	370	0	70
	3	450	430	480	650	610	500	600	410	410	400	460	360
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0
Average Blade Length (mm)	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	370.0	0	0	0	170.0	0	370.0	0	70.0
	3	428.3	352.5	355.0	455.0	451.4	400.0	433.8	299.0	313.3	312.9	311.4	285.0
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0
Halophila Shoot Density ($\#/m^2$)	2	358.4	230.4	51.2	76.8	70.4	44.8	76.8	57.6	12.8	121.6	140.8	70.4