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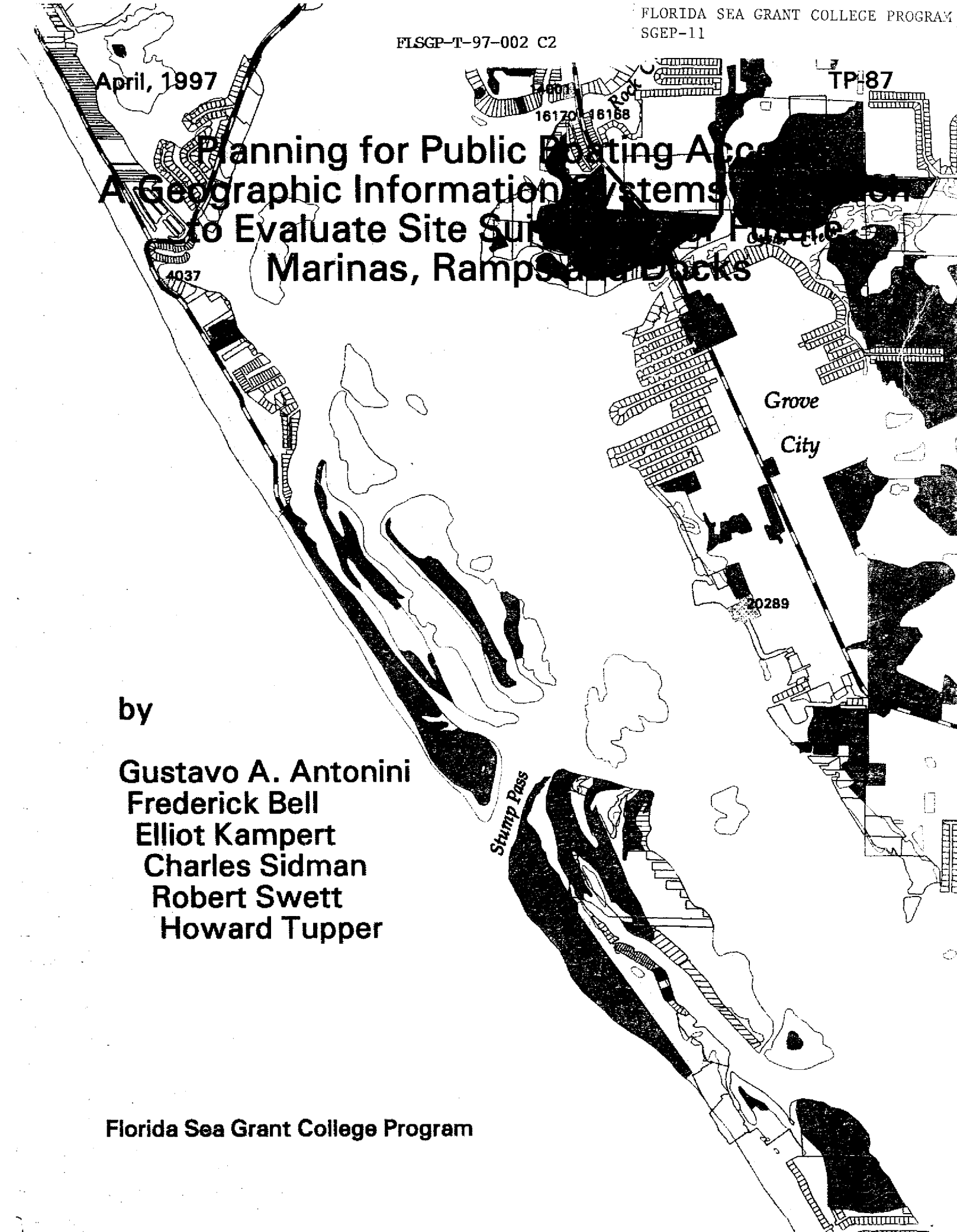
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Planning for Public Boating Access A Geographic Information Systems Approach to Evaluate Site Suitability for Public Marinas, Ramps and Docks

by

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Florida Sea Grant College Program



PLANNING FOR PUBLIC BOATING ACCESS: A GEOGRAPHIC INFORMATION SYSTEMS APPROACH TO EVALUATE SITE SUITABILITY FOR FUTURE MARINAS, RAMPS AND DOCKS

by

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Acronyms

AP	Aquatic Preserve
ARC/INFO	GIS software by Environmental Systems Research Inc.
ASCS	Agricultural Stabilization and Conservation Service (USDA)
CME	Coastal Management Element (of County Comprehensive Plan)
CPI	Consumer Price Index
DLG	Digital-line Graph
EMLS	Environmental Land Management Study
ESRI	Environmental Systems Research Institute
FAC	Florida Administrative Code
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDNR	Florida Department of Natural Resources
FLUCCS	Florida Land use and Cover Classification System
FLUE	Future Land Use Element (of County Comprehensive Plan)
FLUM	Future Land Use Map (of County Comprehensive Plan)
FMRI	Florida Marine Research Institute (of FDEP)
FSA	Florida Statistical Abstract
FSG	Florida Sea Grant
GIS	Geographic Information System
ICW	Intra-coastal Waterway
LOGIT	Logistic Equation for Participation in Water Access Mode
LULC	Land Use - Land Cover
MAOD	Marine Access Overlay District (of County Comprehensive Plan)
NHAP	National High Altitude Photography
OLS	Ordinary Least-Squares
PARID	Parcel Identification Number
PWDU	Preferred Water-Dependent Use
RPA	Resource Protection Area
SWFWMD	Southwest Florida Water Management District
USACOE	U.S. Army Corps of Engineers
USAAF	U.S. Army Air Forces
USBC	U.S. Bureau of Census
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USHR	U.S. House of Representatives

ABSTRACT

This report presents a geographic information system (GIS) approach for evaluating and selecting suitable sites to expand marinas, ramps and private docks, in order to meet anticipated boater demands for shoreside facilities. The analysis provides planners and resource managers with a mechanism to balance growth and new development of water-dependent and water-related boating infrastructure, with protection and management of coastal resources, while minimizing environmental impacts on sensitive marine habitats.

County boater demand projections indicate a need, by the year 2010, for 1,697 wet slips, 1,724 dry racks, 51 boat ramp lanes, and 16,615 private docks. The application of suitability criteria, developed by the Charlotte County Planning Department, determines which sites are "suitable" for: (1) expanding existing marinas and ramps; (2) developing new marinas and ramps; and (3) building private docks. The application includes a regional analysis which compares the present and future stock of shore-side boating facilities with the current distribution of boating trip origins.

The site suitability analysis is based on an evaluation of land-side and water-side information. The land-side data is parcel-based, derived from interpretation of 1:2,400-scale section aeriels and plat maps, which have been ground-truthed, and includes information on zoning, current use, docks, road access, sewer, and potable water. The water-side data is from various sources, at scales of 1:24,000 to 1:60,000, and contains attributes pertaining to salt-water boat access, water depth adjacent to parcel location, sea grass, and wetland. There are 30,564 parcels that comprise the data inventory, which was developed by the University of Florida/Florida Sea Grant Program, in conjunction with the County Planning Department, as a component of the Charlotte County Marine Land and Water Use Siting Study.

PREFACE

This project relied upon the valuable assistance and moral support of various elected and appointed officials, local staff, shore residents and boaters. Their contributions are acknowledged.

Sue Dudley, former County Commissioner and current Chair of the Governor's Citizens Advisory Committee on Coastal Management, offered advice and encouragement throughout this study. Special recognition is given to Will Sheftall, former County Extension Director and Sea Grant Marine Agent, who was a key collaborator, early in the conceptualization of the study's design, and later in its field implementation.

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A number of individuals contributed detailed sources maps of water line and sewer services: Rod Merrit and Thomas Orlosky with Charlotte County Utilities, Robin Sofa with Englewood Water District, Bill Harper with the City of Punta Gorda, Kurt Rohde of Giffels - Webster Engineers (Englewood), Craig Noden (Islander Properties), Robert Spade (Fiddlers Green, Inc.), Dean Beckstead (Palm Island Resort). Xiaodan "Dawn" Qui with the County Metropolitan Planning Organization, provided the source maps for county roads.

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I. EXECUTIVE SUMMARY

A. Background

Charlotte County faces a major planning dilemma: how to balance population growth and coastal development with conservation and management of its estuarine resources. The county is a microcosm of Florida, which between 1960 and 1991 had the fastest growing coastal population (169 percent) of the Lower 48. The 1995 county population was 130,397. With a projected average annual increase of 4,263 persons, Charlotte County's population will grow to 198,600 in 2010 and 243,800 by the year 2020.

Boating is a key element of the coastal lifestyle and growth phenomenon. While the nation's boating population doubled between 1973 and 1989, it tripled in southwest Florida. The 1992 Charlotte County boat population was 13,876. The number of boats is projected to increase to 43,103 by the year 2010. This will place increasing pressure on existing boating facilities and will call for thoughtful planning to accommodate the projected increase.

A county-wide marine, land and water use siting study was undertaken in 1991, in part because of concerns about these dramatic changes. This study also addressed the need to provide for adequate future public access to the shore and water, maintenance of existing navigation, land-side infrastructure and zoning to support marine uses, and adequate standards for public boat ramp access, marina wet slips and dry storage. The study results provide Charlotte County with a planning instrument that specifies the type, quantity and location of public shore access and boating facilities (marinas, ramps, docks) needed to meet anticipated demand through the year 2010.

Specific study elements include: (a) a profile of supply-demand characteristics of boaters; (b) an inventory and mapping of current land-side infrastructure and water access; (c) a suitability evaluation of potential sites to expand marinas, ramps and docks to meet anticipated boater demands; (d) identification of regulatory policies that affect development, use and protection of the county's marine resources, and assessment of current regulatory limits to permit water-dependent and water-related uses; (e) an evaluation of preferred taxation strategies to provide public access to bay waters; and (f) recommendations of changes to the county comprehensive plan to accommodate water-dependent and water-related uses. The results, summarized below, should assist Charlotte County in determining: (1) how to achieve sustainable coastal development; (2) how to guide future uses along its shoreline; and (3) how to prioritize water-dependent and water-related activities in marine use areas.

B. Boating Access: Demand and Supply

Charlotte County has experienced substantial growth in boat registrations (79 percent) from 7,735 in 1981 to 13,876 in 1991. During this 11-year period, Florida's boat population grew by 42 percent, from 480,384 to 683,780. The demand for boating facilities increased at a much greater rate within Charlotte County than elsewhere in the state. Furthermore, the county rate of growth between 1981 and 1991 was substantially greater (by orders of magnitude) in several length classes: <12' class [2x], 26<40' class [3x], ≥40' class [5x].

Projected personal income and population growth will increase Charlotte County boat registrations by 211 percent between 1991 and 2010. The largest percent changes are: 663 percent (from 1,238 to 9,448) for 26<40' boats; 534 percent (from 1,154 to 7,311) for <12' class (probably indicating continued growth of personal watercraft), and 489 percent (from 186 to 1,096) for boats \geq 40' in length. There will be a proportionally greater number of larger boats in the coming years. Larger boats have a greater potential to impact shallow seagrass beds and erode adjacent shorelines.

County boaters gain access to the water from marinas, ramps and private docks. Over half (57 percent) rely on private docks; only 36 percent use ramps and 7 percent use marinas. Ramp use in the county is about half the rate for Florida.

The 26 public and private marinas in Charlotte County in 1991 included 2,497 slips/-racks; 47 percent were wet slips. The initial demand should be satisfied without additional supply, given that there are 485 vacancies in the baseline year (1991). By the year 2000, 494 new slips will be needed, assuming all present excess capacity is used. By 2010, existing capacity must more than double -- from 2,497 in the base period to 5,918 (i.e., 2,497 plus 3,421). This represents an increase of 137 percent. There is an increase in wet slip use over the period which reflects increases in boat length and per capita income. Tourists/transients represent 32 percent of demand; the ratio of tourist to resident demand is implicitly held constant throughout the projection period.

There were 35 boat lanes in the county in 1991 (a ramp may have more than one lane). Peak demand/day was not satisfied in 1995 when peak demand exceeded supply by 10 percent -- at that time, 4 additional lanes were needed. There is a projected need for an additional 51 lanes by the year 2010.

Over 57 percent of Charlotte County registered boaters berth their vessels at private docks behind single family residences or as part of multi-family residences (i.e., with riparian rights). The 1992 inventory of salt-water accessible parcels identified a total supply of 26,531 residential and vacant parcels in the county (12,290 residential and 14,241 vacant) where private docks exist or potentially could be located. Charlotte County is using only 35 percent of its stock of potential private dock sites (assuming there are no environmental constraints). Ninety-two percent of the available stock will be utilized by the year 2010.

The distribution of boat trip origins in Charlotte County (1993) is as follows: trips from docks account for 57 percent; ramps, 36 percent; and marinas, 7 percent. The principal origins for *all* recreation boat trips in Charlotte County are: Punta Gorda (28 percent), Port Charlotte (22 percent), Lemon Bay to Gasparilla Sound (20 percent), Peace River (14 percent), and South Gulf Cove and Myakka River locations (8 percent). The principal trip originating locations for boaters coming from private docks is Punta Gorda (41 percent). For ramp originating boat trips, it is the Peace River (26 percent). Over 65 percent of marina originating trips are in the Lemon Bay to Gasparilla Sound area.

The overall distribution of boat trip destinations in Charlotte County (1993) is as follows: the principal destination is Charlotte Harbor (43 percent), followed by the Gulf of Mexico (20 percent), Lemon Bay (12 percent), and the Peace River (10 percent). While the Gulf of Mexico is the second most important destination for boat trips originating from private docks and marinas, Lemon Bay is the second most important destination for ramp boaters. The Peace River is another key destination for private dock and ramp boaters, but it is unimportant for marina boaters.

C. Boating Resource Geographic Information System (GIS)

This system allows for the capture, storage, integration, analysis, and display of mapped boating information. It is based on data collected by diverse federal, state and county agencies about marine use siting features and related uses on all 30,564 salt-water accessible parcels in Charlotte County, which occur on the ground or in adjoining bay waters.

A regional assessment of boating infrastructure and marine resources divides Charlotte County into five areas: Zone 1 (Lemon Bay to Gasparilla Sound, 12 percent of salt-water parcels); Zone 2 (South Gulf Cove and El Jobean, 24 percent); Zone 3 (Port Charlotte West of US 41, 19 percent); Zone 4 - (Peace River upstream from the US 41 bridge to DeSoto County boundary, 19 percent); and Zone 5 - (Punta Gorda Isles, Alligator Creek and Pirate Harbor, 26 percent).

1. Land Use and Land Cover (LULC). County-wide, almost half (47 percent) of all salt-water accessible parcels are vacant, another 40 percent are residential, 11 percent have some development constraint, and, 2 percent are either commercial, industrial, public, agricultural, submerged or parcelette.

There is considerable variability in LULC between the average county distribution and those within the 5 zones. Some noteworthy examples are:

- (a) **Zone 1 (Lemon Bay to Gasparilla Sound)** - higher proportion of residential use (55 percent), lower of vacant condition (28 percent) and lower of development constraint (8 percent);
- (b) **Zone 2 (Gulf Cove/El Jobean)** - considerably lower proportion of residential use (14 percent), much higher of vacant condition (82 percent) and lower with development constraint (3 percent);
- (c) **Zone 3 (Pt. Charlotte)** - high in residential use (61 percent), lower of vacant (37 percent) and much lower (< 1 percent) with development constraint;
- (d) **Zone 4 (Peace River)** - lower both in residential use and vacant (26 and 23 percent) and much higher (49 percent) with development constraint;
- (e) **Zone 5 (Punta Gorda)** - close to the county average in residential use and vacant condition (54 and 46 percent) but much lower (< 1 percent) in development constraint.

The other two percent of Charlotte County's salt-water accessible parcels are in commercial, industrial, public, agricultural, submerged and parcelette use or cover. Zone 1 has the greatest proportion of these other uses and land covers. The Peace River (Zone 4) has the second largest concentration.

2. Boat Docks. There are 12,070 boat docks (1992) in Charlotte County distributed on 9,304 parcels. Docks are situated on residential (88 percent), commercial (8 percent) and vacant (4 percent) lots. Ninety-six percent of all salt-water parcels with docks are in residential use; this ranges from 70 to 99 percent across the zones. There is a much wider variation in the distribution of commercial and vacant parcels with docks across the zones. Examples include:

- (a) **Zone 1 (Lemon Bay to Gasparilla Sound)** - more than double the county average on a percentage basis (commercial docks and vacant parcels with docks);
- (b) **Zone 2 (Gulf Cove/El Jobean)** - no commercial docks and negligible (<1 percent) vacant with docks;
- (c) **Zone 3 (Pt. Charlotte) and Zone 5 (Punta Gorda)** - about half the county average of commercial docks and negligible (<1 percent) vacant with docks.

The highest concentrations of boat docks are situated in the following locations:

- (a) **residential docks** - Zone 5 (Punta Gorda, 42 percent), Zone 3 (Pt. Charlotte, 24 percent), Zone 1 (Lemon Bay to Gasparilla Sound, 21 percent);
- (b) **commercial docks** - Zone 1 (Lemon Bay to Gasparilla Sound, 58 percent), Zone 5 (Punta Gorda, 23 percent);
- (c) **vacant parcels with docks** - Zone 1 (Lemon Bay to Gasparilla Sound, 73 percent).

The relation of parcels with docks to the total number of salt-water accessible parcels shows that the zones fall into two parcel groups: (a) Zones 2 (Gulf Cove) and 4 (Peace River) where ≤ 10 percent have docks; and (b) Zones 1, 3 and 5, where 45-50 percent have docks.

3. Road Access. Seventy-eight percent of the salt-water accessible parcels have local road access; 14 percent have no road access, and 8 percent are adjacent to urban/rural collectors. An exception to these conditions is Zone 4 (Peace River) where these conditions are reversed: 79 percent of the parcels have no road access and 10 percent are adjacent to local roads. This exception is due to the large concentration of development constraint, submerged and agricultural parcels situated along the Peace River.

4. Water Service Line. Seventy percent of all salt-water accessible parcels have access to county or municipal water service lines, while 30 percent have no potable water supply. Major exceptions to average conditions are: Zones 2 (Gulf Cove) and 4 (Peace River) where approximately 50 and 70 percent of the parcels have no water service lines. As a general rule, the more urbanized the location, such as Zones 3 (Pt. Charlotte) and 5 (Punta Gorda), the higher the percent with a larger main size.

5. Central Sewer. Only 41 percent of the parcels have central sewer service. There are wide contrasts across Charlotte County in the distribution of this service, ranging from Zone 5 (Punta Gorda) with 83 percent having central sewer connections, Zone 3 (Pt. Charlotte) with 55 percent, Zone 2 (Gulf Cove) 29 percent, Zone 1 (Lemon Bay to Gasparilla Sound) 14 percent, and Zone 4 (Peace River) 3 percent.

6. Boat Access. This feature refers to improved (dredged) and unimproved (natural) water-side conditions at the parcel location. Eighty-two percent of the county's salt-water accessible parcels have improved boat access. Over half (52 percent) of the improved access is associated with vacant parcels; another 45 percent is associated with residential use. Ninety-three percent of unimproved boat access is found equally divided among residential, vacant, and development constraint type parcels. The highest concentrations of residential parcels

with improved boat access are found in Zone 5 (Punta Gorda) 37 percent and Zone 3 (Pt. Charlotte) 31 percent. The highest concentration of vacant parcels with improved boat access are found in Zone 2 (Gulf Cove) 46 percent. There are 1,084 parcels with development constraints that have improved or unimproved access. There are 24 percent with improved access. The 76 percent with unimproved access are situated primarily along the Peace River in Zone 4.

7. Water Depth. This feature refers to shallow (< 3 ft.) and deep (\geq 3 ft.) water depth adjacent to the parcel location; it does not account for access channel depths. Almost two-thirds of the parcels are adjacent to water with a \geq 3 ft. depth. Ninety-eight percent of these parcels are vacant (56 percent) and in residential use (42 percent). Most of the zones parallel the county average although a noteworthy exception is Zone 2 (Gulf Cove) where 90 percent of the parcels with \geq 3 ft. water depth are vacant. The largest concentration of shallow water (< 3 ft. depth) parcels is found in Zone 4 (Peace River) 46 percent.

8. Wetlands. Approximately 9 percent of all parcels contain some wetland; two-thirds are located in Zone 4 (Peace River) and another 21 percent are in Zone 1 (Lemon Bay to Gasparilla Sound). Seventy-nine percent are found on parcels with development constraints and 16 percent on vacant lots. Over half of the residential parcels and half of the vacant parcels with wetlands are situated in Zone 1.

9. Aquatic Preserve (AP). Only 7 percent of the parcels are adjacent to aquatic preserves: 4 percent in Lemon Bay AP, and 3 percent in Gasparilla Sound/Charlotte Harbor AP. In Zone 1, all of the salt-water accessible parcels are adjacent to APs: 87 percent are in residential and vacant LULC. Charlotte Harbor AP covers parcels in Zone 1 (Lemon Bay to Gasparilla Sound), Zone 3 (Pt. Charlotte) and Zone 5 (Punta Gorda): 37 percent are residential, 26 percent are vacant, and another 25 percent have development constraints. Most canal developments -- Grove City (Zone 1), South Gulf Cove (Zone 2), Manchester Waterway (Zone 3), Palm Shores (Zone 4), Pirate Harbor (Zone 5) -- are situated outside the aquatic preserve boundaries. However, boats from these canal-front waterways must traverse AP submerged lands to gain access to boating and fishing waters.

10. Seagrass. Zone 1 (Lemon Bay to Gasparilla Sound) contain extensive seagrass beds (with the exception of the central bay north of the Tom Adams bridge, Peterson Channel, Stump Pass channel and the Intracoastal Waterway). Boat traffic in Lemon Bay, outside the natural and dredged channels, cannot avoid impacting on these beds. The county's seagrasses in Charlotte Harbor are situated as fringes along the east, west and north shores. Boat traffic impact in these Charlotte Harbor areas is limited predominantly to vessels entering and exiting from canal-front developments en route to the harbor's deep water, and fishermen plying the beds for trout, redfish and other game fish.

11. Manatees. Information on the distribution of manatees is provided to the Board of County Commissioners (BCC) as a general tool for planning and managing public boating access in Charlotte County. The presence and density of manatees should be taken into con-

sideration by the BCC and County Marine Advisory Committee in determining whether and where slow speed and/or manatee protection zones may be needed.

D. Site Suitability Analysis

The suitability analysis rates parcels as future sites for marinas, boat ramps or private docks. The methodology consists of a point system which scores parcel attributes. A development suitability rating (Preferred Water-Dependent Use, or PWDU) is assigned to each candidate parcel. This rating, for marinas and ramps, is based on an evaluation of developmental and environmental criteria, including vacant adjoining parcels, acreage, land use, land-side infrastructure (water, sewer, road), aquatic preserve, wetland, seagrass, water depth adjacent to the parcel, and boat access. Sites with a cumulative low point score for environmental and developmental parameters are considered poor candidates for intensive uses, such as sport and industrial marinas, commercial docks and waterfront hotels (PWDU I). They may be considered adequate, however, for less intensive uses, including boat ramps, waterfront restaurants and residential developments (PWDU II). The environmental suitability evaluation of private docks on residential and vacant parcels is based on presence of wetlands, access (dredged channel), location adjacent to an aquatic preserve, and water depth. Dock construction should be discouraged at sites with high environmental impact scores.

1. Marinas. There are 20 public access marinas (1991): 15 have vacant adjacent parcels, 3 contain areas of wetland, and 9 are located near seagrass. The analysis indicates 2 marinas with good, 7 with fair, and 11 with poor PWDU ratings. There are 20 vacant parcels that are potentially suitable for new marina development and all 20 parcels receive PWDU ratings of fair and good.

Charlotte County has a projected need for an additional 1,697 wet slips and 1,724 dry stack storage spaces by the year 2010. The county's ability to meet these demands is based on available acreage of suitable sites. It is estimated that Charlotte County needs 67 acres: 29 acres will be required for dry facilities and 38 acres for wet slips (estimates are based on 45 boats per acre for wet slips, and 60 boats per acre, assuming 3 stacks of 20 boats each, for dry storage).

There is less than 1 acre available for wet and dry slips by expanding existing marinas on vacant adjacent parcels. Using the criteria provided in this study, there are an additional 107 acres available for new marinas. There is a surplus of 40 acres for marina development (107 acres available minus 67 acres needed).

Port Charlotte (Zone 3) has the greatest potential to satisfy future marina needs (up to 3,420 wet slips or 4,560 dry slips). Marina expansion in the Punta Gorda Isles region (Zone 5) potentially could accommodate up to 1,200 dry storage or 900 wet slips. Space for an additional 450 wet or 600 dry slips may be available in the South Gulf Cove / El Jobean area (Zone 2). Conversely, shortfalls in acreage may occur from Lemon Bay to Gasparilla Sound (Zone 1) and the Peace River (Zone 4).

2. Private Dock Sites. There are currently 26,531 residential and vacant salt-water accessible parcels, 17,320 *with no docks* (65 percent) and 9,211 (35 percent) *with docks*. The

with no dock category has 16,220 parcels with low environmental impact, 696 medium impact parcels, and 404 parcels where new docks would have a potentially high environmental impact. The greatest number of the high impact parcels are located between Lemon Bay and Gasparilla Sound (304, or 75 percent). The *with dock* category has 8,819 parcels of low environmental impact, 262 medium impact parcels, and 130 with a high impact. The greatest number of medium and high impact parcels (158, or 60 percent) are also located between Lemon Bay and Gasparilla Sound.

3. Boat Ramps. The Spring Lake and Port Charlotte Beach sites are the only existing ramp locations that have adjacent vacant parcels. The Spring Lake and Laishley Park sites are the only ones with a good PWDU rating. There are 5 public parcels that are potentially suitable for boat ramps; 4 of these locations have vacant adjacent parcels. There are 30 non-public parcels potentially suitable for new boat ramps.

Charlotte County has a projected need for an additional 51 ramp lanes by the year 2010. Its ability to meet this demand is based on available acreage of suitably rated sites. It is estimated that Charlotte County needs 17 additional acres (based on 24 boats/lane/day average use and .34 acres of parking space per user). Existing publicly-owned acreage (14 acres) could potentially satisfy a portion of the future boat ramp needs (on-site inspection is needed to determine the footprint of existing buildings and infrastructure and estimate build-out potential). Other sources are the 30 non-public parcels (193 acres) and public right-of-way access points, such as dead-end streets that front on the water. The combined acreage of selected public and non-public parcels suitable for boat ramps greatly exceeds the projected need for 17 acres and provides the county with great flexibility in the selection of appropriate locations for future ramps.

4. Regional Distributions of Supply and Demand. The analysis of supply of suitable (PWDU) sites and anticipated future demand of 5,918 marina wet and dry slips indicates anticipated regional disparities within Charlotte County: greatest differences occur in Port Charlotte (Zone 3) where supply exceeds demand, and from Lemon Bay to Gasparilla Sound (Zone 1), where demand exceeds available sites. Comparisons of anticipated demand for private docks with suitable dock sites show that the available stock will meet or exceed demand estimates for all zones but the Lemon Bay to Gasparilla Sound area. The ramp supply-demand analysis shows sufficient available sites in all areas with the exception of Zone 4 (Peace River).

E. Marine Use Regulations

The *Florida Administrative Code* (Rule 9J-5.012[3]) directs coastal counties to adopt objectives and policies within the coastal management elements of their comprehensive plans which: prioritize shoreline uses, giving priority to water dependent uses; increase the amount of public access to the beach or shorelines consistent with estimated public needs; establish performance standards for shoreline development; and establish criteria for marina siting. Further, these objectives and policies must address land use compatibility, availability of up-land support services, protection of water quality, availability of public use, economic need and feasibility, and water depth. Finally, the rule provides that local governments in coastal areas

which participate in a county-wide marina siting plan must include the plan as part of their coastal management elements.

Planning is one way in which local governments in Florida may achieve these policy objectives. This Marine Land and Water Use Siting Study was undertaken in fulfillment of the policies of the 1988 Charlotte County Comprehensive Plan which itself was done in compliance with Chapter 163 and Rule 9J-5 as amended in 1985 following the Environmental Land Management Study (ELMS II). The Future Land Use Map (FLUM) is the visual representation of the Comprehensive Plan; FLUM contains "overlay districts" intended to provide additional guidance for land use activities. The establishment of zoning districts is another tool available for local governments to implement public land use policy. Regulation, such as the establishment of buffer zones between surface waters and wetlands and development activities, is also used to protect marine resources.

The Preferred Water-Dependent Uses (PWDUs), designated in this study, are consistent with the Resource Protection Areas (RPAs) which occur in the Lemon Bay Aquatic Preserve Management Plan. PWDUs are established using a point matrix which takes into consideration both water-side and land-side environmental and developmental constraints. This matrix does not consider zoning or land use classifications as it is assumed that the Zoning Atlas and FLUM may be amended if a PWDU's underlying zoning and land use designations conflict with a proposed water dependent use. Two such designations have been defined as non-exclusionary overlay districts within which water-dependent uses and structures in Charlotte County should be allowed:

- (I) all types of marinas, including the provision of dry-stack facilities; boat ramps; commercial docks; yacht clubs; moorage for waterfront hotels, motels, dockominiums, and restaurants; boat repair yards; piers; and all other water-dependent uses; and
- (II) commercial and public boat ramps; piers; moorage for waterfront restaurants and business other than marinas; multi-slip docking facilities for residential developments for which the number of slips may not exceed the number of dwelling units.

F. Land Use Incentives

There are several "preferred taxation" (*blue-belting*) strategies by which marina facilities may remain in private ownership yet continue to provide public access to bay waters. They include (along with their estimated cost): preferential property tax incentives (\$249,285/year); deferred taxation (\$47,915/year, 6-year period with roll-back and no interest penalty); restrictive agreements (\$299,850/year); exclusive water-dependent zoning (\$0 for without preferential assessment, \$249,285/year with preferential assessment); and purchase of development rights (\$18,681,090, one-time purchase from all facilities in 1993); the dollar amounts represent 100 percent participation of marinas at the time of this study.

The use of "preferential property tax assessments" -- based on a use-value assessment of marinas and other public access, water-dependent facilities -- is the method by which Charlotte County may provide an economic incentive for the owners of existing marine-dependent

properties to retain their properties in such uses. The "assessed value" formula (profit before taxes ÷ capitalization rate) may be modified by the Charlotte County Property Appraiser to better fit existing assessment methods. While this method does not provide the same level of assurance as does exclusionary zoning or restrictive agreements, the potential legal and political difficulties associated with the former and the perceived reluctance of property owners to enter into the latter suggest that "preferential property tax assessments" may be the best current method available to Charlotte County, to maintain public boating access and infrastructure on existing marine-dependent properties through the year 2010.

Charlotte County may use "restrictive agreements" with the owners of vacant properties to forego development which does not provide public boating access on Preferred Water-Dependent Parcels (PWDUs). In return, the subject property's value would be assessed as being placed under restrictions for use as outdoor recreational or parks purposes. In order to avoid exploitation, as land-banking, such agreements should contain rollback provisions which require the payment of taxes withheld, should the property be developed in a manner which does not provide public access. These restrictive agreements, furthermore, should be made non-transferrable in order to prevent individuals from entering agreements solely to benefit from reduced taxes.

G. Conclusions

This marine, land and water use siting study was undertaken in fulfillment of the policies of the 1988 Charlotte County Comprehensive Plan. It is anticipated that the results will be incorporated -- in whole or in part -- into the 1997 Comprehensive Plan currently under consideration by the Board of County Commissioners for transmittal to the Florida Department of Community Affairs.

Charlotte County's 250 miles of navigable canals and access channels link its 30,564 salt-water accessible parcels with Charlotte Harbor, Lemon Bay and the Gulf of Mexico. The number of boats grew by 79 percent from 1981 to 1991; within county boat registrations are projected to grow, by 211 percent between 1992 and 2010. There will be a 664 percent increase in larger, deeper draft boats which will: (a) influence boater choice in selecting wet slip, dry storage, ramp, or private dock; and (b) require deeper water depths in selected entrance channels and slip locations.

There are disparities within Charlotte County in the distribution of suitable sites (acreage) which can be used to meet anticipated year 2010 needs for marina, ramp and private dock facilities. Based on estimated trends in the number and size of boats from 1991 to the year 2010, the regional supply-demand scenario for Charlotte County is:

Lemon Bay to Gasparilla Sound (Zone 1): shortfall in marina acreage (-71); shortfall in residential and vacant parcels (-4,495); excess in ramp site acreage (+1).

South Gulf Cove and El Jobean (Zone 2): marginally adequate marina acreage (0 balance); excess in residential and vacant parcels (+5,713); excess in ramp site acreage (+13).

Port Charlotte West of US 41 (Zone 3): excess in marina acreage (+76); excess in residential, vacant parcels (+1,882); excess in ramp acreage (+61).

Peace River Upstream from the US 41 Bridge to the DeSoto County Line (Zone 4): shortfall in marina acreage (-3); excess in residential and vacant parcels (+1,053); shortfall in ramp site acreage (-2).

Punta Gorda Isles, Alligator Creek and Pirate Harbor (Zone 5): excess in marina acreage (+20); excess in residential and vacant parcels (+5,268); excess in ramp site acreage (+34).

The most noteworthy disparity is in Zone 1 (Lemon Bay to Gasparilla Sound) where there are greater concentrations of boats, more demand to build docks along the shoreline in order to gain access to bay waters where, coincidentally, sensitive wetlands and seagrass habitats prevail, and large deficits in future marina acreage and residential or vacant parcel dock sites. The potential closure of Stump Pass, if it were to occur by longshore drift, would further concentrate traffic in south Lemon Bay and exacerbate boating pressures on bay resources.

The site suitability figures for marinas, residential docks and boat ramps identify optimal salt-water parcels (existing in 1993) for development. Charlotte County may wish to explore alternative scenarios in which: (a) new water-side parcels -- created through platting or other means -- are added; (b) publicly-owned parcels lying adjacent to, or landward of, existing facilities are included; (c) criteria are either relaxed or further restricted; or (d) residential docks, boat ramps and marinas are sited to direct the number of boats -- with selective drafts -- to appropriate locations in order to minimize impacts on natural resources. Such policy-directed analyses, particularly additions of parcels, to be consistent with other information reported in this study, should be subject to comparably rigorous evaluation criteria.

H. Recommendations

1. Incorporate the Preferred Water-Dependent Uses onto the Future Land Use Map as two Marine Access Overlay Districts.

MAOD 1 indicates properties appropriate for the most intensive use. It includes: all types of marinas and dry-stack facilities; boat ramps; commercial docks; yacht clubs; moorage for waterfront hotels, motels, dockominiums, and restaurants; boat repair yards, piers; and all other water-dependent uses.

MAOD 2 indicates properties appropriate for less intensive water-dependent uses than those allowed in MAOD 1. It includes: commercial and public boat ramps; piers; moorage for waterfront restaurants and businesses other than marinas; multi-slip docking facilities for residential developments for which the number of slips may not exceed the number of dwelling units.

2. Develop a method for applying a use-value assessment to marina and other public access facilities in order to provide an economic incentive which ensures that the properties will remain in a use which provides public access.

3. Enter into agreements with the owners of vacant MAOD 1 and MAOD 2 properties in order to provide economic incentives which discourage the use of these properties in ways which do not provide for public access.
4. Maintain the land-side elements of the Boating Resource GIS and incorporate them into the county's future planning and permitting processes. Keeping records of the number and type of such facilities will help Charlotte County determine whether the level of service standards established through the Comprehensive Plan are being met, and whether the facilities are meeting the needs of the boating public, particularly with regard to location. The information gained through this application of GIS and permit tracking technology will assist the Board of County Commissioners to make sound political and financial decisions regarding the provision of facilities which offer general public access to Charlotte County's valued marine resources.
5. Upgrade the water-side components of the Boating Resource GIS -- boats, water depth, seagrass, mangrove -- in order to assess the county's waterway management needs. Boat access includes both water depths adjacent to parcels and channel depths. The site suitability analysis only considered water depth adjacent to the parcel since no county-wide data were available which describe channel conditions. The trend towards proportionally greater numbers of deeper draft boats will make waterway management issues, such as maintenance dredging, more critical in the future, and will place increasing pressure on existing land-side facilities and bay water resources. A county-wide waterway assessment should be undertaken in order to determine existing channel conditions and boat access needs.
6. Direct future land and water marine use to locations where potential impacts on the environment will be minimized.

II. INTRODUCTION

A. Background

Charlotte County is a microcosm of Florida, which between 1960 and 1991 had the fastest growing coastal population (169 percent) of the Lower 48. (Culliton et al, 1990; USBC, 1994). This growth reflects several demographic trends in the US: more leisure time, rising income, and a recreational lifestyle with many amenities (FDCA, 1995). Boating is a key element of the coastal lifestyle and growth phenomenon. While the nation's boating population doubled between 1973 and 1989, it tripled in southwest Florida (American Red Cross, 1991; FDEP, various years). Therefore, it should come as no surprise that Charlotte County faces a major planning dilemma: balancing population growth and coastal development with conserving and managing its estuarine resources.

Eighty percent (88,951) of county inhabitants reside along the shores of Charlotte Harbor, the Peace and Myakka rivers, Lemon Bay, and Gasparilla Sound. This coastal population includes about 50,000 mostly single-family homes in Port Charlotte (north of the Peace River and west to the Myakka River), the City of Punta Gorda, the Gulf Cove subdivisions (west shore of Charlotte Harbor), Englewood and Cape Haze. There are 30,564 salt-water accessible parcels in the County, of which 42 percent have been developed as waterfront properties and 30 percent have docks with related boating infrastructure. Hundreds of miles of canal properties offer resident and visitor alike an opportunity to pursue unique waterfront living with unexcelled opportunities for boating and fishing. Over half of all county boaters berth their boats in their backyard.

Charlotte County's population, in 1995, was 130,397. With a projected average annual increase of 4,263 persons, the County's population will grow to 198,600 in 2010 and 243,800 by the year 2020.¹ The 1992 county boat population was 13,876. The number of boats is projected to increase to 43,103 by the year 2010 (Bell, 1994). This will place increasing pressure on existing boating facilities and will call for thoughtful planning to accommodate the projected increase. In recognition of these anticipated, dramatic changes, and because of the need to provide for such things as adequate future public access to the shore and water, maintenance of existing navigation, land-side infrastructure and zoning to support marine uses, and adequate standards for public boat ramp access, marina wet slips, and dry storage, the policies of the 1988 Charlotte County Comprehensive Plan mandated the preparation of a Marine Land and Water Use Siting Study. In 1992, the County contracted the services of the University of Florida Sea Grant Program (FSG) to prepare this study based on the guidance provided in the Comprehensive Plan. The results of that study are summarized in this final report. These results should assist the County in determining: (1) how to achieve sustainable coastal development; (2) how to guide future uses along its shoreline, compatible with long-term resource management goals; and (3) how to prioritize water-dependent and water-related activities in marine use areas.

B. An Historical Perspective on the County's Boating Geography

A comparison of the County's water bodies and shoreline in 1916 (USHR, 1919) with contemporary conditions (Figure 1 - see Appendix 7) indicates dramatic changes along the Gulf and within the Harbor and its tributaries: the Intra-Coastal Waterway (ICW) now provides a navigable passage from Gasparilla Sound to Lemon Bay and points north; natural waterways, such as the Peace River, have been improved for navigation; and artificial canals and basins have been dredged in residential developments as by-products of coastal development. The County's 250 miles of navigable canals and access channels link its 30,564 salt-water accessible parcels with Charlotte Harbor, Lemon Bay and the Gulf of Mexico. These channels and adjacent parcels are key elements of the boating geography in Charlotte County.

The most dramatic changes have occurred since WWII and are directly tied to dredge-and-fill which made land available for residential development. Punta Gorda is illustrative of this development process (Figure 2 - see Appendix 7). Much of the area, in the mid-1940s, was scrub, unimproved pasture and wetland. By 1975, Alligator Creek had artificial canals extending north into Charlotte Park and Rio Villa, while most of the canals north of Aqui Esta Drive in Punta Gorda Isles had been created. By 1985, the entire canal system, as it exists today, had been created with 2,286 salt-water parcels, and access channels north to the Peace River, and through Ponce de Leon channel and Alligator Creek to the Harbor. A closer inspection of parcel development over this period along the North and South Forks of Alligator Creek quantifies both shifts in land use/land cover from natural to vacant cleared and residential use, as well as construction and distribution of boat docks (Figure 3 - see Appendix 7 and Table 1). An appreciation for these dramatic changes that have taken place over the past fifty years -- development of waterfront subdivisions, creation of residential canals and basins as by-products of development, and improvement of natural waterways -- is intrinsic to conceptualizing solutions for marine land and water use siting in the County.

C. Rationale

Charlotte County is committed to achieving sustainable development as embodied in its Comprehensive Plan (1988,1997 rev.). Such development planning -- to be consistent with state-mandated requirements -- should give priority to water-dependent and water-related activities in designating future land use along shorelines (FAC, 9J-5.012). The County must plan wisely for future marine use. The Future Land Use (FLUE) and Coastal Management (CME) elements of the plan set out objectives and policies to guide community leaders in achieving this goal. The Marine Land and Water Use Siting Study provides specific guidelines for achieving this goal.

Charlotte County must consider the impacts of growth on both the natural and the built environments, particularly public services, and either plan to maintain acceptable service levels or set growth limits in order to maintain acceptable quality of life standards. Land development regulation is a comprehensive, public policy planning tool that has been used to limit

Land Use and Land Cover	Parcels	Docks
1952		
Developed	14	0
Natural	2,272	0
1975		
Developed	1769	240
Natural	517	0
1988		
Developed	2,257	494
Natural	29	0
Total	2286	

Table 1. Changes in general land use and number of docks for Alligator Creek: 1952, 1975 and 1988.

future land use activities that, left unregulated, might otherwise adversely affect the community's health, safety and welfare. Zoning, another tool, has been used almost entirely to limit impacts on individual building sites, typically uplands, through devices such as minimum setback requirements, height restrictions on structures, parking, landscaping, and lighting, as well as by specifying acceptable types of uses within zoning districts. There has been little use of zoning, however, to regulate shore-side land uses that affect on-the-water uses (Tupper and Antonini, 1996).

Since most county residents live or will reside near the coast, barrier islands, bays and rivers, it is anticipated there will be increased on-the-water recreation and added pressure for marine recreational facilities. Increased use intensifies competition which adds pressure for public regulation to prevent conflicts among competing users, to insure privacy and to protect scarce resources and sensitive habitats. The County's CME proposes to address the regulation of these water-related uses.² The Marine Land and Water Use Siting Study is intended to identify and prioritize activities allowable in marine use areas. Such uses include public use marinas, other water-oriented recreation, water-dependent industries or utilities, water-related uses, and high density residential development with association water-oriented accessory activities.

D. Goals and Objectives

The goal of the project is to provide Charlotte County with a planning instrument that specifies the type, quantity and location of public shore access and boating facilities (marinas, ramps, docks) needed to meet anticipated demand through the year 2010. Specific objectives pursued during the project include:

1. To profile supply-demand characteristics of boaters;
2. To inventory and map current land-side infrastructure and water access adjacent to parcel location;
3. To evaluate the suitability of potential sites to expand marinas, ramps and docks to meet anticipated boater demands;
4. To identify regulatory policies that affect development and use of the county's marine resources, and to assess current regulatory limits to permit water-dependent and water-related uses;
5. To propose changes to the county comprehensive plan to accommodate water-dependent and water-related uses.
6. To make data available to the public so that future marine uses will take place at locations which meet sustainable, long-term management goals.

E. Report Outline

The components of the Marine Land and Water Use Siting Study are diagrammed in Figure 4 (see Appendix 7). An executive summary in Section I precedes this introduction and background statement (II). Bell's boater survey (1994), which provides the basis for determining existing supply and estimating future demand for marina, ramp and private dock facilities, is presented in Section III. The County's boating resource geographic information system (GIS), which the project created, is treated in Section IV. This GIS provided a mechanism for inventorying and mapping boating-dependent land and water attributes for all 30,564 salt-water accessible parcels in the County. Results of the parcel-level evaluation which determined site suitability to expand marinas, ramps and private docks to meet anticipated boater demands for shoreside facilities by the year 2010 is presented in Section V. Current regulatory limits to permitting water-dependent and water-related uses, as well as preferred water-dependent uses (PWDUs), are described in Section VI. Preferred taxation (blue-belting) strategies, by which marina facilities may remain in private ownership yet continue to provide public access to bay waters, as well as proposed marine access overlay district (MAOD) categories, are proposed in Section VII. Conclusions are in Section VIII. Recommendations, including specific policy/project development actions, are presented in Section IX. Endnotes, in Section X, provide explanations of methodology and further discussion of some empirical results.

III. BOATING ACCESS: DEMAND AND SUPPLY

A. Estimations and Projections¹

The demand for recreational boats is really a demand for recreational services (e.g., fishing) provided by boats used in leisure time activities.² Demand is also influenced by income: a rise in income increases the amount of discretionary income for such recreational durable goods as pleasure crafts. Other factors determining the demand for recreational pleasure crafts are the size of the population, price of boats, and the cost of their operation.

A demand model was constructed and the equation was fitted to boating data from Charlotte County.³ Boat registrations were used to characterize the stock of boats. The National Marine Manufacturers Association index, expenditures per recreational boat series, was used to construct a price variable; to make the projections, the price variable was held constant at its 1991 level. The Consumer Price Index (CPI) values for aggregate commodities and for the real price of gasoline were used to approximate the operating cost of a recreational boat. Population was based on projections from the 1990 U.S. Population Census for 1995 and by the University of Florida Bureau of Economic and Business Research for 2010.

Growth trends in boat registrations were evaluated for Charlotte County and the State of Florida over an 11-year period (1981 - 1991) by boat length class. Based on the trend analysis, demand functions were estimated for each boat class (boats $\geq 40'$ were aggregated). The main factors driving these projections are personal per capita income (deflated by the CPI in Charlotte County), and the county population (Bell, 1994, Tables 4 and 5). Probability estimates of boater demand for shore facilities (i.e., marina wet/dry slips, boat ramps, private docks) were derived from responses to the random sample survey questionnaire on current access. These estimates consider projected changes in the numbers of boats in different length (size) classes. A predictive model was developed to derive vessel draft from boat length. Data from the random sample boater telephone survey were used to test and calibrate this equation.⁴

Current facilities were based on a 1991 FDEP listing of marinas (wet slips and dry storage) and boat ramp lanes, and a 1993 FSG aerial photo inventory. A telephone survey of the County's 17 marinas in 1993 was used to determine vacancy rates and ratios of tourist/transient to local resident service needs. Ramp lane capacity estimates were developed using information from the random sample boater telephone survey on boat launch/retrieval times and boater satisfaction with levels of service. Issues such as peak demand, tourist and resident needs, and the county's older retired demographic profile, were addressed in the supply needs model.

B. Boat Populations

The 1991 boat population in the county and state is shown in Table 2. Currently, the largest numbers of boats, in the county and generally in Florida, are in the 12<16' and 16<26' length classes. Relative distributions between county and state subtotals are similar except that the 16<26' length class accounts for 53 percent of county and 45 percent of state boat registrations.

Charlotte County has experienced a substantial growth in boat registrations (79.4 percent) from 7,735 in 1981 to 13,876 in 1991. By comparison, Florida's boat population grew by 42.3 percent, from 480,384 to 683,780, during the same 11-year period. Table 3 compares county and state growth rates by boat length classes for the period. The demand for boating facilities (marinas, ramps, private docks) increased at a much greater rate within the County than in the State of Florida. Furthermore, the county rate of growth between 1981 and 1991 is substantially greater (by orders of magnitude) in several length classes: <12' class [2x], 26<40' class [3x], ≥40' class [5x].

Boat Length	Draft	Charlotte County Boats		Florida	Boats
(ft)	(Avg. ft.)	(Number)	(%)	(Number)	(%)
< 12	0.5	1145	8.26	73126	10.69
12 < 16	0.8	3761	27.10	243430	35.60
16 < 26	1.5	7352	52.98	305175	44.63
26 < 40	3.0	1238	8.92	41140	6.02
=> 40	6.2	186	1.34	7395	1.08
Other*	NA	194	1.40	13514	1.98
Total	NA	13876	100.00	683780	100.00

*canoes and dealer inventories of all length classes

NA not applicable

Table 2. Number of boats in 1991

Boats	Charlotte	Florida
Type	(%)	(%)
all	79	42
Boats (by length class)		
<12'	184	89
12<16'	16	9
16<26'	99	62
26<40'	287	97
=>40'	691	125

Table 3. Growth in boating between 1981 and 1991 (percent change).

The demand model projects income and population growth which will increase boat registrations in various length categories. These predicted changes from 1991 to 2010 are reported in Table 4. While the County's overall boat population increased by 79 percent from 1981 to 1991, it is projected to increase by 211 percent between 1991 and 2010. The largest percent changes are: 663 percent (from 1,238 to 9,448) for 26<40' boats; 534 percent (from 1,145 to 7,311) for <12' class (probably indicating continued growth of personal watercraft), and 489 percent (from 186 to 1,096) for boats \geq 40' in length. There will be a proportionally greater number of larger boats. This tendency will influence boater choice in selecting wet slip, dry storage, ramp, or private dock. Larger boats have deeper drafts and require deeper entrance channel depths to access open water from a slip, boat ramp or private dock. The trend towards purchasing larger, deeper draft boats means that waterway management issues, such as maintenance dredging, will become more critical in the future.

Boat Class Size	Length (ft) Average	Draft (Avg., ft.)	Actual	(1991)	Projected	(2010)	Percent Increase
			Number	Percent	Number	Percent	
<12	10	0.5	1,154	8.25	7,311	16.96	534
12<16	14	0.8	3,761	27.10	4,507	10.46	20
16<26	21	1.5	7,352	52.98	20,597	47.79	180
26<40	33	3.0	1,238	8.92	9,448	21.92	663
=>40	54	6.2	186	1.34	1,096	2.54	489
Other*	NA	NA	194	1.40	NA	NA	NA
Total	NA	NA	13,876	NA	43,103	NA	211

*other - canoes and dealer inventories of all length classes

Table 4. Change in the distribution of boats by length class and projected demand (1991-2010).

C. Boaters and Shore Facility Use

The sample survey of Charlotte County boaters revealed a number of characteristics about the boaters, their boats and recreational activities. An average boater is 61 years of age, white, with no dependent children, a high school graduate, and has a household income of \$43,477. The typical recreational boat in the county is 19-ft. long, of fiberglass construction, has a 1.96 ft. draft (mean), and is powered by a 140-h.p. gasoline engine. The boaters' three top-rated on-the-water activities are: pleasure cruising (78.7 percent), recreational fishing (73.0 percent) and wildlife viewing (50.7 percent) (Bell, 1994).

Charlotte County boaters gain access to the water from marinas, ramps and private docks. Table 5 shows the relative distributions. It is noteworthy that over half (57 percent) rely on private docks; only 36 percent use ramps and 7 percent use marinas. Ramp use in the county is about half the figure for Florida.⁵ This reflects, perhaps, not only large numbers of salt-water accessible parcels, but also the marketing strategies of the County's developers.

Facility	Charlotte County
Marina	7
Ramp	36
Private Dock	57

Table 5. Boat access to the water in 1993 (percent).

Marina level of use is explained by boat ramp fees, marina fees, and boat length. Analysis of the random sample boater survey shows that higher ramp fees would encourage marina use while high marina fees would discourage marina use. Boat length is important because as length increases, ramp use (due to weight and size limitations) or dock use (due to channel depth restrictions) become more problematic. Table 6 shows boat population estimates, based on the random sample boater survey, of actual use (1991) and projected demand (2010) in each of the boat length classes.

Ramp use estimates also are based on probability projections from the sample survey. Year-round residence was an important explanatory determinant: these boaters tend to have a higher probability of using a boat ramp, which is understandable since residents have a better knowledge of available boat ramps. Conversely, boaters who boat more frequently are more likely to gain access to the water by private dock or marina slip. Also, boat length is inversely related to boat ramp use; an increase in boat length ultimately reaches a threshold where length excludes ramp use. Table 7 reports actual and projected ramp demand by boat length class.

The probability of using a private dock is best explained by residence and boating intensity. Year-round residents tend to select private docks less (i.e., prefer boat ramps) and this may reflect the second home in Florida effect, that many owners of private docks are winter residents. Further, and in sharp contrast to boat ramp users, private dock owners are engaged in significantly more boating days than those who boat from ramps. In contrast to marinas and boat ramps, boat length is unrelated to private dock use, meaning that Charlotte County private docks accommodate all kinds of boats regardless of length. Table 8 gives the actual and projected private dock demand for each of the boat length classes.

D. Marina Demand

Marinas in Charlotte County are multi-purpose enterprises servicing tourists/cruising boaters as well as local residents. In 1991, the use ratio was about 25:75/100 boaters, respectively. Except in a few cases, marinas rarely operate at fully capacity; the vacancy rate in 1993 was 20 percent. Table 9 shows the demand projections to 2010 and baseline supply (1991) in the county. The supply baseline, for the 26 marinas reported by the FDEP in 1991, was 2,497 slips/racks; 47 percent were wet slips.⁶

Boat Length Class (ft)	Boat	Population
	Actual (1991)	Projected (2010)
<12	12	75
12<16	86	102
16<26	825	2,293
26<40	178	1,350
=>40	52	302
Total	1,153	4,122

Table 6. Projected marina demand (OLS model)

Boat Length Class (ft)	Boat	Population
	Actual (1991)	Projected (2010)
<12	788	4,759
12<16	2,040	2425
16<26	2,669	7,415
26<40	173	1,313
=>40	3	20
Total	5,673	15,932

Table 7. Projected boat ramp demand (Logit model)

Boat Length Class (ft)	Boat	Population
	Actual (1991)	Projected (2010)
<12	685	4,130
12<16	2,158	2,565
16<26	4,248	11,802
26<40	723	5,475
=>40	111	648
Total	7,925	24,620

Table 8. Projected private dock demand (OLS model)

A perusal of Table 9 shows that wet-dry slip demand should be adequate for the near future without additional supply, given that there are 485 vacancies in the baseline year. By the year 2000, 494 new slips will be needed, assuming all present excess capacity is used. By 2010, existing capacity must more than double -- from 2,497 in the base period to 5,918 (i.e., 2,497 plus 3,421). This represents an increase of 137 percent. The values for excess wet/dry slips in Table 9 are "incremental" over the base stock; they must be subtracted to get the incremental increase from period to period (i.e., 3,421 in 2010 less 1,647 in 2005 yields 774 new slips/racks are needed over the 5-year interval). Note that there is an increase in wet slip use over the period which reflects increases both in boat length (.167 ft/yr) and per capita income.⁷ Probability computations show that tourists/cruising boaters represent 31.8 percent of the slip demand. The ratio of tourist to resident demand is implicitly held constant throughout the projection period.

Supply - Demand	Baseline		Projections		
	1991	1995	2000	2005	2010
Resident Demand*	1,148	1,492	2,030	2,828	4,039
Total Supply	2,497	2,497	2,497	2,497	2,497
(1) Tourists / Transients (25.6%)	639	639	639	639	639
(2) Residents (55.0%)	1,373	1,373	1,373	1,373	1,373
(3) Vacancies (19.4%)	485	310	0	0	0
Total Excess Demand	0	0	494	1,647	3,421
(1) Tourists / Transients	0	0	157	523	1,088
(2) Residents	0	0	337	1,124	2,333
Projected Wet Slips (%)	47.0	47.5	48.4	49.0	49.6
Excess Demand					
(1) Wet Slips	0	0	239	807	1,697
(2) Dry Slips	0	0	200	840	1,724

* Average of OLS and Logit projections

Table 9. Marina demand projections and existing supply (1991 - 2010).

E. Ramp Demand

The analysis of boat ramp demand-supply considered a number of factors in order to determine county needs through the year 2010. User satisfaction with the level of service is

related to providing adequately for peak demand since ramp use tends to be concentrated on weekends and holidays. Ramp facilities must be commensurate with user needs or congestion will ensue. Congestion can lead to user dissatisfaction.

The County, in 1991, had 35 boat lanes (a ramp may have more than one lane). Since a boat must be launched and retrieved for each boat trip, planners may consider that these operations take 20, 30, or even 40 minutes (i.e., closer to 40 minutes during a peak use period). A launch day is considered to have 12 hours. Probability estimates were calculated to determine peaks in demand, though the demographic profile of Charlotte County toward older retired people mitigates against large peaks.

Table 10 presents the demand projections and existing supply for the 1991-2010 period. Though the three supply scenarios are presented -- 20 minutes ('), 30', 40' -- we used the intermediate value of 30' to project demand/supply peak. The result indicates that peak demand/day was not satisfied in 1995 as peak demand exceeded supply by 10 percent, and four additional lanes were needed. There is a need for an additional 51 lanes by the year 2010 and care should be exercised to avoid a significant decline in the level of service.

Supply - Demand	Baseline		Projections		
	1991	1995	2000	2005	2010
Demand Days					
OLS	184,536	228,348	297,540	398,088	549,720
Logit	204,228	248,976	319,680	421,380	573,552
Peak Demand / Day *	754	926	1,132	1,503	2,060
Supply Scenarios/Day (35 Lanes)					
20 Minutes	1,260	1,260	1,260	1,260	1,260
30 Minutes	840	840	840	840	840
40 Minutes	630	630	630	630	630
Demand/Supply (Peak) 30 Minutes	.90	1.10	1.35	1.79	2.45
Needed Boat Lanes	0	4	13	28	51

* Average of OLS and Logit projections

Table 10. Ramp demand projections and existing supply (1991 - 2010).

The random sample boater survey yields additional information regarding boater perceptions with existing levels of service at the county ramps (Table 11). Nearly one-quarter of ramp users felt there were not enough boat ramps in the county in 1993. The same group

(i.e., 24.2 percent) was either somewhat or very dissatisfied with waiting time to use a boat ramp on weekends. Such dissatisfaction is consistent with the demand projections. Table 12 identifies those ramps with parking and waiting time problems.

Questions		Responses	(Percent)	
		Yes	No	Don't Know
Adequate number of boat ramps in Charlotte County		56.3	23.0	20.7
	Very Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Very Dissatisfied
Parking adequacy at boat ramp	50.4	33.8	8.3	7.5
Rate of waiting time to use boat ramp on weekdays		67.6	18.4	1.5
Rate of waiting time to use boat ramp on weekends		49.5	26.3	13.7
				10.5

Source: Telephone Survey

Table 11. Boater satisfaction with levels of service at ramps (1993).

F. Private Dock Demand

Over 57 percent of the registered boaters in Charlotte County berth their vessels at private docks behind single family residences or as part of a dockominium (i.e., with riparian rights). Table 13 shows the demand for private docks through the year 2010. The inventory of salt-water parcels (reported in Section III) identified a total supply of 26,451 residential and vacant parcels in the county (9,203 occupied in 1995 and 17,248 vacant in 1995) where private docks exist or potentially could be located. The county is using only 35 percent of its stock of potential private dock sites (assuming there are no environmental constraints). Table 13 indicates that 92 percent of the available stock will be utilized by the year 2010. As private dock supply approaches build-out, demand will increase for ramps and marina slips.

G. Trip Origins and Destinations

An understanding of the origins and destinations of boat traffic is fundamental to planning the expansion of shore facilities. The random sample boater survey indicates that trip

Somewhat Dissatisfied	Very Dissatisfied
Parking	
Ponce De Leon Park	Punta Gorda Windmill Village
Chuck's Marina	El Jobean Park
Pt. Charlotte Beach Complex	Pt. Charlotte Beach Complex
Riviera Marina	Prairie Creek
Laishley Park	Village of Holiday Lake
Tom Adams Bridge	Tom Adams Bridge
Edgewater / Riverside	Gasparilla Marina
Waiting Time	
Weekdays	
Tom Adams Bridge	Tom Adams Bridge
Laishley Park	Gasparilla Marina
Pt. Charlotte Beach Complex	Pt. Charlotte Beach Complex
El Jobean Park	
Waiting Time	
Weekends	
Laishley Park	Ponce De Leon Park
Charlotte Harbour Camp	Indian Mounds Park
Pt. Charlotte Beach Complex	Gasparilla Marina
Tom Adams Bridge	Pt. Charlotte Beach Complex
El Jobean Park	Tom Adams Bridge

Source: Telephone Survey

Table 12. Boat ramps where users are somewhat or very dissatisfied waiting time.

origins in the county are divided as follows: trips from docks accounts for 61.5 percent; ramps, 32.1 percent; and marinas, 6.6 percent.⁸

Figure 5 (see Appendix 7) shows the relative distribution of geographical locations of trip origins for all (1993) recreational boaters. Those from Punta Gorda lead with 27.7 percent, followed by boaters whose trips originate from Port Charlotte (22.3 percent), Lemon Bay (19.7 percent), Peace River (14.3 percent), and Gulf Cove and Myakka River locations (7.7 percent). It is important to understand that these percentages represent conditions at the time the survey was conducted. As development continues, the percent contribution of boat traffic from each area (e.g., South Gulf Cove) could change.

Figure 6 (see Appendix 7) identifies the relative geographical distribution of trip destinations for all (1993) recreational boaters. The most important destination is Charlotte Harbor (42.7 percent), followed by the Gulf of Mexico (20.3), Lemon Bay (12.0), Peace River (9.7). The site suitability analysis (Section IV) utilizes the geographical distribution of boat trip origins and destinations to evaluate the distribution of existing and suitable future sites for marina, ramp and private dock locations.

Supply - Demand	Baseline		Projections		
	1991	1995	2000	2005	2010
Private Dock Demand Only *	7,599	9,568	12,677	17,252	24,214
Total Supply (Parcels)	26,451	26,451	26,451	26,451	26,451
Demand / Supply	.305	.385	.510	.693	.973
Needed Parcels	0	0	0	0	0
* Average of OLS and Logit projections					

Table 13. Private dock demand projections and existing supply (1991 - 2010).

IV. BOATING RESOURCE GEOGRAPHIC INFORMATION SYSTEM (GIS)

A. GIS Design

The Boating Resource Geographic Information System is an information management system that allows for the capture, storage, integration, analysis, and display of mapped boating information. The Boating GIS integrates data collected by diverse federal, state and county agencies about marine use siting features and related uses on the 30,564 salt-water accessible parcels in Charlotte County, which occur on the ground or in adjoining bay waters. This system links place and object data with automated map archiving, updating and production capabilities. The GIS has been designed as a relational data base which couples an ecosystems approach to boating resource management.¹ It is a powerful analytic tool because of its integrating and information-generating functions. The direction and level of integration are user-stipulated. The marine use site evaluation process may be simulated graphically and numerically by GIS, drawing on the systems' analytic and cartographic capabilities.

Components of the Charlotte County Boating GIS are shown in the flow chart in Figure 7 (see Appendix 7). They include: thematic coverages, data manipulation, processing and storage, analysis, and output components. Thematic coverages are indicated across the top of the flow chart.

The GIS is parcel-based² and each salt-water accessible parcel carries information specific to the Marine Use Siting Study.³ U.S. Geological Survey digital line graphs (DLGs) were obtained from the Southwest Florida Water Management District (SWFWMD) to provide cultural, land use/land cover and shoreline map features for the project base map.⁴ The individual County parcel coverages and DLGs were edge-matched and geographically rectified; where necessary, and when appropriate, the DLG shoreline was adjusted to conform to that of the County parcel data layer. Judgments during this editing process were guided by interpretation of aerial photography and local knowledge.

The 1992 section aerials (1:2,400 scale) were interpreted and field verified to determine current land use and number and type of boat facilities. A parcel identification number (PARID) was assigned to each parcel and the associated data were entered into a spreadsheet. Seagrass coverage was 1982 condition and was compiled at a 1:24,000 scale; it was made available as a GIS coverage by the FDEP's Florida Marine Research Institute (FMRI). The aquatic preserve boundaries were provided as GIS coverages by the FDEP Office of Protected Species Management. The DLGs contain wetland habitat (mangrove, salt marsh, etc.) information which was incorporated into the Boating Resource GIS.

County and municipal half-section assessment maps provided current zoning and subdivision information. Water service line and central sewer information was obtained from county, municipal and private sources.⁵ General characteristics of boat access and water depth were ascertained from NOS hydrographic small-craft charts and a field survey conducted by members of the Charlotte County Marine Advisory Committee. Road access was from a Charlotte County/City of Punta Gorda Metropolitan Planning Organization Atlas (1993).

These data were entered into a spreadsheet and linked to their respective PARIDs. Manatee sighting information was provided by the FMRI and is based on distributional aerial surveys flown twice a month over a 1-2 year period.⁶

All data sources were combined and edited as ARC/INFO 7.0.3 Environmental Systems Research Institute (ESRI) coverages in the Boating Resource GIS. The thematic layers -- land use, boat facilities (docks), water line, central sewer, road access, wetlands, seagrass, aquatic preserve, boat access, water depth -- were obtained at various scales and levels of resolution, necessitating a series of editing procedures in order to align the thematic layers for the purpose of compiling the maps and conducting the geographic analysis.⁷ Data manipulation and pre-processing, as well as the site suitability elements of the system, shown in the flow chart in Figure 7, are described in a subsequent portion of this report. The following section describes the current boating resource conditions which prevail in Charlotte County. The maps and tables which supplement this description are products of the Boating Resource GIS.

B. Basis for Regional Assessment

The locations of the 30,564 salt-water accessible parcels in Charlotte County are shown on the map in Figure 8 (see Appendix 7). The parcels are distributed, from west (Gulf) to east (inland) and south, in five areas, as follows:

Zone 1 (Lemon Bay, Placida Harbor, Turtle Bay, Gasparilla Sound) includes (a) all barrier island communities, as Englewood Beach (Peterson Island), Palm Island Resort and Knight Island (Bocilla Island), Don Pedro Island (Little Gasparilla Island), Boca Grande (Gasparilla Island) and (b) mainland communities of Englewood, Grove City, Cape Haze, Placida;

Zone 2 (South Gulf Cove and El Jobean) includes: (a) west shore of Charlotte Harbor and Myakka River, (b) canal front communities of South Gulf Cove, Gulf Cove, El Jobean, Apollo, Jupiter and Venus Waterways;

Zone 3 (Port Charlotte West of US 41) includes: (a) water bodies of Tippecanoe Bay, Alligator Bay, upper north reach of Charlotte Harbor, (b) canal front communities along Christopher, O'Hara, Manchester, Countryman, East and West Spring Lake, Sunrise, Edgewater Waterways, Grassy Point Estates and Charlotte Harbor (town);

Zone 4 - (Peace River upstream from the US 41 bridge to DeSoto County boundary) includes: (a) water bodies of the Peace River and its tributaries, as Bay Harbor, Hunter Creek, Jim Long Lake, Shell Creek, (b) waterfront communities of Harbor View, Harbour Heights, Deep Creek, Peace River Shores, Peace River Fish Camp, Morgantown, Palm Shores, Sans Souci, Pelican Harbor, Cleveland, Bayshore Park, Solana;

Zone 5 - (Punta Gorda Isles, Alligator Creek and Pirate Harbor) includes: waterways and canal-front communities of Punta Gorda Island, Alligator Creek (North and South Forks), Burnt Store Isles, Pirate Harbor.

Zone	Region	Salt-Water Parcels	Percent
1	Lemon Bay to Gasparilla Sound	3671	12.02
2	South Gulf Cove/El Jobean	7364	24.09
3	Pt. Charlotte West of US 41	5695	18.63
4	Peace River	5958	19.49
5	Punta Gorda Isles/Alligator Creek	7876	25.77
	County Total	30564	100

Table 14. Charlotte County salt-water parcel zones.

C. Land-side Boating Features

1. Land Use and Land Cover (LULC). Section aeriels were photo-interpreted using a 38-tier classification system (see Appendix 1) which is summarized in 9 general LULC categories: residential, commercial, industrial, public, vacant, agricultural, submerged, development constraint, parcelette. Appendix 3a presents summary statistics for the county and 5 zones as parcel counts and relative distributions by LULC and geographic zone. Almost half (47 percent) of all salt-water accessible parcels are vacant. Another 40 percent are residential. Eleven percent have some development constraint.⁸ Major LULCs -- representing 98 percent of the parcels -- are mapped in Figure 10 (see Appendix 7).

There is considerable variability in LULC between the average county distribution and those within the 5 zones. Some noteworthy examples are:

Zone 1 (Lemon Bay to Gasparilla Sound) - higher proportion of residential use (55 percent), lower of vacant condition (28 percent) and lower of development constraint (8 percent);

Zone 2 (Gulf Cove/El Jobean) - considerably lower proportion of residential use (14 percent), much higher of vacant condition (82 percent) and lower with development constraint (3 percent);

Zone 3 (Pt. Charlotte) - high in residential use (61 percent), lower of vacant (37 percent) and much lower (< 1 percent) with development constraint;

Zone 4 (Peace River) - lower both in residential use and vacant (26 and 23 percent) and much higher (49 percent) with development constraint;

Zone 5 (Punta Gorda) - close to the County average in residential use and vacant condition (54 and 46 percent) but much lower (< 1 percent) in development constraint (Appendix 3a).

The other two percent of the County's salt-water parcels are in commercial, industrial, public, agricultural, submerged and parcelette use or cover. These other uses are presented

in Figure 11 (see Appendix 7) and Appendix 3b. Zone 1 (Lemon Bay to Gasparilla Sound) has the greatest proportion of these other uses and land covers. The Peace River (Zone 4) has the second largest concentration. Appendix 3b shows the relation of numbers of parcels to parcel area in the 9 LULC categories and across the 5 geographic zones.

There are a number of striking disparities -- between relative (percent) numbers of parcels and area of parcels -- that must be understood in order to interpret the accompanying maps in Figures 10 - 19 (see Appendix 7). Compare, for example, in Appendix 3b (upper two rows) the county area and parcel counts: for residential parcels, there is double the number of parcels to relative area; for development constraint parcels, there is half the number of parcels to relative area. This relation influences the depiction of parcel features on the accompanying maps. For example, few "development constraint" parcels in Zones 3 (Pt. Charlotte) and 5 (Punta Gorda) account for the absence of roads, water and sewer utility services.⁹

2. Boat Docks. There are 12,070 boat docks (in 1992) in Charlotte County distributed on 9,304 parcels (Appendix 3c). Over 99 percent are situated on residential (88 percent), commercial (8 percent) and vacant (4 percent) lots. Ninety-six percent of all salt-water parcels with docks are in residential use; this ranges from 70 to 99 percent across the zones. There is much wider variation in the distribution of commercial and vacant parcels with docks across the zones. Examples include:

- Zone 1 (Lemon Bay to Gasparilla Sound)** - more than double the county average on a percentage basis (commercial docks and vacant parcels with docks);
- Zone 2 (Gulf Cove/El Jobean)** - no commercial docks and negligible (<1 percent) vacant with docks;
- Zone 3 (Pt. Charlotte) and Zone 5 (Punta Gorda)** - about half the County average of commercial docks and negligible (<1 percent) vacant with docks.

The highest concentrations of boat docks are situated in the following locations:

- residential docks** - Zone 5 (Punta Gorda, 42 percent), Zone 3 (Pt. Charlotte, 24 percent), Zone 1 (Lemon Bay to Gasparilla Sound, 21 percent);
- commercial docks** - Zone 1 (Lemon Bay to Gasparilla Sound, 58 percent), Zone 5 (Punta Gorda, 23 percent);
- vacant parcels with docks** - Zone 1 (Lemon Bay to Gasparilla Sound, 73 percent).

Table 15 shows the relation of parcels with docks to the total number of salt-water accessible parcels. The zones fall into two parcel groups: Zones 2 (Gulf Cove) and 4 (Peace River) where ≤ 10 percent have docks; and Zones 1, 3 and 5, where 45-50 percent have docks. The map in Figure 12 (see Appendix 7) shows these distributions, however, the "parcels without docks" category includes the relatively few numbers of large-area parcels in other LULCs (e.g., submerged, development constraint) which tends to mask the relative concentrations across the county.

County	Salt-water	Parcels
	With Docks	Total
Total	9304	30564
Row %	30.44	
Zone 1	1649	3671
Row %	44.92	
Zone 2	593	7364
Row %	8.05	
Zone 3	2543	5695
Row %	44.65	
Zone 4	632	5958
Row %	10.61	
Zone 5	3887	7876
Row %	49.35	

Table 15. Relation of parcels with docks to total salt-water parcels.

3. Road Access. Seventy-eight percent of the salt-water accessible parcels have local road access; 14 percent have no road access, and 8 percent are adjacent to urban/rural collectors (Appendix 3d). Most zones are consistent with these average conditions. A noteworthy exception is Zone 4 (Peace River) where these conditions are reversed: 79 percent of the parcels have no road access and 10 percent are adjacent to local roads. This exception is due to the large concentration of development constraint, submerged, and agricultural parcels situated along the Peace River. The map in Figure 13 (see Appendix 7) illustrates these conditions (compare with major land uses in Figure 10 - see Appendix 7).

4. Water Service Line. Seventy percent of salt-water accessible parcels have access to county or municipal water service lines, while 30 percent have no potable water supply (Appendix 3e). Major exceptions to average conditions are: Zones 2 (Gulf Cove) and 4 (Peace River) where approximately 50 and 70 percent of the parcels have no access to water service lines. Appendix 3e shows that the more urbanized locations, such as Zones 3 (Pt. Charlotte) and 5 (Punta Gorda), have a higher percent with a larger main size. The map in Figure 14 (see Appendix 7) shows the general distributions of parcels with and without water line access.

5. Central Sewer. Only 41 percent of the parcels have central sewer service (Appendix 3f). Wide contrasts exist across the county in the distribution of this service, ranging from Zone 5 (Punta Gorda) with 83 percent having central sewer connections, Zone 3 (Pt. Char-

lotte) with 55 percent, Zone 2 (Gulf Cove) 29 percent, Zone 1 (Lemon Bay to Gasparilla Sound) 14 percent, and Zone 4 (Peace River) 3 percent. The map in Figure 15 (see Appendix 7) shows these distributions.

D. Water-side Boating Features

1. **Boat Access.** This feature refers to improved (dredged) and unimproved (natural) water-side conditions at the parcel location.¹⁰ Eighty-two percent of the county's salt-water accessible parcels have improved boat access (Table 16). Over half (52 percent) of the improved access is associated with vacant parcels; another 45 percent is associated with residential use (Appendix 4a). Ninety-three percent of unimproved boat access is found equally divided among residential, vacant, and development constraint type parcels (Appendix 4b). The highest concentrations of residential parcels with improved boat access are found in Zone 5 (Punta Gorda) 37 percent and Zone 3 (Pt. Charlotte) 31 percent. The highest concentration of vacant parcels with improved boat access are found in Zone 2 (Gulf Cove) 46 percent. There are 1,084 parcels with development constraints that have improved or unimproved access. There are 24 percent with improved access. The 76 percent with unimproved access are situated primarily along the Peace River in Zone 4 (Appendix 4b). The map in Figure 16 (see Appendix 7) shows county distributions.¹¹

County	Parcels (#)	Total (%)
Improved	25044	81.94
Unimproved	2887	9.45
Questionable	39	0.13
N/A	2594	8.48
Total	30564	100.00

Table 16. General conditions of boat access (1992).

2. **Water Depth.** This feature refers to waterway depth adjacent to a parcel location.¹² Almost two-thirds of the parcels are adjacent to waterways with a depth ≥ 3 ft. (Table 17). Ninety-eight percent of these parcels are vacant (56 percent) or residential (42 percent) (Appendix 4c). Most zones parallel the county average, although a noteworthy exception is Zone 2 (Gulf Cove) where 90 percent of the parcels with ≥ 3 ft water depth are vacant. The largest concentration of shallow water (< 3 ft. depth) parcels is found in Zone 4 (Peace River) 46 percent (Appendix 4d). The map in Figure 17 (see Appendix 7) shows the distribution of shallow (< 3 ft.) and deep (≥ 3 ft.) water locations.

County	Parcels (#)	Total (%)
≥ 3 ft.	18860	61.71
< 3 ft.	3446	11.27
Questionable	5574	18.24
N/A	2684	8.78
Total	30564	100.00

Table 17. General conditions of water depth (1992).

3. Wetlands.¹³ Approximately 9 percent of all parcels contain some wetland; two-thirds are located in Zone 4 (Peace River) and another 21 percent are in Zone 1 (Lemon Bay to Gasparilla Sound, Appendix 4e).¹⁴ Seventy-nine percent are found on parcels with development constraints and 16 percent on vacant lots (Appendix 4f). Over half of the residential parcels and vacant parcels with wetlands are situated in Zone 1 (Lemon Bay to Gasparilla Sound). Note on the map showing these relations (Figure 18 - see Appendix 7) that there are a small number of large area wetland parcels in Zone 2 (Gulf Cove, east shore of Myakka River) and Zone 3 (Pt. Charlotte adjoining Tippecanoe Bay).

4. Aquatic Preserve.¹⁵ Only 7 percent of the parcels are adjacent to aquatic preserves (AP): 4 percent in Lemon Bay AP and 3 percent in Gasparilla Sound / Charlotte Harbor AP (Table 17). All of the salt-water accessible parcels in Zone 1 are adjacent to APs: 87 percent are in residential and vacant LULC. Charlotte Harbor AP covers parcels in Zone 1 (Lemon Bay to Gasparilla Sound), Zone 3 (Pt. Charlotte) and Zone 5 (Punta Gorda): 37 percent are residential, 26 percent are vacant, and another 25 percent have development constraints. The map in Figure 19 (see Appendix 7) shows that most canal developments -- Grove City (Zone 1), South Gulf Cove (Zone 2), Manchester Waterway (Zone 3), Palm Shores (Zone 4), Pirate Harbor (Zone 5) -- are situated outside the aquatic preserve boundaries. However, boats from these canal-front waterways must traverse AP submerged lands to gain access to boating and fishing waters.

5. Seagrass. The map in Figure 20 (see Appendix 7) shows the distribution of seagrass in Charlotte County. This information is not part of the parcel-level data base but was included as a separate coverage in order to take into account this important, sensitive habitat when evaluating potential sites for marinas, ramps and private docks. Zone 1 (Lemon Bay to Gasparilla Sound) waters contain extensive seagrass beds (with the exception of the central bay north of the Tom Adams bridge, Peterson Channel, Stump Pass channel and the Intracoastal Waterway). Boat traffic in Lemon Bay, outside the natural and dredged channels, cannot avoid impacting these beds. The county's seagrasses in Charlotte Harbor are situated as fringes along the east, west and north shores. Boat traffic impact in Charlotte Harbor areas

is limited predominantly to vessels entering and exiting canal-front developments en route to the harbor's deep water, and fishermen plying the beds for trout, redfish and other game fish.

6. Manatees. Information on the distribution of manatees is provided to the Board of County Commissioners (BCC) as a general tool for planning and managing public boating access in Charlotte County (see the map in Figure 21 - see Appendix 7). The presence and density of manatees should be taken into consideration by the BCC and County Marine Advisory Committee in determining whether and where slow speed and/or manatee protection zones may be needed.¹⁶

The suitability analysis used in this study to site marinas, ramps and docks, however, does not include manatee data provided by the Florida Marine Research Institute, due to the problem with properly interpreting "density" measurements relating manatees' use of the County's surface waters. When reviewing the manatee map (Figure 21), the reader is advised to consider the designations of dense and medium manatee density as *relative* measures. These designations serve as a guide to the relative distribution of manatees in Charlotte County. The number of manatees in a "high" manatee density area in the county may be significantly less in surrounding coastal counties which may have thermal outfalls and other known manatee gathering areas.¹⁷

V. SITE SUITABILITY ANALYSIS

A. Rating System¹

The goal of the site analysis is to evaluate the suitability of a parcel for future use as a marina, boat ramp or private dock site. The methodology consists of a point system which scores a parcel's land-based attributes and water-side environmental conditions. A development suitability rating (Preferred Water-Dependent Use, or PWDU) is assigned to each candidate parcel. This rating is based on an evaluation of developmental and environmental criteria, including vacant adjoining parcels, acreage, land use, land-side infrastructure (water, sewer, road), aquatic preserve, wetland, seagrass, water depth, and boat access. Sites with a cumulative low point score for environmental and developmental parameters are considered poor candidates for intensive uses, such as sport and industrial marinas, commercial docks, and waterfront hotels (PWDU I). They may be considered adequate, however, for less intensive uses, including boat ramps, waterfront restaurants and residential developments (PWDU II).² Current zoning, while not considered in the analysis, is included for reference in the tables. It is assumed that zoning is flexible and can be amended.

Salt-water accessible parcels are subjected to a two-step analysis. For Step 1, Parcel Screening, a parcel must equal or exceed specific criteria (Table 18) to be eligible for further consideration in Step 2, Site Suitability Rating. Parcels which pass Step 1 are rated, in Step 2, according to their suitability for siting a marina or boat ramp. The suitability of a parcel, to site a marina or ramp, is determined by assigning an impact rating (0,1,2) based on the condition of each of the parcel's environmental (e.g., sea grass, wetland, aquatic preserve) and developmental attributes (e.g., boat access, water depth, central sewer, water service line, etc.). The Total Environmental Impact Score for a parcel is the sum of all environmental attribute impact ratings, and the Total Developmental Impact Score is the sum of all developmental attribute impact ratings. The final suitability rating for a parcel is the difference of the Total Environmental Impact Score and the Total Developmental Impact Score. A site receiving a final suitability rating of 0-5 points is one suitable for the less intensive PWDU II uses.³ A parcel receiving a final rating of 6-8 points is considered a fair candidate, and is suitable for all PWDU II uses. A PWDU I category is reserved for parcels receiving final ratings of 9-13 points.

Table 19 summarizes criteria used in to evaluate the environmental suitability of private docks on residential and vacant parcels. The attributes of all selected parcels, with and without docks, were assigned an environmental impact rating based on the presence of wetlands, boat access (dredged channel), location adjacent to an aquatic preserve, and water depth. Access and water depth attributes are used as surrogate measures for the presence of seagrass. It is assumed that seagrass is not present in dredged channels with improved access or in water with a depth ≥ 3 feet (mllw). An environmental impact rating of good, fair or poor is derived by adding assessment points. Parcels accumulating less than 3 points have low environmental impact; those with 4 - 5 points have medium impact; and those with 6 - 8 points are high impact sites where dock construction should be discouraged.

Attribute	Assessment Points	**** Database Value
	* Impact Scores	
Environmental Considerations		
Wetlands		
Yes	2	Basic = 4
No	0	Basic ne 4
** Seagrass		
Dense	2	** Interpreted
Sparse or Patchy	1	** Interpreted
None	0	** Interpreted
Aquatic Preserve		
Yes	2	1 or 2
No	0	0
Developmental Considerations		
Access		
Improved	2	1, 3 or 4
Unimproved	0	2
Water Depth		
>= 3 feet	2	1, 3 or 4
< 3 feet	0	2
Water Line Service Availability		
Yes	2	0, 2, 3 or 4
No	0	1
Central Sewer Availability		
Yes	2	0 or 2
No	0	1
Roads		
Collector or larger for Marina		
Yes	2	1, 2, 3 or 4
No	0	5 or 6
Any Paved for Ramp		
Yes	2	1, 2, 3, 4 or 5
No	0	6
Acreage of vacant adjacent parcel		
< 1 acre	0	< 1
1 - 5 acres	1	1 - 5
> 5 acres	2	> 5

***Zoning for Marina's and Ramps

*Subtract values for total environmental impact rating from total development rating to determine MAOD rating.

**Seagrass interpretation from FMRI digital files.

***Current zoning may be inappropriate for marina or ramp.

**** See Appendix 5 for description of attribute values.

0 - 5 points site is poor (PWDU II)
6 - 8 points site is fair (PWDU II)
9 - 13 points site is good (PWDU I)

Table 18. Rating index for marinas and ramps.

Attribute	Assessment Points	** Database Value
* Impact Rating		
Environmental Considerations		
Wetlands		
Yes	2	Basic = 4
No	0	Basic ne 4
Boat Access		
Improved	0	1, 3 or 4
Unimproved	2	2
Aquatic Preserve		
Yes	2	1 or 2
No	0	0
Water Depth		
>= 3 feet	0	1, 3 or 4
< 3 feet	2	2

* Add values for total environmental impact rating.

** See Appendix 5 for description of attribute values

0 - 3 points site is low impact or good (PWDU I)

4 - 5 points site is medium impact or fair (PWDU II)

6 - 8 points site is high impact or poor (PWDU II)

Table 19. Rating index for docks.

B. Results and Discussion

1. Marinas. There are 20 public access marinas (see Figure 22 - see Appendix 7): 15 have vacant adjacent parcels, 3 contain wetland, and 9 are located near seagrass (Appendix 5a). The analysis indicates 2 marinas with good, 7 with fair, and 11 with poor PWDU ratings (Appendix 5b). There are 20 vacant parcels that are potentially suitable for new marina development (Appendix 5d)⁴ and all 20 parcels receive PWDU ratings of fair and good (Appendix 5e).

Bell (1994) projects a need for an additional 1,697 wet slips and 1,724 dry stack storage spaces by the year 2010. The county's ability to meet these demands is based on available acreage of suitable sites. This study uses average densities of 45 boats per acre for wet slips and 60 boats (assuming 3 stacks of 20 boats each) per acre for dry stack storage (Tupper and Antonini, 1996). County height restrictions limit the number of dry boat stacks to

three. These densities provide the basis for determining additional acreage required to meet anticipated needs. It is estimated that Charlotte County will need 67 acres to meet anticipated marina facility needs by the year 2010: 29 acres will be required for dry facilities and 38 acres for wet slips.⁵ The total available acreage, both from existing marinas by expanding onto adjacent vacant parcels, and by development at new sites, is presented in Table 20. Acreage totals are limited to existing marinas and new parcels which allow for intensive marina use (PWDU I).

Marinas	Acreage
Existing Marina Expansion on * VAP	.04
New Parcels	107.0
Total	107.4

*VAP - Vacant Adjacent Parcel

Table 20. Acreage for available marina wet and dry slips (PWDUI).

There is <1 acre available for wet and dry slips by expanding existing marinas onto vacant adjacent parcels. An additional 107 acres are available for new marinas. There is a surplus of 40 acres for marina development (107 acres available minus 67 acres needed). Table 21 shows the geographic distribution of acreage available for marinas. The zones correspond to Bell's (1994) regions of boat trip origins and destinations from marinas. The acreage total for each zone is for PWDU I (good) rated land.⁶

Port Charlotte (Zone 3) has the greatest potential to satisfy future marina needs (up to 3,420 wet slips or 4,560 dry slips). Furthermore, existing marina expansion in the Punta Gorda Isles region (Zone 5) potentially could accommodate up to 1,200 dry slips or 900 wet slips. Space for an additional 450 wet or 600 dry slips may be available in the South Gulf Cove / El Jobean area (Zone 2). Conversely, shortfalls in acreage may occur in Lemon Bay to Gasparilla Sound (Zone 1) and the Peace River (Zone 4). The analysis reveals that future wet and dry slip needs cannot be accommodated solely by the expansion of existing marinas. However, potential new sites appear to provide more than enough acreage to satisfy future marina demand, but available acreage may not be distributed geographically in a manner that is consistent with this future demand (Figure 22).

Zone	Existing Marinas: Acreage for Vacant Adjacent Parcels	Acreage of Vacant Potential Sites	*Total Acreage
Zone 1. Lemon Bay - Gasparilla Sound	0	0	0
Zone 2. South Gulf Cove, El Jobean	0	10	10
Zone 3. Port Charlotte West	0	75	75
Zone 4. Peace River	0.4	2	2
Zone 5. Punta Gorda Isles	0	20	20
Total	.04	107	107

* Acreage Values have been rounded up to the nearest whole acre.

Table 21. Acreage of potential marina expansion and development zone.

2. Private Docks. Table 22 summarizes the results of the suitability analysis of residential and vacant parcels with *no* docks. There are 16,220 parcels (94 percent) with low environmental impact, 696 (4 percent) medium impact parcels, and 404 parcels (2 percent) where new docks would have a potentially high environmental impact.

Table 23 provides a summary of residential and vacant parcels by geographic zone. The table shows that low impact parcels are concentrated in the following zones: South Gulf Cove Zone (40 percent), Punta Gorda Isles Zone, Alligator Creek (24 percent) and Port Charlotte West of US 41 (19 percent). The greatest number of the high impact parcels, 304 or 75 percent, are located in the Lemon Bay to Gasparilla Sound Zone.

Summary information for residential and vacant parcels *with* docks is presented in Table 24. There are 8,819 parcels of low environmental impact, 262 medium impact parcels, and 130 with a high impact. The majority of these parcels, 96 percent, are low impact; the remainder, 4 percent, are medium or high impact. Table 25 shows the geographic distribution of these parcels in the 5 zones. Low impact parcels are concentrated in the following zones: Punta Gorda Isles, Alligator Creek (44 percent) and Port Charlotte West of US 41 (28 percent). The greatest number of medium (118, 91 percent) and high (158, or 60 percent) impact parcels are located in Lemon Bay to Gasparilla Sound.

The map in Figure 23 (see Appendix 7) presents ratings for residential parcels with and without docks. Ratings for vacant parcels with and without docks are presented in Figure 24 (see Appendix 7).

Fifty-seven percent of all boating trips in Charlotte County originate from private docks (Bell, 1994). The magnitude of this statistic is reflected in Bell's projected demand for 16,615

Environmental Impact Rating	Number of Parcels		IMPACT TOTALS	
	Residential	Vacant	All Parcels	% Total
0 - 3 points site is low impact PWDU = I	3001	13219	16220	94
4 - 5 points site is medium impact PWDU = II	241	455	696	4
6 - 8 points site is high impact PWDU = II	112	292	404	2
TOTAL	3354	13966	17320	100

Table 22. Summary suitability ratings for residential and vacant parcels with no docks.

Environmental Impact by Zone	Number of Parcels		IMPACT TOTALS	
	Residential	Vacant	All Parcels	% Total
PWDU I: Low Impact Parcels (0 - 3 points)				
Zone 1. Lemon Bay to Gasparilla Sound	447	557	1004	6
Zone 2. South Gulf Cove, El Jobean etc.	414	6036	6450	40
Zone 3. Port Charlotte West of US 41	936	2073	3009	19
Zone 4. Peace River Upstream US 41	793	1073	1866	11
Zone 5. Punta Gorda Isles, Alligator Creek	411	3480	3891	24
Total	3001	13219	16220	100
PWDU II: Medium Impact Parcels (4 - 5 points)				
Zone 1. Lemon Bay to Gasparilla Sound	60	165	225	32
Zone 2. South Gulf Cove, El Jobean etc.	1	19	20	3
Zone 3. Port Charlotte West of US 41	0	22	22	3
Zone 4. Peace River Upstream US 41	165	229	394	57
Zone 5. Punta Gorda Isles, Alligator Creek	15	20	35	5
Total	241	455	696	100
PWDU II: High Impact Parcels (6 - 8 points)				
Zone 1. Lemon Bay to Gasparilla Sound	86	218	304	75
Zone 2. South Gulf Cove, El Jobean etc.	1	10	11	3
Zone 3. Port Charlotte West of US 41	18	23	41	10
Zone 4. Peace River Upstream US 41	6	35	41	10
Zone 5. Punta Gorda Isles, Alligator Creek	1	6	7	2
Total	112	292	404	100

Table 23. Distribution of suitability-rated residential and vacant parcels with no docks by

Environmental Impact Rating	Number of Parcels		IMPACT TOTALS	
	Residential	Vacant	All Parcels	% Total
0 - 3 points site is low impact PWDU = I	8593	226	8819	96
4 - 5 points site is medium impact PWDU = II	231	31	262	3
6 - 8 points site is high impact PWDU = II	112	18	130	1
TOTAL	8936	275	9211	100

Table 24. Summary suitability ratings for residential and vacant parcels with docks.

Environmental Impact by Zone	Number of Parcels		IMPACT TOTALS	
	Residential	Vacant	All Parcels	% Total
PWDU I: Low Impact Parcels (0 - 3 points)				
Zone 1. Lemon Bay to Gasparilla Sound	1203	110	1313	15
Zone 2. South Gulf Cove, El Jobean etc.	586	6	592	7
Zone 3. Port Charlotte West of US 41	2521	8	2529	28
Zone 4. Peace River Upstream US 41	496	20	516	6
Zone 5. Punta Gorda Isles, Alligator Creek	3787	82	3869	44
Total	8593	226	8819	100
PWDU II: Medium Impact Parcels (4 - 5 points)				
Zone 1. Lemon Bay to Gasparilla Sound	131	27	158	60
Zone 2. South Gulf Cove, El Jobean etc.	0	0	0	0
Zone 3. Port Charlotte West of US 41	0	0	0	0
Zone 4. Peace River Upstream US 41	95	4	99	38
Zone 5. Punta Gorda Isles, Alligator Creek	5	0	5	2
Total	231	31	262	100
PWDU II: High Impact Parcels (6 - 8 points)				
Zone 1. Lemon Bay to Gasparilla Sound	102	16	118	91
Zone 2. South Gulf Cove, El Jobean etc.	1	0	1	1
Zone 3. Port Charlotte West of US 41	4	1	5	4
Zone 4. Peace River Upstream US 41	3	1	4	3
Zone 5. Punta Gorda Isles, Alligator Creek	2	0	2	1
Total	112	18	130	100

Table 25. Distribution of suitability-rated residential and vacant parcels with docks.

private boat docks by the year 2010. An estimate of the total potential supply of salt-water accessible residential and vacant parcels with no environmental constraints provides the basis to determine whether or not enough developable land currently exists to accommodate this anticipated need.

There are currently 26,531 residential and vacant salt-water accessible parcels. A total of 17,320 salt-water accessible residential and vacant parcels with no docks are identified in Tables 22 and 23. The remaining 9,211 parcels, summarized in Tables 24 and 25, represent all residential and vacant parcels which currently have docks.

There are 16,219 parcels which have a low environmental impact; they are assigned a PWDU I category (Tables 22 and 23). The remaining 1,100 medium and high impact parcels are designated PWDU II. Approximately 81 percent of the low impact parcels are vacant. Roughly 65 percent of all PWDU II (medium and high impact) category parcels also are vacant.

A comparison of Bell's estimate of 16,615 required future docks with the 16,220 low impact parcels without docks reveals a potential deficit of 396 docks within the planning horizon. However, there are 696 parcels with medium environmental impact scores (PWDU II). Adding those parcels to the available stock would generate a surplus of 300 parcels for available docks. This allows for some latitude in the permitting of new private docks. Construction of docks on the 404 high impact sites should be discouraged.

Of the 9,211 parcels with docks, 8,819 are considered to have a low environmental impact: they are assigned a PWDU I category (Tables 24 and 25). The remaining 392 medium and high impact parcels are designated PWDU II. The greatest concentration of the medium and high impact residential and vacant parcels with existing docks may be found in Zone 1, from Lemon Bay to Gasparilla Sound.

3. Boat Ramps. The Spring Lake and Port Charlotte Beach sites are the only existing ramp locations that have adjacent vacant parcels.⁷ The Spring Lake and Laishly Park sites are the only ones with a good PWDU rating (Appendix 5i). There are 5 public parcels that are potentially suitable for boat ramps; 4 of these locations have vacant adjacent parcels. (These are described in Appendix 5l and 5m). There are 30 non-public parcels potentially suitable for new boat ramps (Appendix 5j and 5k). All parcels receive PWDU ratings of fair or good.

Bell estimates that 36 percent of the recreational boating trips in Charlotte County originate from ramps. There were 35 ramp lanes within the county in 1992. Bell projects the need for an additional 51 lanes by the year 2010. Average use is 24 boats per lane per day. Each car and trailer requires 600 square feet (.014 acre) of parking space, thus, each lane requires a minimum of .34 acres. This estimate reveals a projected need for 17 additional acres to accommodate 51 additional boat ramp lanes.

A summary of the ramp analysis shows that the expansion potential of all but 2 of the existing boat ramps is poor or fair (Appendix 5h and 5i). However, existing publicly-owned acreage (14 acres) could potentially satisfy the boat ramp needs (Appendix 5l). These acreage estimates, however, do not consider the existing uses of these public parcels, or their surrounding land uses. As with existing marinas, without knowledge of the footprint of existing buildings and infrastructure, it is impossible to use the acreage of existing municipal ramp sites as an indicator of build-out potential. In addition, the analysis does not consider public right-of-way, such as dead-end streets that front the water, which could be candidates for public

boat ramps. Nevertheless, an additional 30 non-public parcels, totaling 193 acres, are identified as potential candidates suitable for boat ramp facilities (Appendix 5j and 5k).

The map in Figure 25 (see Appendix 7) shows these distributions. The combined acreage of selected public and non-public parcels suitable for boat ramps greatly exceeds the projected need for 17 acres (Appendix 5j and 5l). This affords the County great flexibility in the selection of appropriate locations for future ramps.

C. Regional Distributions of Supply and Demand

Tables 26, 27, 28 present a comparison of the year 2010 projected demand for marina wet/dry slips, boat ramp lanes and docks, with the existing supply of PWDU I sites.

1. **Marinas.** The geographic distribution of existing wet and dry slips listed in Table 26 was determined from Bell (1994) who projects a county-wide demand, in year 2010, for a total of 5,918 wet and dry slips. Table 26 presents, by geographic zone, a year 2010 estimate of the shortfall (or excess) of slips within each geographic zone. The projected slip demand for each zone was estimated using Bell's boat trip origin percentages. The difference between the projected demand and the current supply gives an indication of the demand that the county must meet. These demand estimates are compared to slip estimates derived from available PWDU I acreage (Table 21). The greatest differences occur in Port Charlotte (Zone 3) where supply exceeds demand, and from Lemon Bay to Gasparilla Sound (Zone 1), where demand exceeds available sites.

2. **Private Docks.** Comparisons of dock demand with dock availability are provided in Table 27. Parcels available for private dock construction meet or exceed Bell's demand estimates for all zones but Lemon Bay to Gasparilla Sound (Zone 1). The results indicate a shortfall of 4,495 suitable parcels between projected demand and availability for Zone 1.

3. **Ramps.** Table 28 presents, for each geographic zone, the projected excess demand for ramp lanes. The projections are based on the procedure outlined by Bell (Table 25, 1994). The existing supply of ramp lanes in Table 28 was determined from Bell (Table, 35, 1994). While the estimate was based on a total of 35 lanes in Charlotte County, the projections in Table 28 are based on an existing (1996) supply of 43 lanes. As such, the projected demand for additional lanes will differ from projections in the preceding section of this report.⁸

Zone	Projected 2010 Wet/Dry Slip	Current Supply Wet/Dry Slips	Wet/Dry Slips Excess / Shortfall	Wet/Dry Slips Acreage Needed	Available PWDU Acreage	Acreage Excess / Short- fall
	Demand					
1	3847	138	-3079	71	0	-71
2	592	72	-520	10	10	0
3	0	50	50	0	76	76
4	296	70	-226	5	2	-3
5	888	2012	1124	0	20	20

Table 26. Comparison of projected demand for marina wet and dry slips with available PWDU I acreage.

Zone	Existing Supply of PWDU I Docks	Projected 2010 Dock De- mand	Excess / Shortfall
1	2317	6812	-4495
2	7042	1329	5713
3	5537	3655	1882
4	2382	1329	1053
5	7760	2492	5268

Table 27. Comparisons of projected dock demand to existing supply of PWDU I residential and vacant parcels.

Zone	Existing Supply of Ramp Lanes	Boat Capac- ity Per Day	Projected 2010 Boat Demand Per Day	Projected Total Number of Lanes Needed	Excess Lane Demand	Projected Acre- age Demand	Available PWDU Acreage	Acreage Excess / Short- fall
1	12	288	391	17	5	2	3	1
2	3	72	124	6	3	2	15	13
3	5	120	556	24	19	7	68	61
4	12	288	536	23	11	4	2	-2
5	6	144	165	7	1	1	35	34

Table 28. Comparison of projected demand for boat ramp lanes with available PWDU I acreage.

VI. MARINE USE REGULATIONS

The Florida Administrative Code (Rule 9J-5.012[3]) directs coastal counties to adopt objectives and policies within the coastal management elements of their comprehensive plans which: (a) prioritize shoreline uses, giving priority to water-dependent uses; (b) increase the amount of public access to the beach or shorelines in a manner consistent with projected public needs; (c) establish performance standards for shoreline development; and (d) establish criteria for marina siting. Further, these objectives and policies must address land use compatibility, availability of upland support services, protection of water quality and natural resources, availability of public use, economic need and feasibility, and water depth for adequate boat access. Finally, Rule 9J-5 provides that local governments in coastal areas, which participate in a county-wide marina site plan, must include the plan as part of their coastal management element. Rule 9J-5, however, does not state how these objectives and policies will be implemented; that decision is left to local government.

There are a number of methods by which local governments can fulfill these objectives and policies. Planning is one such mechanism.¹ Charlotte County has undertaken planning for a number of years, having adopted its first Comprehensive Plan in 1966, with subsequent revisions. Planning in Florida, since the early 1980s, has become a quasi-regulatory activity and has moved to the forefront of public land use policy. This Sea Grant report culminates the Charlotte County marine land and water use siting study, which was undertaken in fulfillment of the policies of the 1988 Charlotte County Comprehensive Plan, which, in turn, was done in compliance with Chapter 163 and Rule 9J-5 as amended in 1985 following the second Environmental Land Management Study (ELMS, 1983). It is anticipated that the marine use study findings will be incorporated -- in whole or in part -- into the 1997 Comprehensive Plan transmitted by the Board of County Commissioners on March 18, 1997 to the Florida Department of Community Affairs.

This marine use study is not the only planning-oriented research which addresses local boating activities. Charlotte County also has contracted the services of a consulting firm to develop its Recreation, Parks, and Open Space Master Plan (Wallace, Roberts & Todd, 1997) which, upon completion, will help guide the growth of the County's park facilities and recreational programs. The recreational importance of boating is not overlooked in this Master Plan; the results of a County-wide survey indicate that 91 percent of respondents consider recreational boating to be the most important general recreational activity in Charlotte County. This figure is consistent with information presented in the introduction of this Sea Grant report which states that 99 percent of boating activities in Charlotte County are recreation/pleasure-oriented. Both statistics affirm Charlotte County's image as a waterfront community and the need to plan for future public access to the County's waters. The findings of both studies should be incorporated into the County Comprehensive Plan.

The County Future Land Use Map (FLUM) is a visual representation of the Comprehensive Plan. It is also a blueprint for the county's future. Illustrated on the FLUM are 16 use categories; they range from "Agriculture/Conservation" intended primarily for low-intensity uses, to "Industrial" within which the County envisions its most intensive development and land use activities. The FLUM also contains several "overlay districts" intended to provide addi-

tional guidance for land use activities which may be needed to conserve the economic, natural or other resources found in each district. Generally, FLUM categories -- along with the overlay districts -- are broadly defined and rely on their underlying zoning to clarify and refine the density and intensity of land use.

The establishment of zoning districts is another tool available for local governments to implement public land use policy.² Charlotte County adopted its first Zoning Code in 1962 and, since then, has amended it on several occasions. The current Zoning Code was adopted in 1989 and allows water-dependent activities in a number of districts, from private docking facilities in residential districts to full-service marinas in commercial and more intensive zones. Water-dependent and water-related uses allowed within zoning districts are summarized in Appendix 6.

The Zoning Code establishes a series of hierarchical uses within general categories with the opportunity for the establishment of a water-dependent use or structure as either a principal or accessory use, or through a special exception. For example, one may establish a restaurant (a use which is neither particularly water-dependent or water-related) as a principal use within the Commercial Office Park District. A strong case could be made to allow the installation of a multi-slip dock for boater customers as an accessory use, especially since such establishments presently exist in Charlotte County and are common throughout Florida and the U.S.

Zoning districts -- except for the Marine Park District and, possibly, the Environmentally Sensitive District -- do not take into consideration the natural resources which could be negatively impacted by the development of intensive on-the-water, over-the-water, or abutting uses and structures. Typically, design standards are concerned with setbacks, lot sizes, and other physical development constraints, and not with the presence of seagrass, mangrove, sensitive benthic communities, or other valued estuarine resources. Finally, it is important to note that the inclusion of water-dependent or water-related uses within a district does not guarantee public access through the development of a property within that district. In fact, requiring a private property owner to provide public access as a condition for development approval may be subject to legal challenge as a taking or exaction.

Regulation, which is often the tool used to implement planning and zoning, also may be used to help protect marine resources. Through land development regulations, adopted to implement the 1988 Comprehensive Plan, Charlotte County has established some limited, local protection for marine resources, primarily through the establishment of a 15 ft. buffer zone between surface waters/wetlands and development activities. Notwithstanding this requirement, the county has opted to stay out of the regulatory arena, and has preferred to defer authority to other public regulatory agencies.³

The Comprehensive Plan also provides that the county will cooperate with the FDEP in the management of aquatic preserves, of which three (Lemon Bay, Cape Haze, Gasparilla Sound/Charlotte Harbor) are situated within Charlotte County's boundaries. The Charlotte Harbor Aquatic Preserves Management Plan, Lemon Bay Aquatic Preserve Management Plan, and Charlotte Harbor Surface Water Improvement and Management Plan, were taken into consideration during the development of the Marine Land and Water Use Siting Study.⁴

The Lemon Bay Aquatic Preserve Management Plan is unique in that it classifies Lemon Bay into Resource Protection Areas (RPAs), which are based on the quality of the marine resources within each zone and on land-side zoning and land use designations of the

adjacent upland properties. Table 29 lists the RPAs which occur in the Lemon Bay Aquatic Preserve and the activities allowed in each (FDNR, 1991).

Management/Resource Protection Areas	Allowable Uses
Single-Family - Multi-Family - Commercial - Public Recreation / Primary Resource Protection Area	Utility easements within designated corridors, private residential docks, private residential multi-slip docks, public docks, ramps
Public Recreation - Preservation / Primary Resource Protection Area	Utility easements within designated corridors, public docks
Single-Family - Multi-Family / Primary Resource Protection Area	Utility easements within designated corridors, private residential docks, private residential multi-slip docks, piers
Preservation / Primary Resource Protection Area	Individual dock with not more than two slips
Single-Family - Multi-Family - Commercial / Primary Resource Protection Area	Utility easements within designated corridors, private residential docks, private residential multi-slip docks
Single-Family / Secondary Resource Protection Area	Utility easements within designated corridors, private single residential docks and piers
Preserve - Open Water / Primary Resource Protection Area	Utility easements within designated corridors

Table 29. Management/Resource Protection Areas in Charlotte County Lemon Bay Aquatic Preserve (FDNR, 1991)

The Preferred Water-Dependent Uses (PWDUs), designated in this Sea Grant report, are consistent with the RPAs which occur in the Lemon Bay Aquatic Preserve. PWDUs are based on a point score which takes into consideration water-side and land-side developmental constraints. This score does not consider a parcel's zoning or land use classification since the Zoning Atlas and FLUM may be amended if a PWDU's underlying zoning and land use designations conflict with a proposed water-dependent use.⁵ This study recommends that the PWDUs be applied to the County Future Land Use Map as non-exclusionary (i.e., non-water-dependent uses are *not* excluded) overlay districts and be referenced, specifically, as Marine Access Overlay Districts

(MAODs) within which the following water-dependent uses and structures should be allowed.

- MAOD I All types of marinas, including the provision of dry-stack facilities; boat ramps; commercial docks; yacht clubs; moorage for waterfront hotels, motels, dockominiums, and restaurants; boat repair yards, piers; and all other water-dependent uses.
- MAOD II Commercial and public boat ramps; piers; moorage for waterfront restaurants and businesses other than marinas; multi-slip docking facilities for residential developments for which the number of slips may not exceed the number of dwelling units.

In the event that a proposed water-dependent use, allowed within a parcel's MAOD, necessitates a FLUM amendment or re-zoning, the proposed use will be automatically consistent with the Comprehensive Plan. This provides a considerable advantage to the applicant in dealing not only with the County but also with the permitting programs enforced by the State's regulatory agencies. As required by the Florida Coastal Management Program, all such permits must be consistent with local government comprehensive plans within the jurisdiction where permit application applies.

In recognition of the property rights associated with riparian ownership, properties not included in either MAOD I or MAOD II can be permitted one dock (with no more than two slips) or launch facilities intended to serve only the subject property. For purposes of implementation, walkways, boat lifts, catwalks, and covered boat houses, as permitted under existing federal, state, and county regulations, should have no effect on the construction or maintenance of seawalls, revetments, retaining walls, riprap, or other shoreline hardening structures which will be reviewed and permitted according to existing federal, state, and county regulations. As with the establishment of zoning districts, designating non-exclusionary MAODs and assigning uses allowed in each does not guarantee that those uses which allow public access will be built.

VII. LAND USE INCENTIVES

Operating a marina, where public access is the primary service and attraction, is a marginal business. The average Charlotte County marina, in 1993, took in slightly less than \$1 million in sales, while gross (before taxes) profits were approximately \$29,290.¹ The marina industry, in addition to a marginal profit structure, faces a number of other challenges, such as increasing pressure to convert to competing land uses (primarily private residential development), escalating land values (higher taxes), and regulatory constraints (reflected in operating costs and aggravation). There exists the real threat of losing privately-run, public access marinas.²

Several "preferred taxation" (*blue-belting*) strategies are available to keep marina facilities in private ownership and continue to provide public access to bay waters. These strategies assign *taxable* values to properties based on a use-value assessment which considers the costs of doing "marine" business versus the gross income generated by the "marine" business.³ Blue-belting strategies are summarized as follows:

1. Preferential Property Tax Incentives

- marina taxed according to earning potential in renting boat storage or launching
- no penalty (typically) for conversion to non-water-dependent uses

2. Deferred Taxation

- marina taxed according to earning potential in renting boat storage or launching
- roll-back provision which requires repayment of preferential tax treatment if facility is converted to non-water-dependent uses
- interest charges may be included

3. Restrictive Agreements

- marina owner enters into a contract (between marina owner and local government) for a specified period of time, agreeing that land will be maintained in water-dependent uses in return for preferential taxation
- the agreement may be canceled by the marina owner who is subject to a cancellation fee

4. Exclusive Water-Dependent Zoning

- land within zones may not be converted to non-water-dependent uses

(unless coupled with tax relief, may result in tax liability and financial loss for property owner due to increased value over time of waterfront) property

5. Purchase of Development Rights

- based on development as "one stick in the bundle of rights" associated with the ownership of real property
- marina owner sells property development rights (density units) to another party - may be a local government, or may be a developer seeking increased density for a project
- the value of the development right is the difference between the market value and the water-dependent value of the land
- marina owner retains all other rights in the bundle and profits by using land for remaining water-dependent uses

The estimated cost of each of the above "blue-belting" strategies to Charlotte County, using the dollar amounts which represent 100 percent participation of marinas at the time of the report, is as follows:

1. Preferential Property Tax Incentives\$249,285/yr
2. Deferred Taxation
(6-year period with roll-back and no interest penalty)\$ 47,915/yr
3. Restrictive Agreements\$299,850/yr
4. Water-Dependent Zoning

Exclusive (property may **only** be used for water-dependent uses)

Without preferential assessment\$ 0

With preferential assessment\$249,285/yr

Non-exclusive

(property may be used for other than water-dependent uses)

With preferential assessment\$249,285/yr

5. Purchase of Development Rights

One-time purchase from all facilities in existence in 1993\$18,681,090

The use of Exclusive Zoning (without preferential taxation) is, by far, the least expensive (\$0) of the above strategies, in terms of lost tax revenues per year. However, given the susceptibility of restrictive zoning to legal challenges as either a taking, an exaction, or causing diminished value (Bert Harris Act), reliance on exclusionary zoning, particularly without any form of financial incentive for the property owner, could end up as the most expensive when measured in legal fees, aggravation, and potential political costs. The most expensive approach (\$18,681,090), the Purchase of Development Rights, is arguably the least susceptible to litigation, and provides the greatest long-term assurance that privately owned water-dependent uses, which provide public access, will not be converted to non-public uses. However, the cost to purchase development rights is considerable, and may not be acceptable to the general public/taxpayers (a group which includes many non-boaters) or elected officials. This leaves for consideration other approaches which offer assurance that the private sector will be able to continue to provide public access to the County's waters.

Bell (1994) recommends the use of Preferential Property Tax Assessments (based on a use-value assessment of marinas and other public access, water-dependent facilities) to provide economic incentives for the owners of such properties to retain their properties in such uses.⁴ The basic formula used by Bell (1994) to derive the assessed value is:

$$\text{Assessed Value} = \text{Profit Before Taxes} \div \text{Capitalization Rate}$$

Profit Before Taxes is determined by subtracting the operating costs from the gross income of the facility.⁵ Capitalization Rate is determined by the interest rates applied to marinas or similar-risk business loans.⁶

While this method does not provide the same level of assurance as either exclusionary zoning or restrictive agreements that affected properties will not be converted to uses which do not provide public access, the potential legal and political difficulties associated with the former and the perceived reluctance of property owners to enter into the latter suggests that the Preferential Property Tax Assessment approach may be the best method available to Charlotte County at this time. If additional assurance is sought, the County should consider incorporating roll-back provisions or requiring restrictive agreements as part of its blue-belt strategy.⁷

This strategy, because it is based largely on a use-value assessment, would only apply to properties on which public access facilities have been developed. This does not create any incentive for the owners of vacant properties (which have neither revenue nor operating costs) within the MAODs to develop their properties in a manner which provides public access or to forego development which does not provide public access. However, since no public benefit (access) is provided through vacant properties, it is inappropriate to provide tax relief in the same manner as to those which do offer public boating access.

In order to create an incentive for owners of vacant properties to forego development which does not provide public boating access, this study recommends that the county enter into Restrictive Agreements (which may also be referenced as Developer's Agreements) with the owners of vacant properties within the MAODs. Such agreements would specify that the owner agrees not to develop in a manner which precludes public access. In return, the subject property's value would be assessed as provided under Section 193.501 of the Florida Statutes (properties which have been placed under restrictions for use as outdoor recreational

or parks purposes). These agreements would remain in force and effect for a period of time specified within the agreement and, following that period, could be renewed on an annual basis as mutually agreeable to the county and property owner. If the agreement is not renewed, the property's assessed value would return to what it would have been had the agreement not been enacted.

Because developable waterfront property has a considerably higher value than similar, non-waterfront property, the strategy for vacant lands discussed above may be subject to exploitation in the form of land-banking. In other words, the owner of a MAOD I property may agree to forego development which does not provide public access for a period of 10 years, fully intending to develop the property in a non-public access use in 12 years. This would enable the owner to enjoy 10 years of reduced taxes without providing any public benefit in return. In order to prevent this from occurring, all such agreements into which the county enters should contain roll-back provisions that require the payment of the taxes withheld should the property be developed in a manner which does not provide public access. The payment should extend over the life of the agreement, not to exceed the last 10 years during which it was in force and effect. Further, in order to prevent individuals intending to develop non-public access uses from purchasing properties under such agreements solely for the purpose of benefiting from the reduced taxes, this study recommends that such agreements be made non-transferrable (i.e., running with individual ownership, and not with the land).

VIII. CONCLUSIONS

This marine, land and water use siting study was undertaken in fulfillment of the policies of the 1988 Charlotte County Comprehensive Plan. It is anticipated that the results will be incorporated -- in whole or in part -- into the 1997 Comprehensive Plan currently under consideration by the Board of County Commissioners for transmittal to the Florida Department of Community Affairs.

The County's 250 miles of navigable canals and access channels link its 30,564 salt-water accessible parcels with Charlotte Harbor, Lemon Bay and the Gulf of Mexico. The number of boats grew by 79 percent from 1981 to 1991. Within county boat registrations are projected to grow by 211 percent between 1992 and 2010. There will be a 664 percent increase in larger, deeper draft boats which will: (a) influence boater choice in selecting wet slip, dry storage, ramp, or private dock; and (b) require deeper water depths in entrance channel and slip locations.

Disparities exist within Charlotte County in the distribution of sites (acreage) which are suitable to meet anticipated Year 2010 needs for marina, ramp and private dock facilities. A summary of the regional supply-demand analysis shows:

Lemon Bay to Gasparilla Sound (Zone 1): shortfall in marina acreage (-71); shortfall in residential and vacant parcels (-4,495); excess in ramp site acreage (+1).

South Gulf Cove and El Jobean (Zone 2): marginally adequate marina acreage (0 balance); excess in residential and vacant parcels (+5,713); excess in ramp site acreage (+13).

Port Charlotte West of US 41 (Zone 3): excess in marina acreage (+76); excess in residential and vacant parcels (+1,882); excess in ramp site acreage (+61).

Peace River Upstream from the US 41 Bridge to the DeSoto County Line (Zone 4): shortfall in marina acreage (-3); excess in residential and vacant parcels (+1,053); shortfall in ramp site acreage (-2).

Punta Gorda Isles, Alligator Creek and Pirate Harbor (Zone 5): excess in marina acreage (+20); excess in residential and vacant parcels (+5,268); excess in ramp site acreage (+34).

The most noteworthy disparity is in Zone 1 (beach and adjacent mainland) where there are greater concentrations of boats; more demand to build docks along the shoreline in order to gain access to bay waters where, coincidentally, sensitive wetlands and sea grass habitats prevail; and large deficits in future marina acreage and residential or vacant parcel dock sites. The potential closure of Stump Pass, if it were to occur by longshore drift, would further concentrate traffic in south Lemon Bay and exacerbate boating pressures on bay resources.

The site suitability figures for marinas, residential docks and boat ramps identify those salt-water parcels (existing in 1993) which are optimal for development. The county may wish to explore alternative scenarios in which: (a) new water-side parcels -- created through platting or other means -- are added; (b) publicly-owned parcels lying adjacent to, or landward of, existing facilities are included; or (c) criteria are either relaxed or further restricted. Such chan-

ges, particularly additions of parcels, to be consistent with other information reported in this study, should be subject to comparably rigorous evaluation criteria.

IX. RECOMMENDATIONS

1. Incorporate the Preferred Water-Dependent Uses onto the Future Land Use Map as two Marine Access Overlay Districts.

MAOD 1 indicates properties appropriate for the most intensive use. It includes: all types of marinas and dry-stack facilities; boat ramps; commercial docks; yacht clubs; moorage for waterfront hotels, motels, dockominiums, and restaurants; boat repair yards, piers; and all other water-dependent uses.

MAOD 2 indicates properties appropriate for less intensive water-dependent uses than those allowed in MAOD 1. It includes: commercial and public boat ramps; piers; moorage for waterfront restaurants and businesses other than marinas; multi-slip docking facilities for residential developments for which the number of slips may not exceed the number of dwelling units.

2. Develop a method for applying a use-value assessment to marina and other public access facilities in order to provide an economic incentive which ensures that the properties will remain in a use which provides public access.
3. Enter into agreements with the owners of vacant MAOD 1 and MAOD 2 properties in order to provide economic incentives which discourage the use of these properties in ways which do not provide for public access.
4. Maintain the land-side elements of the Boating Resource GIS and incorporate them into the County's future planning and permitting processes. Keeping records of the number and type of such facilities will help Charlotte County determine whether the level of service standards established through the Comprehensive Plan are being met, and whether the facilities are meeting the needs of the boating public, particularly with regard to location. The information gained through this application of GIS and permit tracking technology will assist the Board of County Commissioners to make sound political and financial decisions regarding the provision of facilities which offer general public access to Charlotte County's valued marine resources.
5. Upgrade the water-side components of the Boating Resource GIS -- boats, water depth, seagrass, mangrove -- in order to assess the County's waterway management needs. Boat access includes both water depths adjacent to parcels and channel depths. The site suitability analysis only considered water depth adjacent to the parcel since no county-wide data were available which describe channel conditions. The trend towards proportionally greater numbers of deeper draft boats will make waterway management issues, such as maintenance dredging, more critical in the future, and will place increasing pressure on existing land-side facilities and bay wa-

ter resources. A county-wide waterway assessment should be undertaken in order to determine existing channel conditions and boat access needs.

6. Direct future land and water marine use to locations where potential impacts on the environment will be minimal.

X. ENDNOTES

Introduction

1. Population change includes a trend of increasing in-migration of new residents into the county. Over the 1990-93 period, net migration was 12,460, a total population change of 10,720 (FSA, 1994). County projections are for 260,000 additional inhabitants by 2010, with 2.15:1 persons per household, suggesting an additional 121,000 dwellings may be needed to double the existing housing stock (Charlotte County Comprehensive Plan, 1988).
2. Three CME components are relevant to regulating these water-related uses.
Objective 6 addresses establishment of criteria or standards for determining, within appropriately designated shoreline areas, priorities for water-dependent and water-related uses.
Policy 6.1 states:
In accordance with the State mandate to give priority to water dependent and water related uses along the shoreline, local government shall complete, by 1990, a "Marine Land and Water Use Siting Study" that identifies potential marine zones. Upon completion of the study, the Future Land Use Plan will be amended to include marine uses areas, and these areas will be identified on the Future Land Use Map. The zoning regulations also will be amended to provide for a "marine use" zoning classification.

Policy 6.2 defines the "Marine Land and Water Use Siting Study" to prioritize allowable uses in the marine use areas, including:
 - 1) public use marinas;
 - 2) other water-oriented recreation;
 - 3) commercial fishing;
 - 4) water-dependent industries or utilities;
 - 5) water-related uses; and
 - 6) high density residential with marinas and other water uses.
Policy 6.3 states:
The designation of marine use areas shall recognize existing and maintainable navigation access as a scarce and high priority component of providing for water access and for water dependent businesses and industries. Local government shall, therefore, capitalize upon water access opportunities by seeking to provide land side infrastructure and zoning supportive of marine use areas in these locations.

Policy 6.4 states:
The designation of marine use areas along natural shoreline where non-private, water dependent uses do not presently exist, shall reflect the potential for FDEP/USACOE permits and FDEP leases.

Objective 7 calls for an increase in public access to shoreline and coastal waters of the County and Punta Gorda in proportion to population growth.
Policy 7.2 states:
Local government shall provide sufficient areas to accommodate the projected need for water-dependent and water-related uses by designating marine zones, as described under *Objective 6*.

Objective 12 establishes appropriate service standards for beach and public boat ramp access, and marina wet and dry storage capacity.

Policy 12.2 provides standards which have been converted to approximate county requirements.

Boating Access: Demand and Supply

1. Two sources of information were used to determine boating estimates and demand-supply projections. First, the State of Florida vessel registration data base provided information on numbers of registered boats by length class (A-1 = <12'; A-2 = 12<16'; 1 = 16<26'; 2 = 26<40'; 3 = 40<65'; 4 = 65<110'; 5 ≥ 110'). These data are available for the period 1981 to the present from the Florida Department of Highway Safety and Motor Vehicles. A list of Charlotte County boat owners was compiled for 1991-92, based on this source, and produced 13,876 registrants. Second, a random sample of 300 Charlotte County boat owners was selected and a telephone survey was made in 1993 using a random digit dialing method by the Survey Research Laboratory at Florida State University. Such a survey is accurate to ± 7 percentage points. This survey provided information on boating activities, boater demographics, boat characteristics, and the origin and destination of boat trips. See Bell, 1994, Appendix D, for sample survey questionnaire.
2. According to the responses from a recreational activities survey conducted as part of the County's Recreation and Parks Master Plan (in development), recreational boating was listed as the Number 1 general recreation activity by 91 percent of those surveyed (Wallace et al, 1997).
3. The model used to estimate demand is as follows:
 $Q_{rb} = f(PYPCD; POP; P_{rb}, P_o)$
where,
 Q_{rb} = number of recreational boats demanded;
PYPCD = personal income per capita in real terms (i.e., deflated);
POP = population;
 P_{rb} = real price of recreational boats;
 P_o = real operating cost of a recreational boat.
4. Both linear semi-log and log-log functions were tested but the latter out-performed the former in using length (ft) to predict draft (ft). An initial equation was estimated (i.e., log-log) and several predicted drafts were considered too large relative to length. Seventeen observations where length was less than 6 times draft were eliminated. The following results were obtained:
$$\text{Log DRAFT} = -4.106381 + 1.486854 \text{ LogLENGTH}$$
$$(-15.96) \quad (17.32)$$

(t-values in parentheses)

 $N = 283; R^2 = .515; F = 300.0$
As might be expected, the draft of a pleasure craft increases in greater proportion to an increase in length. In general, the volume of the craft expands exponentially as the linear length of the craft increases, requiring greater draft. The equation indicates that a 10 percent increase in length will increase the craft's draft by 15 percent. Using the mid-point of the length classifications (i.e., <12', 12<16', etc.), draft in feet was predicted using the equation. The largest size classes (i.e., 26<40' and >40') have estimated drafts of 3.24 and 6.69 feet respectively.

5. The random sample survey indicated that 57.3 percent of Charlotte County boaters access the water from private docks. If we were to draw a random boater from the county population, the probability of selecting one that uses a private dock is nearly six out of ten times. Therefore, we may consider the percentage as a probability, and the probability (Pr) of using any of the three types of facilities -- marina slips [MS], boat ramps [BR], private docks [PD] — will sum to unity. This relation is described by the equation:

$$\text{PrMS} + \text{PrBR} + \text{PrPD} = 1$$

For example, if you consider marina, the probability yes I do, or no I don't use a marina is stated as:

PrMS 1 = YES

PrMS 0 = NO

We would expect in Charlotte County, 6.7 percent yes and 93.3 percent no answers in the marina use case. The selection of a facility may be based upon demographics (e.g., age), economics (e.g., slip rental fee), boat characteristics (e.g., length, draft), and other factors, such as parking or even the kind of people using the facility. If the variable PrMS can be related to any of these factors, then, it may be possible to use these relationships to make the demand projections. The survey sample provided such independent variables for testing. Two statistical techniques -- ordinary least-squares (OLS) and logit -- were used to estimate this relationship. All independent variables that were tested in order to explain boaters' choice in selecting marina, ramp, or private dock access are reported in Bell (1994, Appendix A).

6. A marina is defined as a boat facility with 10 or more slips (Bell, personal communication)..
7. Larger boats will increase the probability of using a wet slip (Pr W), while increases in personal income per capita will decrease wet slip usage (PYPC). The net effect is to raise Pr W over the 1991-2010 period as shown in Table 9.
8. The detailed information on registered boaters helped stratify the sample population of 300 individuals as follows: private dock (N = 172); boat ramps (N = 108); and marinas (N = 20). Although the marina boater sample size is small (N = 20), results are still statistically valid.

Boating Resource Geographic Information System (GIS)

1. The relational character of the data base allows related records from different files to be associated with each other. A major advantage of this type of data base structure is the almost unlimited flexibility in forming relationships among data items.
2. The Charlotte County GIS Department provided a set of 111 parcel coverages, at a 1:2,400 scale, for the mapping purposes of this project. The parcels are from a 1993 data base. New parcels may be created in the future through platting or other means. These parcels should be subjected to an evaluation using the criteria presented in this report.
3. See Appendix 1 for a description of each attribute.

4. See Appendix 2 for a description of the SWFWMD Land Use/Cover Classification System, which is based on FLUCCS, edition 2.
5. Water-line transmission was from the following map sources: Englewood Water District (1:2,400); Bocilla Utilities, Inc., for Don Pedro and Palm Island developments; Charlotte County Utilities, for Pt. Charlotte, El Jobean, Gulf Cove (1:7,200); City of Punta Gorda (1:12,000). Central sewer was from Charlotte County Utilities and the City of Punta Gorda.
6. The manatee data were collected by two agencies. The Florida Marine Research Institute flew manatee surveys for Charlotte Harbor and the Myakka and Peace Rivers. Mote Marine Laboratory (MML) flew manatee surveys for Lemon Bay, the Myakka River, and portions of Charlotte Harbor. FMRI combined the surveys from the two agencies into two GIS raster coverages. When areas were surveyed by both agencies (Charlotte Harbor and Myakka River), only the observations made by FMRI were included in the data set made available by FMRI. One raster coverage was constructed from manatee observations made during the warm-season (March through November), the other coverage was constructed from cold-season observations (December through February). The warm-season grid has, by far, the greater number of manatee observations.
7. GIS is a demanding technology which requires user vigilance to produce reliable map products, particularly when integrating spatial data derived from diverse sources with unique scales and resolutions. The common denominator of this Marine Use Siting Study is the plat parcel. This is a large-scale, small-area, high resolution feature. Therefore, large-scale (1:2,400) section aeriels were used as the interpretation base for characterizing current land use and boat facilities. Where intermediate scale data (1:24,000/1:40,000) were relied upon, for example to capture boat access, water depth and habitat conditions, supplemental sources, as ground-truthing and interviews, were used to upgrade and up-scale the information. This additional step was necessary since the user cannot increase the information content on a map (or GIS coverage) solely by enlarging the scale of the source map. The apparent expansion of knowledge -- without the additional step -- would be a mirage.
8. Development constraint parcels are those situated in wetlands or other areas where development cannot occur without extensive mitigation or site preparation.
9. The lower half of Appendix 3b shows the relation of parcel count to area within each mapped feature class. A number of examples highlight these disparities: (a) Industrial - Zone 1 (Lemon Bay to Gasparilla Sound) has 50 percent of the parcels and 70 percent of the area; (b) Public - Zone 5 (Punta Gorda) has 23 percent of the parcels but only 7 percent of the area; (c) Submerged - Zone 4 (Peace River) has 50 percent of the parcels but only 1 percent of the area (Harbour Heights); (d) Development Constraint - Zone 3 (Pt. Charlotte) has 1 percent of the parcels and 49 percent of the area, while Zone 4 (Peace River) has 83 percent of the parcels and 25 percent of the area.
10. A parcel may have improved access along its shoreline where a boat dock is situated, but the access channel to the harbor or bay, through which the boat must pass to exit to boating waters, may be unimproved or in a natural condition.
11. An area of special concern occurs in the vicinity of Alligator Bay, Pt. Charlotte (Zone 3), where parcels are situated adjacent to an improved channel which does not extend far

enough into the bay to provide adequate depth for safe navigation. For this reason, some of these parcels are shown as *unimproved* on the Boat Access Map.

12. A boat may have deep (≥ 3 ft.) water adjacent to the parcel where its dock is situated but may be impeded by shallow (< 3 ft.) water in feeder or access channels leading to the Harbor or open bays. Data on access channel depths were unavailable at the time of this study, and, therefore, were not considered in the site suitability analysis.
13. The Wetland Map was compiled using a GIS overlay process and is based on the SWFWMD LULC mapping. Land use and land cover were photo-interpreted from 1:24,000 and 1:40,000 color infrared aerial photography by Geonex Martel staff, as part of a contract with the SWFWMD. All photo-interpreters had prior experience in LULC or wetland mapping. The Florida Department of Transportation's LULC Classification System (FLUCCS) was used for all mapping. Uplands were mapped with a 5 acre minimum mapping unit and using FLUCCS Level II categories. Wetland were mapped using a 0.5 acre minimum mapping unit (where possible) using FLUCCS Level III categories. Ancillary materials used during the photo-interpretation included land use maps for most counties and major urban areas, USDA/SCS county soils atlases and National Wetland Inventory maps.
14. FSG staff tagged a parcel containing *wetlands* if any portion of it contained wetland (this **should** be field-verified).
15. Aquatic preserves are designated by the state legislature to preserve natural conditions for future generations. APs also are classified as Outstanding Florida Waters.
16. Charlotte County has adopted within the goals, objectives and policies of the Natural Resource Conservation and Coastal Management Elements of its Comprehensive Plan, protective measures for manatees, including the establishment of protective speed zones within designated areas of the County's natural surface waters.
17. The resolution of the raster coverages is 25 meters square (625 square meters per cell) and the value within each 25-meter cell represents manatee 'abundance', measured in units of Manatees/Cell/Flight. These values represent the likelihood of observing a manatee within a cell over a period of time (Flamm, personal communication). More specifically, these values represent the expected number of manatees one would expect to see when monitoring a small area for 2 hours at a time.

The manatee abundance values contained in the raster coverages were interpreted in conjunction with the maps showing flight paths. FMRI assumed that, depending on the number of observers, manatees could be identified at a distance of 400 meters on either side of the plane. A cell value of zero may indicate that, either (a) no manatees were observed during survey, or (b) the area was not surveyed. Which case holds for a particular instance can be determined by inspection of the flight path maps.

The procedure for compiling the raster coverages is summarized below.

1. All manatee observations from all flights were appended into a raster coverage. The cell (25 meter X 25 meter) value is the average number of manatees observed at that point for all flights. Thus, if 10 manatees were observed on one flight, 5 on a second flight, 15 on the third, and 0 on the remaining 44 flights, the cell value is 0.64 (30 manatees observed / 47 flights), which represents an "average" of 0.64 manatees observed per flight.

2. A 532-cell filter is "grown" around the observation cell and an abundance value is calculated for each of the 532 cells which are within the filter [(observation point value * 100,000) / 532]. Each cell value is multiplied by 100,000 to avoid floating point arithmetic. (Note: the FMRI model takes point observations and converts them to polygons (groups of 532 cells) which represent the daily 'behavior/travel patterns' of a manatee as derived from telemetry data).
3. Where two or more 532-cell filters overlay, the values from the "stacked" cells (those cells within the area of filter intersection) are added together. For example, if there are 3 observation points with values of 3, 4, and 15 manatees, the cell values for each of the corresponding 532-cell filters are:

Observation 1: (3 manatees x 100,000) / 532 = 564

Observation 2: (4 manatees x 100,000) / 532 = 752

Observation 3: (15 manatees x 100,000) / 532 = 2820

For those cells which fall within the 3-way area of intersection of filters, corresponding to Observations 1, 2, and 3, the resulting cell value would be: 564 + 752 + 2820 = 4136. For those cells which fall within the 2-way area of intersection of filters, corresponding to Observations 1 and 2, the resulting cell value would be: 564 + 752 = 1316.

4. Interpretation: A fundamental problem, as indicated by FMRI personnel, concerns the proper interpretation of the "Manatee Abundance" values contained in the raster coverages. The cell values are an estimate of density (manatees/unit area), though it can be argued that is not a measure of "true" density (Flamm, personal communication). For an Ecological Sensitivity Index project (oil spill analysis), FMRI categorized cell values corresponding to > 0 and < 1 manatee per square kilometer, as medium density, and >= 1 manatee per square kilometer as high density. This allowed FMRI to identify "zones" of high manatee presence. These zones were more than just the pixels with high values, but areas often comprising both high and medium values knowing that animals move back and forth.

The manatee data were not incorporated directly into the suitability analysis. A map, however, was compiled (Figure 21) which indicates the various manatee density zones which follow from the FMRI Ecological Sensitivity Index. The density zones provide a guideline to the Charlotte County Planning department to determine the impact of ramp, marina, and dock siting on manatee populations.

Site Suitability Analysis

1. A step-by-step explanation of the GIS analysis, including application of the selection criteria and the parameter scores for individual parcels, is presented in Appendix 5.
2. PWDU I and PWDU II definitions are reviewed under the proposed Marine Access Overlay Districts (MAOD I and II) in the Marine Use Regulations section (V) of this report.

3. PWDU II uses include water access for waterfront business, multi-family residential docking facilities, piers and boat ramps. Parcels receiving a poor score (0-5 points) are not suitable for multi-family residential docking facilities.
4. Appendix 5d also includes data used to assign final suitability ratings. Five of the 20 parcels are > 10 acres in area; 4 parcels contain mangrove and none are adjacent to sea grass.
5. Both acreage and presence of vacant adjacent parcels are important criteria for evaluating the expansion potential of existing marinas. Acreage calculations for existing marina expansion potential (VAP in Appendix 5a) are added to the acreage of vacant parcels that potentially are suited for new marina development (Appendix 5d). Without knowing the footprint of existing buildings and parking lots, it is impossible to use the acreage of the existing marina site as an indicator of build-out potential. Some of the marinas are located on peninsulas somewhat isolated from possible neighboring parcels (i.e., the parcel boundaries do not touch). Parcel selection and verification of boundaries by interpretation of section aerials eliminates these concerns.
6. Table 21 is used in conjunction with Appendix 5a, 5b, 5d, and 5e to determine the zonal distribution within the county of the total potential acreage for wet and dry slips.
7. The characteristics of the 10 existing boat ramps are summarized in Appendix 5h.
8. Bell calculates an average boat lane capacity per day of 24, based on an estimated 30 minute time period to launch and retrieve a boat and a 12-hour day [(60 minutes / 30 minutes) * 12 hours]. Boat capacity (Table 10) is the number of lanes in a geographic zone times the average boat lane capacity per day. Bell projects a year 2010 peak demand per day of 2,060 boats utilizing Charlotte County ramps. The peak demand per day in Table 10, by geographic zone, was estimated based on the boater trip origins from ramps in each zone (Bell, 1994). The estimated quantity of lanes required in 2010 is determined by dividing the projected peak demand per day by the boat lane capacity per day. The difference between lanes needed in 2010 and the present supply indicates the additional demand which the county must meet. There appears to be more than enough acreage to satisfy projected needs in Zones 5,3 and 2. The only shortfall between ramp site availability and boat ramp demand occurs in Zone 4.

Marine Use Regulations

1. Planning in Florida is governed largely by Florida Statute (Chapter 163) and Florida Administrative Code (Rule 9J-5).
2. Zoning groups land uses by type and provides standards for development activities within each zoning district.
3. Policy 2.3 of the existing Conservation Element in the County Comprehensive Plan states that the County recognizes the lead authority of the Florida Department of Environmental Regulation (FDER)*, Florida Department of Natural Resources (FDNR)*, U.S. Army Corps of Engineers, and the water management districts in environmental regulation, and it will support these agencies in the execution of their mandate without duplicating permitting or monitoring efforts.

*At the time this policy was written, FDER and FDNR had not merged to form FDEP.

4. A thorough discussion of the regulatory aspects of FDEP's management of Charlotte County natural resources, as well as the functions and authority of the other regulatory agencies, is presented in Tupper and Antonini, 1996.
5. The Board of County Commissioners in Charlotte County, in 1996, approved 12 FLUM amendments and 16 re-zonings.

Land Use Incentives

1. This figure is only slightly less than that reported to the author of this section in February, 1997, by a Charlotte County marina operator who was unaware of the 1993 figure.
2. A current example of this threat is the on-going development of Cape Haze Marina Village, an 85-unit, private, marina community, built around an existing basin; this property was re-zoned from Commercial General to allow the residential units.
3. The reference to "blue-belting" is a derivation of "green-belting"; the latter refers to the granting of tax relief to farmers to reserve land for *bona fide* agricultural uses (Bell, 1994). Greatly simplified, this is done by assigning *taxable* values to agricultural properties based on a use-value assessment which considers the costs per acre associated with agricultural production versus the gross income per acre generated by the agricultural products. First started in Maryland in 1956, green-belting is now common throughout the U.S., including Florida. In Charlotte County, there are 208,000+ acres which benefit from green-belt tax assessments.¹ The application of use-value assessments is governed by the Florida Statutes.
4. This method is analogous to green-belting as applied to agricultural lands to prevent their conversion to non-agricultural uses. As Charlotte County does not include a roll-back provision with its agricultural classifications, none is recommended here.
5. The formula may be modified by the County Property Appraiser to better fit existing assessment methods used in Charlotte County as provided by the Florida Statutes.
6. Bell (1994) uses the yield on 30-year, (Bbb-rated lower yield due to risk) corporate bonds as the Capitalization Rate when determining the benefits to the facility operator as well as the revenue costs to the County.
7. It should be noted that, during the 1996 session, the Florida legislature amended Chapter 193 of the Florida Statutes, to provide tax incentives to owners of properties which provide high aquifer recharge. Though not specifically defined as such in the statute, discussions with the Property Appraiser's Office indicate that, at least in Charlotte County, "blue-belting" is the term applied to relief for abstaining from development in order to provide aquifer recharge. In order to prevent confusion, the County may wish to use another term for providing tax incentives for public boating access to the County's waters.

XI. REFERENCES

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- U.S. Bureau of Census (USBC), 1994, Adopted from Soundings, November 1994, p. 127.

U.S. House of Representative, 1919, Preliminary Examination, Charlotte Harbor, Florida, inset map, Doc. 113, 66th Congress, 1st Session, Washington, D.C.

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APPENDIX 1

SALT WATER ACCESSIBLE PARCEL COVERAGE

PARIDNO - A Parcel identification number created and assigned to each parcel by UF. Multiple parcels may have the same PARIDNO, indicating they are one unit. This number does not relate to any County identification number.

MAPID - Relates the parcel to 1992, 1:2,400, black-and-white section aerials and assessment maps on which the parcel is located.

SUBDIV1 - Parcel subdivision code obtained from assessment maps supplied by the County.

ZONING1 - Parcel zoning classification obtained from the assessment maps supplied by the County.

WATER - Level of water infrastructure available at the parcel

- 0 = No Data
- 1 = No Water
- 2 = Water main less than 6 inches
- 3 = Water main greater than or equal to 6 inches
- 4 = Water main present, size undetermined

SEWER - Level of sewer infrastructure available at the parcel

- 0 = No Data
- 1 = No Sewer
- 2 = Sewer available

ROAD - Level of road infrastructure available to the parcel

- 1 = Principal Arterial
- 2 = Minor Arterial
- 3 = Urban/Rural Major Collector
- 4 = Urban/Rural Collector
- 5 = Local Road
- 6 = No Road

CITYBND

- 0 = Parcel is in the County
- 1 = Parcel is in the City

LANDUSE1 - Land use/ land cover of the parcel

- 100 Residential
 - 110 Residential single-family dwelling
 - 120 Residential multi-family dwelling
 - 130 RV park
 - 140 Mobile Home Park
 - 150 Private park and/or recreational center (for subdivision only)
- 200 Commercial
 - 210 Commercial general
 - 211 Boat services
 - 212 Fish Processing
 - 220 Commercial tourism
 - 221 Boat rental\Charter boats
 - 222 Ferry landing
 - 223 Bait and tackle
 - 224 Restaurant
 - 225 Hotel\Motel\Resort
 - 226 Retail
 - 227 Hotel with charter boat(s) dock
 - 230 Marina(s) and yacht clubs
 - 231 Marina
 - 232 Destination marina\Resort (multi-use: Restaurants, retail)
 - 233 Yacht and boat clubs
- 300 Industrial
- 400 Public
 - 401 School
 - 402 Utilities
 - 403 Church
 - 404 Golf Course
 - 405 Parking
- 410 Park
 - 411 Beach
 - 412 Fishing pier
 - 413 Skiing\Sailboard
 - 414 Beach\Fishing pier\Skiing
 - 415 Beach\Fishing pier
 - 416 Fishing pier\Skiing
 - 417 Beach\Sailboard\Skiing
 - 418 Nature

420	Beach
430	Boat ramp
440	Fishing pier
450	Skiing
460	Sailboard
500	Vacant land\Parcels
600	Agricultural land\Parcels
700	Submerged land\Parcels
800	Development constraint
900	Waterfront parcelette

DOCKS - the quantity (number) of docks attached to the parcel

BTRAMPS - the quantity (number) of boat ramps attached to parcel.

MAC - Integer number refers to one in a series of boat trafficsheds (e.g. canal systems) surveyed by the Marine Advisory Committee. Refer to the paper map and Lotus worksheet that are in Elliot Kampert's possession for trafficshed names and numbers.

REMOTESLIP - Some parcels have access to boat slips which are not attached to the parcel. This quantity (number) indicates the number of remote slips a parcel has access to.

DEPTH - The limiting water depth of the parcel

- 1 = Greater than or equal to 3 feet
- 2 = Less than 3 feet
- 3 = Questionable
- 4 = Not applicable

ACCESS - The level of water access available to the parcel.

- 1 = Improved
- 2 = Unimproved
- 3 = Questionable
- 4 = Not applicable

PRESERVE - whether parcel abuts an Aquatic Preserve and, if so, which preserve

- 0 = Does not abut a preserve
- 1 = Charlotte Harbor
- 2 = Lemon Bay

APPENDIX 2

BASE MAP DATA CODES

FLUCSID - Integer code based on the SWFMD land use/land cover FLUCCS classification system (based on FLUCCS, ed. 2).

1000 Urban and built-up

- 1100 Residential, Low density (less than 2 dwelling units per acre)
- 1200 Residential, Medium density (2 to 5 dwelling units per acre)
- 1300 Residential, High density (greater than 5 dwelling units per acre)
- 1400 Commercial and services
- 1500 Industrial
- 1600 Extractive
- 1700 Institutional
- 1800 Recreational
- 1900 Open Land

2000 Agriculture

- 2100 Cropland and pastureland
 - 2140 Row crops
- 2200 Tree crops
- 2300 Feeding operations
- 2400 Nurseries and vineyards
- 2500 Specialty farms
 - 2550 Tropical fish farms
- 2600 Other open lands (rural)

3000 Rangeland

- 3100 Herbaceous
- 3200 Shrub and brushland
- 3300 Mixed rangeland

4000 Upland forests

- 4100 Upland coniferous forests
 - 4110 Pine flatwoods
- 4200 Upland hardwood forests
- 4340 Mixed coniferous/hardwood

5000 Water

- 5100 Streams and waterways

- 5200 Lakes
 - 5210 Lakes larger than 500 acres
 - 5220 Lakes larger than 100 acres but less than 500 acres
 - 5230 Lakes larger than 10 acres but less than 100 acres
 - 5240 Lakes larger than 10 acres which are dominant features
- 5300 Reservoirs
 - 5310 Reservoirs larger than 500 acres
 - 5320 Reservoirs larger than 100 acres but less than 500 acres
 - 5330 Reservoirs larger than 10 acres but less than 100 acres
 - 5340 Reservoirs less than 10 acres which are dominant features
- 5400 Bays and estuaries
 - 5410 Embayments opening directly into the Gulf or Atlantic Ocean
 - 5420 Embayments not opening directly into the Gulf or Ocean.
- 6000 Wetlands
 - 6100 Wetland hardwood forests
 - 6110 Bay swamp
 - 6120 Mangrove swamps
 - 6150 River/Lake swamp
 - 6200 Wetland coniferous forests
 - 6210 Cypress
 - 6300 Wetland forested mixed
 - 6400 Vegetated non-forested wetlands
 - 6410 Freshwater marsh
 - 6411 Sawgrass marsh
 - 6412 Cattail marsh
 - 6413 Spike rush marsh
 - 6420 Saltwater marsh
 - 6421 Cordgrass (Spartina)
 - 6422 Needlerush (Juncus)
 - 6430 Wet prairies
 - 6440 Aquatic vegetation
 - 6443 Water hyacinth
 - 6444 Duckweed
 - 6500 Non-Vegetated
 - 6510 Tidal flats
 - 6520 Shorelines
 - 6530 Intermittent ponds
 - 6540 Oyster bars
- 7000 Barren land
 - 7100 Beaches
 - 7200 Sand other than beaches
 - 7300 Exposed rocks
 - 7400 Disturbed land

8000 Transportation, communications and utilities
8100 Transportation
8200 Communications
8300 Utilities

CODE - integer code indicates presence and density of sea grass beds.

0	=	No sea grass
901	=	Sparse
903	=	Dense
904	=	Patchy

APPENDIX 3

TABLES ILLUSTRATING LAND-SIDE FEATURES

County	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development Constraint	Parcels	Total Number of Parcels
Total	12290	219	2	158	14241	11	52	3474	117	30564
Row %	40.21	0.72	0.01	0.52	46.59	0.04	0.17	11.37	0.38	100.00
Col. %	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Zone 1	2029	101	1	56	1093	6	24	300	61	3671
Row %	55.27	2.75	0.03	1.53	29.77	0.16	0.65	8.17	1.66	100.00
Col. %	16.51	46.12	50.00	35.44	7.68	54.55	46.15	8.64	52.14	12.01
Zone 2	1003	12	0	24	6071	0	0	254	0	7364
Row %	13.62	0.16	0.00	0.33	82.44	0.00	0.00	3.45	0.00	100.00
Col. %	8.16	5.48	0	15.19	42.63	0	0	7.31	0	24.09
Zone 3	3479	48	1	11	2127	0	1	28	0	5695
Row %	61.09	0.84	0.02	0.19	37.35	0.00	0.02	0.48	0.00	100.00
Col. %	28.31	21.92	50.00	6.96	14.94	0	1.92	0.81	0	18.63
Zone 4	1558	31	0	31	1362	5	26	2890	55	5958
Row %	26.15	0.52	0.00	0.52	22.86	0.08	0.44	48.51	0.92	100.00
Col. %	12.68	14.16	0	19.62	9.56	45.45	50.00	83.19	47.01	19.49
Zone 5	4221	27	0	36	3588	0	1	2	1	7876
Row %	53.59	0.34	0.00	0.46	45.56	0.00	0.01	0.03	0.01	100.00
Col. %	34.34	12.33	0	22.78	25.19	0	1.92	0.06	0.85	25.77

Appendix 3a. Land use (1992).

Row Percents	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development	Parcelett	Total
County Area %	22.5	1.0	0.3	3.8	43.3	2.8	4.8	21.5	0.0	100.0
County Count	40.2	0.7	0.0	0.5	46.6	0.0	0.2	11.4	0.4	100.0
Zone 1 Area %	21.9	2.4	0.8	9.1	33.2	4.7	19.2	8.5	0.0	100.0
Zone 1 Count	55.3	2.8	0.0	1.5	29.8	0.2	0.7	8.2	1.7	100.0
Zone 2 Area %	7.4	0.1	0.0	4.4	79.0	0.0	0.0	9.0	0.0	100.0
Zone 2 Count	13.6	0.2	0.0	0.3	82.4	0.0	0.0	3.5	0.0	100.0
Zone 3 Area %	22.7	0.5	0.3	1.4	35.2	0.0	1.3	38.6	0.0	100.0
Zone 3 Count	61.1	0.8	0.0	0.2	37.4	0.0	0.0	0.5	0.0	100.0
Zone 4 Area %	18.6	0.8	0.0	1.1	28.6	12.3	0.3	38.4	0.0	100.0
Zone 4 Count	26.2	0.5	0.0	0.5	22.9	0.1	0.4	48.5	0.9	100.0
Zone 5 Area %	43.5	1.5	0.0	1.7	41.9	0.0	0.0	11.5	0.0	100.0
Zone 5 Count	53.6	0.3	0.0	0.5	45.6	0.0	0.0	0.0	0.0	100.0

Col. Percents	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development Constraint	Parcelett e	Total
County Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Zone 1 Area %	22.4	52.7	70.5	55.8	17.6	39.1	91.8	9.1	32.8	23.0
Zone 1 Count %	16.5	46.1	50.0	35.4	7.7	54.6	46.2	8.6	52.1	12.0
Zone 2 Area %	6.3	1.0	0.0	22.5	34.8	0.0	0.0	8.0	0.0	19.1
Zone 2 Count %	8.2	5.5	0.0	15.2	42.6	0.0	0.0	7.3	0.0	24.1
Zone 3 Area %	27.7	12.5	29.5	10.6	22.4	0.0	7.3	49.4	0.0	27.5
Zone 3 Count %	28.3	21.9	50.0	7.0	14.9	0.0	1.9	0.8	0.0	18.6
Zone 4 Area %	11.4	10.4	0.0	3.7	9.1	60.9	0.9	24.6	23.7	13.8
Zone 4 Count %	12.7	14.2	0.0	19.6	9.6	45.4	50.0	83.2	47.0	19.5
Zone 5 Area %	32.2	23.3	0.0	7.4	16.2	0.0	0.0	8.9	43.5	16.7
Zone 5 Count %	34.3	12.3	0.0	22.8	25.2	0.0	1.9	0.1	0.9	25.8

Appendix 3b. Relation of parcel area to number of parcels by land use - land cover in each zone.

County	Residential		Commercial		Industrial		Public		Vacant		Agricultural		Submerged		Development Constraint		Parcellet		Total Number	
	Docks	Parcels	Docks	Parcels	Docks	Parcels	Docks	Parcels	Docks	Parcels	Docks	Parcels	Docks	Parcels	Docks	Parcels	Docks	Parcels	Docks	Parcels
Total	10582	8936	915	82	28	1	1	1	516	275	1	1	0	0	6	5	21	3	12070	9304
Row %	87.66	96.04	7.58	0.88	0.23	0.01	0.01	0.01	4.27	2.96	0.01	0.01	0.00	0.00	0.05	0.05	0.19	0.03	100.00	100.00
Col. %	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Zone 1	2305	1436	534	51	28	1	1	1	377	153	1	1	0	0	4	3	21	3	3271	1649
Row %	70.47	87.08	16.33	3.09	0.86	0.06	0.03	0.06	11.53	9.28	0.03	0.06	0.00	0.00	0.12	0.18	0.64	0.18	100.01	100.00
Col. %	21.78	16.07	58.36	62.20	100.00	100.00	100.00	100.00	73.06	55.64	100.00	100.00	0.00	0.00	66.67	60.00	100.00	100.00	27.10	17.72
Zone 2	608	587	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0	614	593
Row %	99.02	98.99	0.00	0.00	0.00	0.00	0.00	0.00	0.98	1.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00
Col. %	5.75	6.37	0.00	0.00	0.00	0.00	0.00	0.00	1.16	2.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.09	6.37
Zone 3	2529	2525	89	9	0	0	0	0	16	9	0	0	0	0	0	0	0	0	2634	2543
Row %	96.01	99.29	3.38	0.35	0.00	0.00	0.00	0.00	0.61	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00
Col. %	23.90	28.26	9.73	10.98	0.00	0.00	0.00	0.00	3.10	3.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.82	27.33
Zone 4	743	594	79	11	0	0	0	0	33	25	0	0	0	0	2	2	0	0	857	632
Row %	86.70	93.99	9.22	1.74	0.00	0.00	0.00	0.00	3.85	3.96	0.00	0.00	0.00	0.00	0.23	0.32	0.00	0.00	100.00	100.00
Col. %	7.02	6.65	8.63	13.41	0.00	0.00	0.00	0.00	6.40	9.09	0.00	0.00	0.00	0.00	33.33	40.00	0.00	0.00	7.10	6.79
Zone 5	4397	3794	213	11	0	0	0	0	84	82	0	0	0	0	0	0	0	0	4694	3887
Row %	93.67	97.61	4.54	0.28	0.00	0.00	0.00	0.00	1.79	2.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00
Col. %	41.55	42.46	23.28	13.41	0.00	0.00	0.00	0.00	16.28	29.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.89	41.78

Appendix 3c. Boat docks (1992).

County	Principal Arterial	Minor Arterial	Urban\Rural Major Collector	Urban\Rural Collector	Local Road	No Road	TOTAL
Total	91	74	1,900	512	23,839	4,148	30,564
Row %	0.30	0.24	6.22	1.67	78.00	13.57	100.00
Col. %	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Zone 1	0	41	329	0	2708	593	3671
Row %	0.00	1.12	8.96	0.00	73.77	16.15	100.00
Col. %	0.00	55.41	17.32	0.00	11.36	14.30	12.01
Zone 2	2	25	26	395	6679	237	7364
Row %	0.03	0.34	0.35	5.36	90.70	3.26	100.00
Col. %	2.20	33.78	1.37	77.15	28.02	5.71	24.09
Zone 3	35	8	632	8	4972	40	5695
Row %	0.61	0.14	11.10	0.14	87.30	0.70	100.00
Col. %	38.46	10.81	33.26	1.56	20.86	0.96	18.63
Zone 4	42	0	111	106	2426	3273	5958
Row %	0.70	0.00	1.86	1.78	40.72	54.93	100.00
Col. %	46.15	0.00	5.84	20.70	10.18	78.91	19.49
Zone 5	12	0	802	3	7054	5	7876
Row %	0.15	0.00	10.18	0.04	89.56	0.06	100.00
Col. %	13.19	0.00	42.21	0.59	29.59	0.12	25.77

Appendix 3d. Road access.

County	No Data	No Water	Water Provided			TOTAL
			< 6" Main	>= 6" Main	Size unknown	
Total	162	9120	9455	11722	105	30564
Row %	0.53	29.84	30.94	38.35	0.34	100.00
Col. %	100.00	100.00	100.00	100.00	100.00	100.00
Zone 1	161	775	1841	795	99	3671
Row %	4.39	21.11	50.15	21.66	2.70	100.00
Col. %	99.38	8.50	19.47	6.78	94.29	12.01
Zone 2	0	3628	879	2851	6	7364
Row %	0.00	49.27	11.94	38.72	0.08	100.00
Col. %	0.00	39.78	9.30	24.32	5.71	24.09
Zone 3	0	254	2121	3320	0	5695
Row %	0.00	4.46	37.24	58.30	0.00	100.00
Col. %	0.00	2.79	22.43	28.32	0.00	18.63
Zone 4	0	4255	1046	657	0	5958
Row %	0.00	71.42	17.56	11.03	0.00	100.00
Col. %	0.00	46.66	11.06	5.60	0.00	19.49
Zone 5	1	208	3568	4099	0	7876
Row %	0.01	2.64	45.30	52.04	0.00	100.00
Col. %	0.62	2.28	37.74	34.97	0.00	25.77

Appendix 3e. Water from public utility provider.

County	No Data	No Sewer	Sewer Service	TOTAL
Total	914	17171	12479	30564
Row %	2.99	56.18	40.83	100.00
Col. %	100.00	100.00	100.00	100.00
Zone 1	537	2625	509	3671
Row %	14.63	71.51	13.87	100.00
Col. %	58.75	15.29	4.08	12.01
Zone 2	279	4913	2172	7364
Row %	3.79	66.72	29.49	100.00
Col. %	30.53	28.61	17.41	24.09
Zone 3	0.00	2572	3123	5695
Row %	0.00	45.16	54.84	100.00
Col. %	0.00	14.98	25.03	18.63
Zone 4	21	5784	153	5958
Row %	0.35	97.08	2.57	100.00
Col. %	2.30	33.68	1.23	19.49
Zone 5	77	1277	6522	7876
Row %	0.98	16.21	82.81	100.00
Col. %	8.42	7.74	52.26	25.77

Appendix 3f. Sewer from public utility provider.

APPENDIX 4

TABLES ILLUSTRATING WATER-SIDE FEATURES

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County	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development Constraint	Parclette	Total
Total	11325	181	2	92	13113	0	10	259	62	25044
Row %	45.22	0.72	0.01	0.37	52.36	0.00	0.04	1.03	0.25	100.00
Col. %	100.00	100.00	100.00	99.99	100.00	0.00	100.00	100.00	100.00	100.00
Zone 1	1659	89	1	19	689	0	7	14	61	2539
Row %	65.34	3.51	0.04	0.75	27.14	0.00	0.28	0.55	2.40	100.00
Col. %	14.65	49.17	50.00	20.65	5.25	0.00	70.00	5.41	98.39	10.14
Zone 2	1000	12	0	16	6046	0	0	172	0	7246
Row %	13.80	0.17	0.00	0.22	83.44	0.00	0.00	2.37	0.00	100.00
Col. %	8.83	6.63	0.00	17.39	46.11	0.00	0.00	66.41	0.00	28.93
Zone 3	3457	25	1	5	2059	0	0	17	0	5564
Row %	62.13	0.45	0.02	0.09	37.01	0.00	0.00	0.31	0.00	100.00
Col. %	30.53	13.81	50.00	5.43	15.70	0.00	0.00	6.56	0.00	22.22
Zone 4	1039	28	0	25	781	0	3	55	0	1931
Row %	53.81	1.45	0.00	1.29	40.45	0.00	0.16	2.85	0.00	100.00
Col. %	9.17	15.47	0.00	27.17	5.96	0.00	30.00	21.24	0.00	7.71
Zone 5	4170	27	0	27	3538	0	0	1	1	7764
Row %	53.71	0.35	0.00	0.35	45.57	0.00	0.00	0.01	0.01	100.00
Col. %	36.82	14.92	0.00	29.35	26.98	0.00	0.00	0.39	1.61	31.00

Appendix 4a. Improved boat access by land use and land cover categories.

County	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development Constraint	Parclette	Total
Total	956	38	0	66	894	11	42	825	55	2887
Row %	33.11	1.32	0.00	2.29	30.97	0.38	1.45	28.58	1.91	100.00
Col. %	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Zone 1	361	12	0	37	401	6	17	286	0	1120
Row %	32.23	1.07	0.00	3.30	35.80	0.54	1.52	25.54	0.00	100.00
Col. %	37.76	31.58	0.00	56.06	44.85	54.55	40.48	34.67	0.00	38.79
Zone 2	3	0	0	8	25	0	0	82	0	118
Row %	2.54	0.00	0.00	6.78	21.19	0.00	0.00	69.49	0.00	100.00
Col. %	0.31	0.00	0.00	12.12	2.80	0.00	0.00	9.94	0.00	4.09
Zone 3	22	23	0	6	68	0	1	11	0	131
Row %	16.79	17.56	0.00	4.58	51.91	0.00	0.76	8.40	0.00	100.00
Col. %	2.30	60.53	0.00	9.09	7.61	0.00	2.38	1.33	0.00	4.54
Zone 4	519	3	0	6	350	5	23	445	55	1406
Row %	36.91	0.21	0.00	0.43	24.89	0.36	1.64	31.65	3.91	100.00
Col. %	54.29	7.89	0.00	9.09	39.15	45.45	54.76	53.94	100.00	48.70
Zone 5	51	0	0	9	50	0	1	1	0	112
Row %	45.54	0.00	0.0	8.04	44.64	0.00	0.89	0.89	0.00	100.00
Col. %	5.33	0.00	0.00	13.64	5.59	0.00	2.38	0.12	0.00	3.88

Appendix 4b. Unimproved boat access by land use and land cover categories.

County	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development Constraint	Parclette	Total
Total	956	38	0	66	894	11	42	825	55	2887
Row %	33.11	1.32	0.00	2.29	30.97	0.38	1.45	28.58	1.91	100.00
Col. %	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Zone 1	361	12	0	37	401	6	17	286	0	1120
Row %	32.23	1.07	0.00	3.30	35.80	0.54	1.52	25.54	0.00	100.00
Col. %	37.76	31.58	0.00	56.06	44.85	54.55	40.48	34.67	0.00	38.79
Zone 2	3	0	0	8	25	0	0	82	0	118
Row %	2.54	0.00	0.00	6.78	21.19	0.00	0.00	69.49	0.00	100.00
Col. %	0.31	0.00	0.00	12.12	2.80	0.00	0.00	9.94	0.00	4.09
Zone 3	22	23	0	6	68	0	1	11	0	131
Row %	16.79	17.56	0.00	4.58	51.91	0.00	0.76	8.40	0.00	100.00
Col. %	2.30	60.53	0.00	9.09	7.61	0.00	2.38	1.33	0.00	4.54
Zone 4	519	3	0	6	350	5	23	445	55	1406
Row %	36.91	0.21	0.00	0.43	24.89	0.36	1.64	31.65	3.91	100.00
Col. %	54.29	7.89	0.00	9.09	39.15	45.45	54.76	53.94	100.00	48.70
Zone 5	51	0	0	9	50	0	1	1	0	112
Row %	45.54	0.00	0.0	8.04	44.64	0.00	0.89	0.89	0.00	100.00
Col. %	5.33	0.00	0.00	13.64	5.59	0.00	2.38	0.12	0.00	3.88

Appendix 4b. Unimproved boat access by land use and land cover categories.

County	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development Constraint	Parcelette	Total
Total	7845	135	1	75	10536	0	17	228	23	18860
Row %	41.60	0.72	0.01	0.40	55.86	0.00	0.09	1.21	0.01	99.90
Col. %	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00
Zone 1	867	86	1	19	669	0	15	28	2	1687
Row %	51.39	5.10	0.06	1.13	39.66	0.00	0.89	1.66	0.12	100.00
Col. %	11.05	63.70	100.00	25.33	6.35	0.00	88.24	12.28	8.70	8.94
Zone 2	505	0	0	14	4857	0	0	1	0	5377
Row %	9.39	0.00	0.00	0.26	90.33	0.00	0.00	0.02	0.00	100.00
Col. %	6.44	0.00	0.00	18.67	46.10	0.00	0.00	0.44	0.00	28.51
Zone 3	1487	3	0	2	933	0	0	12	0	2437
Row %	61.02	0.12	0.00	0.08	38.28	0.00	0.00	0.49	0.00	100.00
Col. %	18.95	2.22	0.00	2.67	8.86	0.00	0.00	5.26	0.00	12.92
Zone 4	862	20	0	6	542	0	1	187	20	1638
Row %	52.63	1.22	0.00	0.37	33.09	0.00	0.06	11.42	1.22	100.00
Col. %	10.99	14.81	0.00	8.00	5.14	0.00	5.88	82.02	86.96	8.69
Zone 5	4124	26	0	34	3535	0	1	0	1	7721
Row %	53.41	0.34	0.00	0.44	45.78	0.00	0.01	0.00	0.01	100.00
Col. %	52.57	19.26	0.00	45.33	33.55	0.00	5.88	0.00	4.35	40.94

Appendix 4c. Deep water access (\geq 3 ft.) by land use and land cover categories.

County	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development	Parcels	Total
Total	1440	52	0	63		3	34	369	35	3446
Row %	41.79	1.51	0.00	1.83		0.09	0.99	10.71	1.02	100.00
Col. %	100.00	100.00	0.00	100.0	100.0	100.00	100.00	100.00	100.00	100.00
Zone 1	257	4	0	30		3	9	88	0	579
Row %	44.39	0.69	0.00	5.18		0.52	1.55	15.20	0.00	100.00
Col. %	17.85	7.69	0.00	47.62		100.00	26.47	23.85	0.00	16.80
Zone 2	431	12	0	2		0	0	45	0	1153
Row %	37.38	1.04	0.00	0.17		0.00	0.00	3.90	0.00	100.00
Col. %	29.93	23.08	0.00	3.17		0.00	0.00	12.20	0.00	33.46
Zone 3	20	24	0	6		0	0	9	0	80
Row %	25.00	30.00	0.00	7.50		0.00	0.00	11.25	0.00	100.00
Col. %	1.39	46.15	0.00	9.52		0.00	0.00	2.44	0.00	2.32
Zone 4	675	11	0	25		0	25	225	35	1568
Row %	43.05	0.70	0.00	1.59		0.00	1.59	14.35	2.23	100.00
Col. %	46.88	21.15	0.00	39.68		0.00	73.53	60.98	100.00	45.50
Zone 5	57	1	0	0		0	0	2	0	66
Row %	86.36	1.52	0.00	0.00		0.00	0.00	3.03	0.00	100.00
Col. %	3.96	1.92	0.00	0.00		0.00	0.00	0.54	0.00	1.92

Appendix 4d. Shallow water access (< 3 ft.) by land use and land cover categories.

County	Wetland Parcels	Non-Wetlands	Total
Total	2669	27895	30564
Row %	8.7	91.3	100.0
Col. %	100.0	100.0	100.0
Zone 1	557	3114	3671
Row %	15.2	84.8	100.0
Col. %	20.9	11.2	12.1
Zone 2	219	7145	7364
Row %	3.0	97.0	100.0
Col. %	8.2	25.6	24.1
Zone 3	73	5622	5695
Row %	1.3	98.7	100.0
Col. %	2.7	20.2	18.6
Zone 4	1767	4191	5958
Row %	29.7	70.2	100.0
Col. %	66.2	15.0	19.5
Zone 5	52	7824	7876
Row %	0.7	99.3	100.0
Col. %	2.0	28.0	25.8

Appendix 4e. General distribution of wetlands.

County	Residential	Vacant	Development Constraint	Total
Total	136	414	2058	2608
Row %	5.2	15.9	78.9	100.0
Col. %	100.0	100.0	100.1	100.0
Zone 1	76	223	216	515
Row %	14.8	43.3	41.9	100.0
Col. %	55.9	53.9	10.5	19.8
Zone 2	0	34	181	215
Row %	0.0	15.8	84.2	100.0
Col. %	0.0	8.3	8.8	8.2
Zone 3	7	35	28	70
Row %	10.0	50.0	40.0	100.0
Col. %	5.2	8.5	1.4	2.7
Zone 4	42	85	1631	1758
Row %	2.4	4.8	92.8	100.0
Col. %	30.9	20.5	79.3	67.4
Zone 5	11	37	2	50
Row %	8.1	74.0	4.0	100.0
Col. %	11.2	8.9	0.1	1.9

Appendix 4f. Wetland conditions by land use and cover classes.

County	Lemon Bay AP	Charlotte Hbr. AP	Outside AP	Total
Total	1350	756	28458	30564
Row %	4.4	2.5	93.1	100.0
Col. %	100.0	100.0	100.0	100.0
Zone 1	1350	297	2024	3671
Row %	36.8	8.1	55.1	100.0
Col. %	100.0	39.3	7.1	12.0
Zone 2	0	13	7351	7364
Row %	0.0	0.2	99.8	100.0
Col. %	0.0	1.7	25.8	24.1
Zone 3	0	167	5528	5695
Row %	0.0	2.9	97.1	100.0
Col. %	0.0	22.1	19.4	18.6
Zone 4	0	0	5958	5958
Row %	0.0	0.0	100.0	100.0
Col. %	0.0	0.0	20.9	19.5
Zone 5	0	279	7597	7876
Row %	0.0	3.5	96.5	100.0
Col. %	0.0	36.9	26.7	25.8

Appendix 4g. General distribution of parcels in aquatic preserves.

Charlotte Hbr. AP	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development Constraint	Parcelett e	Total Number of Parcels
Total	277	43	1	41	196	3	5	190	0	756
Row %	36.6	5.7	0.1	5.4	25.9	0.4	0.7	25.1	0.0	100.0
Col. %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Zone 1	50	5	1	2	65	3	3	168	0	297
Row %	16.8	1.7	0.3	0.7	21.9	1.0	1.0	56.6	0.0	100.0
Col. %	18.1	11.6	100.0	4.9	33.2	100.0	60.0	88.4	0.0	39.3
Zone 2	2	0	0	1	3	0	0	7	0	13
Row %	15.4	0.0	0.0	7.7	23.1	0.0	0.0	53.8	0.0	100.0
Col. %	0.7	0.0	0.0	2.4	1.5	0.0	0.0	3.7	0.0	1.7
Zone 3	65	25	0	7	56	0	1	13	0	167
Row %	38.9	15.0	0.0	4.2	33.5	0.0	0.6	7.8	0.0	100.0
Col. %	23.5	58.1	0.0	17.1	28.6	0.0	20.0	6.8	0.0	22.1
Zone 5	160	13	0	31	72	0	1	2	0	279
Row %	57.3	4.7	0.0	11.1	25.8	0.0	0.4	0.7	0.0	100.0
Col. %	57.8	30.2	0.0	75.6	36.7	0.0	20.0	1.1	0.0	36.9

Lemon Bay AP	Residential	Commercial	Industrial	Public	Vacant	Agricultural	Submerged	Development Constraint	Parcelett e	Total Number of Parcels
Zone 1	590	47	0	46	578	3	19	65	2	1350
Row %	43.7	3.5	0.0	3.4	42.8	0.2	1.4	4.8	0.1	100.0
Col. %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Appendix 4h. Parcels in Charlotte Harbor and Lemon Bay Aquatic Preserves by land use and land cover categories.

APPENDIX 5

SITE SUITABILITY GIS PROCEDURE

Marina Facilities

Existing Marina Sites Suitable for Expansion. Existing marina facilities are identified in the GIS database (Table 18) using the Arc/Info TABLES reselect command (i.e., RESELECT landuse1 >=230 and landuse1 <=233). The parcel identification number is used to shade each selected marina. A shaded "marina" parcel provides a cue in Arcedit to zoom in and visually inspect neighboring parcels. Parcel adjacency is verified using 1:2,400 section aerials. The land use and acreage of neighboring parcels is confirmed by querying the parcel database. Each site is evaluated according to the suitability index (Table 18) and is assigned a rating of poor, fair, or good. Appendix 5a gives the input data and Appendix 5b gives the transformed parameter scores and suitability rating for each existing marina site suitable for expansion.

New Potential Marina Sites. The criteria used to identify new marina sites is outlined in Appendix 5c. The Arc/Info TABLES RESELECT command is used to select parcels meeting these requirements. This procedure identified 20 parcels. A second query examines the land use and acreage of adjoining parcels. The suitability of selected parcels for marina development is assessed by conditions outlined in Tables 18 and Appendix 5c. For example, potential sites with high developmental and low environmental ratings with large vacant adjacent parcels are considered more desirable than sites containing mangrove, without infrastructure or access, and without vacant adjacent parcels. Appendix 5d gives the input data and Appendix 5e gives the transformed parameter scores and parcel suitability rating for new potential marina sites.

Private Docks

This analysis focuses on identifying those residential and vacant parcels where private boat docks may adversely affect the surrounding environment. There are two parts to this analysis. First, all residential and vacant parcels *without* docks are identified and evaluated with respect to their environmental suitability for private dock expansion. Second, all residential and vacant parcels *with* existing docks are identified and evaluated for their environmental suitability purpose. A new coverage is created by combining residential and vacant parcels *with* and *without* docks, with environmentally sensitive areas identified in the SWFWMD land use/land cover coverage. Appendix 5f outlines the selection criteria for environmental suitability analysis. The ARC RESELECT command is used to create a new coverage of residential or vacant parcels with and without docks, that contains environmentally sensitive vegetation such as wetland.

A rating index (Table 19) is used to assess the environmental suitability of all residential and vacant salt-water accessible parcels *with* docks and *without* docks. This index is very similar to the development suitability rating index used for the marina and ramp analyses (Table 18). According to this system, points are accumulated for each environmental parameter; the more points accumulated, the greater the environmental impact resulting from private docks. The dock analysis proceeds as follows:

Step 1. Combine mangrove and wetland elements from the SWFWMD coverage with vacant and residential parcels with no docks.

A. Add an item to the parcel coverage and calculate the item equal to the unique identification number carried by each parcel.

```
ARC:> ADDITEM PARCEL.PAT PARCEL.PAT RELATER 10 10 I
```

B. Reselect out of the parcel coverage all 26,530 residential and vacant parcels *with* and *without* boat docks.

```
ARC:> RESELECT PARCEL RESVAC
```

```
enter expression: reselect landuse1 >= 100 and landuse1 <= 150 or landuse1 = 500
```

C. Reselect out of the USGS coverage, all environmentally sensitive coastal areas (wetland).

```
ARC:> RESELECT USGS WETLANDS
```

```
enter expression: reselect basic = 4 (ID for wetland)
```

RESVAC - contains only residential and vacant parcels with and without docks

WETLANDS - contains only wetland polygons

Step 2. Use INTERSECT overlay function to merge WETLANDS and RESVAC coverages.

```
ARC:> INTERSECT RESVAC WETLANDS RESVACWET poly option
```

Intersect computes the geometric intersection of two coverages. Only those features, from both coverages, which occupy the same geographic space, are preserved in the output coverage. This step results in an output coverage, RESVACWET, that contains only those residential and vacant parcels with wetlands that fall within the parcel boundaries. The feature attributes of both coverages are joined in the output coverage.

Step 3. Add items to the PARCELS polygon attribute table for the impact rating (see Appendix 5f).

```
TABLES: ADDITEM RESVACWET.pat mscore 2 2 I 0
```

```
TABLES: ADDITEM RESVACWET.pat ascore 2 2 I 0
```

```
TABLES: ADDITEM RESVACWET.pat aqscore 2 2 I 0
```

TABLES: ADDITEM RESVACWET.pat wdscore 2 2 1 0
TABLES: ADDITEM RESVACWET.pat maod 2 2 1 0

mscore = field for wetland score
ascore = field for access score
aqscore = field for aquatic preserve score
wdscore = field for water depth score
PWDU = field for final environmental rating score

Step 4. Query the polygon attribute table for the presence of environmental criteria outlined in Appendix 5f. Assign to the respective field a value of 0 or 2 based on the presence or absence of that attribute. For example consider the following:

TABLES: RESELECT depth = 2 (selects all records with water depth \leq 3 feet)
TABLES: 2890 records selected
TABLES: CALC wdscore = 2

A value of 2 (higher impact) is assigned to wdscore field of those parcels meeting the criteria for water depth \leq 3 feet.

Step 5. Relate RESVACWET to PARCELS coverage and calculate mscore value.

TABLES: SELECT PARCELS.PAT
TABLES: Enter Command: RELATE ADD
TABLES: Relation Name: mscore
TABLES: Table Identifier: resvacwet.pat
TABLES: Database Name: info
TABLES: INFO Item: parcels#
TABLES: Relate Column: relater
TABLES: Relate Type: linear
TABLES: Relate Access: ro

TABLES: RESELECT parcels# = mscore//relater
TABLES: CALCULATE mscore = 2

Step 6. Calculate final environmental sensitivity rating.

TABLES: CALC PWDU = mscore + ascore + aqscore + wdscore

The PWDU field contains the final environmental suitability score for each residential and vacant parcel. This number is compared to the break points for high, medium, and low impact, outlined in Appendix 5f.

Step 7. Summarize the high, low, and medium environmental sensitivity counts by geographic zone.

Boat Ramps

Existing Ramp Sites Suitable for Expansion. There are 10 municipal boat ramps located in Charlotte County. A new item, PUBRAMP, is added to the polygon attribute table. This item is calculated = 1 for each existing ramp site. Neighboring parcels are queried and evaluated (see Table 18 and Appendix 5g) in the same manner as described for existing marinas. The final score is obtained by subtracting environmental considerations from developmental considerations. Appendix 5h gives the input data and Appendix 5i gives the transformed parameter scores and parcel suitability rating for each existing ramp site. suitable for expansion.

Non-Public Parcels Suitable for New Ramp Sites. The first step of the analysis focuses on identifying all non-public vacant sites meeting the selection criteria as outlined in Appendix 5g. Note that the road designation is relaxed to include all paved roads, not only collectors and higher. The second step evaluates site suitability based on the presence of vacant adjacent parcels and their acreage, as well as the presence of seagrass and wetland (see Table 18). The final score is obtained by subtracting environmental considerations from developmental considerations. Appendix 5j gives the input data and Appendix 5k gives the transformed parameter scores and parcel suitability rating for each potential new ramp site on public parcels.

Public Parcels Suitable for New Ramp Sites. All public parcels are considered by querying the landuse and public ramp attributes (RESELECT landuse1 >=410 and landuse1 <=460 and pubramp =0). The selected parcels are evaluated further by attributes described in Appendix 5g. For example, parcels < 1 acre with no water or sewer are eliminated. A second step evaluates the remaining parcels in the same manner as marinas and boat ramps, by visually inspecting the neighboring parcels in ARCEDIT. Site suitability criteria are outlined in Table 18; these are relaxed so that a greater number of parcels can be considered - there are approximately 150 waterfront public parcels in the county. The final score is obtained by subtracting environmental considerations from developmental considerations. Appendix 5l gives the input data and Appendix 5m gives the transformed parameter scores and parcel suitability rating for each potential new ramp site on public parcels.

Marina	Parcel Number	Zone	*VAP yes/no	VAP Total Acreage	Aquatic Preserve	Access	Sea-grass	Wetlands	Water Depth	Infrastructure		
										Water	Sewer	Road
Eldred's Marina	44005	1	Yes	14.95	2	1	No	Yes	1	1	1	3
Gasparilla Marina	44025	1	Yes	1.91	1	1	Dense	No	1	1	1	3
The Boatworks	14246	1	Yes	0.84	0	1	Dense	No	1	3	1	2
Uncle Henry's Marina	54032	1	No	0	1	1	No	No	1	1	1	3
Chadwick Cove Marina	4037	1	No	0	2	1	No	No	1	3	2	3
Ainger Creek Marina	16170	1	No	0	2	1	Dense	No	2	3	2	3
Kevin's Place	16168	1	No	0	0	1	Dense	No	3	3	2	3
Stump Pass Marina	20289	1	Yes	2.57	0	1	Patchy	No	1	2	1	5
Sea Gull Moorings	28074	1	Yes	13.2	2	1	Dense	No	1	3	1	5
Englewood Bait House	14216	1	Yes	2.5	2	2	Dense	Yes	1	3	2	3
Chuck's Marina	14001	1	Yes	1.04	0	1	Dense	No	1	3	1	3
Gulfwind / Palm Island	258022	1	Yes	1.01	2	1	Dense	Yes	1	3	2	5
Gulf Coast Marine	126054	2	No	0	0	1	No	No	2	2	0	2
Seahorse Marina	168034	3	Yes	0.54	1	2	No	No	2	3	1	1
Punta Gorda Marina	212026	4	Yes	0.4	0	1	No	No	1	3	1	1
Peace River Fish Camp	182012	4	Yes	0.12	0	1	No	No	1	1	1	5
Lalshley Park Marina	236006	4	No	0	0	1	No	No	1	2	2	1
Gator Creek Marine	244818	5	Yes	3.83	1	1	No	No	1	3	1	5
Riviera Marina	244246	5	Yes	0.37	1	1	No	No	1	3	1	5
Fisherman's Village	222655	5	No	0	1	2	No	No	1	3	2	5

* VAP stands for Vacant Adjacent Parcel

Appendix 5a. Data for evaluating the suitability of expanding existing public access marinas.

Marina	Parcel Number	*VAP y=1 n=0	Developmental Considerations				Access Imp = 2 Unimp = 0	Environmental Considerations			Score	PWDU Rating
			VAP Acreage <1 = 0; 1-5 = 1 > 5 = 2	Water Depth >=3 ft. MLW y = 2, n = 0	Water y=2 n=0	Sewer y=2 n=0	Roads y=2 n=0	Wet-lands y = 2, n = 0	Seagrass S and P = 1 D = 2, n = 0	Aquatic Preserve y = 2, n=0		
Eldred's Marina	44005	1	2	2	0	0	2	2	0	2	5	Poor
Gasparilla Marina	44025	1	1	2	0	0	2	0	2	2	4	Poor
The Boatworks	14246	1	0	2	2	0	2	0	2	0	7	Fair
Uncle Henry's Marina	54032	0	0	2	0	0	2	0	0	2	4	Poor
Chadwick Cove Marina	4037	0	0	2	2	2	2	0	0	2	8	Fair
Ainger Creek Marina	16170	0	0	0	2	2	2	0	2	2	4	Poor
Kevin's Place	16168	0	0	2	2	2	2	0	2	0	8	Fair
Stump Pass Marina	20289	1	1	2	2	0	2	0	1	0	7	Fair
Sea Gulf Moorings	28074	1	2	2	2	0	0	0	2	2	5	Poor
Englewood Bait House	14216	1	1	2	2	2	2	2	2	2	4	Poor
Chuck's Marina	14001	1	1	2	2	0	2	0	2	0	8	Fair
Gulfwind / Palm Island	258022	1	1	2	2	2	0	2	2	2	4	Poor
Gulf Coast Marine	126054	0	0	0	2	0	2	0	0	0	6	Fair
Seahorse Marina	168034	1	0	0	2	0	2	0	0	2	3	Poor
Punta Gorda Marina	212026	1	0	2	2	0	2	0	0	0	9	Good
Peace River Fish Camp	182012	1	0	2	0	0	0	0	0	0	5	Poor
Laishley Park Marina	236006	0	0	2	2	2	2	0	0	0	10	Good
Gator Creek Marina	244818	1	1	2	2	0	0	0	0	2	6	Fair
Riviera Marina	244246	1	0	2	2	0	0	0	0	2	5	Poor
Fisherman's Village	222655	0	0	2	2	2	0	0	0	2	4	Poor

* VAP stands for Vacant Adjacent Parcel 0 - 5 points, the site is poor (PWDU II) 6 - 8 points, the site is fair (PWDU II) 9 - 13 points, the site is good (PWDU I)

Appendix 5b. Suitability ratings for existing public access marina expansion.

Selection Criteria	Database Attributes and Values
IDENTIFY EXISTING MARINAS	
Existing marinas	Landuse1 = 231
IDENTIFY NEW MARINA SITES	
Water depth >= 3 feet mllw	depth = 1, 3, 4
Water access is improved	access = 1, 3, 4
Not adjacent to aquatic preserve	preserve = 0
Water service line	water > 1
Central sewer service available	sewer = 2
Road (collector or above)	road < 5
Greater than 1 acre	acreage > 1
Vacant land with no environmental constraints.	Landuse1 = 500

Appendix 5c. Criteria for analyzing the expansion potential of existing marinas and the location of new marinas on vacant parcels.

Parcel Number	Zone	Current Zoning	Parcel Acreage	*VAP yes/no	VAP Total acreage	Aquatic Preserve	Access Preserve	Sea-grass	Well-lands	Water		Infrastructure	
										Depth	Water	Sewer	Road
108029	3 cg		2.5	Yes	0.27	0		1 No	No	1	3		2
108030	3 cg		1.11	Yes	0.27	0		1 No	No	1	3		2
158403	3 cg		22.44	Yes	21.03	0		1 No	Yes	1	3		3
326002	3 unknown		25	No	0	0		1 No	Yes	1	3		3
164001	3 rmf-10		21.03	Yes	6.1	0		1 No	No	1	3		3
212088	4 city		1.51	No	0	0		1 No	No	1	3		4
224727	5 rmf-15		12.95	No	0	0		1 No	No	1	3		3
244324	5 rmf-10		2.32	No	0	0		1 No	No	1	3		3
80001	2 es/p		18.98	No	0	0		1 No	Yes	1	3		4
232157	5 rmf-15		4.47	No	0	0		1 No	No	1	3		3
158382	3 rsf-3.5		9.78	No	0	0		1 No	Yes	1	3		3
152031	3 rmf-15		6.2	Yes	2.01	0		1 No	No	3	3		3
152030	3 rsf-3.5		1.47	No	0	0		1 No	No	1	2		3
124035	3 rsf-3.5		1.96	Yes	0.26	0		1 No	No	1	3		3
124037	3 rsf-3.5		6.71	No	0	0		1 No	No	1	3		3
164042	3 rsf-3.5		11.41	Yes	21.29	0		1 No	No	3	3		3
70686	2 rsf-3.5/p		3.72	Yes	0.3	0		1 No	No	1	3		4
70864	2 rsf-3.5/p		2.79	Yes	0.21	0		1 No	No	1	3		4
84868	2 rsf-3.5		1.44	Yes	2.58	0		1 No	No	1	3		4
84669	2 rsf-3.5		2.34	Yes	0.47	0		1 No	No	1	3		4

Appendix 5d. Data for evaluating the suitability of vacant parcels for new marina sites.

Parcel Number	Zone	Current Zoning	*VAP y=1 n=0	VAP Acreage <1 = 0; 1-5 = 1 > 5 = 2	Developmental Considerations					Environmental Considerations				Score	PWDU Rating
					Water Depth >=3 ft. MLW	Water y=2	Sewer y=2	Road y=2	Access Imp = 2	Wetlands	Seagrass S and P = 1	Aquatic Preserve			
108029	3	cg	1	0	2	2	2	2	2	2	0	0	11	Good	
108030	3	cg	1	0	2	2	2	2	2	2	0	0	11	Good	
158403	3	cg	1	2	2	2	2	2	2	2	2	1	10	Good	
326002	3	unknown	0	0	2	2	2	2	2	2	2	1	7	Fair	
164001	3	rmf-10	1	2	2	2	2	2	2	2	0	1	12	Good	
212088	4	city	0	0	2	2	2	2	2	2	0	0	10	Good	
224727	5	rmf-15	0	0	2	2	2	2	2	2	0	1	9	Good	
244324	5	rmf-10	0	0	2	2	2	2	2	2	0	1	9	Good	
80001	2	es/p	0	0	2	2	2	2	2	2	2	0	8	Fair	
232157	5	rmf-15	0	0	2	2	2	2	2	2	0	1	9	Good	
158382	3	rsf-3.5	0	0	2	2	2	2	2	2	2	0	8	Fair	
152031	3	rmf-15	1	1	2	2	2	2	2	2	0	0	12	Good	
152030	3	rsf-3.5	0	0	2	2	2	2	2	2	0	0	10	Good	
124035	3	rsf-3.5	1	0	2	2	2	2	2	2	0	0	11	Good	
124037	3	rsf-3.5	0	0	2	2	2	2	2	2	0	0	10	Good	
164042	3	rsf-3.5	1	2	2	2	2	2	2	2	0	0	13	Good	
70686	2	rsf-3.5 /p	1	0	2	2	2	2	2	2	0	0	11	Good	
70864	2	rsf-3.5/p	1	0	2	2	2	2	2	2	0	0	11	Good	
84868	2	rsf-3.5	1	1	2	2	2	2	2	2	0	0	12	Good	
84669	2	rsf-3.5	1	0	2	2	2	2	2	2	0	0	11	Good	

*VAP = Vacant Adjacent Parcel	0 - 5 points, the site is poor (PWDU II)	6 - 8 points, the site is fair (PWDU II)	9 - 13 points, the site is good (PWDU I)
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Appendix 5e. Suitability ratings for new marina sites.

Selection Criteria	Database Attributes and Values
PARCELS COVERAGE	
Landuse is residential or vacant	Landuse1 >= 100 and Landuse1 <= 150 or landuse1 = 500
without dock	Docks = 0
with dock	Docks > 0
USGS LAND USE/COVER COVERAGE	
Land cover is wetlands	Basic = 4 (id for wetlands)

Appendix 5f. Criteria for selecting all residential single family and vacant parcels with and without docks for environmental suitability analysis.

Selection Criteria	Database Attributes and Values
IDENTIFY EXISTING BOAT RAMPS	
Existing boat ramps	Pubramp = 1
IDENTIFY NON-PUBLIC SITES	
Water depth >= 3 feet mllw	depth = 1, 3, 4
Water access is improved	access = 1, 3, 4
Not adjacent to aquatic preserve	preserve = 0
Water service line available	water > 1
Central sewer service available	sewer = 2
Road (all paved roads)	road < 6
Greater than 1 acre	acreage > 1
Landuse is vacant or public but excludes parcels with boat ramps	Landuse1 >=410 and Landuse1 <=460 or Landuse1 = 500 and Pubramp = 0
*IDENTIFY PUBLIC SITES	
Water depth >= 3 feet mllw	depth = 1, 3, 4
Water access is improved	access = 1, 3, 4
Greater than 1 acre	acreage > 1
Landuse is public but excludes parcels with boat ramps	Landuse1 >=410 and Landuse1 <=460 and Pubramp =0
*Only three public parcels remained potentially suitable using the criteria for the selection of non-public parcels. As such, the criteria for the selection of public parcels was relaxed due to the small number of existing public parcels.	

Appendix 5g. Criteria for identifying existing boat ramps and selecting non-public and public parcels for new ramp development.

Municipal Boat Ramp	Parcel Number	Zone	VAP yes/no	VAP Total Acreage	Aquatic Preserve	Access	Seagrass	Wetlands	Water Depth	Infrastructure	
										Water	Sewer
Tom Adams Bridge	14390	1	No	0	2	2	No	No	1	1	2
Placida Ramp	44004	1	No	0	1	1	No	No	1	1	1
El Jobean Ramp	500002	2	No	0	0	1	No	No	2	2	0
Spring Lake Park Ramp	142058	3	Yes	4.13	0	1	No	No	3	3	2
Port Charlotte Beach Ramp	154824	3	Yes	0.69	1	1	No	No	1	2	2
Harbor Heights Park Ramp	186083	4	No	0	0	2	No	No	2	2	1
Riverside Ramp	196026	4	No	0	0	2	No	No	1	1	1
Darst Park Ramp	206032	4	No	0	0	1	No	No	2	2	1
Lashley Park Ramp	236006	4	No	0	0	1	No	No	1	2	2
Clark Park	196031	4	No	0	0	1	No	No	2	1	1
Ponce de Leon Park Ramp	228002	5	No	0	1	1	No	No	1	2	2

Appendix 5h. Data for evaluating the suitability of expanding existing ramp sites.

Municipal Boat Ramp	Parcel Number	Zone	VAP		Developmental Considerations		Environmental Considerations		Score	PWDU Rating
			y=1 n=0	y=0 n=0	VAP Acreage <1 = 0; 1-5 = 1 >5 = 2	Water Depth >=3 ft. MLW y=2, n=0	Water y=2 n=0	Sewer y=2 n=0		
Tom Adams Bridge	14390	1	0	0	0	2	0	2	2	4
Placida Ramp	44004	1	0	0	0	2	0	2	2	2
El Jobean	500002	2	0	0	0	2	0	2	2	2
Spring Lake Park Ramp	142058	3	1	1	1	2	2	2	0	8
Port Charlotte Beach Ramp	154824	3	1	0	0	2	2	2	0	12
Harbor Heights Park Ramp	186083	4	0	0	0	2	2	2	0	9
Riverside Ramp	196026	4	0	0	0	2	0	2	0	4
Darst Park Ramp	206032	4	0	0	0	2	0	2	0	4
Lashley Park Ramp	236006	4	0	0	0	2	2	2	0	5
Clark Park	196031	4	0	0	0	2	2	2	0	10
Ponce de Leon Park Ramp	228002	5	0	0	0	2	2	2	0	6
										8

*VAP = Vacant Adjacent Parcel 0 - 5 points, the site is poor (PWDU II) 6 - 8 points, the site is fair (PWDU II) 9 - 13 points, the site is good (PWDU I)

Appendix 5i. Suitability ratings for existing ramp site expansion.

Parcel Number	Zone	Current Zoning	Parcel Acreage	VAP yes/no	VAP Total Acreage	Aquatic Preserve	Access	Seagrass	Wetlands	Water Depth	Infrastructure	
											Water	Sewer/Road
258075	1	rsf-3.5	11.13	No	0	0	1	Dense	Yes	3	3	2
6046	1	rsf-3.5	1.01	No	0	0	1	No	No	1	2	2
16019	1	rsf-2.5	1.42	No	0	0	1	No	No	1	3	2
14210	1	cg	1.06	Yes	0.32	0	1	No	No	1	3	2
84868	2	rsf-3.5	1.44	Yes	2.58	0	1	No	No	1	3	2
84669	2	rsf-3.5	2.34	Yes	0.47	0	1	No	No	1	3	2
70686	2	rsf-3.5/p	3.72	Yes	0.3	0	1	No	No	1	3	2
70864	2	rsf-3.5/p	2.79	Yes	0.21	0	1	No	No	1	3	2
80001	2	es/p	18.99	Yes	0	0	1	No	Yes	1	3	2
152030	3	rsf-3.5	1.47	No	0	0	1	No	No	1	2	2
124037	3	rsf-3.5	6.71	No	0	0	1	No	No	1	3	2
164042	3	rsf-3.5	11.41	Yes	21.29	0	1	No	No	3	3	2
158382	3	rsf-3.5	9.78	No	0	0	1	No	Yes	1	3	2
158191	3	rsf-3.5	2.67	Yes	20.22	0	1	No	Yes	1	3	2
158190	3	rsf-3.5	1.14	Yes	3.81	0	1	No	Yes	1	3	2
152032	3	rmf-15	2.01	Yes	6.2	0	1	No	Yes	3	3	2
108029	3	cg	2.5	Yes	0.27	0	1	No	No	1	3	2
124035	3	rsf-3.5	1.96	Yes	0.26	0	1	No	No	1	3	2
152031	3	rmf-15	6.2	Yes	2.01	0	1	No	No	3	3	2
326002	3	unknown	40	No	0	0	1	No	Yes	1	3	2
164001	3	rmf-10	21.02	Yes	6.1	0	1	No	Yes	1	3	2
108030	3	cg	1.11	Yes	0.26	0	1	No	No	1	3	2
158403	3	cg	6.1	Yes	21.03	0	1	No	No	1	3	2
212088	4	city	1.52	No	0	0	1	No	No	1	3	2
244324	5	rmf-10	2.33	Yes	0	0	1	No	No	1	3	2
224727	5	rmf-15	12.94	Yes	0.23	0	1	No	No	1	3	2
220196	5	rmf-15	2.7	Yes	6.63	0	1	No	No	1	3	2
220197	5	rmf-15	5.68	Yes	2.7	0	1	No	No	1	3	2
227127	5	rmf-15	5.59	No	0	0	1	No	No	1	3	2
232157	5	rmf-15	4.48	Yes	0	0	1	No	No	1	3	2

Appendix 5j. Data for evaluating the suitability of new ramp sites on non-public parcels.

Parcel Number	Zone	Current Zoning	Developmental Considerations					Environmental Considerations				Score	PWDU Rating
			*VAP y=1 n=0	VAP Acreage <1 = 0, 1-5 = 1 > 5 = 2	Water Depth y=2 n=0	Water/Sewer y=2 n=0	**Road y=2 n=0	Access Imp = 2 Unimp = 0	Wetlands y = 2, n = 0	Seagrass S and P = 1 D = 2, n = 0	Aquatic Preserve y = 2, n = 0		
258075	1	rsf-3.5	0	0	2	2	2	2	2	2	0	6	Fair
6046	1	rsf-3.5	0	0	2	2	2	2	2	0	0	10	Good
16019	1	rsf-2.5	0	0	2	2	2	2	2	0	0	10	Good
14210	1	cg	1	0	2	2	2	2	2	0	0	11	Good
84868	2	rsf-3.5	1	1	2	2	2	2	2	0	0	12	Good
84669	2	rsf-3.5	1	0	2	2	2	2	2	0	0	11	Good
70686	2	rsf-3.5/p	1	0	2	2	2	2	2	0	0	11	Good
70864	2	rsf-3.5/p	1	0	2	2	2	2	2	0	0	11	Good
80001	2	es/p	0	0	2	2	2	2	2	2	0	8	Fair
152030	3	rsf-3.5	0	0	2	2	2	2	2	0	0	10	Good
124037	3	rsf-3.5	0	0	2	2	2	2	2	0	0	10	Good
164042	3	rsf-3.5	1	2	2	2	2	2	2	0	0	13	Good
158382	3	rsf-3.5	0	0	2	2	2	2	2	2	0	8	Fair
158191	3	rsf-3.5	1	2	2	2	2	2	2	2	0	11	Good
158190	3	rsf-3.5	1	1	2	2	2	2	2	2	0	10	Good
152032	3	rmf-15	1	2	2	2	2	2	2	2	0	11	Good
108029	3	cg	1	0	2	2	2	2	2	0	0	11	Good
124035	3	rsf-3.5	1	0	2	2	2	2	2	2	0	11	Good
152031	3	rmf-15	1	1	2	2	2	2	2	0	0	11	Good
326002	3	unknown	0	0	2	2	2	2	2	0	0	11	Good
164001	3	rmf-10	1	2	2	2	2	2	2	2	0	12	Good
108030	3	cg	1	0	2	2	2	2	2	2	0	8	Fair
158403	3	cg	1	2	2	2	2	2	2	2	0	11	Good
212088	4	city	0	0	2	2	2	2	2	0	0	11	Good
244324	5	rmf-10	0	0	2	2	2	2	2	0	0	13	Good
224727	5	rmf-15	1	0	2	2	2	2	2	0	0	10	Good
220196	5	rmf-15	1	2	2	2	2	2	2	0	0	11	Good
220197	5	rmf-15	1	1	2	2	2	2	2	0	0	13	Good
227127	5	rmf-15	0	0	2	2	2	2	2	0	0	12	Good
232157	5	rmf-15	0	0	2	2	2	2	2	0	0	10	Good

*VAP stands for vacant adjacent parcel or adjacent public parcel **Road designation has been relaxed to consider all roads, not just collector or above.

0 - 5 points, the site is poor (PWDU II) 6 - 8 points, the site is fair (PWDU II) 9 - 13 points, the site is good (PWDU I)

Appendix 5k. Suitability ratings for new ramp sites on non-public parcels.

Parcel Number	Zone	Current Zoning	Parcel Acreage	VAP yes/no	VAP Total Acreage	Aquatic Preserve	Access	Seagrass	Wetlands	Water Depth	Infrastructure Water	Sewer	Road
74288	2	p	1.58	Yes	0.17	0	1	No	No	1	1	1	5
88029	2	p	4.87	Yes	13.49	0	1	No	Yes	1	1	2	5
154421	3	rsf-3.5/p	3.46	No	0	0	1	No	No	3	3	2	5
222659	5	p	2.52	Yes	1.23	1	1	No	No	1	1	1	3
222658	5	p	1.23	Yes	2.52	1	1	No	No	1	3	2	5

Appendix 5I. Data for evaluating the suitability of new ramp sites on public parcels.

Parcel Number	Zone	Developmental Considerations				Environmental Considerations				Score	PWDU Rating
		*VAP y=1 n=0	VAP Acreage <1=0; 1-5=1 >5=2	Water Depth >=3 ft MLW y=2, n=0	Water y=2 n=0	Sewer y=2 n=0	**Road y=2 n=0	Access Imp=2 Unimp=0 y=2, n=0	Wetlands y=2, n=0	Seagrass S and P=1 D=2, n=0	Aquatic Preserve y=2, n=0
74288	2	1	1	2	0	0	2	2	0	0	8 Fair
88029	2	1	2	2	0	2	2	2	2	0	9 Good
154421	3	0	0	2	2	2	2	2	0	0	10 Good
222659	5	1	1	2	0	0	2	2	0	2	6 Fair
222658	5	1	1	2	2	2	2	2	0	2	10 Good

*VAP = vacant adjacent parcel or adjacent public parcel

**Road designation has been relaxed to consider all roads, not just collector or above.

0 - 5 points, the site is poor (PWDU II)

6 - 8 points, the site is fair (PWDU II)

9 - 13 points, the site is good (PWDU I)

Appendix 5m. Suitability ratings for new ramp sites on public parcels.

APPENDIX 6

WATER-RELATED AND WATER-DEPENDENT USES ALLOWED WITHIN ZONING DISTRICTS

(Source: Section 3-9 of the *Code of Laws and Ordinances of Charlotte County Charlotte County, Florida* commonly referenced as the *Charlotte County Zoning Regulations*, as adopted in 1989 and amended)

Zoning District	Permitted Principal Uses	Permitted Accessory Uses	Special Exception
Environmentally Sensitive (ES)	Piers, docks, wharves, boat houses, boat docks, and boat lifts	Uses and structures customarily accessory and clearly related to permitted uses	Fishing camps, resort and sports marinas, commercial fisheries
Marine Park (MP)	Boating, fishing, swimming, diving, water skiing, surfboarding, wading, and similar activities; boat docks and boat lifts, seawalls, bulkheads, riprap, navigation markers and signal devices	Uses, but not structures, customarily accessory and clearly related to permitted uses	Structures and uses directly related to permitted uses in upland zoning districts abutting the MP district; covered boat slips and boat houses; commercial wet storage of boats; houseboats and live-aboards
Agriculture (AG and AE)	Parks and other recreation uses such as...fishing, other uses which create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses	Yacht clubs
Residential Estates (RE)	None specifically. Individual uses create openings for accessory uses	The following uses and structures customarily accessory and clearly related to permitted uses: Boat docks	Yacht clubs
Residential Single Family (RSF)	Non-commercial boat docks; other uses which create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses	Yacht clubs
Residential Multi Family (RMF)	Non-commercial boat docks; other uses which create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses	Yacht clubs, resort marinas

**WATER-RELATED AND WATER-DEPENDENT USES
ALLOWED WITHIN ZONING DISTRICTS**

(Source: Section 3-9 of the *Code of Laws and Ordinances of Charlotte County Charlotte County, Florida* commonly referenced as the *Charlotte County Zoning Regulations*, as adopted in 1989 and amended)

Residential Multi Family - Tourist (RMF - T)	Non-commercial boat docks, resort and sport marinas	Uses and structures customarily accessory and clearly related to permitted uses	None specifically, certain uses (including principal and accessory) may allow docks or other water-related uses and structures as part of the special exception; e.g.: dockside restaurants
Mobile Home Park (MHP)	Park recreation facilities including docks, piers, and boat launching areas	Uses and structures customarily accessory and clearly related to permitted uses which are located on the same parcel as the RV park and are not likely to attract visitors in large numbers	Resort marinas
Mobile Home Subdivision (MHP)	Non-commercial boats docks; other uses which create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses	None specifically
Mobile Home Conventional (MHC)	Non-commercial boats docks; other uses which create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses	None specifically
Recreational Vehicle Park (RVP)	Recreational park facilities including...docks, piers, boat launching areas, etc.	Uses and structures customarily accessory and clearly related to permitted uses which are located on the same parcel as the RV park and are not likely to attract visitors in large numbers	Resort marinas
Office, Medical, and Institutional (OMI)	None specifically. Individual uses create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses	None specifically

**WATER-RELATED AND WATER-DEPENDENT USES
ALLOWED WITHIN ZONING DISTRICTS**

(Source: Section 3-9 of the *Code of Laws and Ordinances of Charlotte County Charlotte County, Florida* commonly referenced as the *Charlotte County Zoning Regulations*, as adopted in 1989 and amended)

Commercial Office Park (COP)	None specifically. Individual uses create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses, including a residential dwelling unit within the same structure as the principal permitted use	None specifically
Commercial Neighborhood (CN)	None specifically. Individual uses create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses	None specifically
Commercial General (CG)	Resort marinas, sport marinas	Uses and structures customarily accessory and clearly related to permitted uses, including a residential dwelling unit within the same structure as the principal permitted use	None specifically
Commercial Intensive (CI)	Resort marinas, sport marinas	Uses and structures customarily accessory and clearly related to permitted uses, including a residential dwelling unit within the same structure as the principal permitted use	None specifically
Commercial Highway (CH)	None specifically. Individual uses create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses, including a residential dwelling unit within the same structure as the principal permitted use	None specifically

**WATER-RELATED AND WATER-DEPENDENT USES
ALLOWED WITHIN ZONING DISTRICTS**

(Source: Section 3-9 of the *Code of Laws and Ordinances of Charlotte County Charlotte County, Florida* commonly referenced as the *Charlotte County Zoning Regulations*, as adopted in 1989 and amended)

Commercial Tourist (CT)	Resort marinas, sport marinas	Uses and structures customarily accessory and clearly related to permitted uses, including a residential dwelling unit within the same structure as the principal permitted use	None specifically
Industrial Office Park (IOP)	None specifically. Individual uses create openings for accessory uses	Uses and structures customarily accessory and clearly related to permitted uses, except that no residential facilities shall be allowed except for watchmen or caretakers whose work requires residence on the premises	None specifically
Industrial Light (IL)	Resort marinas, sport marinas, boat repair yards	Uses and structures customarily accessory and clearly related to permitted uses, except that no residential facilities shall be allowed except for watchmen or caretakers whose work requires residence on the premises	Industrial marinas
Industrial General (IG)	Resort marinas, sport marinas, boat repair yards, Industrial marinas	Uses and structures customarily accessory and clearly related to permitted uses, except that no residential facilities shall be allowed except for watchmen or caretakers whose work requires residence on the premises	None specifically
Planned Development (PD)	Almost any use	Almost any use	Not applicable

Appendix 7

Figures

4.

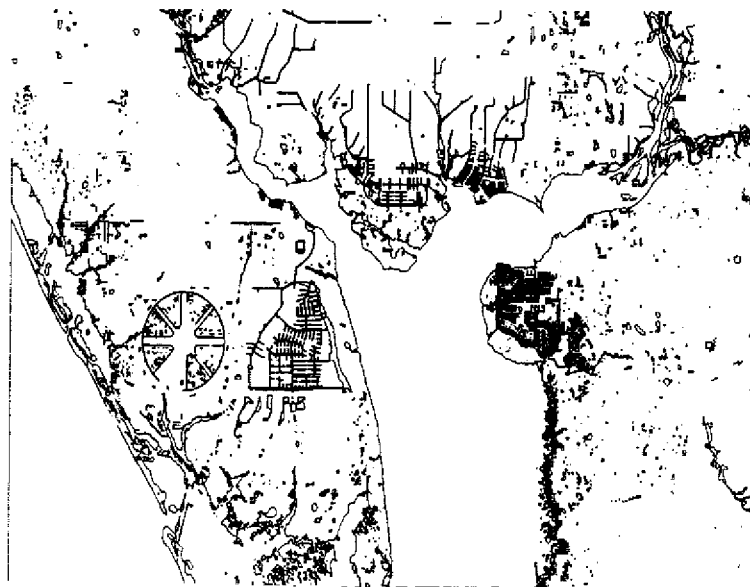
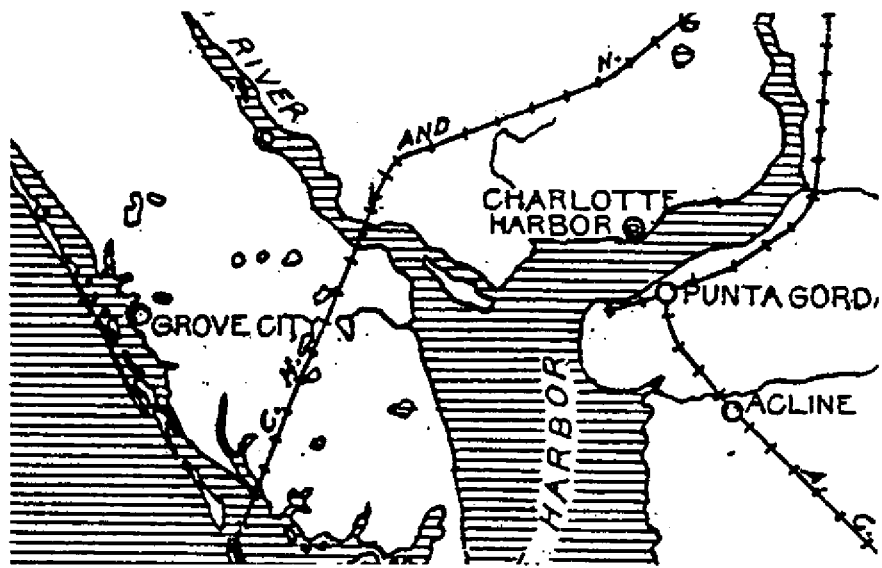


Figure 1. Generalized map of water bodies and shoreline in 1916 and 1996.



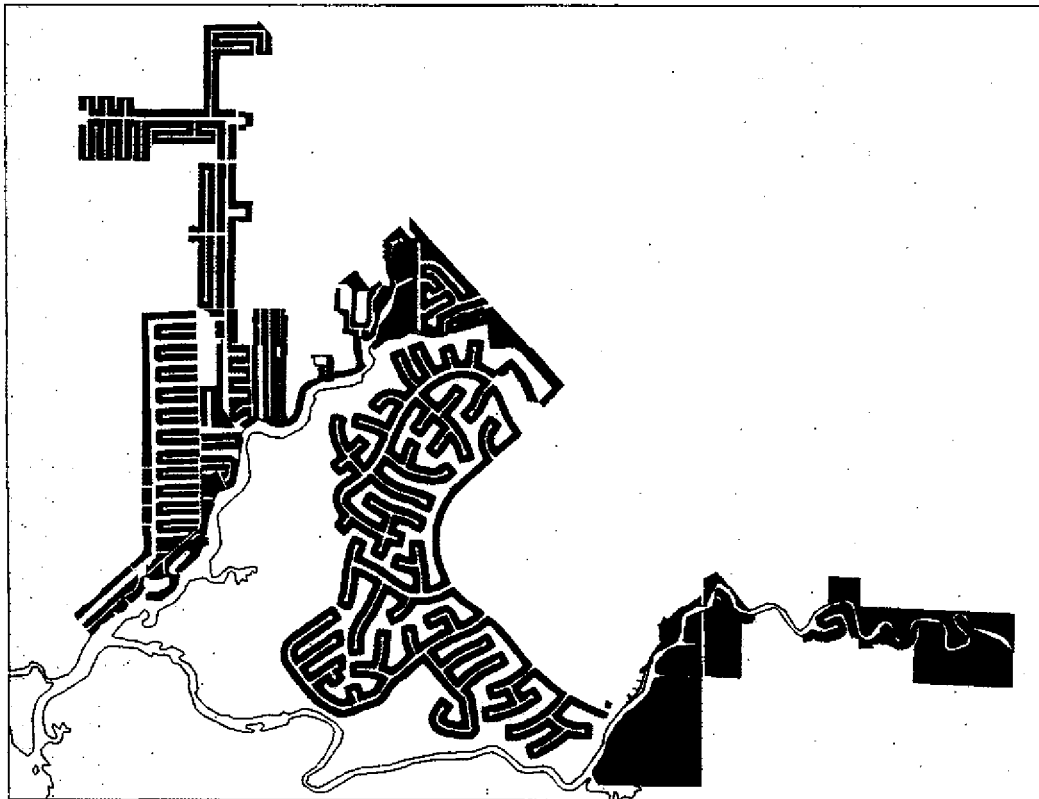
Figure 2. Time series aerial mosaics of Punta Gorda, Florida: 1944, 1972 and 1985.

**Please Turn Page
To see Figures 3a and 3b:**

**General land use - land cover
change along Alligator Creek.**

ALLIGATOR CREEK

1952



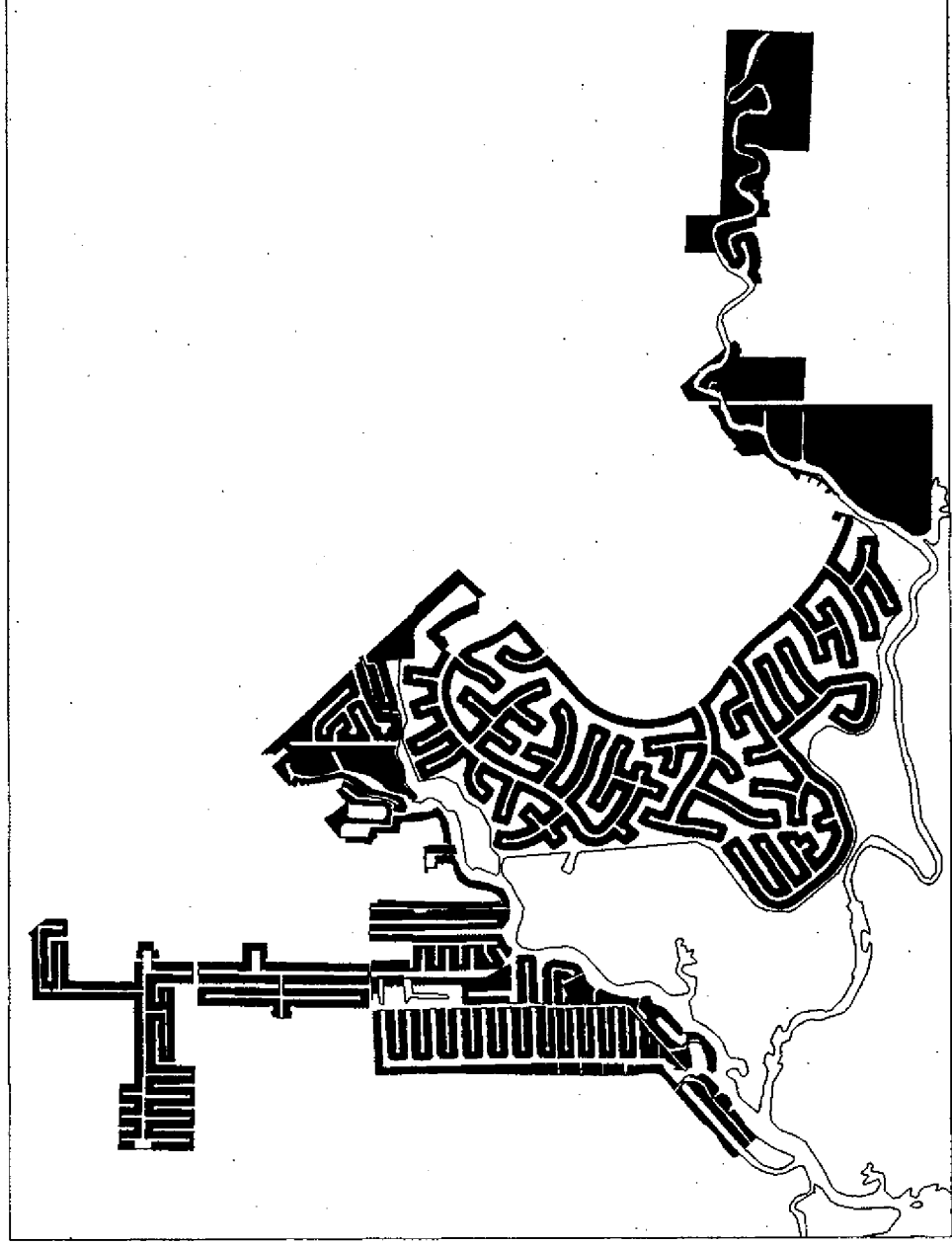
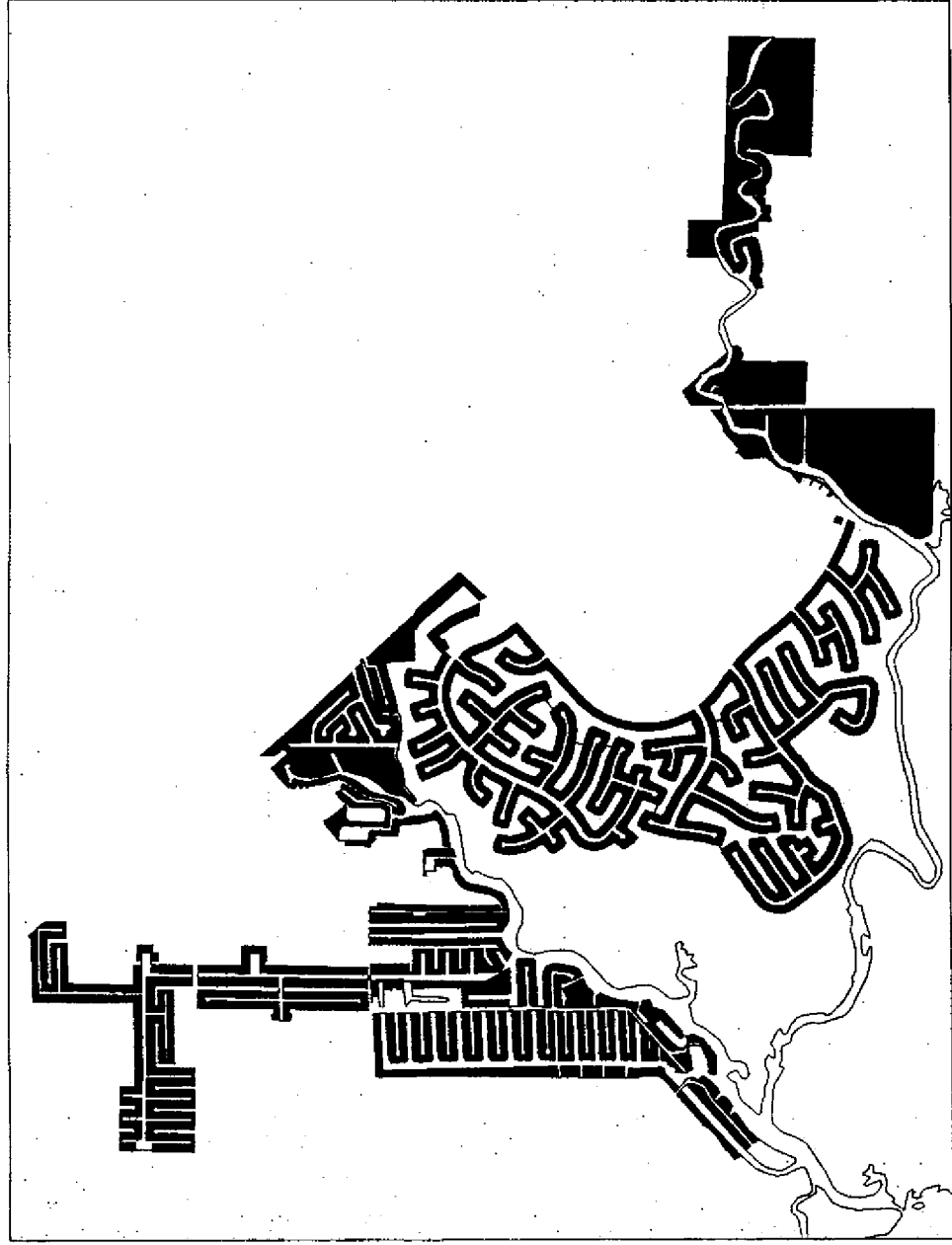
■ Developed
■ Natural

Figure 3a. General land use - land cover change along Alligator Creek: 1952.

ALLIGATOR CREEK

1975

1988



Developed
Natural

Figure 3b. General land use - land cover change along Alligator Creek: 1975 and 1988.

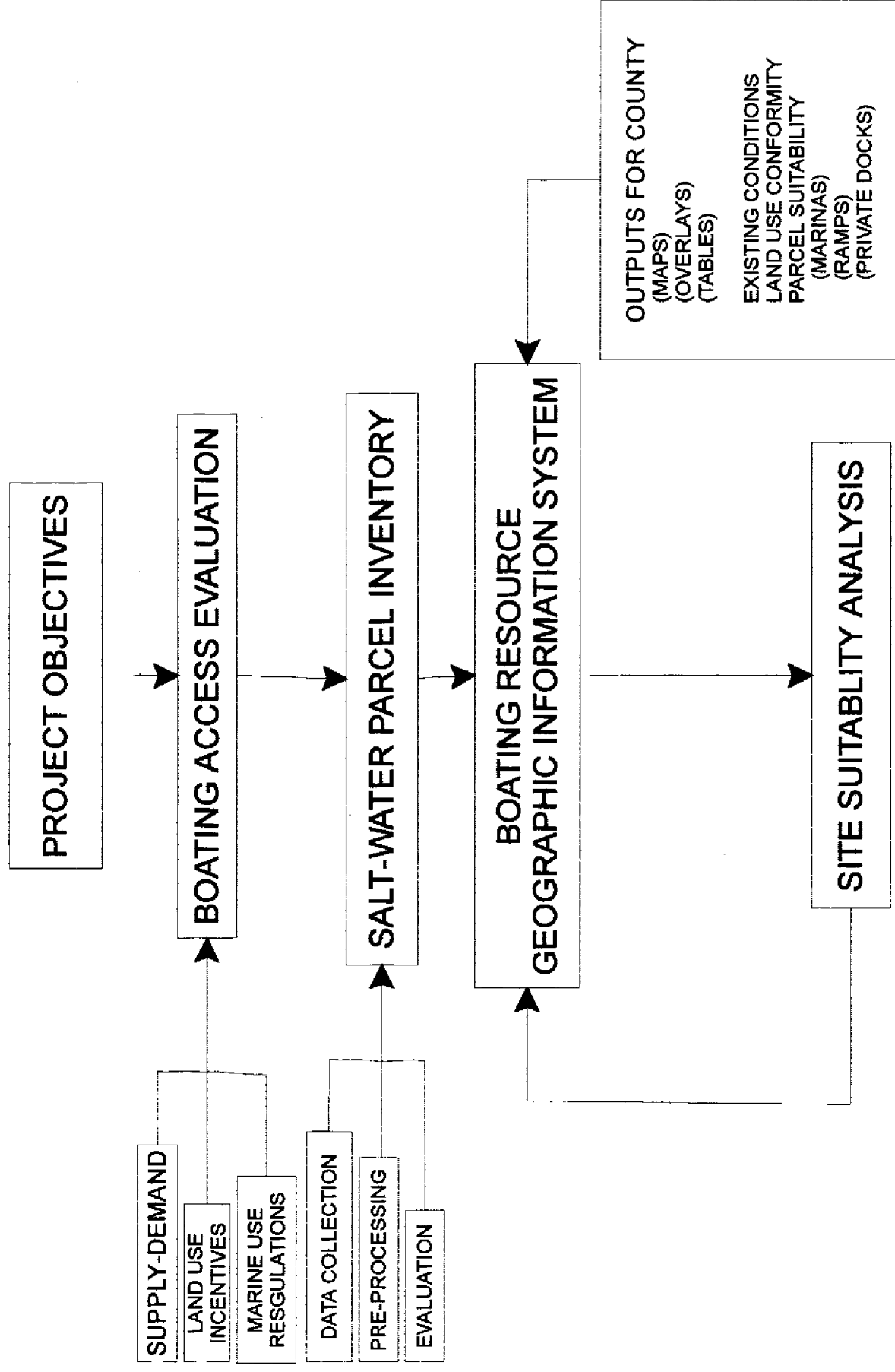


Figure 4. Operating components of the marine, land and water use siting study

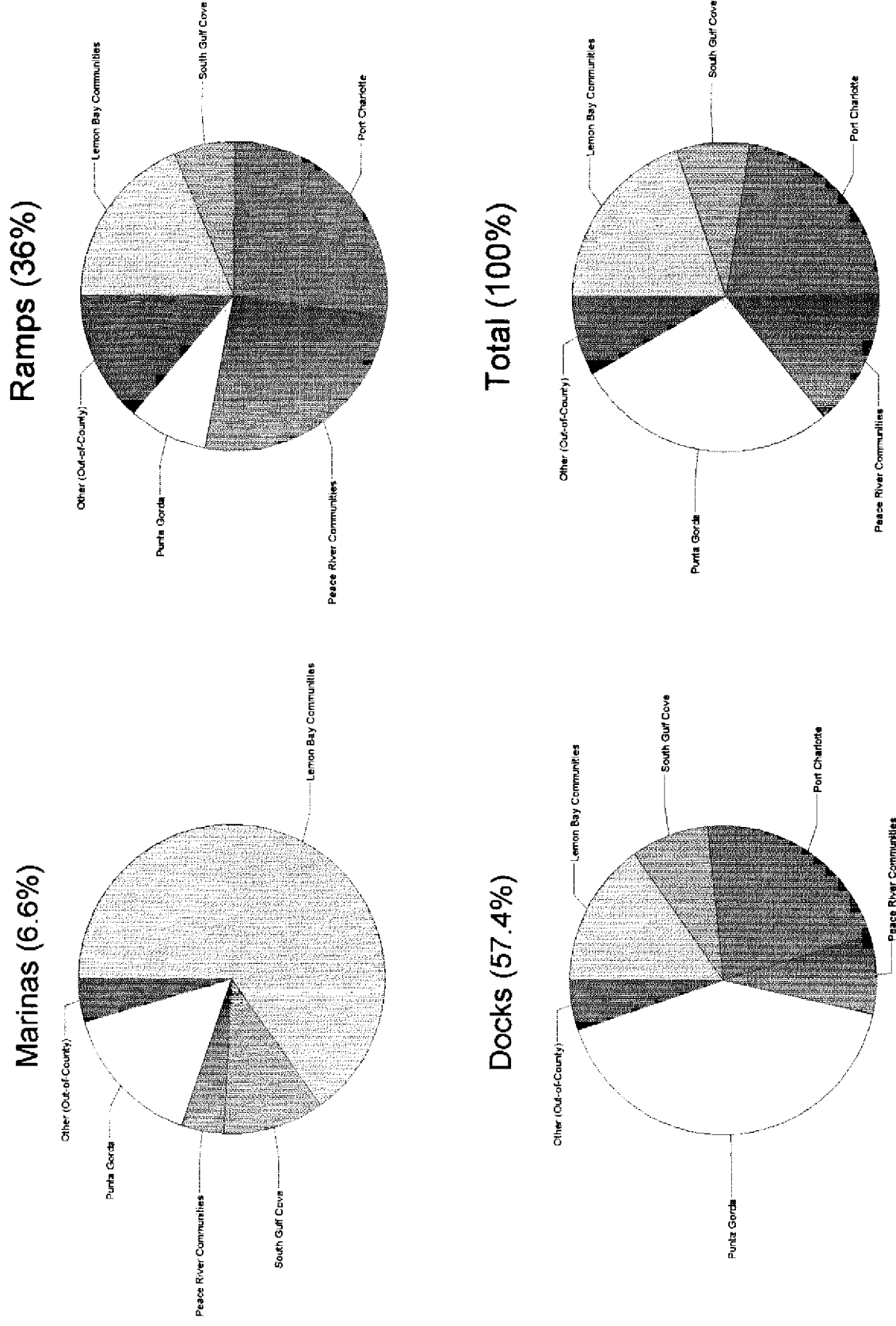


Figure 5. Origins of boat trips (1993) from private docks, ramps and marina facilities.

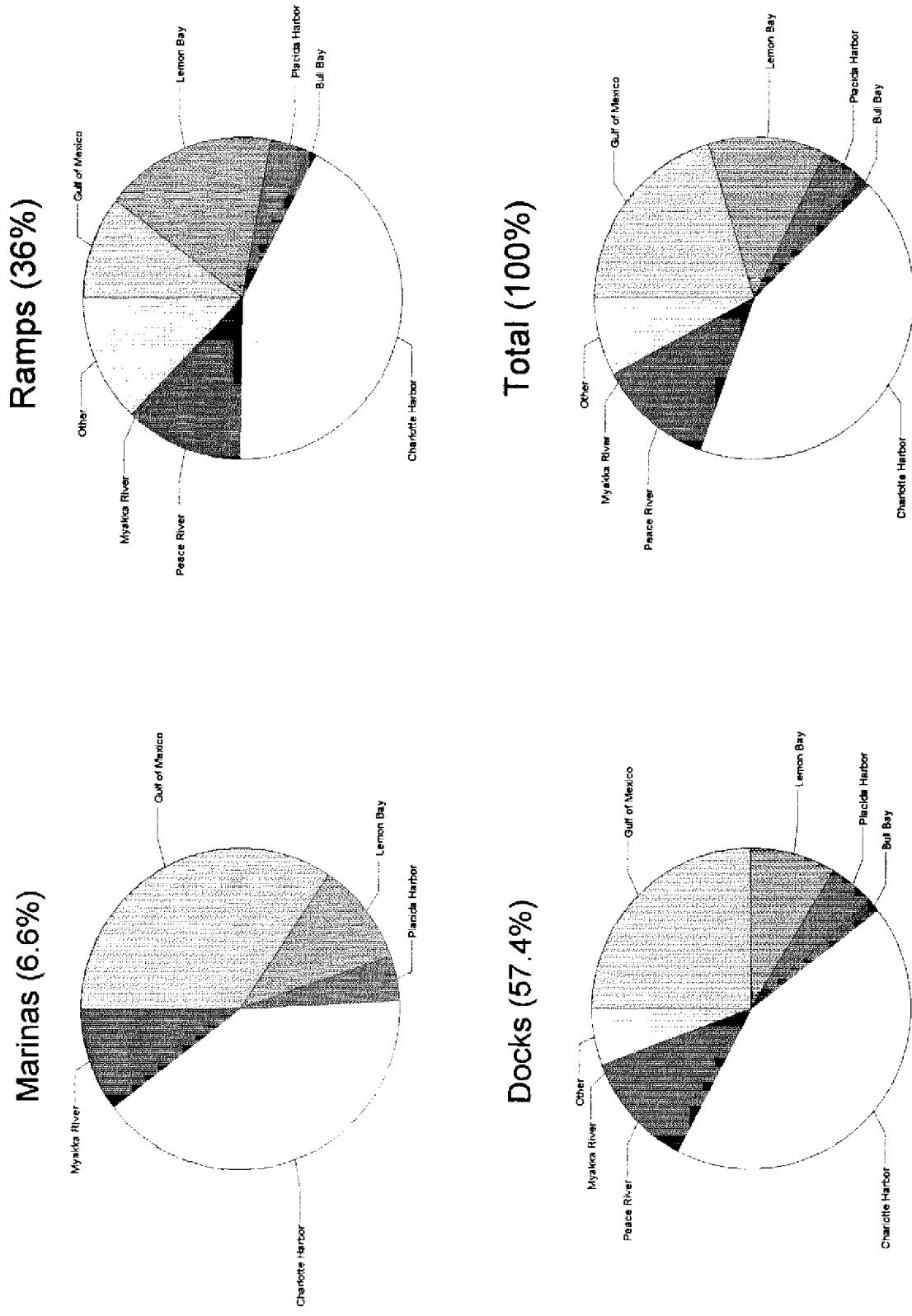


Figure 6. Destination of boat trips (1993) from private docks, ramps and marina origins.

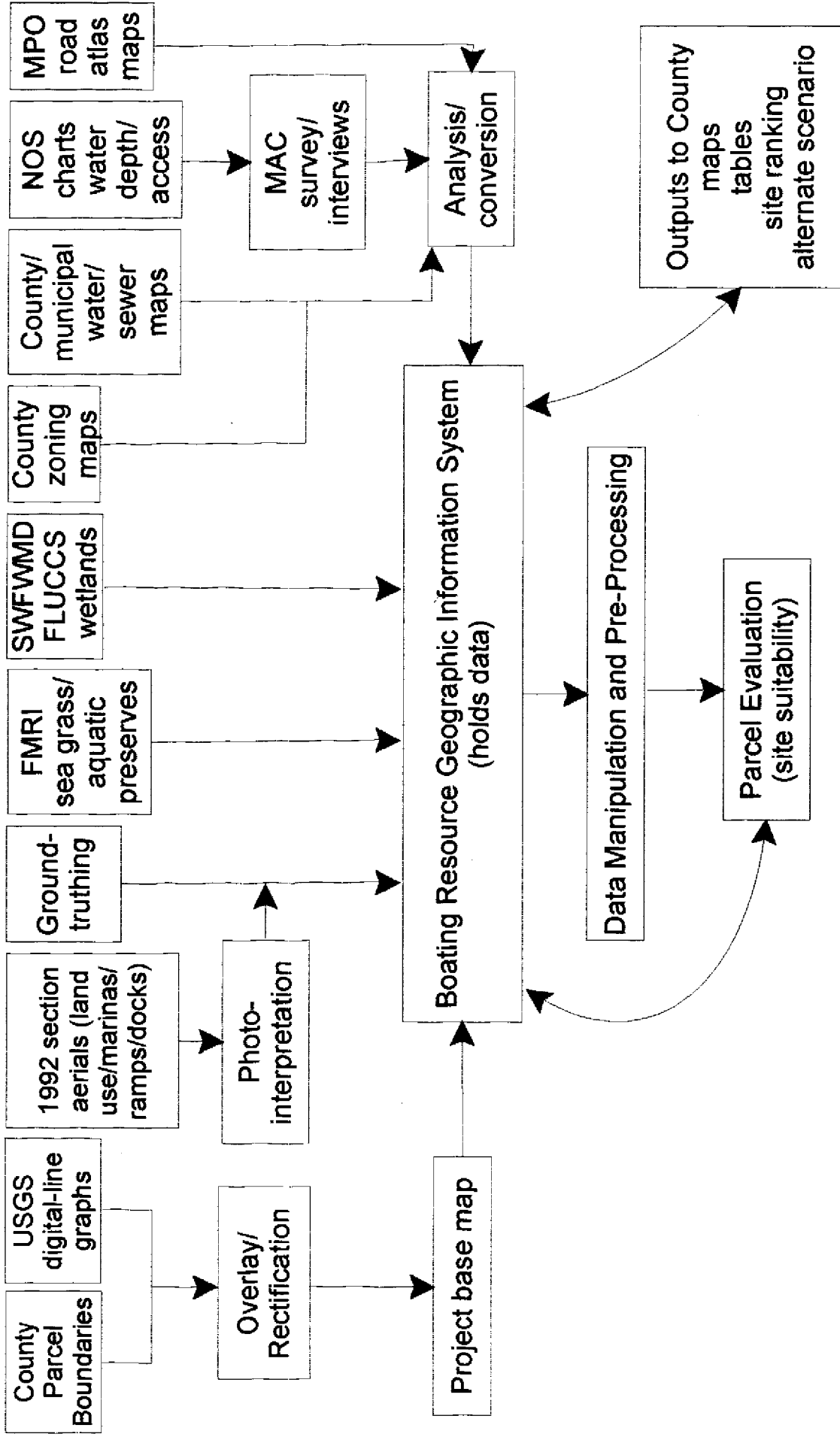


Figure 7. Flow-chart of Charlotte County Boating Resource Geographic Information System

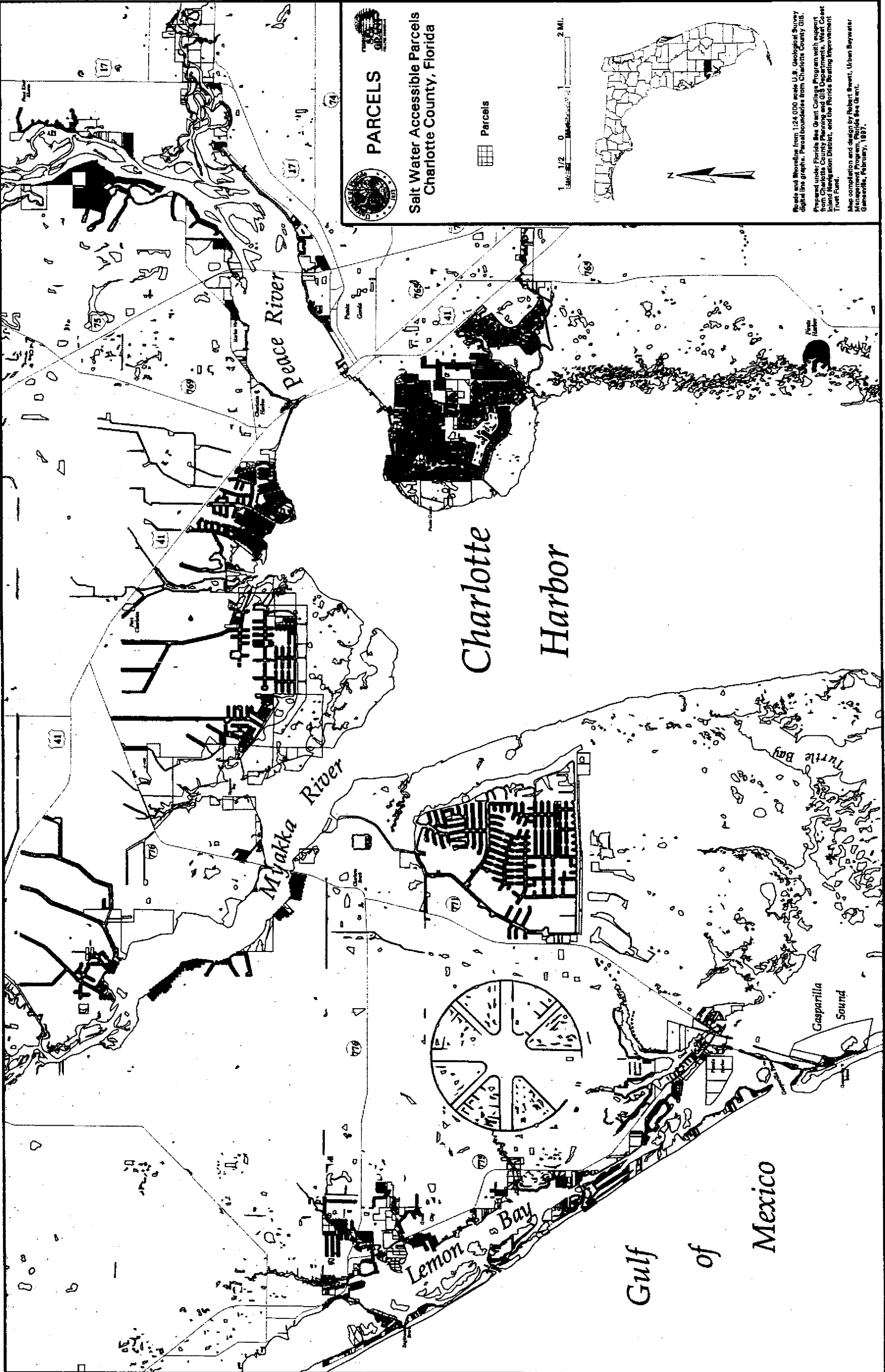


Figure 8. Salt water accessible parcels.

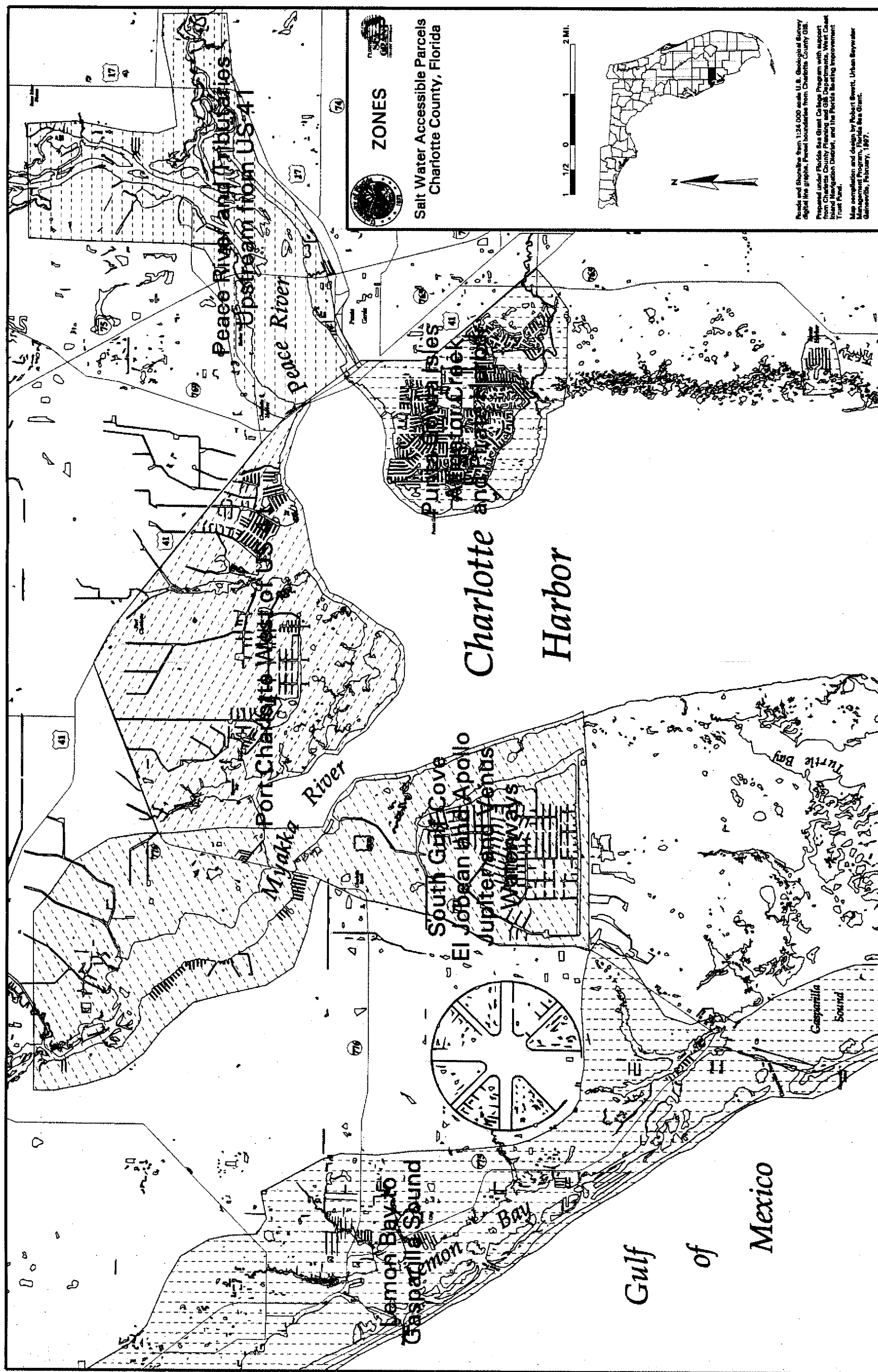


Figure 9. Five marine use siting zones.

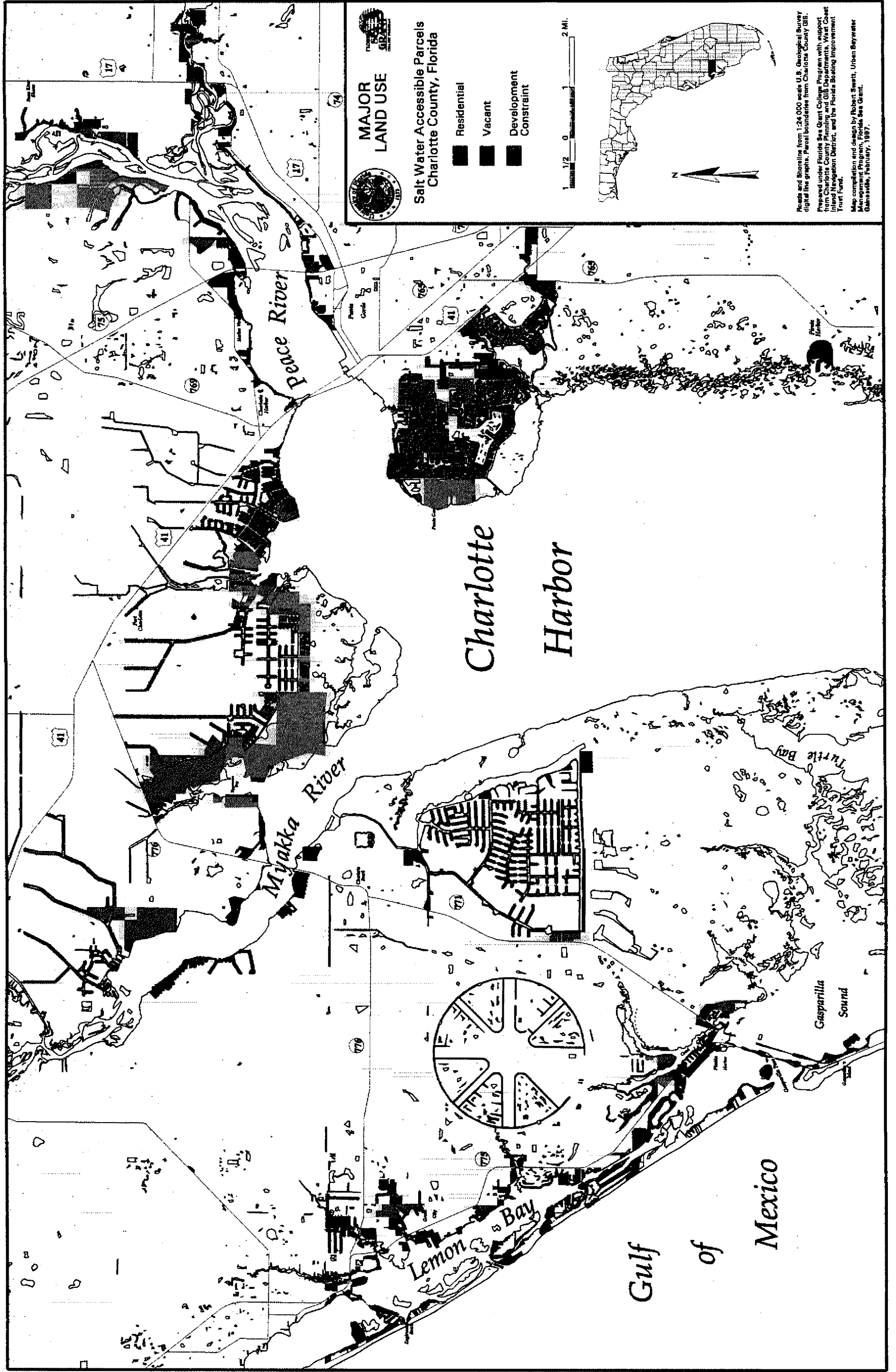


Figure 10. Major types of land use and land cover.

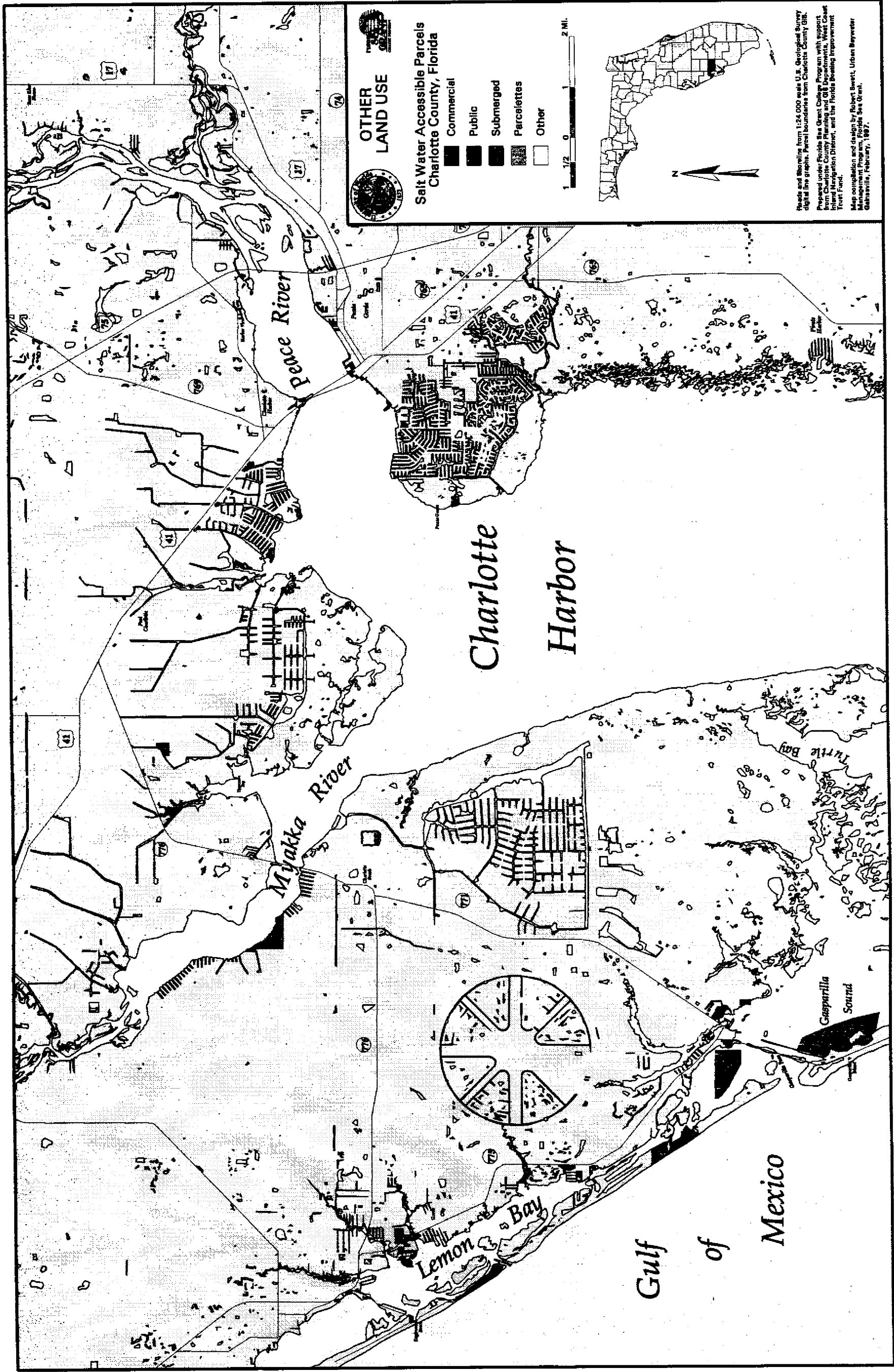


Figure 11. Other types of land use and land cover.

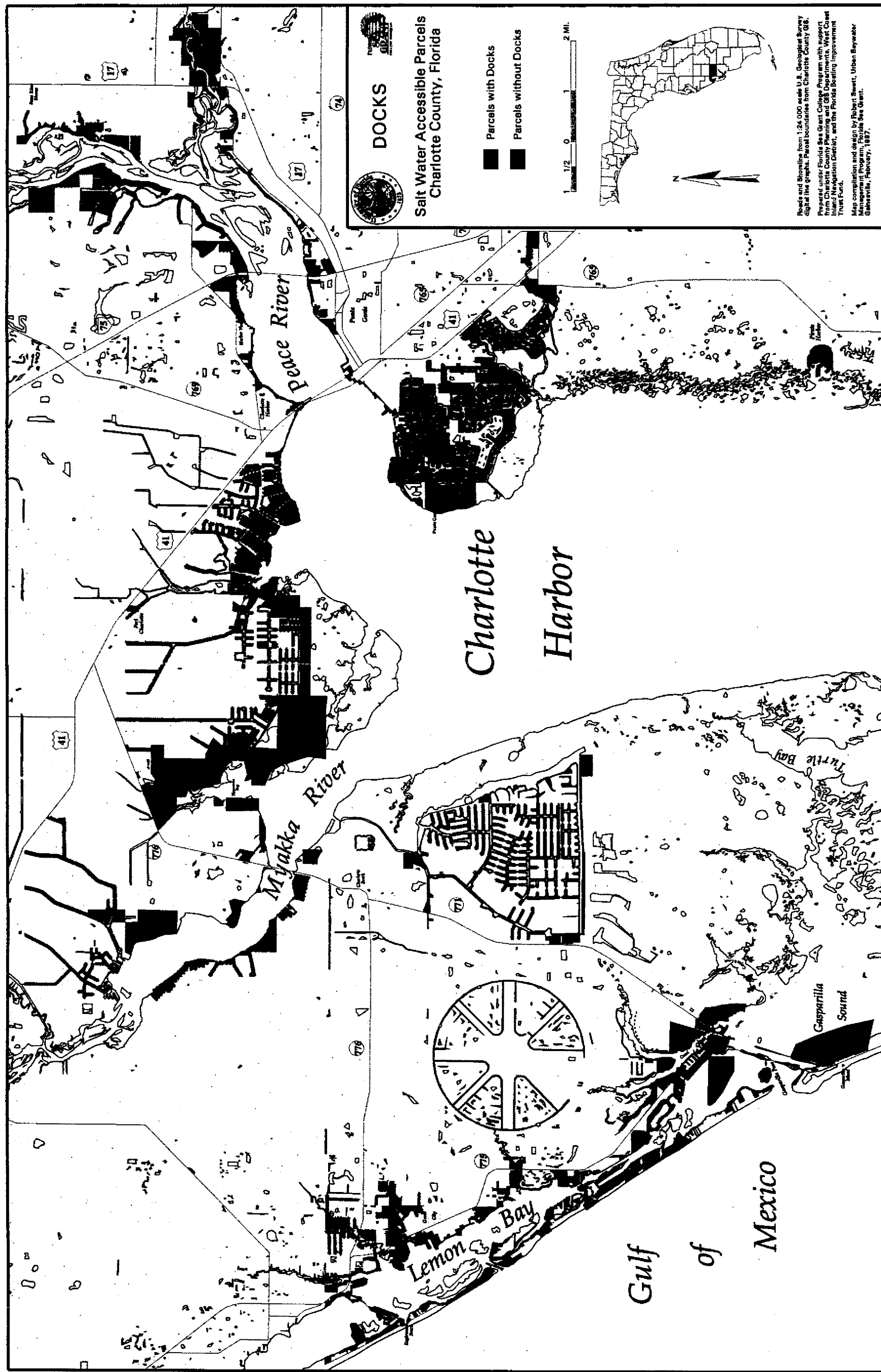


Figure 12. Boat docks.

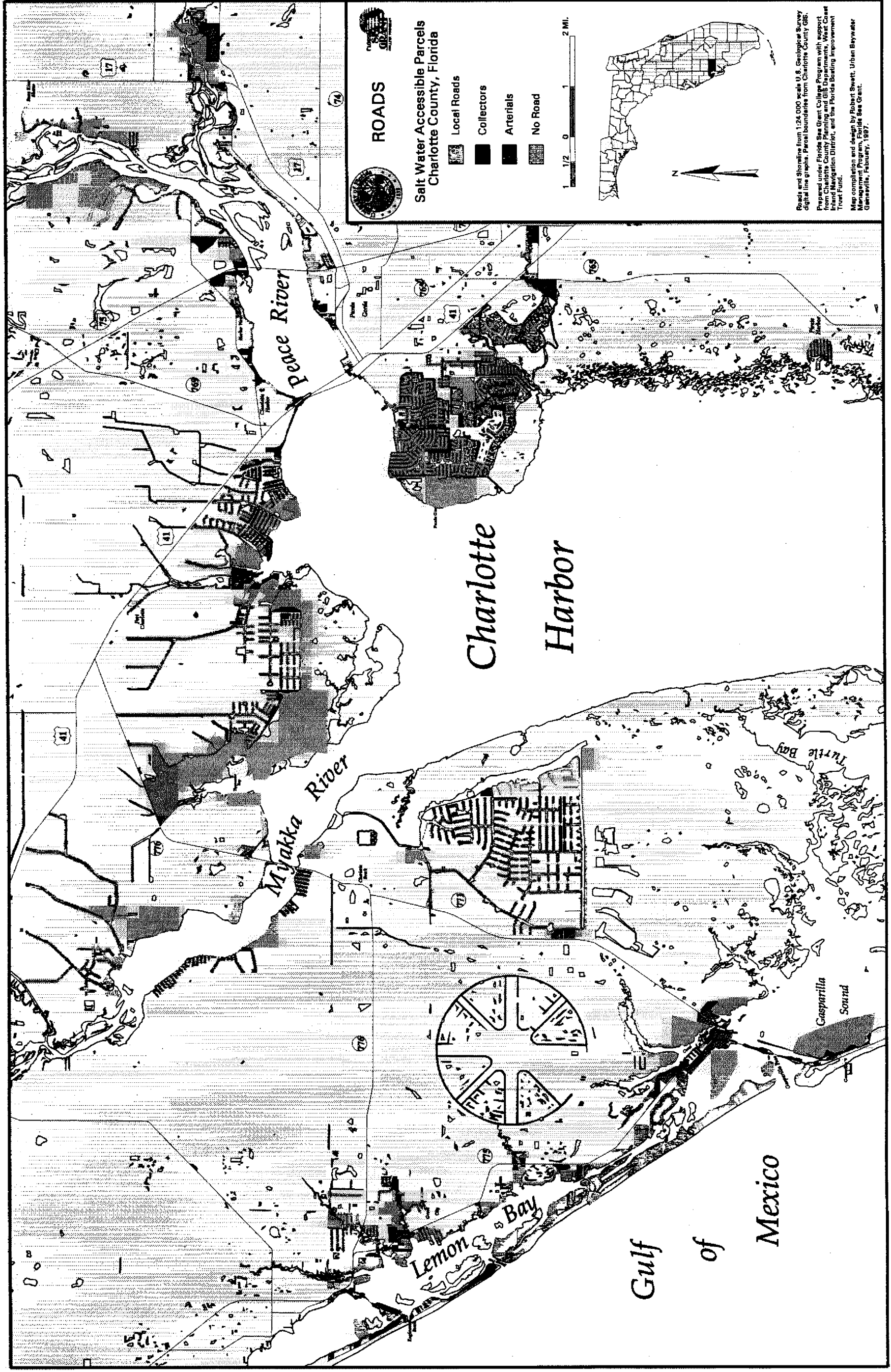


Figure 13. Roads.

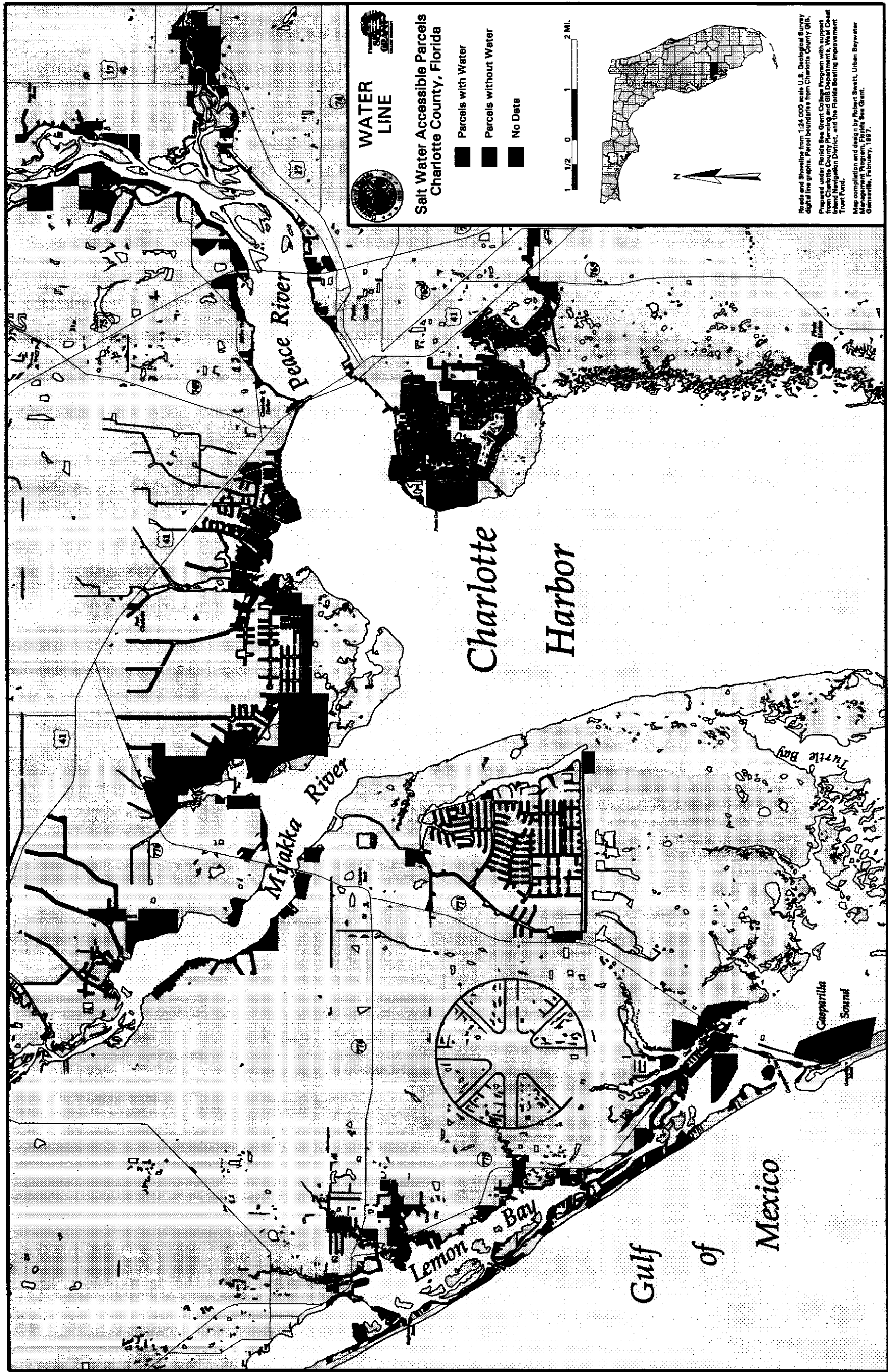


Figure 14. Water service line.

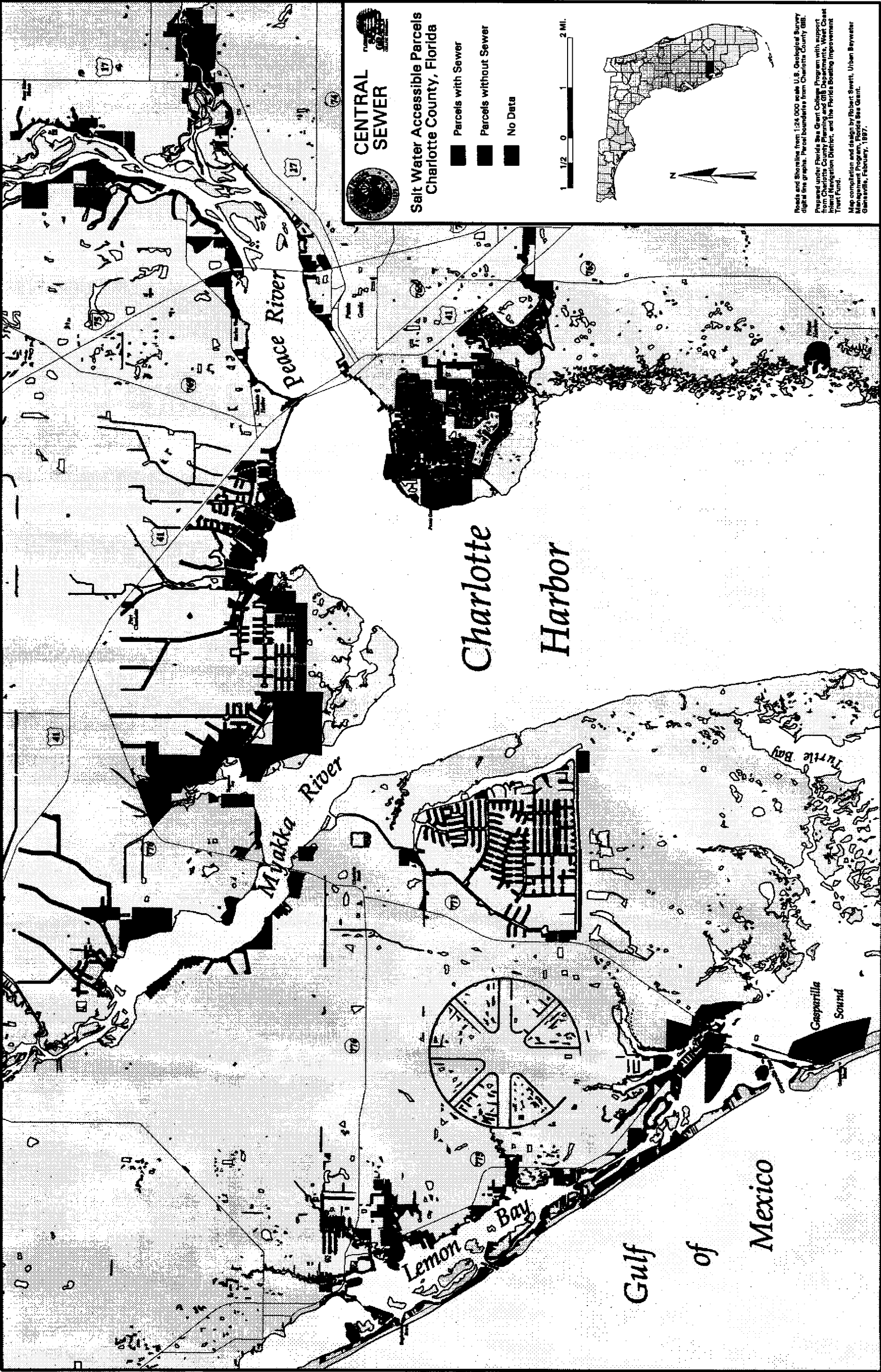


Figure 15. Central sewer.

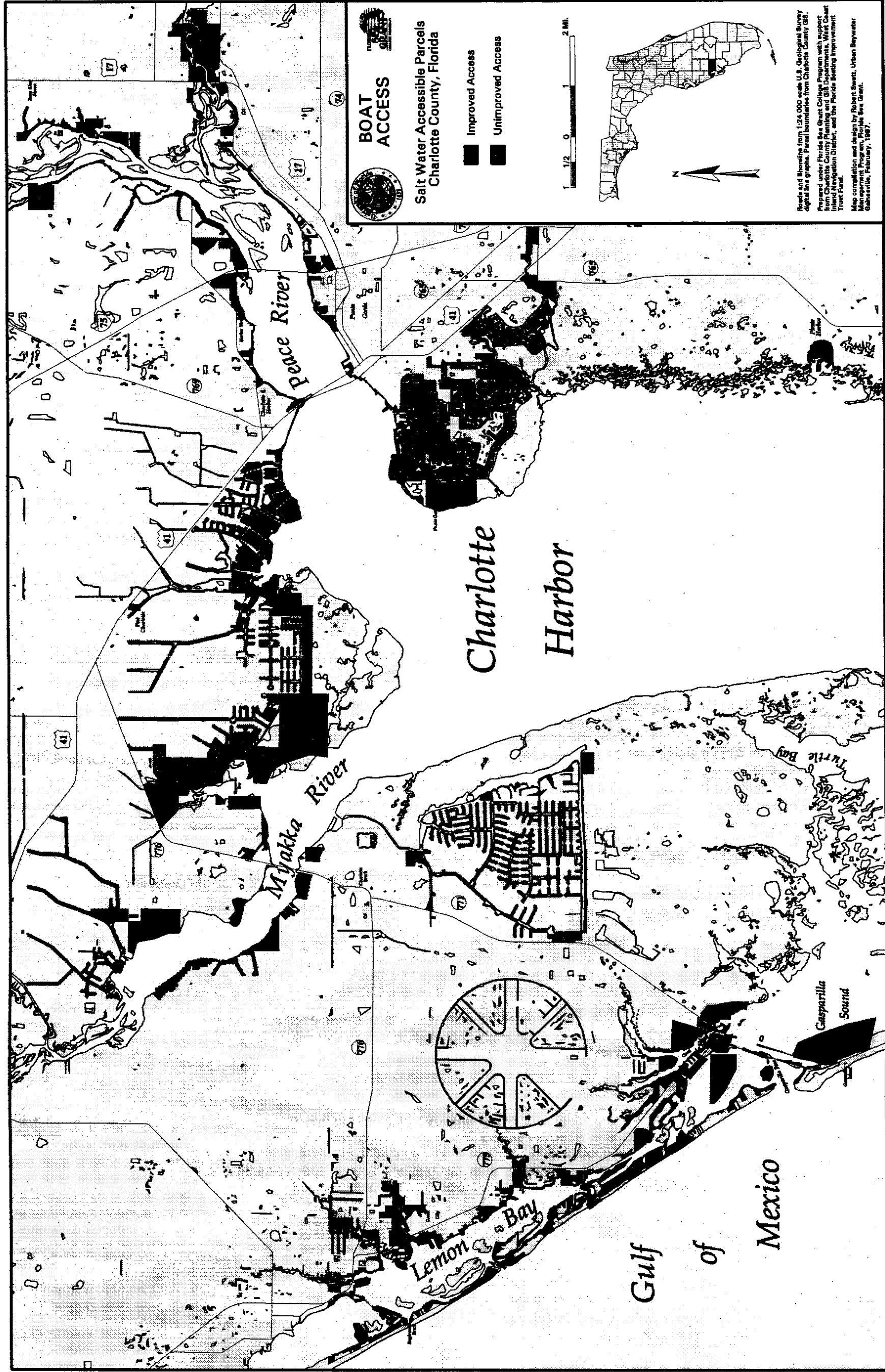


Figure 16. Boat Access.

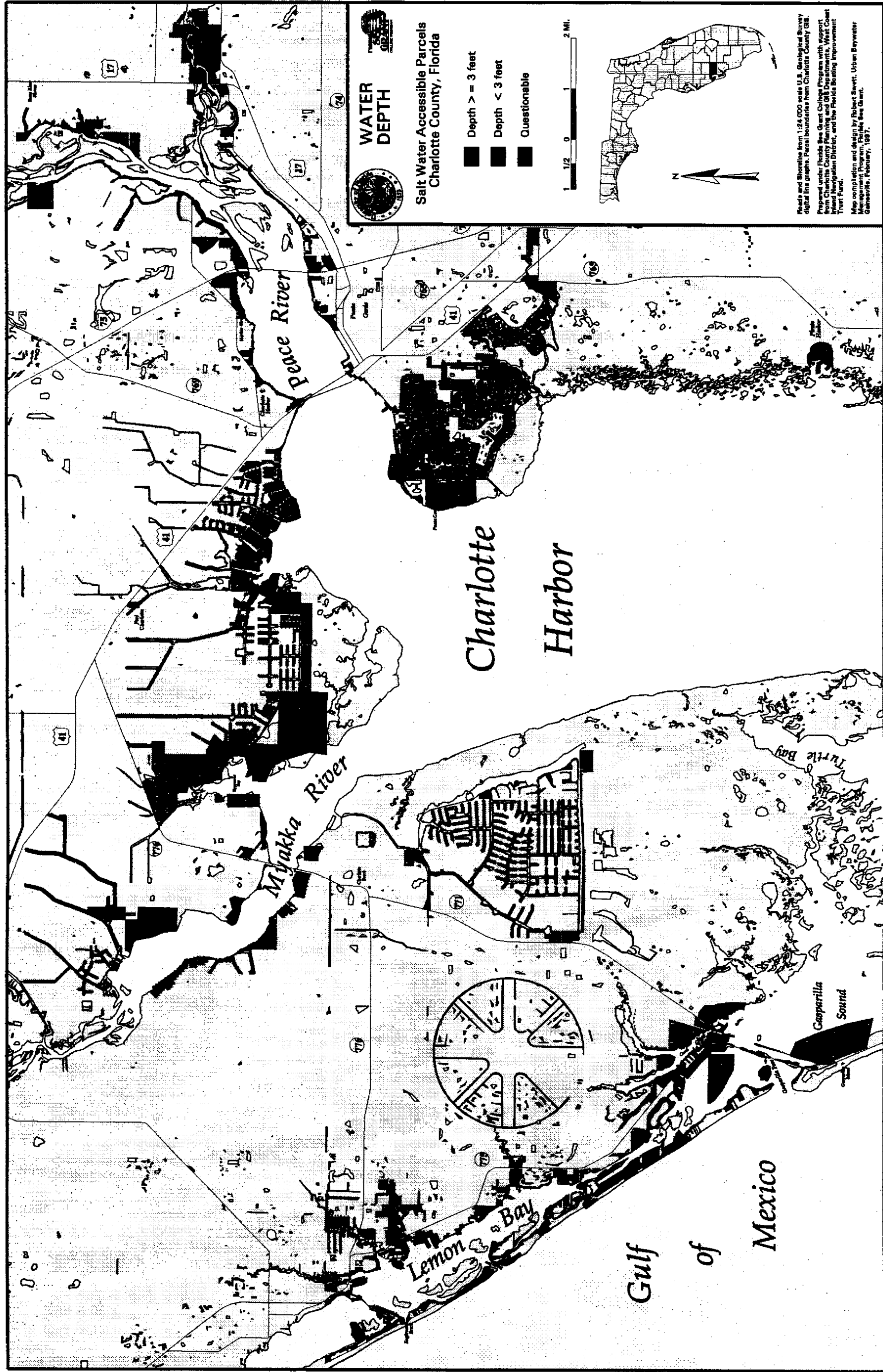


Figure 17. Water depth.

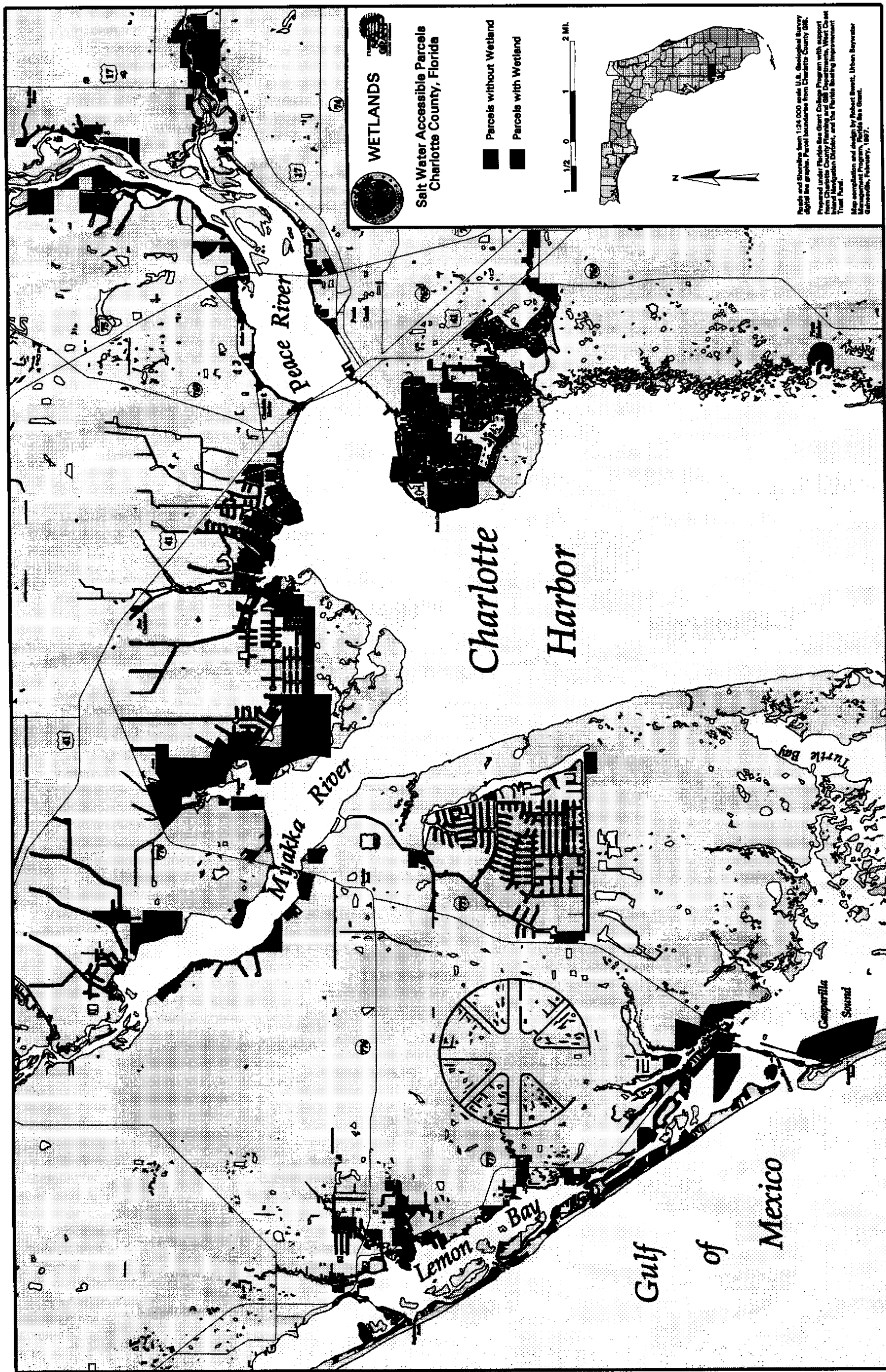


Figure 18. Wetlands.

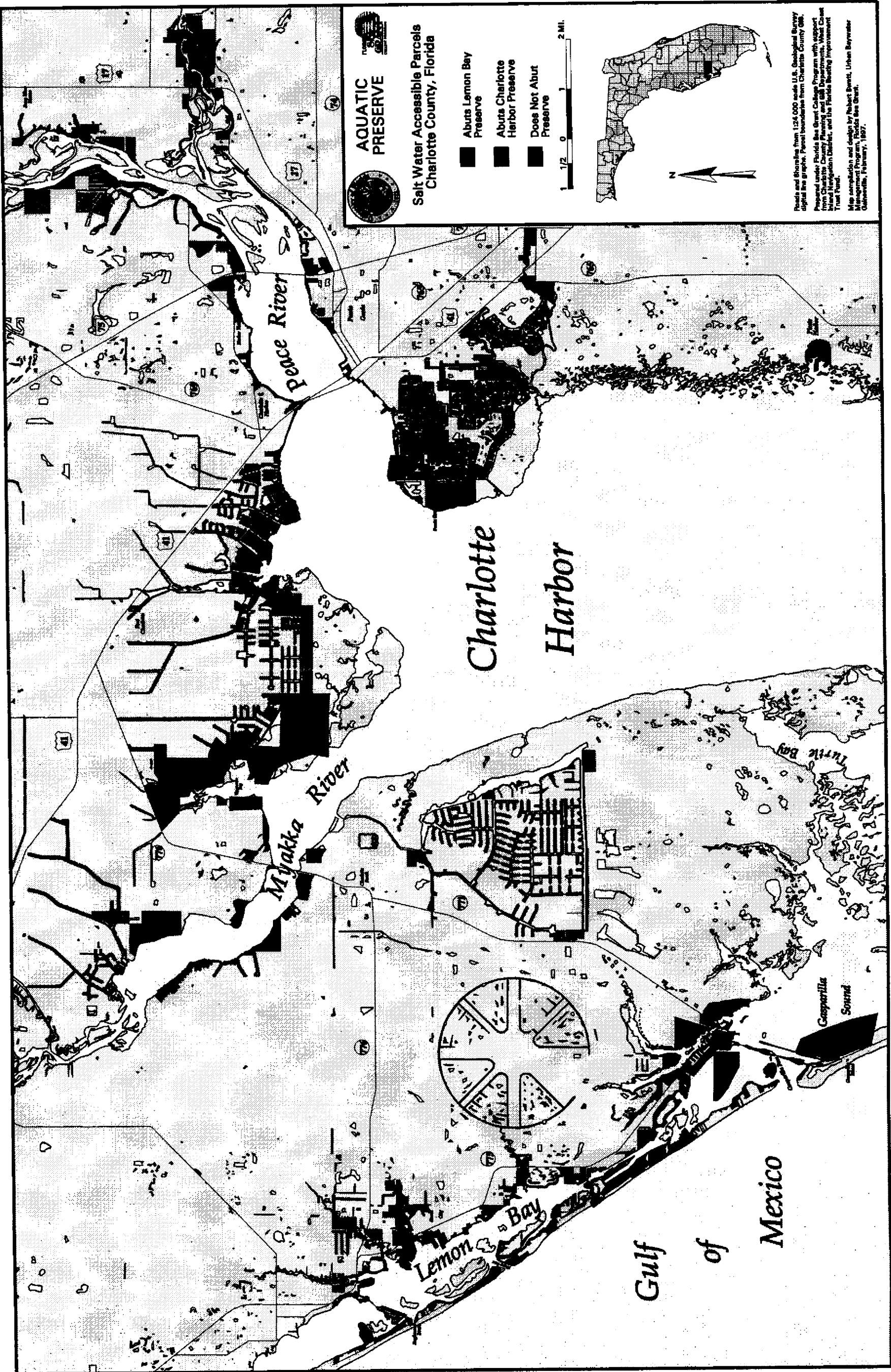


Figure 19. Aquatic Preserves.

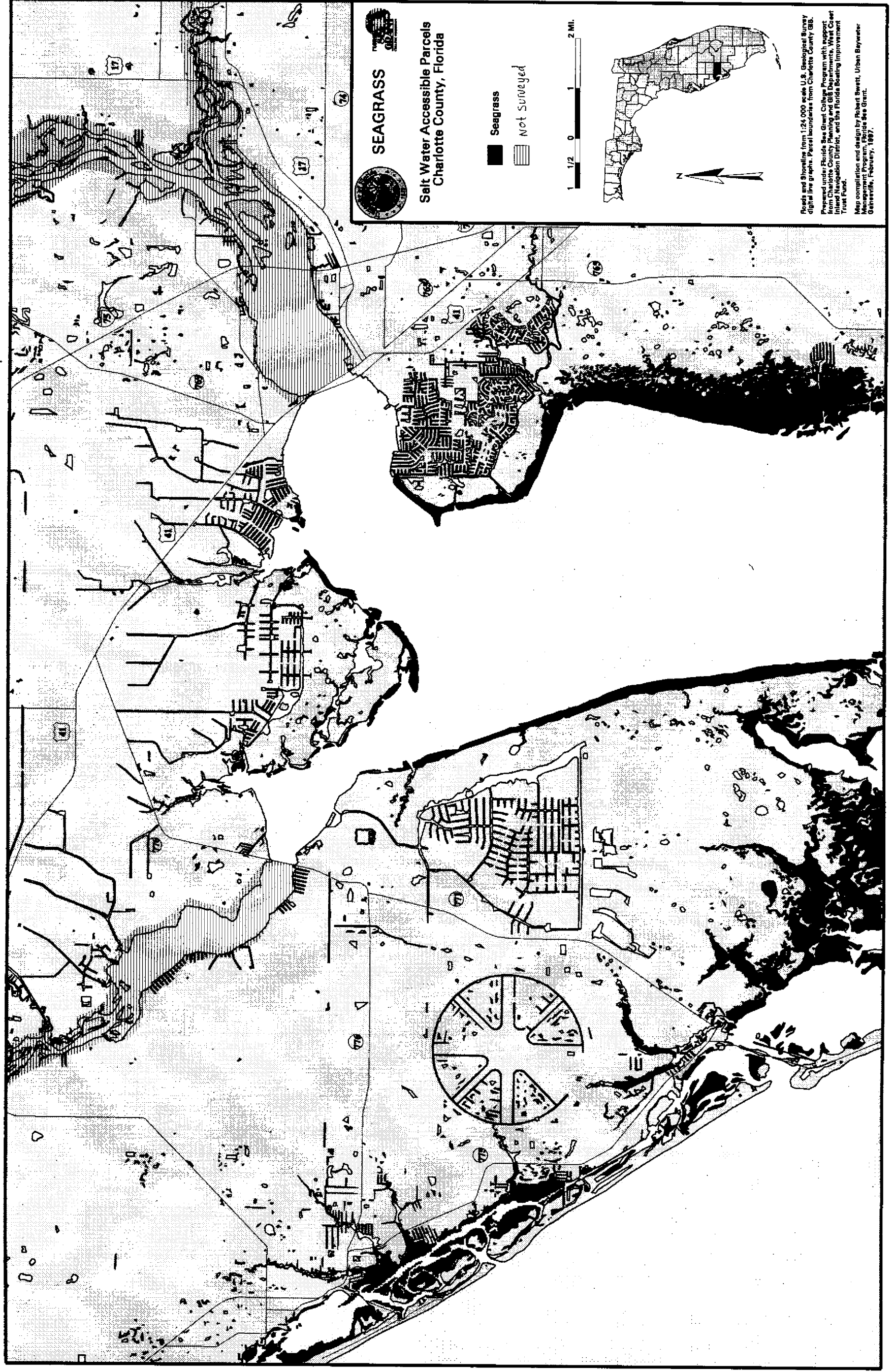


Figure 20. Seagrass.

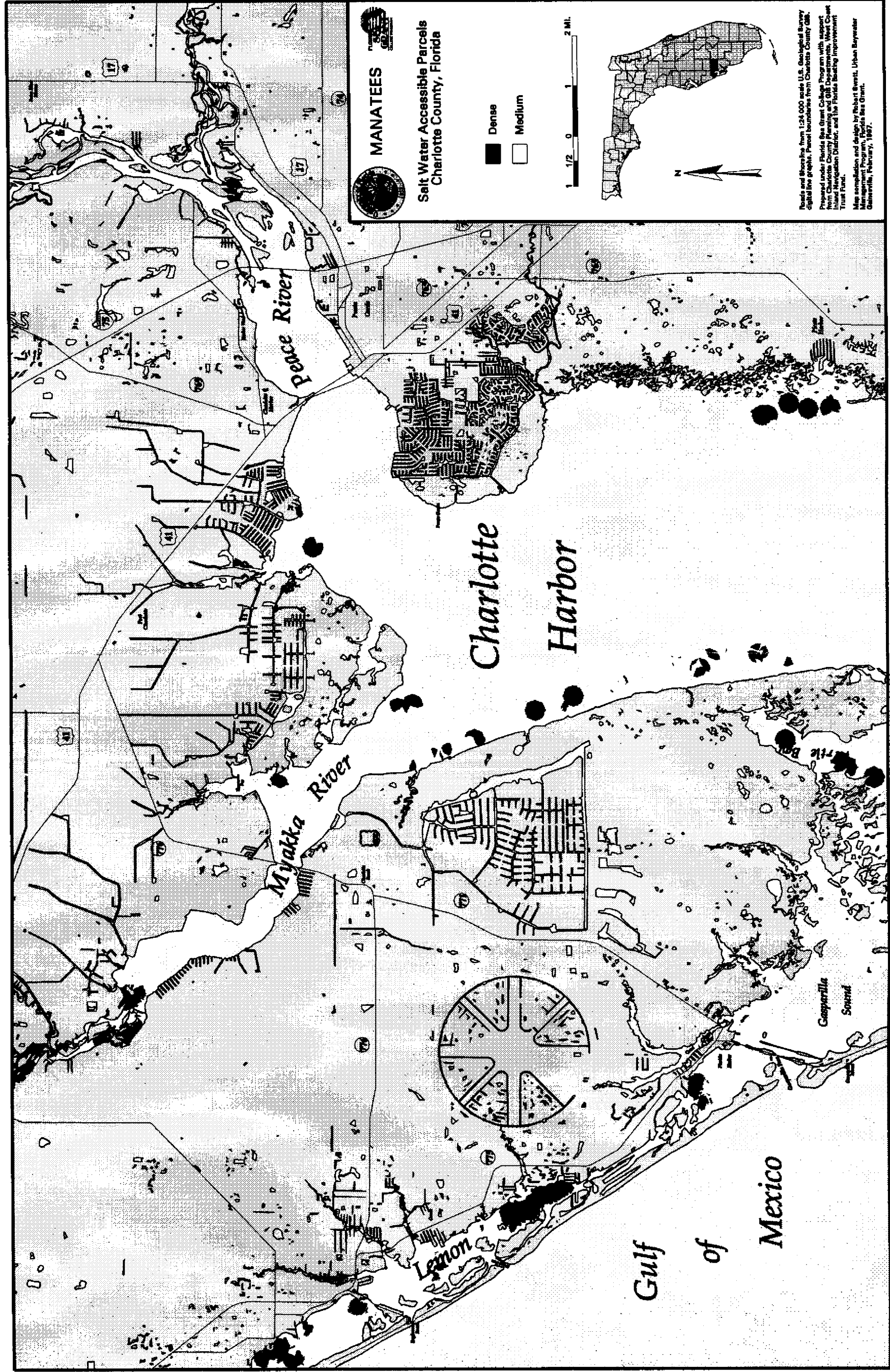


Figure 21. Manatees.

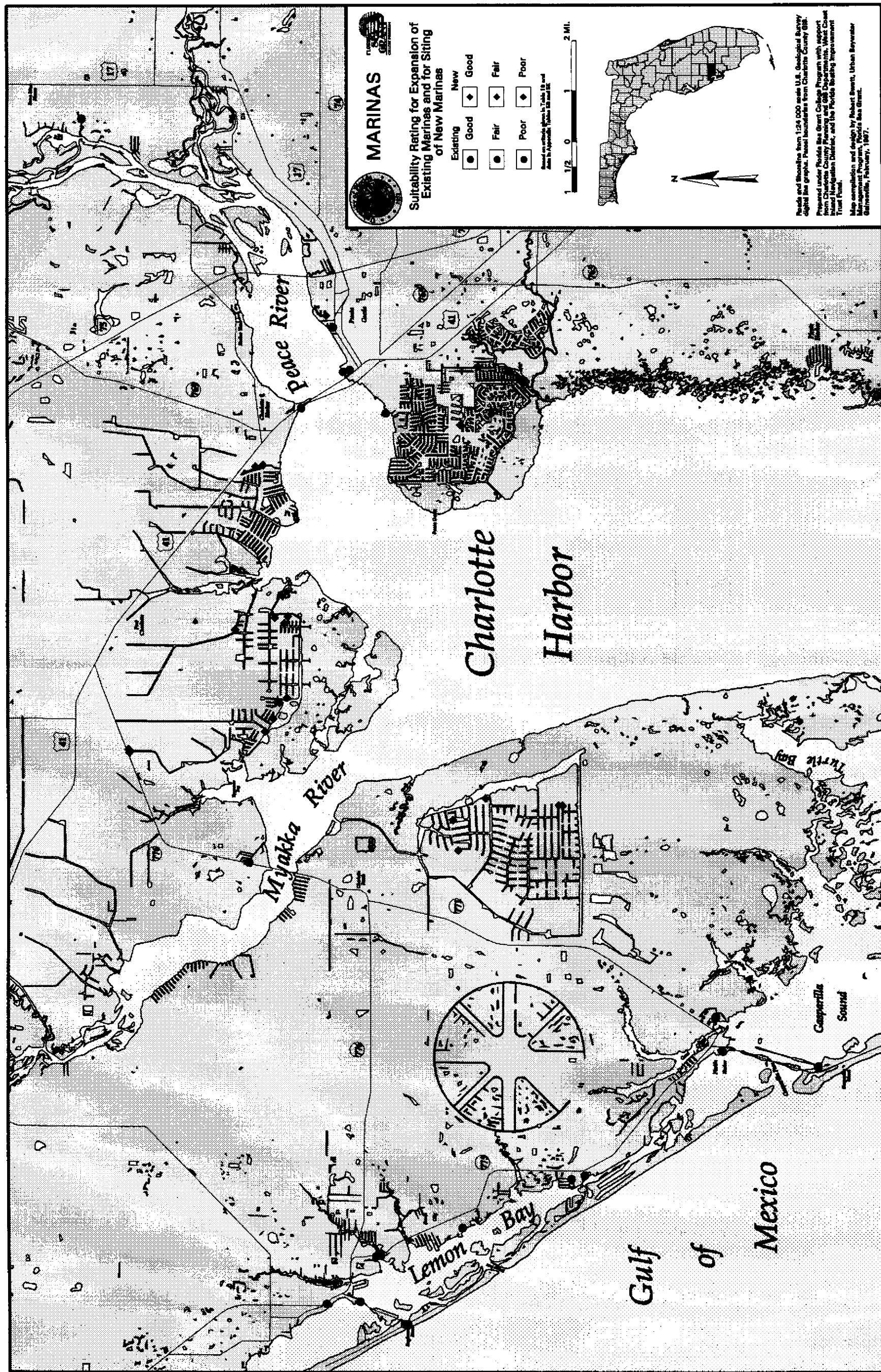


Figure 22. Rated existing marina expansion and new marina site locations.

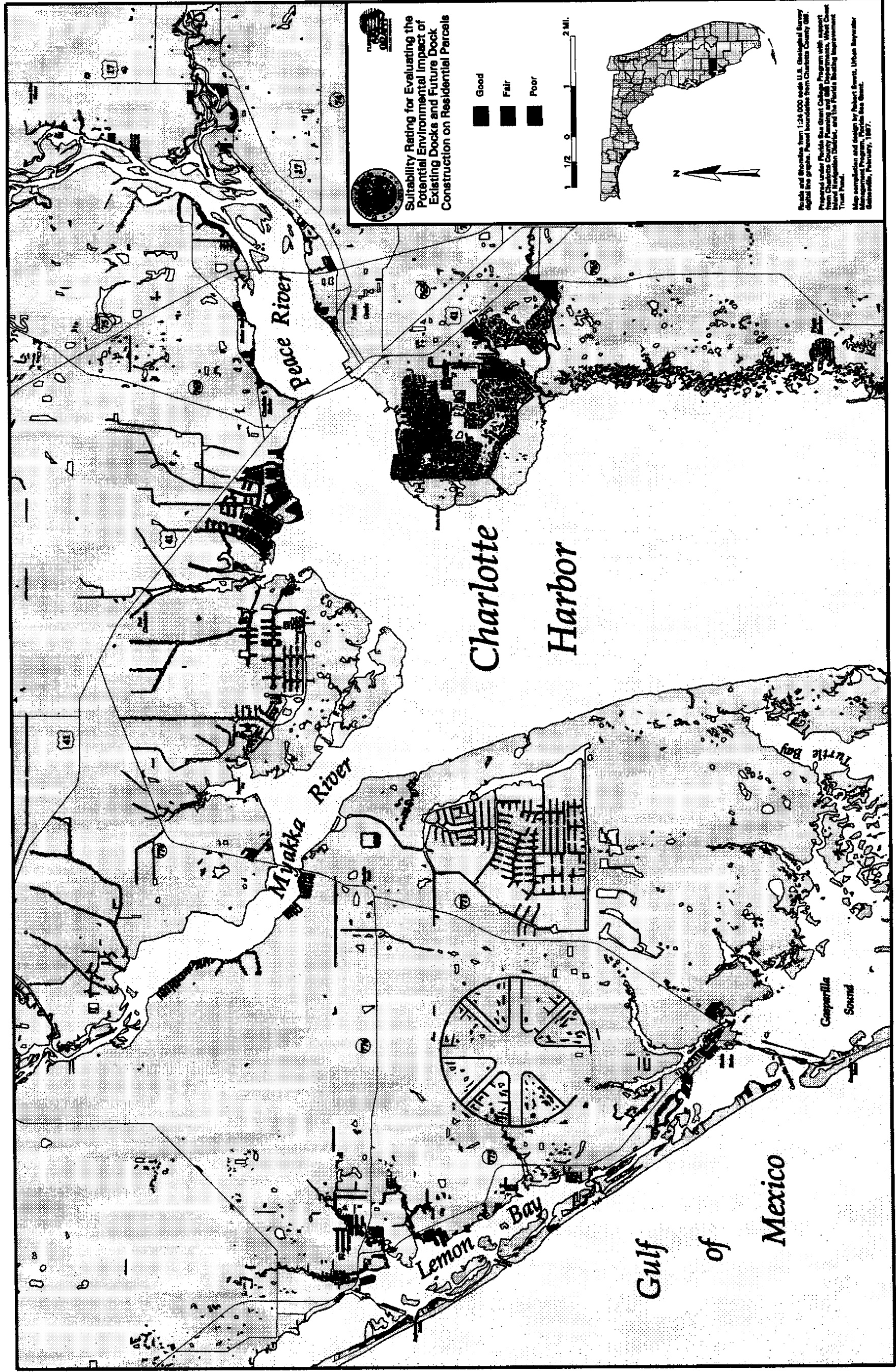


Figure 23. Rated residential parcels with and without docks.

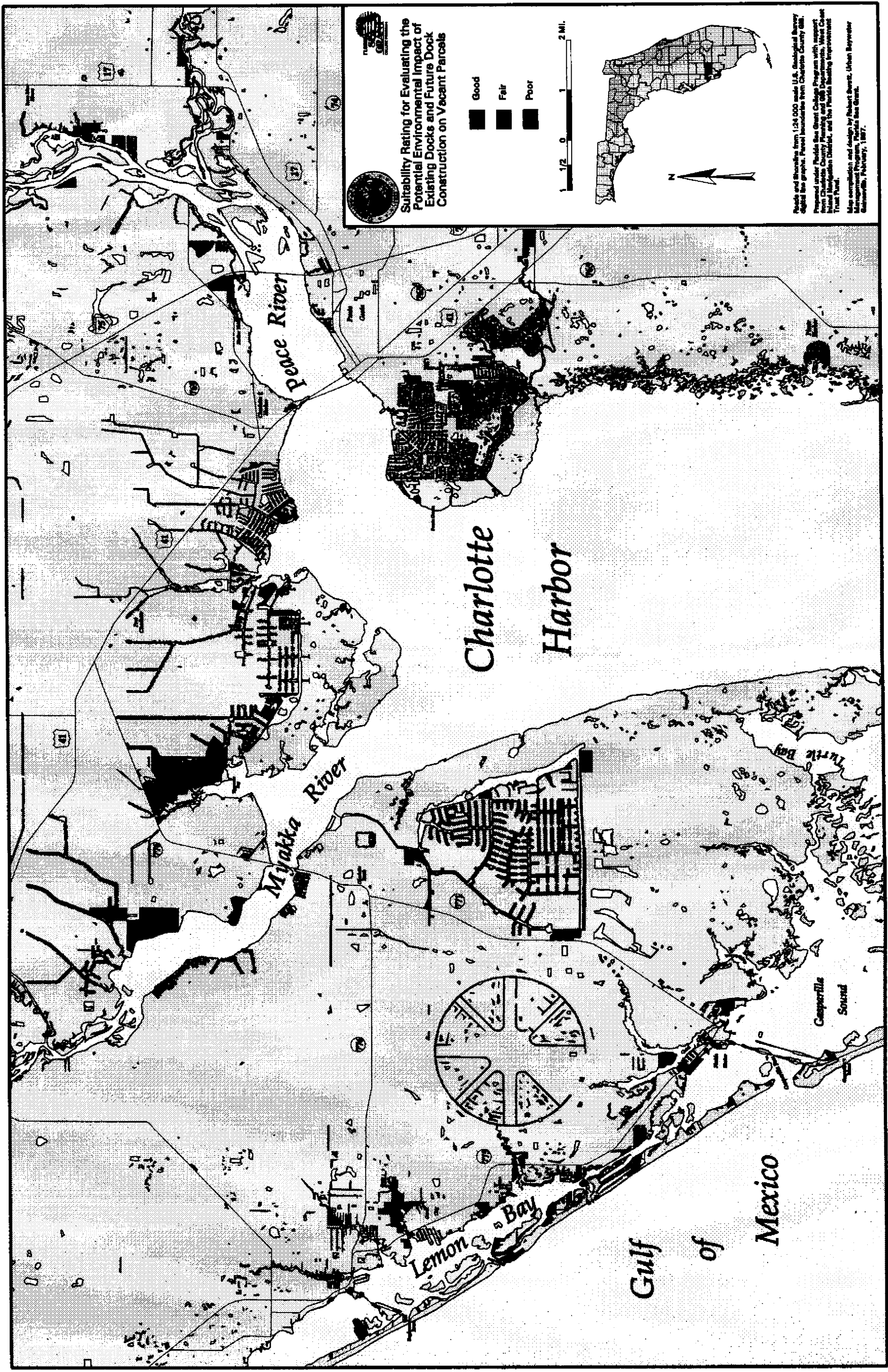


Figure 24. Rated vacant parcels with and without docks.

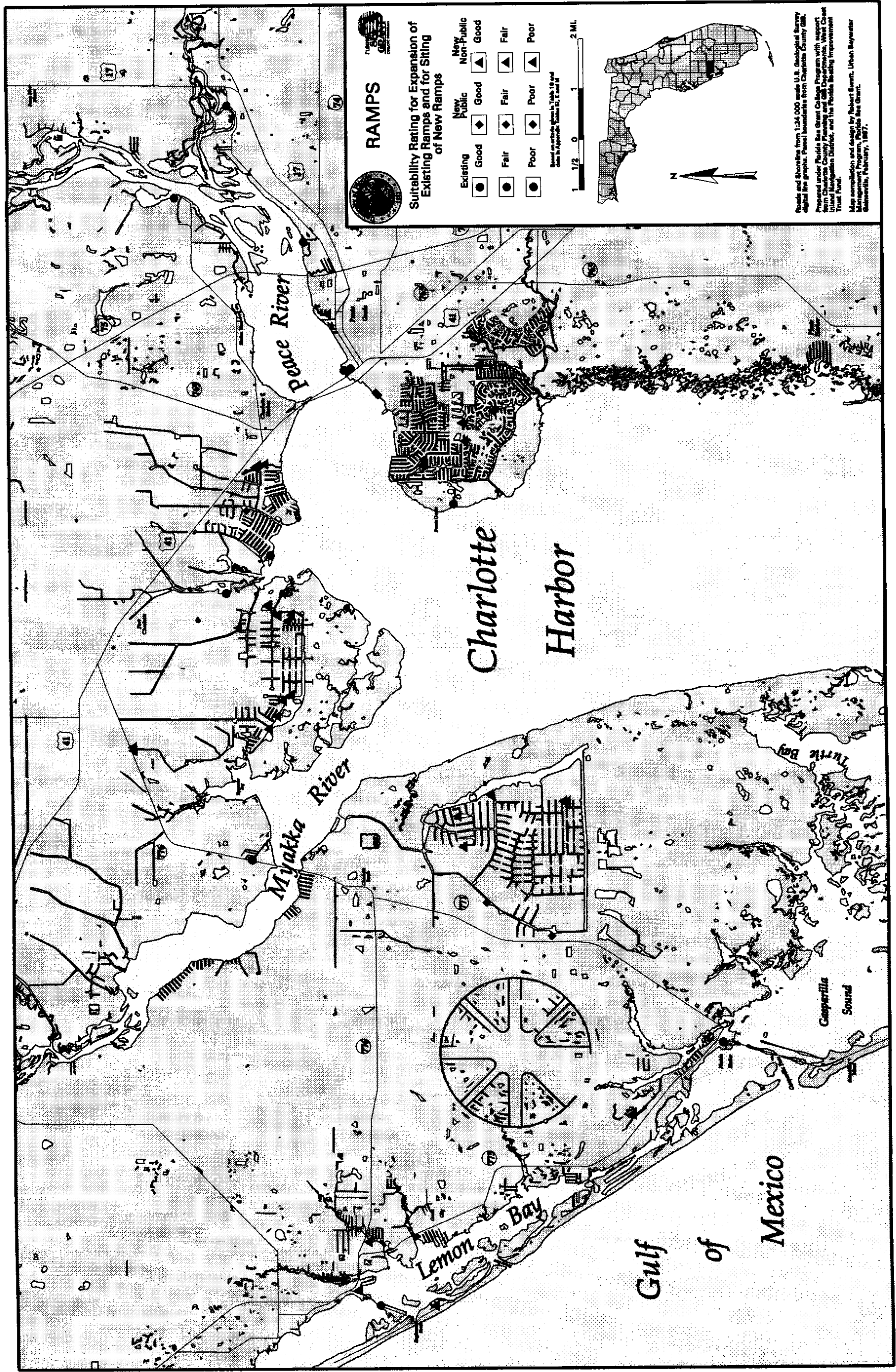


Figure 25. Rated existing ramp expansion, and new public and non-public ramp site locations.

