A Historical Geography of Southwest Florida Waterways

VOLUME TWO

Placida Harbor to Marco Island

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2002

Gasparilla Pass, looking southeast past the causeway and abandoned railroad trestle to Gasparilla Sound with Charlotte Harbor in distance.

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Placida Harbor to Marco Island

written by

Gustavo A. Antonini

David A. Fann

Paul Roat

art production by

Tom Cross, Inc.

design & Illustrations by

Patti Cross

edited by

Paul Roat

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Chuck Listowski (Executive Director, West Coast Inland Navigation District, WCIND) inspired us to consider as our task, not only providing the public with a broader understanding of the historic roots of coastal development, but also establishing a scientific baseline needed by planners and elected officials to set policy and implement waterway resource management. The WCIND Board — elected commissioners from Manatee County (Joe McClash, Chair), Sarasota County (Nora Paterson and Shannon Staub, Alternate), Charlotte County (Mac Horton), and Lee County (Ray Judah) — provided encouragement throughout the project.

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About the Authors

Gustavo A. Antonini is Sea Grant Professor Emeritus at the University of Florida and Managing Member of the waterways consulting firm, Antonini & Associates, LLC. Gus received B.S., M.A., and Ph.D. degrees from Columbia University in New York City. He was a Professor of Geography at the University of Florida from 1970 to 2000 and affiliated with the Florida Sea Grant Program, as the Boating Extension Specialist, from 1988 to 2000. The Sea Grant Boating Program he directed received the Governor's Council for a Sustainable Florida Year 2000 Award.

Prior to 1988, he worked mostly in the Caribbean and Latin America on natural resource and watershed management issues. Since 1988, Gus has focused on Florida coastal management and marine recreation planning projects, dealing with boat live-aboards, derelict vessel removal, hurricane recovery, artificial reef monitoring, anchoring, waterway management and boat traffic evaluations.

Gus has boated in Florida for 30 years and has cruised the Caribbean, Bahamas and U.S. eastern seaboard aboard a Cheoy Lee Cruisaire 35, *La Vida*, which also serves as a self-contained field station for waterway research. Gus holds a Merchant Marine Master's Ticket (100 tons), and is a 28-year member of the U.S. Coast Guard Auxiliary.

When not boating or consulting on Southwest Florida waterways, Gus is training on his bike for ultra-marathon brevets or cycle-touring in some distant, exotic locale.

La Vida, the authors aboard, with sails and sheets eased off the wind, somewhere along the Southwest Florida coast.

David A. Fann is a geographer with the Florida Sea Grant College Program, University of Florida, Gainesville. He received a B.S. in Technical Journalism and a M.S. in Geography from the University of Florida. He performs Geographic Information System (GIS) analyses, creates map-based educational publications for recreational boaters, and participates in field data collection whenever possible. Along with *A Historical Geography of Southwest Florida Waterways, Volumes One and Two*, his primary focus in recent years has been the Regional Waterway Management System project in Manatee, Sarasota, and Lee Counties. This project gathers information on waterway conditions and boat populations, analyzes both kinds of data in a GIS, and provides the results to county policy makers, facilitating an efficient, region-wide approach to waterway management.

Before returning to the University of Florida in 1993, David did rocket science with Martin Marietta Aerospace at Kennedy Space Center and Cape Canaveral Air Force Station. He began his career as a technical writer/editor at Martin Marietta's Orlando Division.

For more than 30 years, David has sailed and fished Florida waters.

Paul Roat is a Florida native who has spent most of his life on the barrier islands of Manatee and Sarasota counties. Paul graduated from the University of South Florida with a degree in photojournalism and has spent 25 years writing or editing community newspapers, magazines and books. Paul works with Tom Cross Inc., a consulting firm specializing in environmental and marine writing and graphics. He is news editor for *The Islander*, a community newspaper based on Anna Maria Island.

1941 - The Changing Sea and Earth

". . . the sea, too, lay restless, awaiting the time when once more it should
encroach upon the coastal plain, and creep up the sides of the foothills,
and lap at the bases of the mountain ranges . . .
so the relation of sea and coast and mountain range
was that of a moment in geologic time.
For once more the mountains would be worn away
by the endless erosion of water and carried in silt to the sea,
and once more all the coast would be water again,
and the places of its cities and towns would belong to the sea."

— In Under the Sea-Wind: A Naturalist's Picture of Ocean Life
Rachel Carson
©1940
Published by Simon and Schuster,
New York. p. 271.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Sea Grant College Program
1315 East-West Highway
Silver Spring, Maryland 20910

Coastal Southwest Florida has undergone dramatic changes in the past 120 years. The vast mangrove forests, expansive seagrass meadows and serene sawgrass tracts have been changed into housing developments and waterfront condominiums. The once-quiet towns and fishing villages have been transformed into bustling communities. Unfortunately, the new residents to the coast are all too often unaware of the region's history.

The great naturalist and ecologist, Edward O. Wilson, in remarking on man's alteration of the environment, speaks of managing the human "footprint" on natural systems as society's greatest challenge in this the new century.

Yet, there are few such places where man's footprint is more starkly visible than the coast of Southwest Florida. In little more than three decades, a blink of an eye in human history, this coastline has gone from a mostly pristine region of small towns and coastal communities to one of immense development that has markedly changed the face of Southwest Florida.

Massive dredging and fill projects have reshaped the land and waterways. We have made land where nature did not, and dug waterways in areas nature picked to be seagrass beds. It is only through understanding these changes made throughout the years that we can fully appreciate the alterations to this once-pristine landscape.

As a society, we are intensely proud of our history and progress as a nation, tend not toward retrospection and focus intensely on the future. But to truly understand the immense changes that we have wrought on scale that is not readily observable or comprehensible, we need a point of reference and historical perspective if we are to derive necessary lessons from that history.

A Historical Geography of Southwest Florida Waterways, Volume Two, Placida Harbor to Marco Island offers readers a glimpse of the changes that have occurred in the region. Visual depiction of the manmade changes that have taken place are shown through maps and photographs.

As in Volume I, the authors chronicle magnificently the magnitude of cumulative impacts of thousands of smaller actions and among many jurisdictions over a relatively short time.

Only by learning of the past can we understand the needs of the future. Dr. Antonini and colleagues unveil the complex history and geography of this interesting and beautiful area. Southwest Florida with its rare ecosystems should be managed and nurtured in the coming years.

The authors have done us all an incalculable service yet again. They have provided us with invaluable information, insight and guidance we will surely need to address the difficult issues of environment and community that lie ahead.

Ronald C. Baird
Director
National Sea Grant College Program

The Ship's Bell
Throughout each four-hour watch, hours and half-hours are struck by a ship's bell. The time is described as "one bell" for the first half hour, "two bells for the second half hour, and so on, up to eight bells.

INTRODUCTION

Perhaps nowhere else in Florida are manmade alterations to the natural landscape more visible than in the Southwest, along the coast between Placida Harbor and Marco Islands and east through the Caloosahatchee Valley to Lake Okeechobee. This 184-mile stretch of barrier island shore and riverine valley waterways, fishing villages, and small scattered agricultural communities in the pre–development, early 20th century era — is today a bustling chain of waterfront communities and thriving cities.

The coastline includes large estuaries, such as Charlotte Harbor, Pine Island Sound, and San Carlos Bay; smaller embayments; and hundreds of miles of manmade channels and canals linking the massive developments of Punta Gorda, Cape Coral, and Marco with the bays and, ultimately, the Gulf of Mexico. It also encompasses the Caloosahatchee, a riverine system that is part of the Okeechobee Waterway, the only water link across Florida, from the Gulf to the Atlantic Ocean.

Little Gasparilla Island, view north. Gasparilla Pass on lower left, abandoned railroad trestle and causeway to Placida on right, Placida Harbor and Cape Haze development in midground.

The peaceful communities and cities of today give little indication of recent conflicts in the region. In fact, few locations in the nation have received as much attention from federal, state, regional, and local managers and regulators of waterway and coastal development as has Southwest Florida.

Pressure from developers to dredge and fill vast tracts of land for home construction behind seawalls and embankments prompted statewide attention and federal action, which resulted in the curbing of permits that allowed growth and caused massive changes in the way Florida's leaders — and the developers — viewed and permitted development.

Some interests favored waterway construction to benefit navigation and riverine commerce. Meanwhile, land-oriented interests advocated waterways as great drainage ditches for quickly removing unwanted water from valuable agricultural acreage. The result was heated debate and dramatic changes in the ways rivers were viewed and used throughout Florida.

Lessons learned through these historical conflicts may bode well for future discussions of Southwest Florida development. National attention is currently focused on South Florida in the wake of a federal-state-regional program to preserve and protect the Everglades from development pressure and ensure water flow to sensitive areas far downstream in the "River of Grass."

This book, *A Historical Geography of Southwest Florida Waterways, Volume Two*, offers a glimpse of the changes that have occurred along this Southwest Florida coast since the late 19th Century. Undoubtedly, the biggest alterations to the natural landscape have occurred through manmade changes in the waterways, by the creation of the Gulf Intracoastal Waterway (ICW) and the Okeechobee Waterway and by development of waterfront communities upon submerged land.

Before development, this stretch of coastline was an area of "wild" Florida, where natural barriers of shoals separated embayments and blocked passage of vessels. (See Boating Geography chapter.) As settlements began to flourish in the region in the late 1800s, the demands for transportation of goods grew, and dredging began in the region. In the 1880s, the lower course of the Caloosahatchee was the first waterway in the region to be "channelized." Dredging of passes in Charlotte Harbor, and Pine Island Sound followed. The early 1960s saw completion of the ICW from the mouth of the Caloosahatchee to Gasparilla Sound and points north. (See Dredging History chapter.)

With the region opened to the easy transport of goods and services, and with an immense demand for Florida housing after World War II, access channels and canals were deemed the easiest way to create homesites from "worthless swampland." The end of the development boom saw 1,136 miles of boat channels completed from Placida Harbor to Marco Island, totally changing the face of Southwest Florida. (See Access Channels chapter.)

An effective way to comprehend the changes in the region is through photographs and maps showing the pre- and post-development settings at selected locations, as depicted in the Photographic Record chapter. The Land Use Changes chapter highlights, community-by-community, the physical alterations in the area through housing development, railroad line creation, and dredging of the ICW.

Tidal inlets are a vital part of the landscape of Southwest Florida. The exchange of saltwater from the Gulf with freshwater of streams and rivers in the bays is facilitated through the passes between barrier islands. Inlets provide recreational opportunities for tens of thousands of boaters and fishers, and the Inlets chapter is devoted to their importance for navigation, recreation, and the environment.

The Caloosahatchee [Caloosa= indigenous Native Americans who inhabited Southwest Florida, Hatchee= Seminole for river] chapter chronicles the history of the Caloosahatchee Valley, which may serve as a harbinger for the future of at least several elements of the ongoing multi-billion dollar Everglades restoration effort. The river is an extreme case of altering land and water for coastal development and, in the process, irrevocably changing its form and function. The historic river, a valuable asset to pioneers as a commercial artery for transporting goods and providing services, had a meandering, shifting course sometimes drastically affected by floods and droughts. Today, it is the straight-channel, dredged, Okeechobee Waterway, used by resource managers for flood control and by boaters transiting between the Eastern Seaboard and the Gulf Coast. Questions on how to manage the historic river and its water in the future, constrained by its historical and ecological niche in South Florida, will provide a challenge in the years ahead.

Where Volume One and Volume Two meet, at the south end of Lemon Bay, with Stump Pass in the foreground, lower Lemon Bay in midground on left, The Cutoff (boundary) at dash line, Charlotte Harbor in background, looking south.

The Charting Waterway Changes chapter describes how Geographic Information System computer programs enable source material from different eras to contribute to the creation of the maps in this book. Cartographers place maps and charts in reference systems that evolve as knowledge of the Earth's true shape improves. A major problem is bringing them all into a common system, so that investigators can accurately measure and display historic changes in study area parameters of interest.

The future of Southwest Florida's vast system of bays, inlets, rivers, sleepy fishing communities, waterfront suburban tracts, and bustling urban cores is unknown. A growing awareness exists among residents that their paradise could easily be lost without widespread adoption of a stewardship ethic and continuing public efforts to restore and maintain the region's unique ecological and cultural treasures. The balance between people and nature will continue to be the challenge for Southwest Florida and its waterways.

This book is part of a series of publications on the boating geography of the region. *A Historical Geography of Southwest Florida Waterways, Volume One*, similarly treated the adjoining area to the north, from Lemon Bay to Anna Maria Sound (south of Tampa Bay).

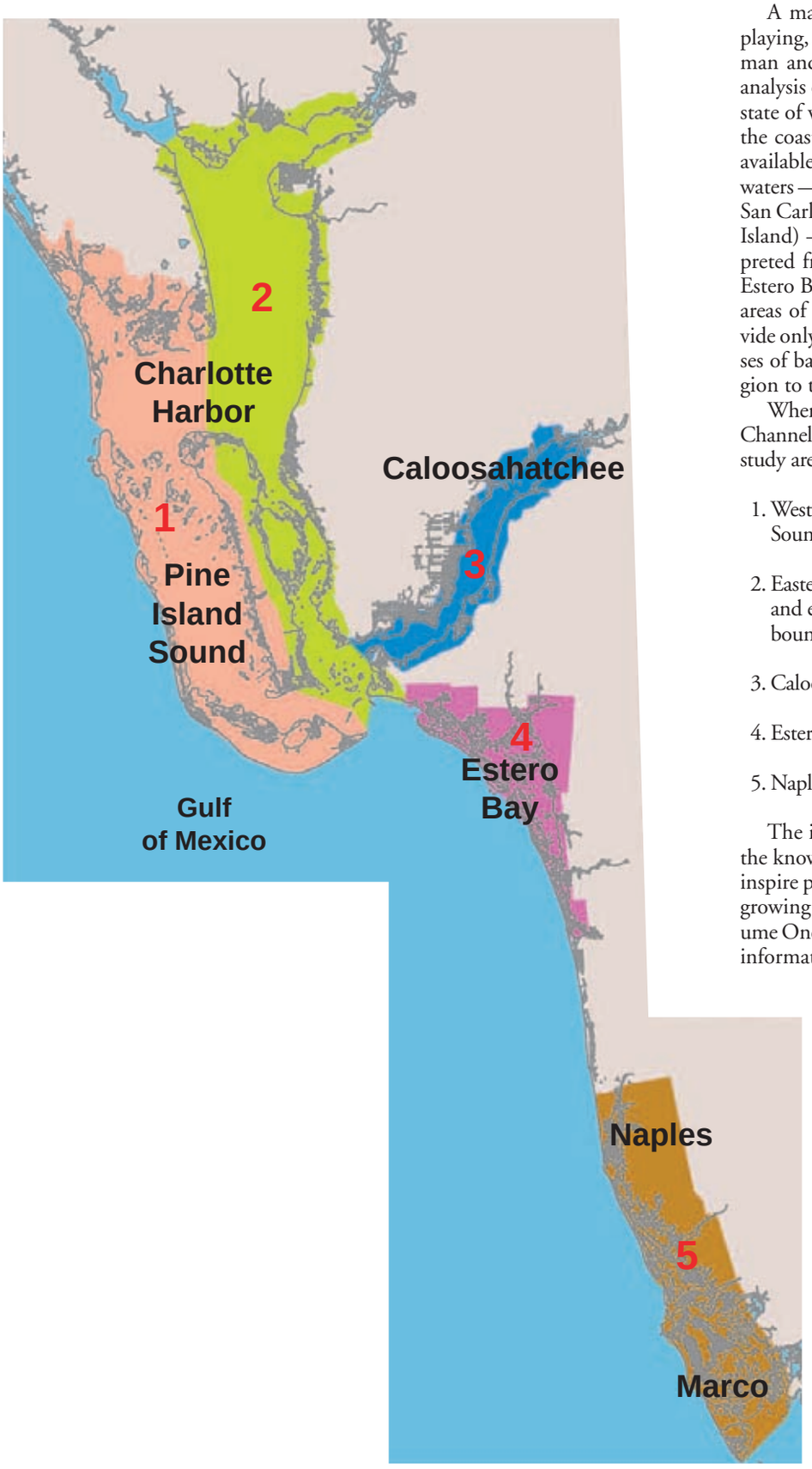
While similar waterway conditions prevail in the northern (Volume One) region, several differences in the coastal development process between the northern and southern regions are noteworthy. First, the federally authorized ICW navigation channel was dredged much earlier in the north, reaching south from Tampa Bay to Sarasota in 1896 and from Sarasota to Venice in 1907. The ICW segment from Venice to Lemon Bay was dredged in the 1960s, coinciding with the ICW improvements covered in Volume Two.

Canal development occurred in the northern region much earlier as well, spurred on by entrepreneurs like John Ringling of Sarasota. Though canal development in the northern region was widespread, most canal systems there were smaller in scope and shorter in length. (A notable exception was Siesta Key's Grand Canal system.) The filling of bay water to create residential property was relatively more common; as a result, conversion of *water to land* predominated in the northern region. Thus, Volume One included the chapter "Land and Water Changes along the Waterway."

In contrast, the change from *land to water* along the pre–development shoreline largely defined coastal development in the southern region. Dredging vast networks of waterways landward of the shoreline created immense, canal-based communities like Punta Gorda Isles, Cape Coral, and Marco Island. Relatively much less conversion of water to land by filling of bay water took place in the southern region. Hence, this volume presents a chapter highlighting canal development case studies, rather than the regional land-water change analyses of Volume One.

Placida Harbor and Cape Haze canal development in foreground, looking north over Coral Creek towards Rotunda West.

Punta Gorda Isles in midground, looking north towards the Peace River, with Port Charlotte in background, Burnt Store Isles canal development in lower right.



A map-based approach is ideal for quantifying, displaying, and understanding the changes wrought by both man and nature along the southwest Florida coast. An analysis of the mapped features helps explain the present state of waterway conditions and the changing nature of the coastal environment. Where historic depth data are available as point soundings throughout areas of open waters — such as in Charlotte Harbor, Pine Island Sound, San Carlos Bay, and the Caloosahatchee (below Beautiful Island) — chloropleth maps show average depths interpreted from the soundings. However, historic charts of Estero Bay and the Naples–Marco region — where large areas of navigable bay waters are less abundant — provide only channel centerline depths. This precludes analyses of bathymetric change over much of the mapped region to the south.

Where region-wide maps are displayed, as in the Access Channels chapter and the Land Use Change chapter, the study area is segmented into five areal zones (Map 1).

1. Western Charlotte Harbor, including Pine Island Sound and western San Carlos Bay.

2. Eastern Charlotte Harbor, including Matlacha Pass and eastern San Carlos Bay (with the area 1 and 2 boundary following State Road 767 along Pine Island).

3. Caloosahatchee (upstream to Beautiful Island).

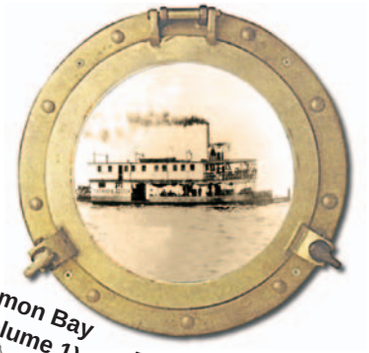
4. Estero Bay and Wiggins Bay.

5. Naples–Marco.

The intent of the volumes in this series is to increase the knowledge about coastal change in the region and to inspire public stewardship for a healthy environment in a growing community. Since the 1999 publication of Volume One, resource planners and elected officials have used information in the historical geography analysis to formulate prescriptive policies and actions to deal with waterway management needs. Habitat restoration of spoil islands, anchorage planning, and an innovative method of general permitting for maintenance dredging are some of the issues where an application of the principles and information contained in these books have been applied.

Digital map data contained in both volumes of this series will be incorporated into *A Coastal Data Server System for the Gulf Intracoastal Waterway and Adjoining Bay Waters of Southwest Florida,* to be hosted by the GeoPlan Center of the University of Florida. The NOAA Coastal Service Center, Charleston, SC, is supporting this effort through a grant to Florida Sea Grant.

Map 1.
Regional map presentations in the
Access Channels and Land Use Changes chapters.

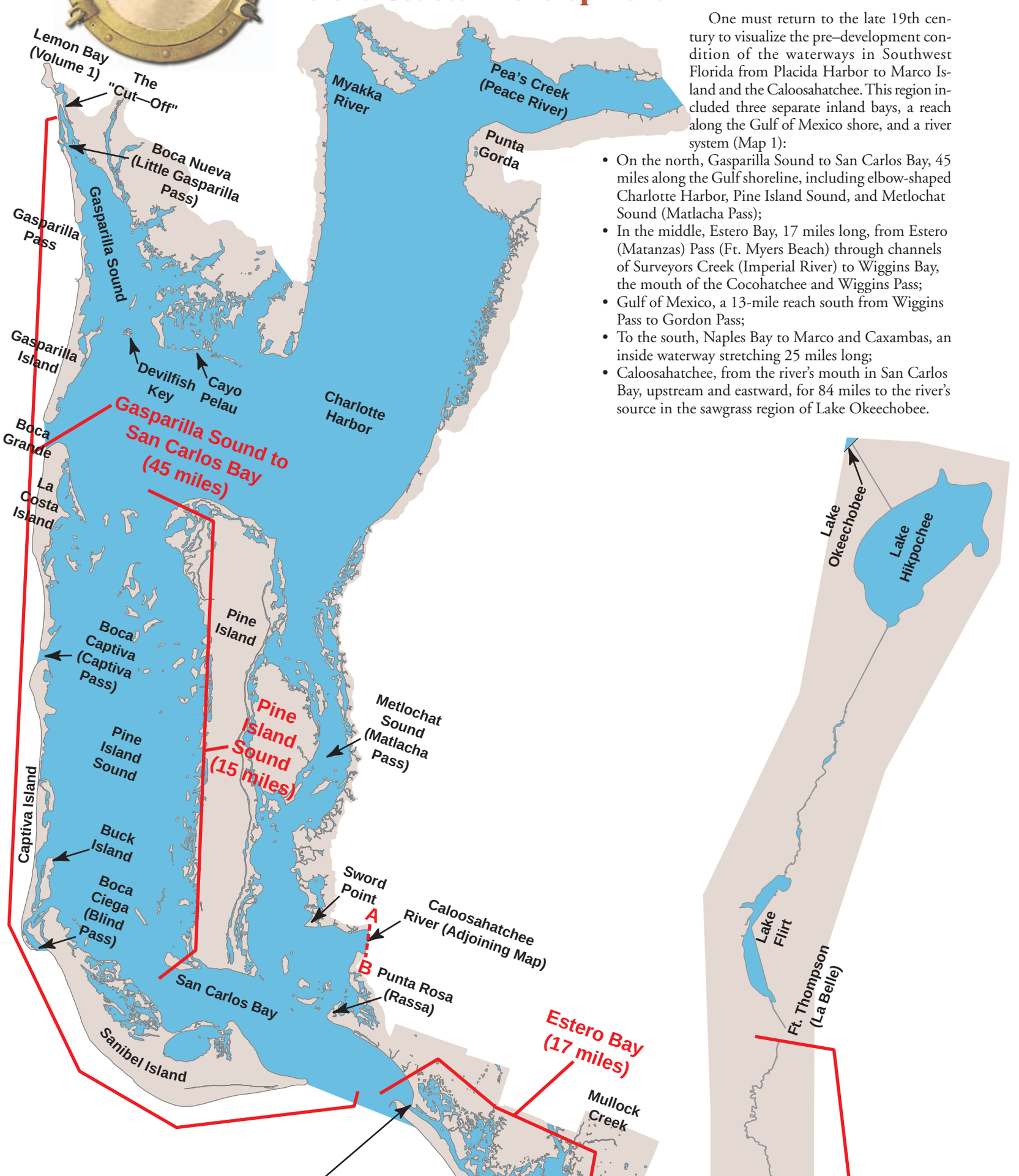


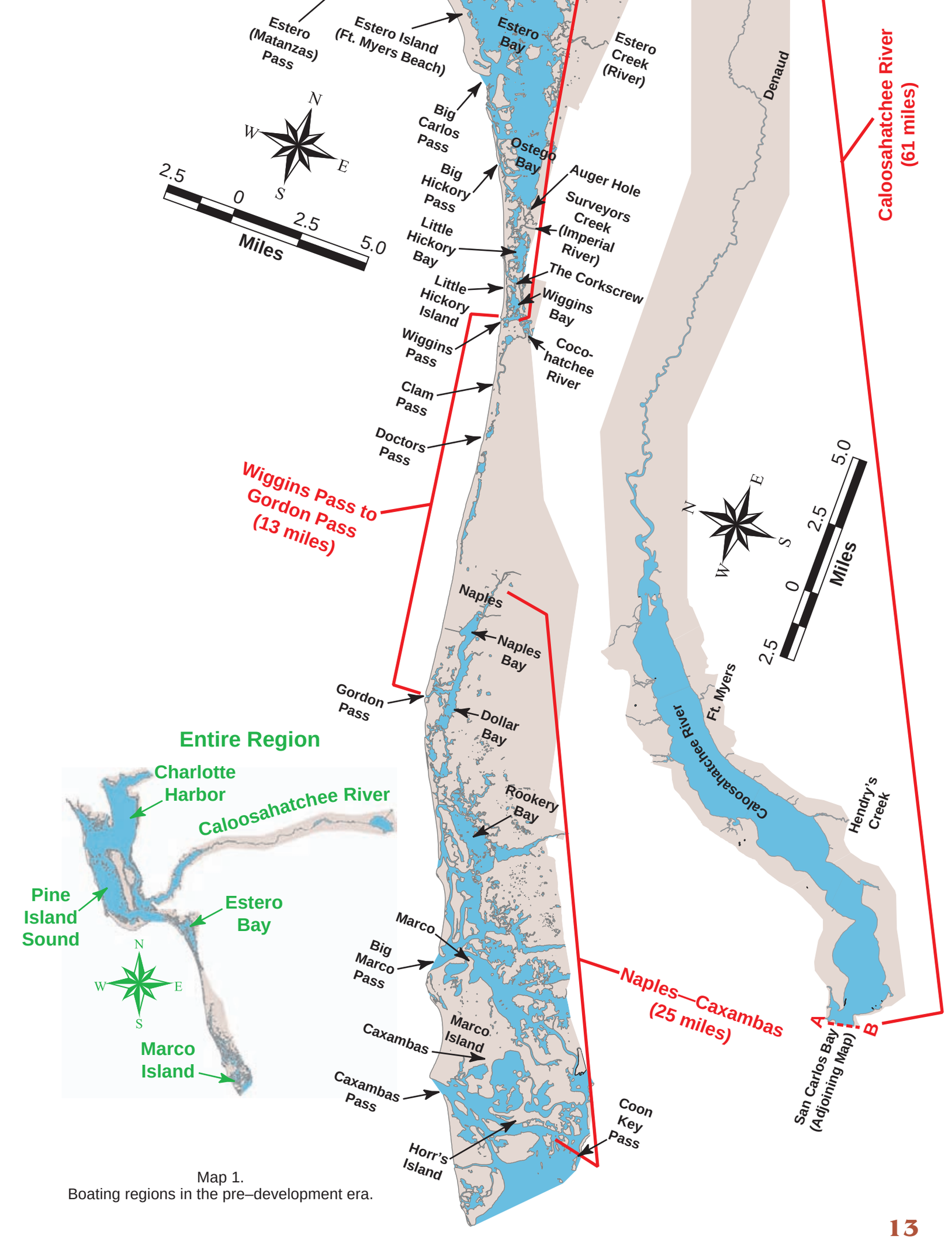
HISTORICAL DEVELOPMENT OF SOUTHWEST FLORIDA WATERWAYS

The Boating Geography of Southwest Florida Before Coastal Development

One must return to the late 19th century to visualize the pre–development condition of the waterways in Southwest Florida from Placida Harbor to Marco Island and the Caloosahatchee. This region included three separate inland bays, a reach along the Gulf of Mexico shore, and a river system (Map 1):

- On the north, Gasparilla Sound to San Carlos Bay, 45 miles along the Gulf shoreline, including elbow-shaped Charlotte Harbor, Pine Island Sound, and Metlochat Sound (Matlacha Pass);
- In the middle, Estero Bay, 17 miles long, from Estero (Matanzas) Pass (Ft. Myers Beach) through channels of Surveyors Creek (Imperial River) to Wiggins Bay, the mouth of the Cocohatchee and Wiggins Pass;
- Gulf of Mexico, a 13-mile reach south from Wiggins Pass to Gordon Pass;
- To the south, Naples Bay to Marco and Caxambas, an inside waterway stretching 25 miles long;
- Caloosahatchee, from the river's mouth in San Carlos Bay, upstream and eastward, for 84 miles to the river's source in the sawgrass region of Lake Okeechobee.





Map 1.
Boating regions in the pre–development era.

Natural barriers historically separated these waterways. The connections from Gasparilla Sound and San Carlos Bay were impeded: north to Lemon Bay by "The Cut-Off," east to the Caloosahatchee by the river's delta, and south from San Carlos Bay to the Gulf of Mexico by inlet shoals. Mariners entering and leaving Estero Bay had to run Estero (Matanzas) Pass and Wiggins Pass, as well as negotiate the tortuous, winding channel connecting Estero and Wiggins Bays. There were no harbors of refuge, such as present-day Clam Pass and Doctors Pass, along the Gulf Coast. Farther south, beyond the entrance at Gordon Pass, the inside passage from Naples Bay to Marco was strewn with oyster bars that made navigation risky even for shallow-draft vessels. On the Caloosahatchee, waterfalls set the head of navigation at Ft. Thompson (La Belle). Settlers along this coast could sail along the Gulf shore in good weather, but strong onshore winds would force them inside, where passage was especially impeded when seasonal "northers" reduced the water depths and made many shoals impassable.

From the north, mariners entered Gasparilla Sound through Gasparilla Pass (6.5–foot depth), though shallow-draft coasters sometimes used Little Gasparilla (Boca Nueva) Pass (3.5-foot depth) in settled weather. The sound, 9 miles long, varied in width from approximately a half mile in the north to 6 miles in the south (including Bull and Turtle Bays), where it connected with Charlotte Harbor. The principal channel south was between Devil Fish Key and Gasparilla Island (4.5 feet deep). Another shallower, crooked channel ran east between Devil Fish Key and Cayo Pelau. Charlotte Harbor, an extensive embayment with relatively uniform depths, opened to the south and stretched 10 miles east by 20 miles north. Vessels entered the harbor from the Gulf through Boca Grande Pass, which had a natural depth of 19 feet over the bar. East through the harbor, 9-foot depths could be carried to Punta Gorda. Pea's Creek (also called Pease Creek and, later, the Peace River) emptied into Charlotte Harbor just northeast of Punta Gorda.

Vessels heading south, either from Boca Grande or Charlotte Harbor, coasted down Pine Island Sound, the 15-mile-long by 3- to 4-mile-wide passage of water situated between Pine Island and the barrier island chain of La Costa, Captiva, and Sanibel Islands. Shoals existed opposite Boca Captiva (Captiva Pass) and Boca Ciega (Blind Pass). In fair weather, fishing schooners used either pass. Vessels touched at a fishing station on the northeast coast of Captiva Island. In 1880, Boca Ciega was not "blind" (closed), but had a 400-foot-wide channel. A side channel veered north between Buck and Captiva Islands, with depths from 3 to 6 feet all the way out to the sound. Along the inside passage heading south in Pine Island Sound, and after the shoals opposite Blind Pass, deep water opened into San Carlos Bay, and the channel skirted the east shore of Sanibel Island south to the Gulf of Mexico.

Numerous islands fringed Metlochat Sound (Matlacha Pass), separating Pine Island from the mainland to the east. The channel through Middle Metlochat was tortuous and impassable for vessels of more than 2–foot draft. Upper and Lower Metlochat Sound were relatively less obstructed by islands and afforded deeper water, accommodating vessels drawing 6 to 7 feet. Pine Island and Metlochat Sounds joined at the south in San Carlos Bay. An extensive tidal delta at the mouth of the Caloosahatchee shoaled the east portion of San Carlos Bay.

Estero River during the Koreshan settlement era, circa 1900.

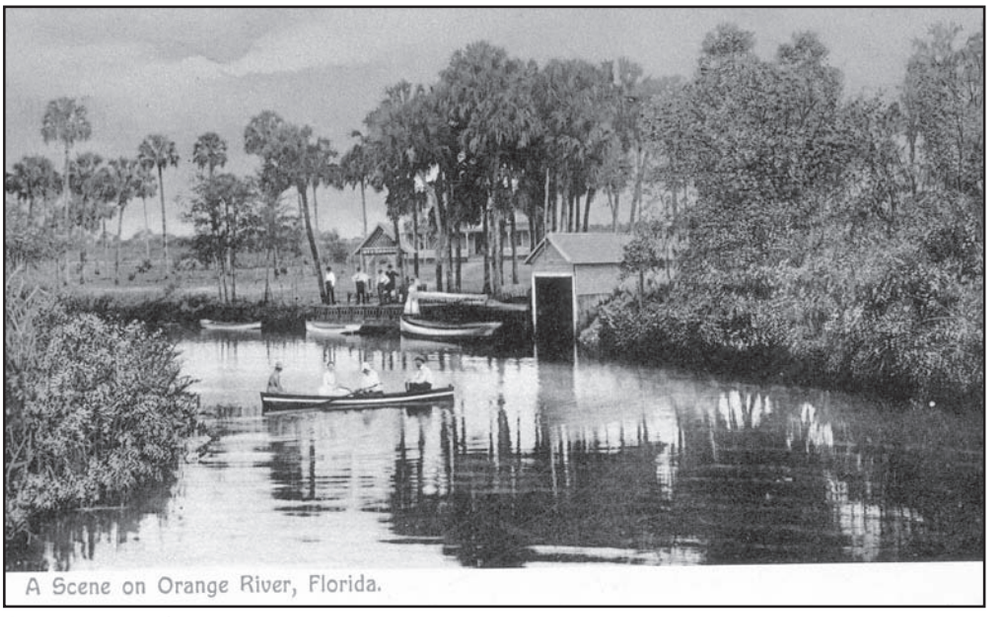
Cuban fishing smacks sailing in Charlotte Harbor, 1922.

Imperial River, early 1900.


Coastal view of Marco Island, early 1900.

Estero Bay, which trends northwest/southeast and is approximately 7 miles long and 2 miles wide at its center, tapers at each end. Mariners entered at the north through Estero Pass (Matanzas Pass). The bay was bounded on the west by Estero, Big Hickory, and Little Hickory Islands. Though Big Carlos Pass retains its historic position and shape today, the other inlets situated south of it were very differently shaped in earlier eras. (The Inlet Dynamics chapter explains the effects of human intervention and natural processes on the history of these inlets.) Numerous islands of various sizes are scattered throughout the bay. A long sand bar covered with 6 to 12 inches of water at mean low water restricted vessels at the mouth of Estero Creek. Another sand bar was at the mouth of Surveyors Creek (Imperial River), with approximately 1 foot of water at mean low tide. Estero Bay ended at the Auger Hole, a tortuous distributary channel at the mouth of Surveyors Creek, a little south of Big Hickory Pass. Vessels transiting south had to negotiate this constriction and pass into Surveyors Creek, then down that creek through the Cork Screw, another sharply bending channel of shallow water, before entering Little Hickory Bay, a distance of 4 miles, in order to reach the Cocohatchee and Wiggins Pass.

The Gulf shore south of San Carlos Bay (Ft. Myers Beach) was sparsely populated in predevelopment times. This was especially true of the 13–mile stretch of coastline between Wiggins and Gordon Pass. Naples Bay could be approached through Gordon Pass, but there was only a fish camp at the inlet mouth in the early 1900s. An inside waterway connected this pass to Naples and extended south for 12 miles to Big Marco Pass. The passage was a few hundred feet to 1 mile distant from the Gulf beach, from 40 feet to one-half-mile wide, and from 3 to 10 feet deep. Many transverse oyster bars, covered by a dense growth of mangroves, obstructed the passage. About 3 miles south of Naples was Dollar Bay, a wider section of this waterway, and Rookery Bay, another enlarged section, lay another 4 miles south. Fishermen used tidal channels to run east of Marco Island and round Coon Key Pass, a distance of 13 miles, to reach Caxambas.



Orange River, early 1900.

The banks along the Caloosahatchee were lined with rickety docks, sewer outfall pipes and litter before the turn of the century. In 1888, the Ft. Myers Council ordered outhouses on the waterfront removed as they were "offensive to the best interest of the community."

The Caloosahatchee, early in the 19th century, was recognized as the key to settling the vast Okeechobee Basin. Unlike today, the river did not reach the big lake. An extensive shoal (5.5 foot depth), across the mouth where the river entered San Carlos Bay between Sword Point and Punta Rosa (Rassa), hampered navigation. Other obstacles included numerous oyster bars along the 17-mile reach up to Ft. Myers and a very crooked, shallow (4 feet deep), and long (44 mile) channel from Ft. Myers to the waterfalls at Ft. Thompson (La Belle). The river's source was 4 miles upstream of Ft. Thompson near Lake Flirt, which was 16 miles west of Lake Okeechobee. The Caloosahatchee above Ft. Myers was subject to overflow during the wet seasons. There are numerous recordings of 17-foot–high floods at Denaud; these recurring events prompted private ventures and government attempts to regulate river flow for land drainage and reclamation.

These were the general conditions that prevailed before changes were made, with navigation improvements and land drainage the principal goals behind the man-made alterations.

Caloosahatchee shoreline.

Bird's-eye view of Punta Gorda before seawall.

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Pig butchering on the bank of the Caloosahatchee in 1911.

Dredging History of Southwest Florida Inland Waterways

The region's dredging history is linked to the recognized advantages afforded by shipping local products to market on inland waterways, as well as by the desire to control flooding with upland drainage. Oftentimes, these two objectives pitted competing and conflicting interest: waterway navigation versus land reclamation. As coastal settlements were established in the late 1800s, local communities sought governmental assistance in creating inland navigation routes. Prior to the extension of railroads south of Tampa Bay, there was great interest in opening steamboat communication across Florida. Several navigable routes were investigated: from Jacksonville, via the St. John's River, then by way of Topokalija Lake (now called Lake Tohopekaliga) to Charlotte Harbor; and down the Kissimmee River and Caloosahatchee to Ft. Myers.

With a surge in interest following the Civil War to develop lands adjoining Lake Okeechobee, the great liquid heart of Florida, private investors, armed with land grants from the state to subsidize drainage projects, attempted several canal dredging projects to link the lake with the Gulf. (These improvements are discussed further in the Caloosahatchee chapter.) By and large, however, local settlers sought to improve sheltered water routes that could provide safe passage for light-draft vessels within Charlotte Harbor and the lower Caloosahatchee, in Estero Bay, and between Naples and Marco Island. The chronology of events is summarized in Table 1 and illustrated in Maps 1 and 2.

The hydrographic charts produced by the U.S. Coast and Geodetic Survey (Coast Survey), along with U.S. Army Corps of Engineers (Army Engineers) reports and maps to Congress, provide an invaluable baseline of information on waterway conditions in Southwest Florida during the pre- and early development period. Ship captains use Coast Survey charts to navigate and pilot within coastal waters. The reports and maps of the Army Engineers result from field studies to determine the engineering feasibility and economic justification for waterway improvements. Safety of vessels at sea and commercial concerns guided expenditures of federal funds for navigation improvements. The Army Engineers were responsible for surveying and improving waterways judged to have national importance through the General Survey Act of 1824 and the Rivers and Harbors Act of 1878. The earliest source charts and maps cover Charlotte Harbor and Pine Island Sound (1863-1879) and the Caloosahatchee (1887-1893). As few coastal settlements existed beyond San Carlos Bay prior to 1900, there was little justification in extending comprehensive charting to the south. The Army Engineers undertook a centerline survey of Estero Bay in 1908, but the Coast Survey charting dates from 1970. The earliest charts for the inside passage from Naples to Caxambas, based on centerline surveys, date from 1930.

Caloosahatchee and Okeechobee Waterway

The earliest dredging improvements in the region, which focused on the Caloosahatchee, were linked to the land drainage schemes of Hamilton Disston and the Gulf Coast Canal and Okeechobee Land Co. (1881-1888). These projects were designed to develop the rich, black muck-lands adjoining Lake Okeechobee by connecting the upper reach of the Caloosahatchee (from Lake Flirt) to Lake Okeechobee, and by removing a waterfall at Ft. Thompson. A federal navigation project, begun in 1883, improved the downstream reach of the river by creating a 7-feet-deep by 100-feet-wide channel over the Gulf bar at the river's mouth below Punta Rassa and through the oyster shoals to Ft. Myers. In 1910, this channel was enlarged to a depth of 12 feet and a width of 200 feet. The middle reach of the Caloosahatchee, from Ft. Myers to Ft. Thompson, became federalized in 1887, when the Army Engineers dredged a 4-feet-deep by 35-feet-wide channel and removed snags and overhanging trees. In 1902, the Army Engineers dredged (4-feet-deep by 50-feet-wide) the Orange River (formerly Twelve Mile Creek, 12 miles upstream from Ft. Myers), a Caloosahatchee tributary, from its mouth to Buckingham.

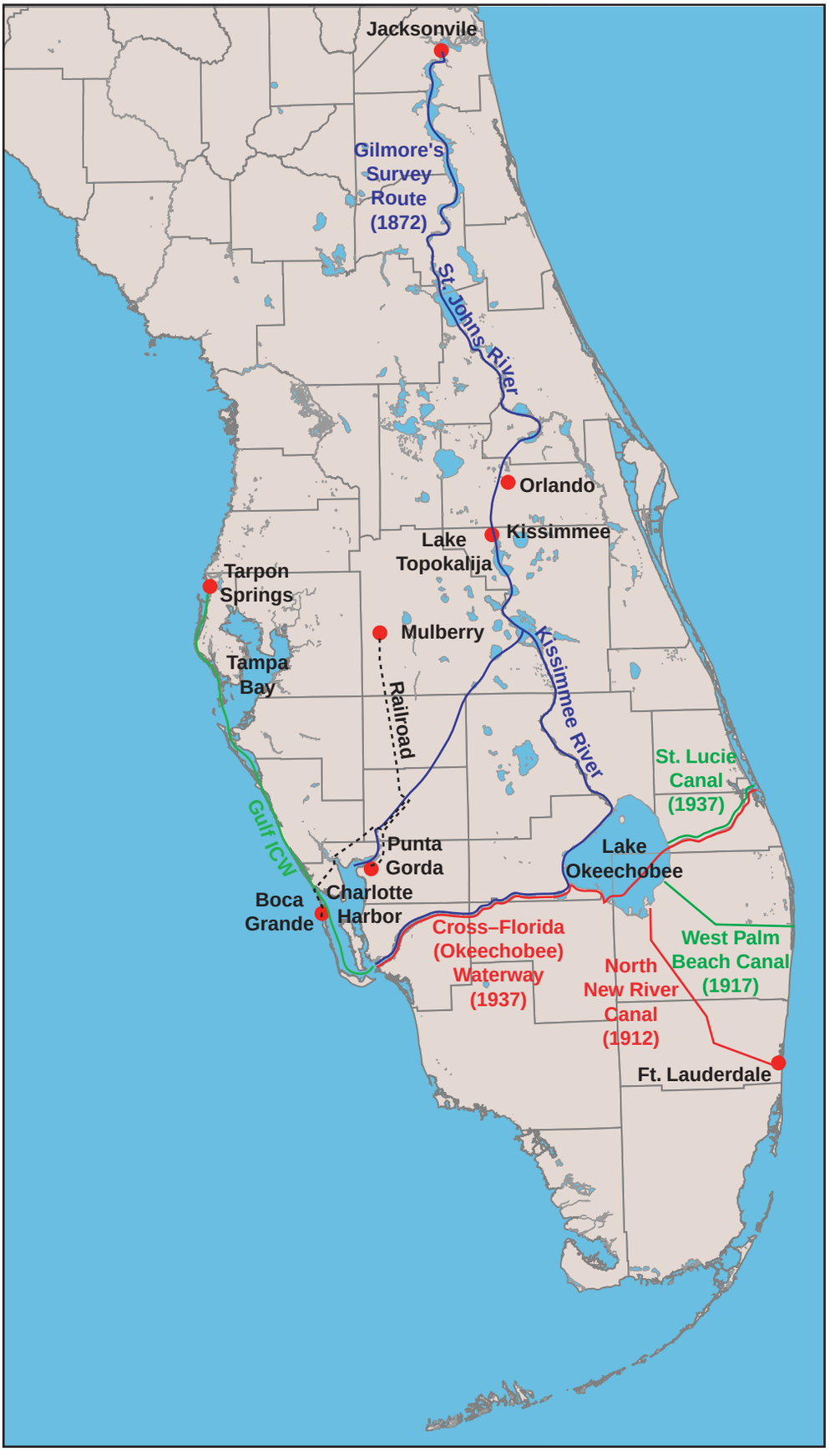
The development-era history of the Caloosahatchee is a record of competing demands for land drainage versus navigation. By 1883, a steamboat connection had been established between Ft. Myers and Kissimmee. In 1902, during tourist season (January-May), steamers ran daily between Ft. Myers and Punta Gorda. During the remainder of the year, the steamer service was three times per week. Another steamship line ran occasionally between Ft. Myers and Punta Gorda. Two schooners made semimonthly trips to Tampa. Other steamers made trips three times a week to upriver points as far as Ft. Thompson, a distance of 44 miles. Completion of the North New River (drainage) Canal, linking Lake Okeechobee to the Atlantic Ocean at Ft. Lauderdale, created a de facto Cross-Florida Waterway, but this easternmost route was closed to boat traffic in 1914 because of rock obstructions and hyacinths. The opening of the West Palm Beach (drainage) Canal in 1917 provided a temporary, alternative boat passage from the Gulf of Mexico to Florida's Eastern Seaboard.

In 1913, Florida Gov. Park Trammel advocated federal development of a navigable Cross-State Waterway in southern Florida, but this policy became law only on Aug. 30, 1935, through the Rivers and Harbors Act. And on March 22, 1937, the Cross-Florida Waterway, known today as the Okeechobee Waterway, was inaugurated; this passage included opening the St. Lucie Canal eastern segment and dredging a 7-feet-deep Caloosahatchee channel between Ft. Myers and Ft. Thompson.

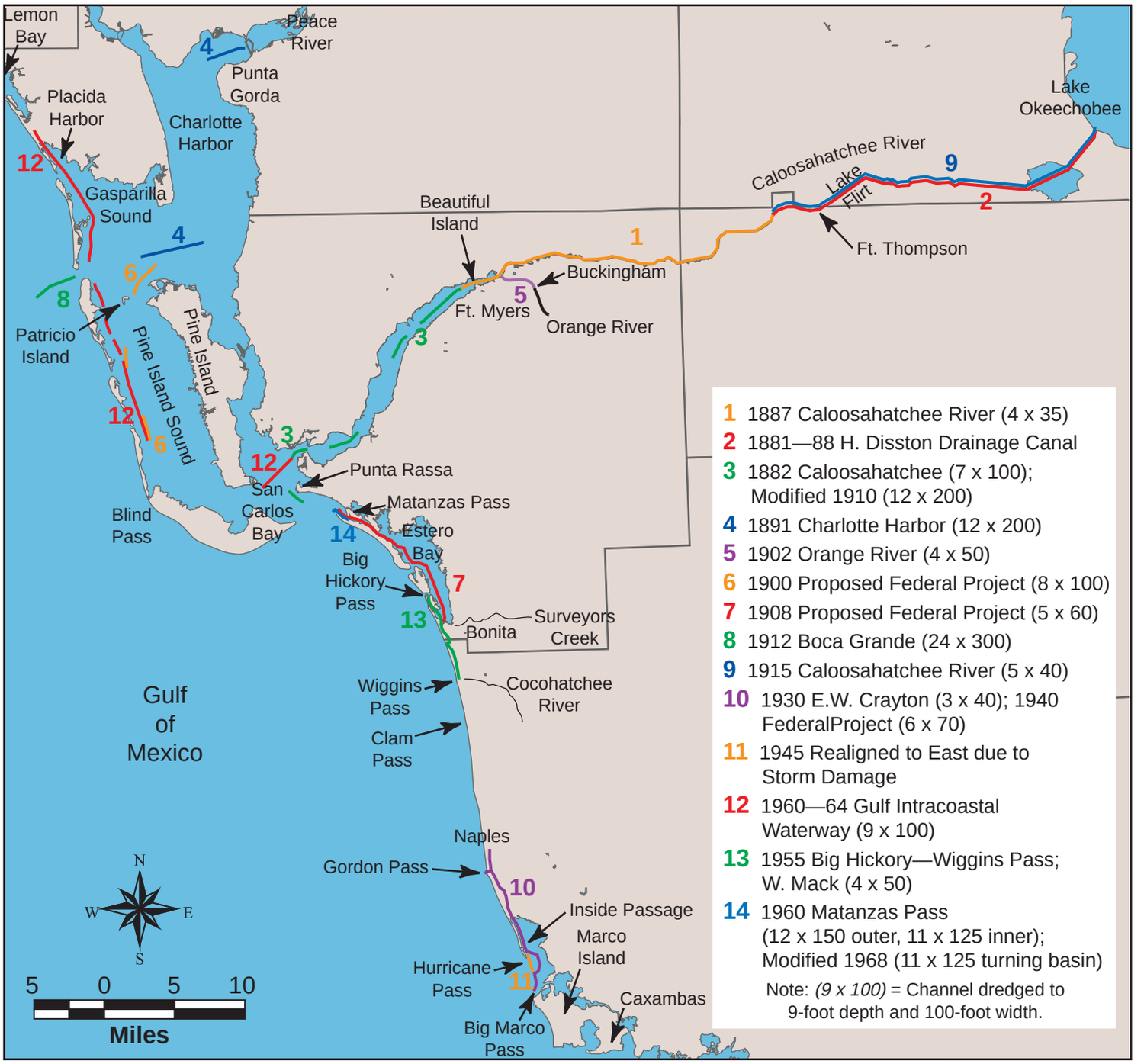
Historical Synopsis of Waterway Improvements in Southwest Florida (Volume Two).

1881-1888 Caloosahatchee (Upper)	Hamilton Disston (Atlantic and Gulf Coast Canal and Okeechobee Land Company): removed rock ledge waterfall at Ft. Thompson, straightened (removed bends) in river below Ft. Thompson; and dredged upper reach connecting river to Lake Okeechobee.
1882 Caloosahatchee (Lower)	Federal project: dredged channel from river mouth to Ft. Myers 100-feet-wide and 7-feet-deep.
1887 Caloosahatchee (Middle)	Federal project: dredged channel 4-feet-deep and 35-feet-wide, removed snags and overhanging trees from Ft. Myers to Ft. Thompson.
1891 Charlotte Harbor	Federal project established: channel 12-feet-deep and 200-feet-wide from inside Boca Grande Pass to Punta Gorda.
1900 Pine Island Sound	Army Engineers: recommended federal improvements for channel 8-feet-deep and 100-feet-wide through shoals northeast of Patricio Island and northeast of Blind Pass (not adopted).
1902 Orange River (Twelve Mile Creek)	Federal project established: channel 4-feet-deep and 50-feet-wide from mouth 6 miles upstream to head of navigation at Buckingham.
1908 Estero Bay	Army Engineers: recommended federal improvements for channel 5-feet-deep and 60-feet-wide from Matanzas Pass to mouth of Surveyors Creek (Imperial River) (not adopted).
1910 Caloosahatchee (Lower)	Federal project: modified to widen (200-feet) and deepen (12-feet) channel from bar below Punta Rassa to Ft. Myers.
1912 Cross - Florida Waterway	North New River Canal: connected Lake Okeechobee to Ft. Lauderdale. (Navigation usage terminated in 1914 due to rock obstructions and hyacinths.)
1912 Boca Grande	Federal project established: inlet channel through Boca Grande Pass to wharves at south end of Gasparilla Island, 24-feet-deep and 300-feet-wide.
1913 Cross - Florida Waterway	Gov. Trammel advocated federal government develop navigable Cross - State Waterway.
1915 Caloosahatchee (Upper)	State of Florida: dredged channel 5-feet-deep and 40-feet-wide from Lake Okeechobee to La Belle.
1917 Cross - Florida Waterway	West Palm Beach Canal to Lake Okeechobee: opened to boat traffic.
1930 Naples Bay - Marco (Inside Passage)	E.W. Crayton: dredged 3-feet-deep by 40-feet-wide inside passage, cut through oyster bars.
1935 Cross - Florida Waterway	Rivers and Harbors Act of Aug. 30, 1935: obligated federal government to build waterway; included St. Lucie Canal and dredging 7-feet-deep, Caloosahatchee channel between Ft. Myers and Ft. Thompson.
1937 Cross - Florida Waterway	Opened March 1937.
1939 Gulf Intracoastal Waterway	Board of Engineers for Rivers and Harbors: recommended federal intracoastal project, 9-feet-deep and 100-feet-wide, from Caloosahatchee (Ft. Myers) north to Anclote River (Tarpon Springs); World War II delayed funding until 1945.
1940 Naples Bay - Marco (Inside Passage)	Federal project: completed 6-feet-deep and 70-feet-wide channel from southern limit of Naples to landward side of Big Marco Pass, 10 miles.
1945 Naples Bay - Marco (Inside Passage)	Federal channel: relocated east of Hurricane Pass (due to storm damage).
1945 Gulf Intracoastal Waterway	Congress authorized and funded Gulf Intracoastal Waterway.
1948 Gulf Intracoastal Waterway	Modifying legislation revised cost-sharing arrangement between federal government and local interests.
1955 Big Hickory Pass - Wiggins Pass (Inside Passage)	Walter Mack: dredged 4-feet-deep by 50-feet-wide channel from south Estero Bay to the Cocohatchee (Wiggins Pass).
1960-64 Gulf Intracoastal Waterway	ICW: channel dredged 9-feet-deep by 100-feet-wide, began June 1960 at Punta Rassa and reached Placida in late 1964.
1960, 1968 Matanzas Pass Channel	Federal channel construction completed in 1961, 12-feet-deep and 150-feet-wide, from Gulf (San Carlos Bay) to Bowditch Point, and 11-feet-deep and 125-feet-wide (constricted to 85 feet by existing bridge) from Bowditch Point to Matanzas Pass; 1968 amendment added turning basin.

Table 1.



Map 1.
Surveyed routes and waterways across Florida.



MAP 2.
Surveyed routes and waterways on the Southwest coast and along the Caloosahatchee River.

"While the Pine Island Canal apparently was built by the Calusa or their ancestors, its construction could have involved the labor and knowledge of local as well as neighboring peoples…canoe canals were parts of a technology that was shared by many Florida Indians…the narrow, shallow channels of Florida Indian canoe canals reflect the character of Florida Indian watercraft…narrow, keel-less, shallow draft boats…their average width was approximately…16 inches…the draft of such canoes was apparently around 15 cm (6 inches) or less…The Pine Island Canal crossed the width of Pine Island and is believed to have facilitated canoe travel between Pine Island Sound and Matlacha Pass…Each end of the Pine Island Canal was at sea level. In between, the canal traversed land reaching a maximum elevation of 3.7–4.0 m (12–13 ft) above mean sea level near the center of the island…the evidence supports the interpretation that the Pine Island Canal functioned by using ground water in a controlled channel.

Charlotte Harbor and Pine Island Sound

Navigation improvements for a 12-foot-deep by 200-foot-wide channel from inside Boca Grande entrance to the wharf at Punta Gorda were authorized by the federal government in 1891 and completed in 1897, justified principally to accommodate barge shipments of phosphate rock from mines in the Peace River Valley. Railroads brought phosphate to the wharf at Punta Gorda; it was then lightered to vessels lying in Boca Grande anchorage. Other cargo shipped to and from Charlotte Harbor included cattle, grain, fish, oysters, lumber, and general merchandise.

In 1911, the Charlotte Harbor & Northern Railway — locals called the railway the Cold, Hungry and Naked — completed construction of a rail line from the pebble phosphate mines at Mulberry, Fla., to Southwest Florida and across Placida Harbor to south Boca Grande. Storage facilities there could accommodate 23,000 tons of phosphate rock, and a system of belt conveyors moved the ore aboard ship at dockside. At that time, Boca Grande Pass had a natural depth of 19 feet over the bar. As phosphate shipments increased, larger vessels required deeper water when loaded. Initially, vessels were partially loaded at the South Boca Grande terminal and completed loading from barges towed out beyond the channel shoal. This system proved hazardous, and in 1912, the federal government adopted a project to dredge a 24-foot-deep by 300-foot-wide channel from the Gulf to the south Boca Grande terminal.

The inside passage west of Pine Island, between Charlotte Harbor and San Carlos Bay, was an important thoroughfare during the early development era of Southwest Florida. Steamers, like the Plant Steamship Company's *Saint Lucie* and the *Lawrence*, plied between Punta Gorda and Ft. Myers, shipping southbound grain, general merchandise, and crate material, while returning north mostly with oranges, grapefruit, and early vegetables. Two shoals, less than 5 feet deep and 600 feet long, were situated along this route: one off Patricio Island at the north end of Pine Island and the other near the southern end of Pine Island opposite Blind Pass. These obstructions were in constricted segments of the channel, which made passage difficult and hazardous for fully loaded cargo vessels during "northwester" storms. The Army Engineers, in 1900, recommended federal improvements for a channel 8-feet-deep and 100-feet-wide through these shoals, but the improvements were not adopted until 1960. No effective inside passage, north of Gasparilla Sound to Lemon Bay, existed in the pre–development era. Most vessels heading north from Charlotte Harbor transited Boca Grande to the Gulf of Mexico.

Estero Bay

The region south of San Carlos Bay was *"mare incognitum"* in the pre-development period. As coastal settlements were few and far between, there was no incentive for the federal government to conduct bathymetric surveys and compile charts. Eventually, when the Army Engineers surveyed Estero Bay in 1908, they could not locate an inland water route from Matanzas Pass to Naples, even though the Coast Survey chart seemed to indicate an interior waterway as far south as Clam Pass. At the time, there were three very small gasoline freight launches running between Ft. Myers and the Estero River, one twice weekly and two three-times weekly. Also, a mail steamer provided service from Ft. Myers to Carlos. As many as 36 fishing smacks were counted on the bay during the fishing season, when one carload of fish could be taken every two days to Punta Gorda for shipment by railroad. The Army Engineers recommended dredging a 5-foot-deep by 60-foot-wide channel from the mouth of Matanzas Pass to Surveyor's Creek (Imperial River) in 1908. While this proposed project was not implemented, federal authorization was received in 1960, and amended in 1968, for improving the Matanzas Pass Channel from the Gulf to a turning basin off San Carlos Island. In 1955, private developer Walter Mack, with contributions from the Bonita (town) Chamber of Commerce, dredged a channel, 4-feet-deep by 50-feet-wide, from Big Hickory Pass south to the Cocohatchee, thereby providing boat access between Estero Bay and Wiggins Pass.

Dredge crew, circa 1900.

It is hypothesized the canal held a series of stepped impoundments by taking advantage of Pine Island's poorly drained soils and shallow fluctuating water table…the Pine Island Canal was not completely straight… stretches curved or angled from one side to another…in response to topographic features and allowed the canal to remain level or to have a very gentle slope, thus helping the canal to hold water."

—George M. Luer and Ryan J. Wheeler, "How the Pine Island Canal Worked: Topography, Hydraulics, and Engineering,"

—*The Florida Anthropologist*, Vol. 50, No. 3, September 1997.

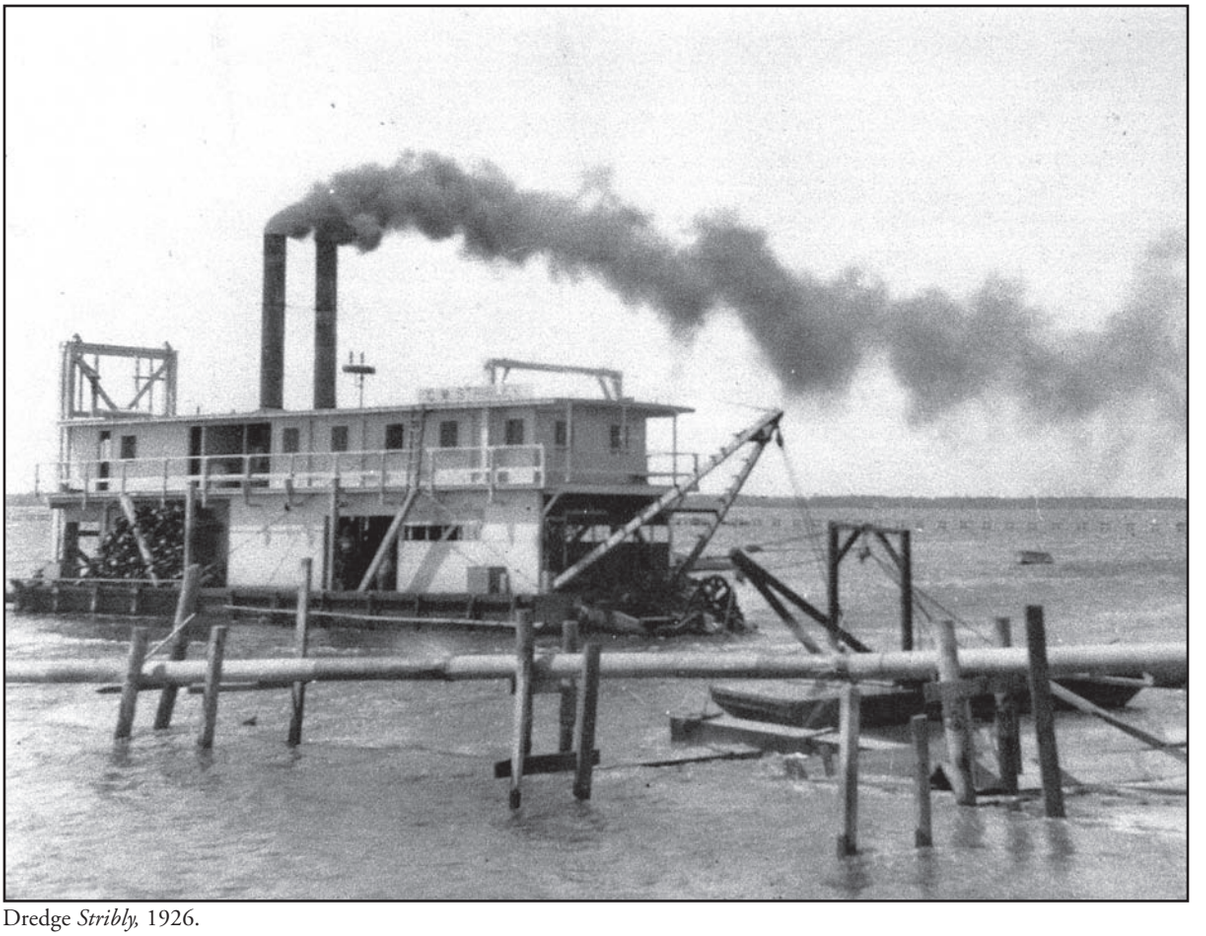
Naples and Marco Island

Naples constructed a pier in 1889 to accommodate steamship freight and passengers. Further improvements to waterway access to Naples were made in the 1930s by a local entrepreneur E. W. Crayton, who dredged and maintained cuts with depths from 3 to 8 feet and widths of 30 to 50 feet in the reach from Naples to Big Marco Pass. In 1940, the federal government assumed the project, which provides for an interior channel (6 feet deep and 70 feet wide) from the southern limit of the town of Naples to the landward side of Big Marco Pass. The waterway from Naples to Big Marco Pass is 14 miles long; local interests maintain the northerly four miles. The hurricane of October 1944 breached the barrier beach north of Big Marco Pass and severely shoaled the federal channel. The shoal was dredged in 1945 and the channel was relocated east of Hurricane Pass.

Gulf Intracoastal Waterway

The U.S. Board of Engineers for Rivers and Harbors recognized in 1939 the need to create a commercial water thoroughfare for passengers, goods, and services and recommended creation of the Gulf Intracoastal Waterway, a 9-foot-deep by 100-foot-wide channel stretching from the mouth of the Caloosahatchee to Lemon Bay and beyond (to Tarpon Springs). Federal funds, however, were not authorized until 1945. Dredging began from the south end in June 1960 and reached northern Gasparilla Sound by late 1964.

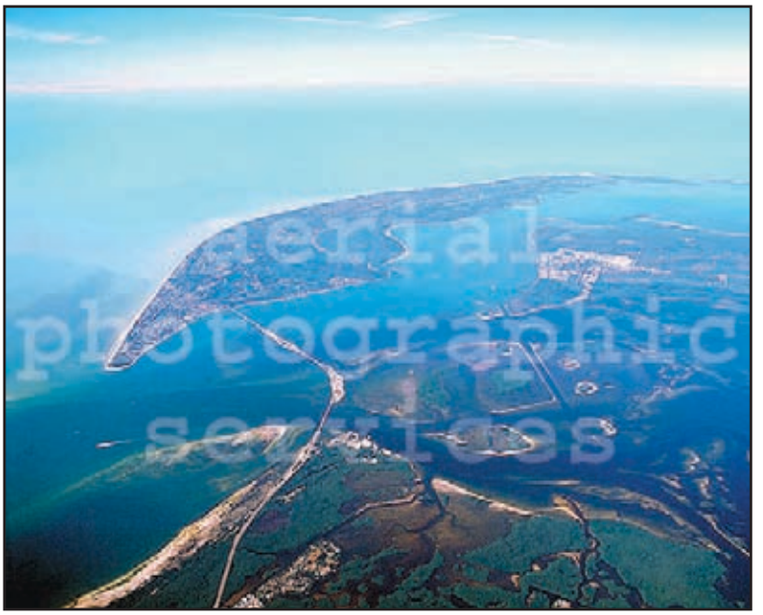
This federal project required a local sponsor to assist with funding channel maintenance, once the initial dredging had created the waterway. In 1947, the Florida Legislature created the West Coast Inland Navigation District (WCIND) as a special taxing authority for this purpose. The WCIND originally encompassed the counties of Lee, Charlotte, Sarasota, Manatee, and Pinellas, but Pinellas withdrew from the district in the 1970s. The district's mandate in time broadened to include other waterway management functions, such as dealing with anchorages, boat traffic, inlets, and beaches.



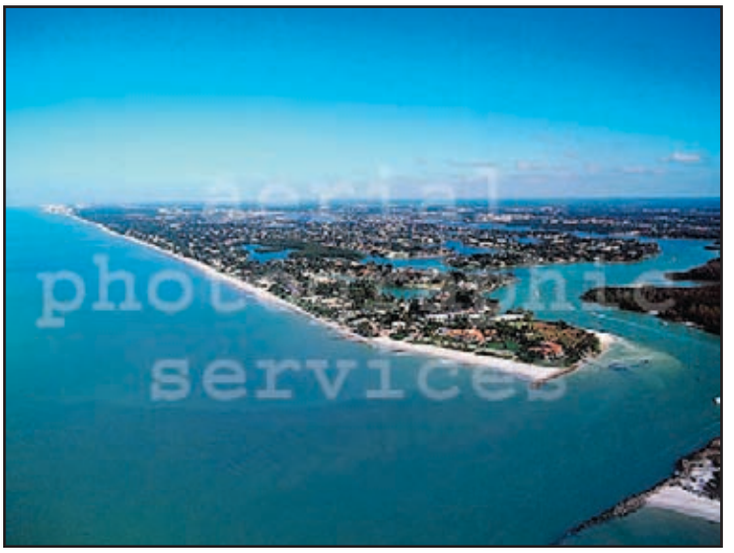
Dredge *Stribly,* 1926.

Contemporary Conditions

Today's system of arterial and secondary (access) channels provides boaters with unparalleled opportunities to transit the inland waterways of Southwest Florida. Key elements are: the Gulf Intracoastal Waterway, connecting Southwest Florida north to Tampa Bay and to coastal destinations in Alabama, Louisiana, and Texas; and the Okeechobee Waterway, providing a link across Florida to the U.S. Eastern Seaboard. These primary arteries interconnect at the mouth of the Caloosahatchee. A short four miles south is Matanzas Pass, the northern terminus of the route through Estero Bay to Wiggins Pass, utilized by shallow draft vessels en route to destinations south. Vessels must leave the inland waterway route at Wiggins Pass and transit along the Gulf shore 14 miles to Gordon Pass. At that point, boats enter the inside passage linking Naples with Marco Island. Such a boating infrastructure was unimaginable a century ago.



View west-northwest from Punta Rassa, Connie Mack Island at bottom of photo, with causeway leading to Sanibel Island in midground, Miserable Mile '1' of ICW appears as dredged cut with conical spoil islands on both sides of channel, leading to St. James City (Pine Island) and San Carlos Bay.



Gordon Pass jetties, looking north, Port Royal canal development in midground with the Naples downtown skyline on the horizon to the left.

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Dredging Then and Now

The Army Engineers during the 1890s and early 1900s operated its own dredge, the U.S. Steam Snagboat and Dredge *Suwanee*, which made channel improvements and set day beacons in the inlets, inland waterways, and rivers in Southwest Florida. This vessel was a steam-driven, shallow-draft, square-bowed scow, 100 feet long, with a 24-foot beam and 4-foot draft. Although underpowered, she was suited to her task.

The *Suwanee* was put together inexpensively, as an experiment in creating a general-purpose vessel for work on small bays and rivers. Her suction dredge discharged the raised slurry upon the shore through pipes swung perpendicular to her sides, while her derrick provided the lifting power to raise rocks and snags from the bay bottom. It was difficult work, since much of the dredging had to be done from the bow of the boat, on bars too shallow to permit the *Suwanee*'s passage. Cuts were made by dragging the cutter — a hoof-shaped hood armed with teeth and a clear water valve above it — along the bottom using a hoisting tackle mounted on a guide pole. An auxiliary water jet from the boat's donkey pump was applied near and under the cutter.

The cut made at each move of the boat was 35 feet wide and 3 feet long. The average amount of solid material was about 25 percent of the discharge, but amounts as high as 85 percent were recorded. The total capacity of the pump — a 6-inch Edward's special cataract pump run by a belt from a flywheel on the hoisting engines — was 1400 gallons per minute or 800 gallons of water loaded with 25 percent of heavy material. The best day's work of the pump was 460 cubic yards. After discharge, the mud, which formed about 30 percent of the dredged material, floated for some distance, but the sand settled within 20 to 40 feet from the end of the pipe. The ship's complement included a 10-man crew to operate the snagboat, a launch, a float boat, and two rowboats.

Today, the Army Engineers contract private firms for maintenance dredging of federally-authorized inlets and the ICW. The West Coast Inland Navigation District directly hires contractors to dredge public secondary access channels. Most dredging operations — inlet operations aside — are designed to "surgically" remove accumulated silt and mud; the current general permit of the District allows it to dredge in Sarasota and Manatee counties up to 6,500 cubic yards at each authorized site over a 5-year period. Federal and state rules stringently regulate dredging to ensure that proper procedures are in place to protect bay and upland locales.

Steam tug towing phosphate-laden schooner out Boca Grande, circa 1890s.

One type of hydraulic dredging system, designed for open water conditions, operates from a 30 by 100 foot barge outfitted with twin Detroit Diesel engines and 5-foot diameter propellers for improved maneuverability. Four hydraulic "spuds" lift the vessel out of the water for special work conditions. This system can remove 60 percent solids in sandy material with a production rate of 600 cubic yards per hour; the amount of clay material as solid is on the order of 15 percent, with the removal rate of about 100 cubic yards per hour.

Small, handheld systems, the least intrusive to the environment and shoreline residents, are used increasingly. These diver-operated systems require no tugboat and barge or other, large, unsightly support equipment stationed at the dredge site. A single diver operating a hand dredge can pump 600 gallons per minute of 45–65 percent solid materials by volume. This precision dredging approach minimizes environmental impacts by allowing the diver to direct the dredge head by hand in order to avoid disturbing sensitive bay bottom. Spoil material can be removed through a pipe up to 1,000 feet from the dredge and placed onto an upland dewatering containment site or into tractor trailers outfitted with watertight dump beds for offsite disposal.

Dredge operators must exercise care to avoid raising the turbidity level at the dredge site. Any water returned from the dried-out spoil must meet permitting standards, which may require manipulation of conditioning chemicals in a mixing tank and mechanical dewatering of the mixture in a recessed chamber filter press in order to remove suspended solids. The need for maintaining a quality coastal environment should be apparent, given the increasing population pressures from both waterfront and water-based recreational uses.

When the Army Engineers operated in the region during the pre–development period, procedures were simple and costs modest, even by standards of those days. Aside from removing the dredged material and placing it on an adjacent spoil site, some additional expense might be incurred for engineering designs and contingencies. Today, costs are higher and the duration of work appreciably longer. Table 2 compares the actual costs, adjusted to 1982-84 dollars, for two similar dredging operations in the region. The relative cost increases by an order of 2.5 times more for dredging and removing spoil material, in large measure due to the special equipment and handling required in order to maintain a clean and healthy environment. The non-construction cost is 7.5 times greater today, due largely to the need to acquire and comply with permit conditions, including water quality monitoring and reporting, which may continue long after the dredging event. Notwithstanding the overall increase in cost, however, the per unit of effort for removing a cubic yard of spoil is much less today than 100 years ago, making for a much more efficient operation, with the savings attributable to modern technology.

Phosphate ore carrier at Port Boca Grande, 1978.

Cost comparisons of dredging 1,000 cubic yards in pre–development and contemporary periods.

Dredging Project	Actual Coast ($)	Actual Cost Adjusted to Comparable Values ($)
Pre–development (1900)*		
Removing Material	250	2,526
Engineering and Contingencies	37	376
Total	287	2,902
Contemporary (2001)**		
Removing Material	11,000	6,211
Engineering and Contingencies	5,000	2,823
Total	16,000	9,034
Relative Cost Increases		
Dredging	2.5 times more costly	
Non-Construction***	7.5 times more costly	

Costs normalized using Bureau of Labor Statistics Consumer Price Index (1982-84 base = 100):
Price indices are: 1913.....9.9; 1982-84.....100.0; 2001....177.1

* Army Corps of Engineers dredging "Horseshoe Shoal," northern Pine Island Sound, 1900 (assume cost comparable to 1913 figure), 7,399 cubic yard project, use 13.5 percent of cost to estimate 1,000 cubic yard volume,

** West Coast Inland Navigation District dredging Gottfried Creek, Lemon Bay, 2000-2001 10,000 cubic yard project, use 10 percent of cost to estimate 1,000 cubic yard volume,

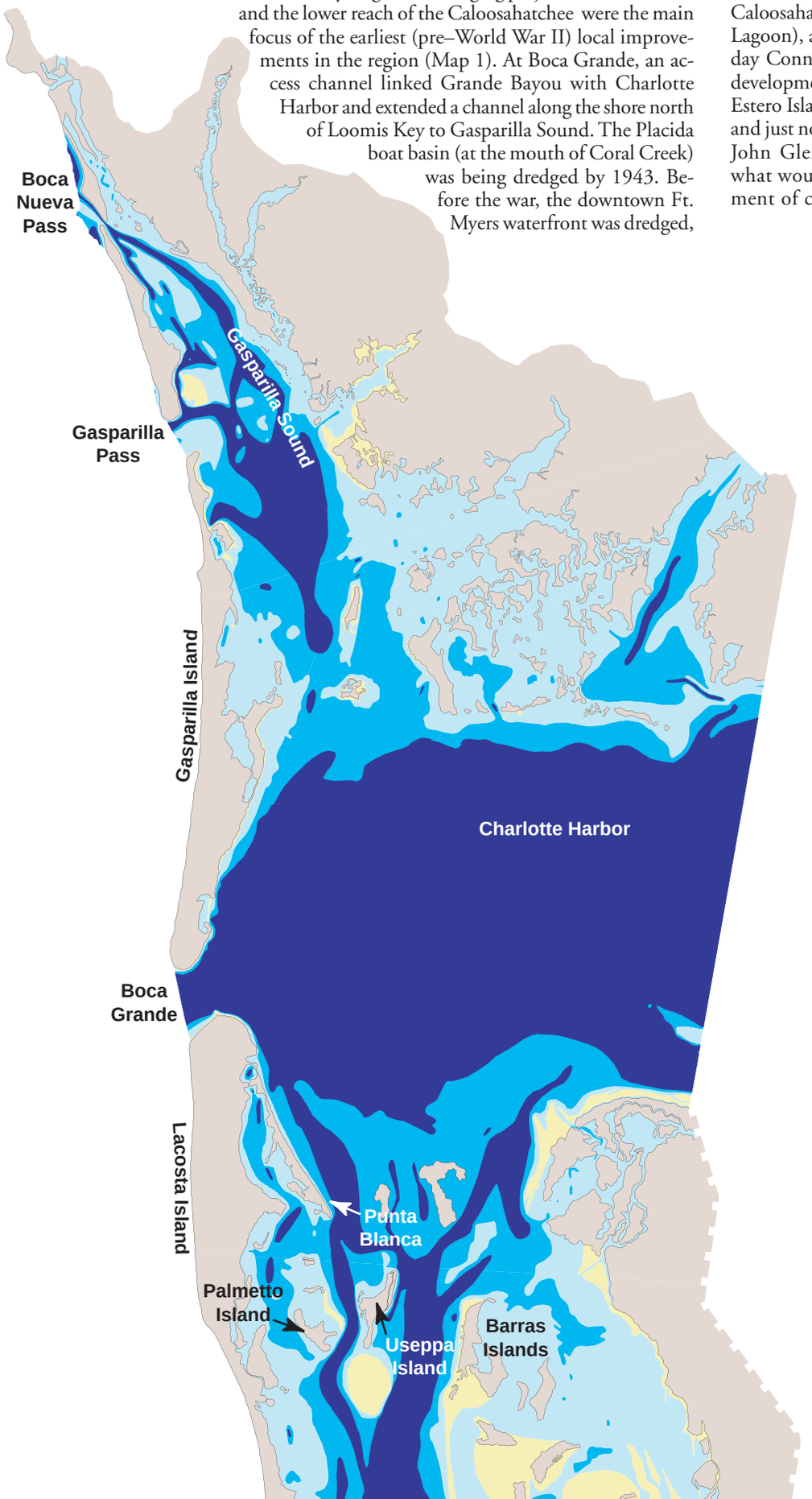
*** Permitting, engineering, monitoring, excluding legal expenses.

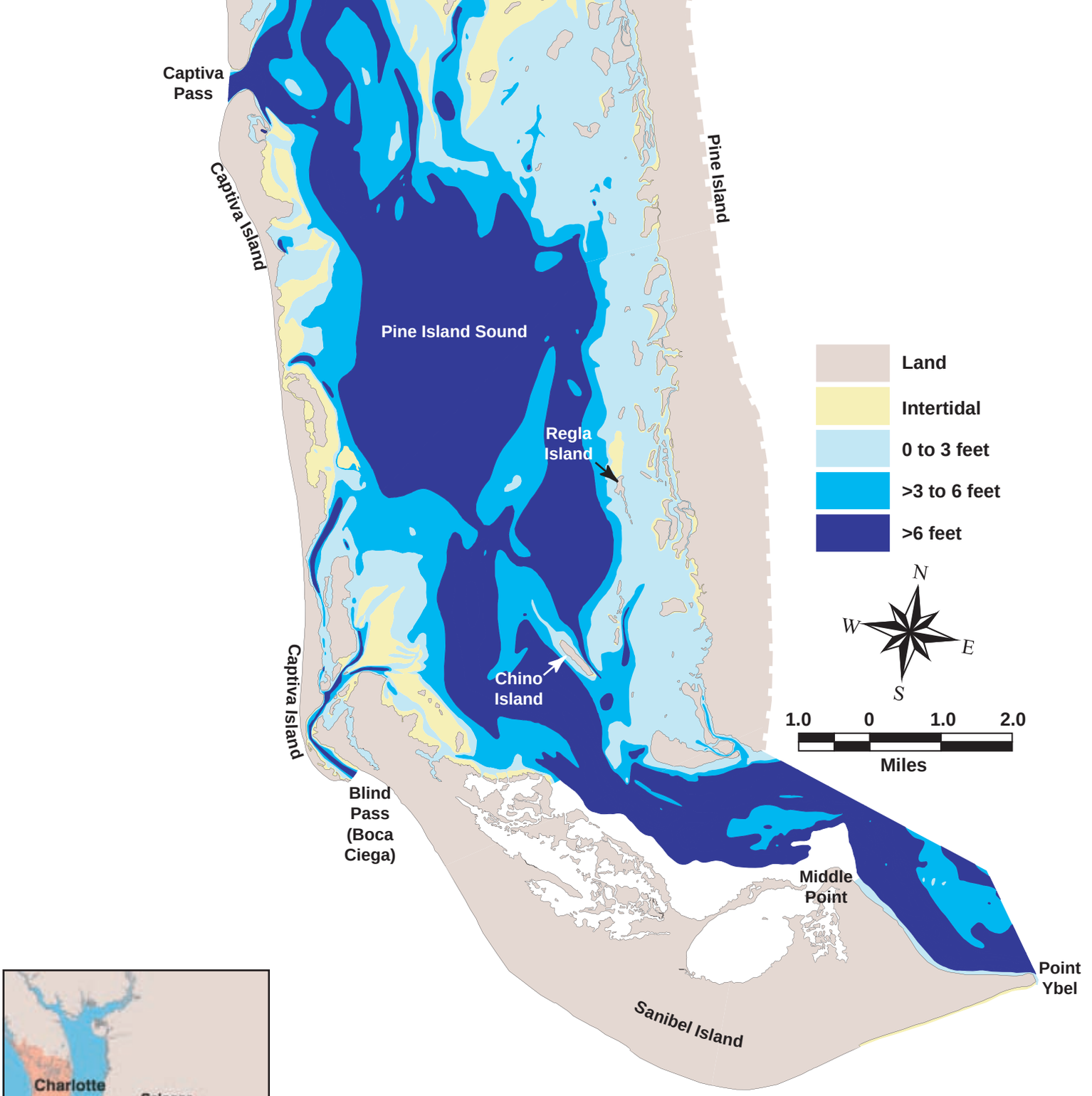
Table 2.

Dredging of Access Channels and Residential Canal Development

History

The Army Engineers' dredging projects at Boca Grande and the lower reach of the Caloosahatchee were the main focus of the earliest (pre–World War II) local improvements in the region (Map 1). At Boca Grande, an access channel linked Grande Bayou with Charlotte Harbor and extended a channel along the shore north of Loomis Key to Gasparilla Sound. The Placida boat basin (at the mouth of Coral Creek) was being dredged by 1943. Before the war, the downtown Ft. Myers waterfront was dredged, filled, and bulkheaded. Access channels along the Caloosahatchee were dredged into Hendry's Creek (Deep Lagoon), at Iona Cove, and at Punta Rassa Cove (present day Connie Mack Island). The earliest residential canal development in the region occurred on the north end of Estero Island (Ft. Myers Beach) facing San Carlos Island, and just north of Gordon Pass (Naples), where by 1940, John Glen Sample had begun canal construction of what would become Port Royal, an exclusive development of canals and beachfront estates.



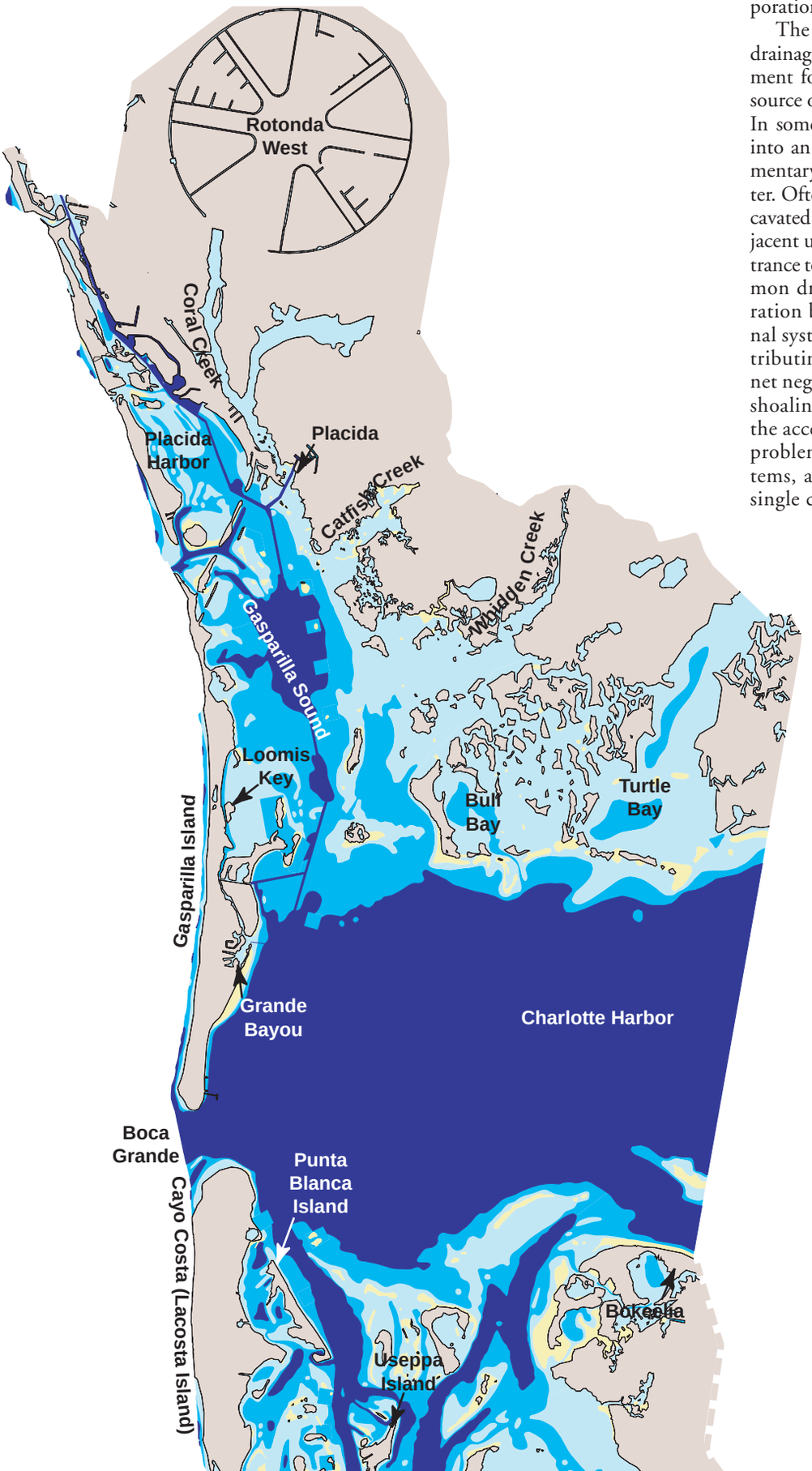


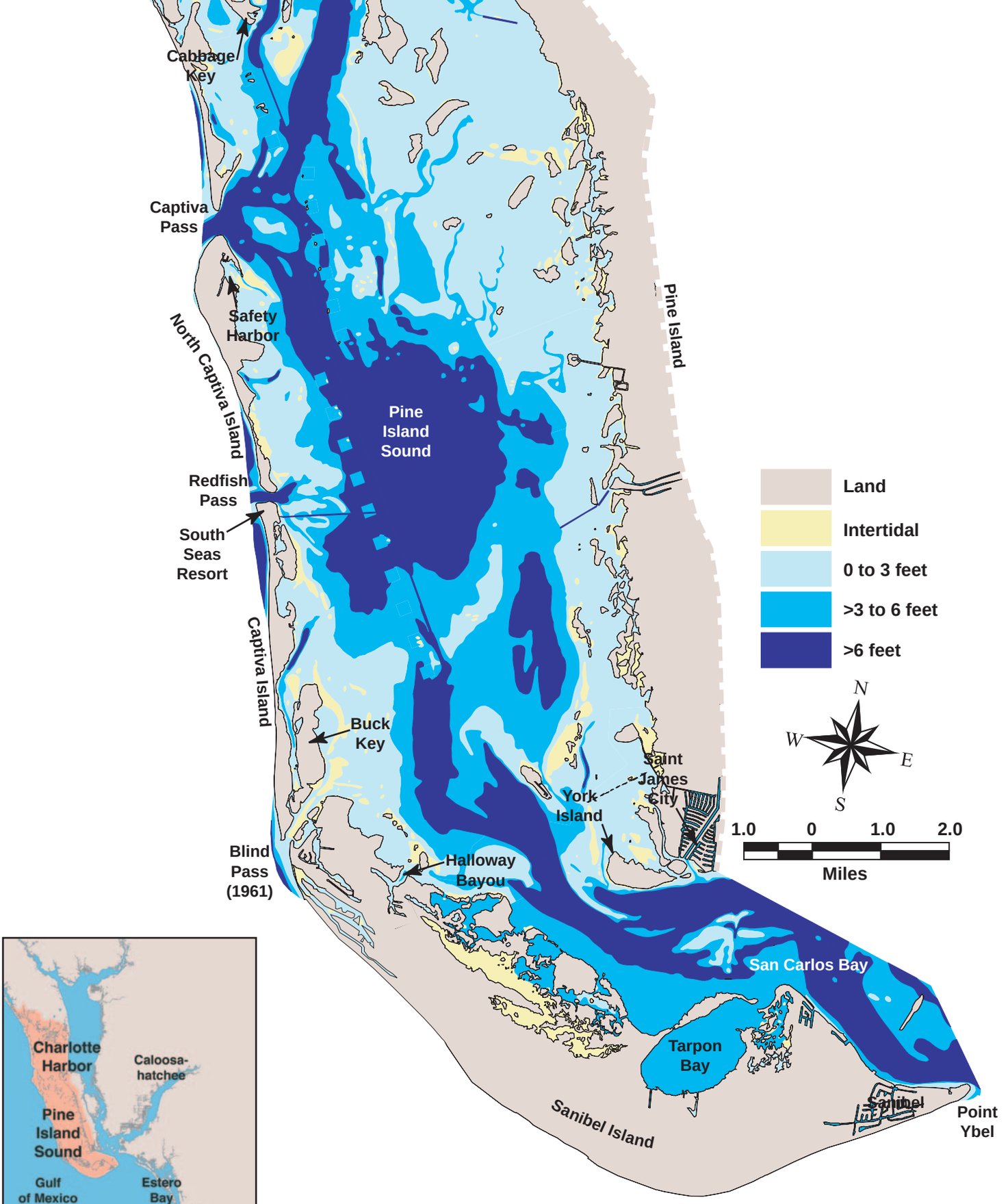
Map 1A.
Barrier island pre–development conditions

Pre–development era and contemporary channels and depths. Map 1 is divided into parts A-J, pre–development and modern periods. The first area is split into three parts: (1) barrier island (2) Peace River/Matlacha Pass (3) Caloosahatchee. For this region, widespread depths are available and presented. For the other two regions (4) Estero Bay and (5) Naples/Marco Island, only channel depths are available/and shown.

Dredge-and-fill became the established method to meet the growing post-war demand for waterfront housing. Beginning in the early 1950s, developers dug many "finger canals," with the fill deposited behind vertical cement seawalls. Sometimes, upland natural drainage features (swales) were used as templates to extend finger canals inland. A significant feature of this development era was the building of large-scale canal communities by a handful of individuals and corporations: Port Charlotte, 90,000 acres in 1956 by General Development Corp.; Cape Coral, 1,700 acres in 1959 by Gulf American Corp.; Marco Island, 25,000 acres in 1964 by Deltona Corp; and Rotunda West, 20,000 acres in 1969 by Cavanaugh Leasing Corp. One family, the Mackle brothers (Frank, Elliott, and Robert), owned or controlled major portions of General Development, Gulf American, and Deltona Corporations (see Case Studies).

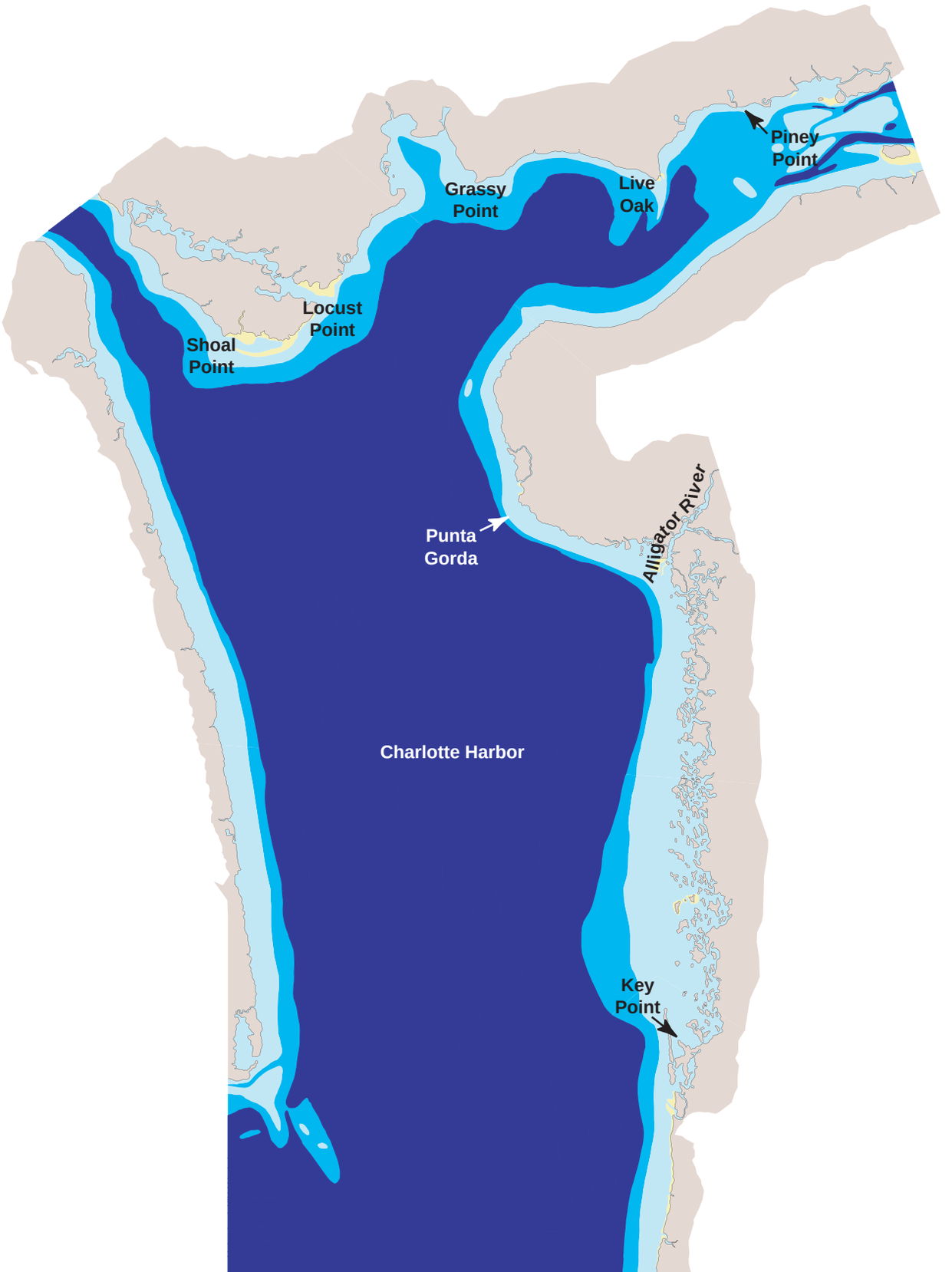
The canals served a number of purposes, including drainage, creation of waterfront property as an enhancement for sales, access to open water for boating, and a source of fill material for the creation of developable lots. In some cases, as in Port Charlotte, the canals drained into an interceptor lagoon constructed to provide rudimentary water treatment prior to discharge into open water. Oftentimes, though, the dead ends of canals were excavated to excessive depths in order to provide fill for adjacent upland development while the canal mouth or entrance to the main water body was left shallow. This common dredging practice led to environmental deterioration by decreasing the flushing efficiency of the canal system, aggravating salinity stratification and contributing to oxygen stress in benthic organisms. The net negative cost to the boater was — and is — chronic shoaling at the mouths of canals and restrictions in the access channels leading to deep, open water. These problems, though most severe, in the larger canal systems, are present almost everywhere, even in simple, single canals.

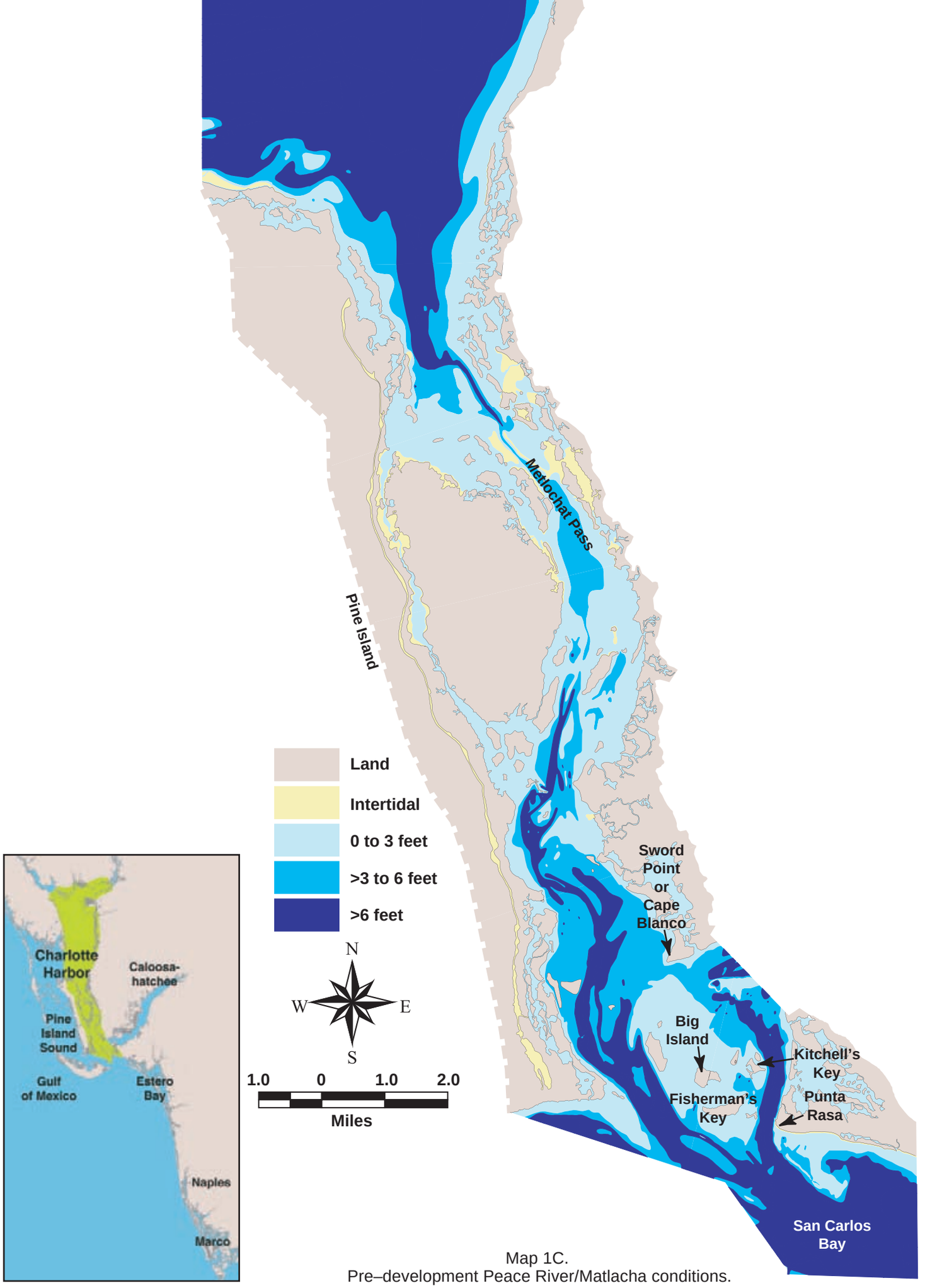




Map 1B.
Contemporary barrier island conditions.

An explosion of waterfront canal development began in the early 1950s at Aqualane Shores, just north of Port Royal (Naples), Goodland (east of Marco Island), and St. James City (south Pine Island). By the 1960s, residential subdivisions were developing on Naples Bay north from Gordon Pass to the City of Naples: Port Royal on the west shore, and Oyster Bay, Royal Harbor and Haldemen Creek on the east. In 1958, Collier County constructed a road that severed the natural drainage between Clam Bay and Doctors (Moorings) Bay. This was followed by the dredging of finger canals in south Clam Bay and by a major investment of Moorings Development Co., Canada, in Doctors Bay, including dredging, seawall construction, land fill, and inlet stabilization in the form of jetties and channel dredging at Doctors Pass. The Moorings development scheme spanned most of the 1960s (see Photographic Record of Waterway Changes). Naples Park, situated to the north of Clam Bay and south of Wiggins Pass, was part of this period's history, and included dredging both the residential canals and the feeder channel through Water Turkey Bay to the Cocohatchee.

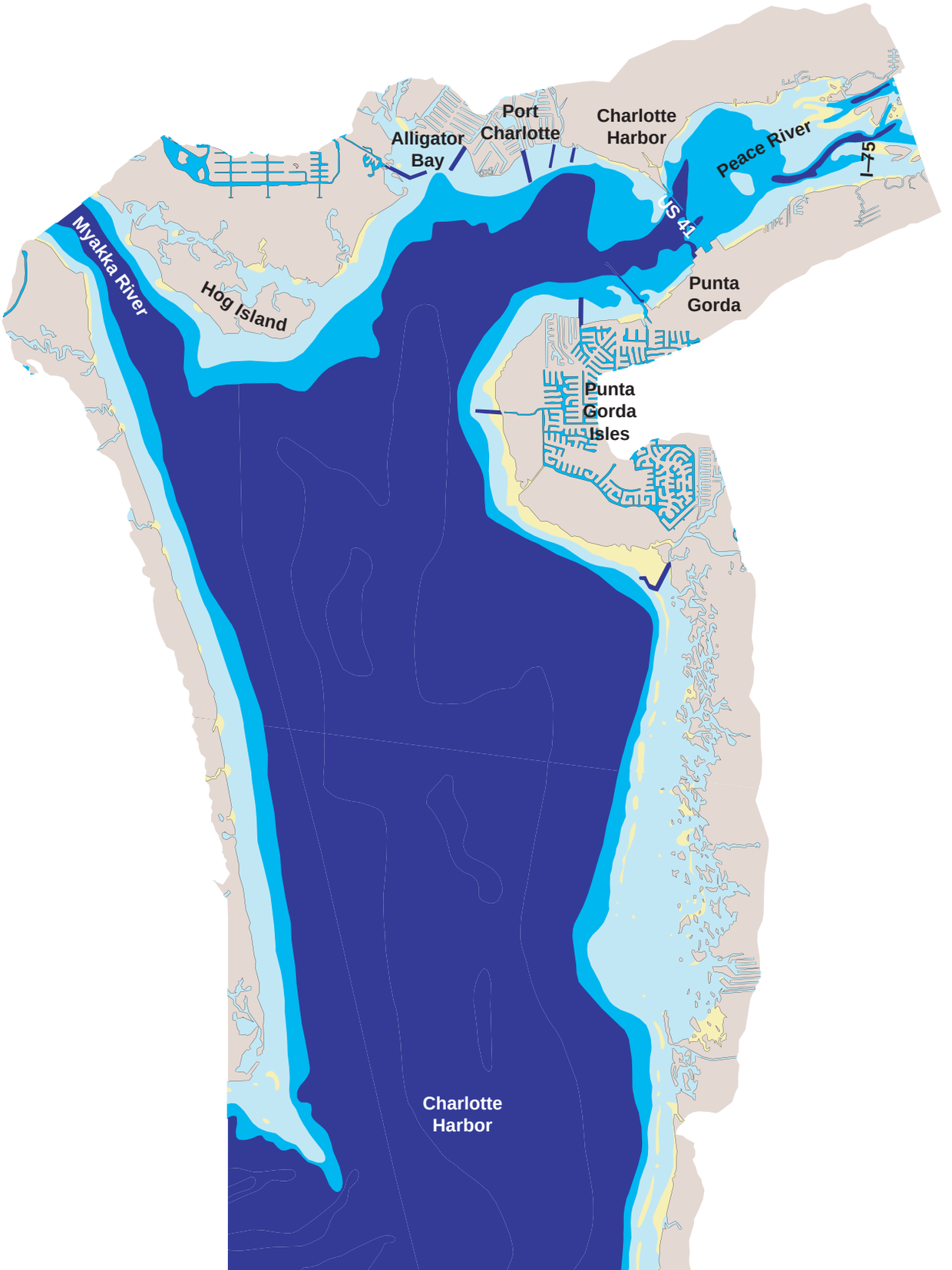


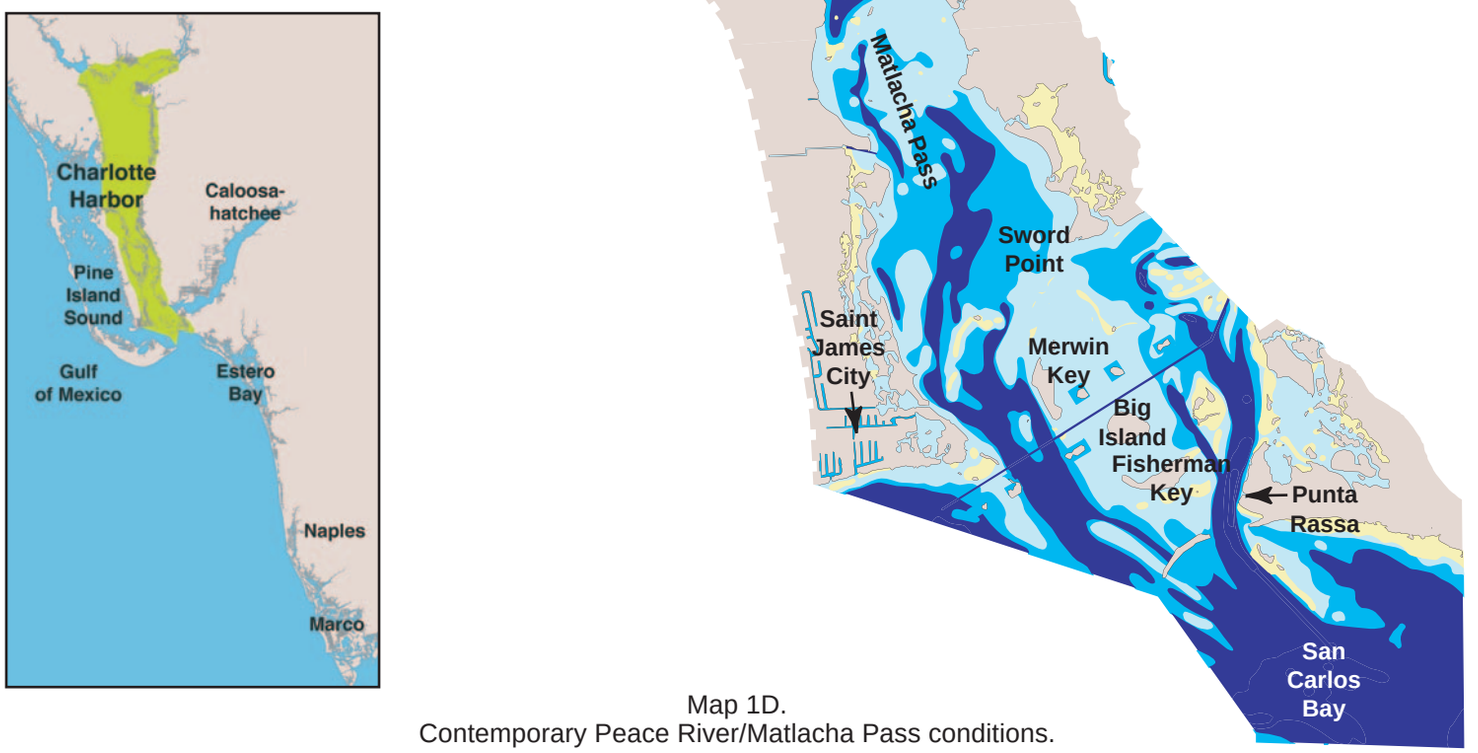


Map 1C.
Pre–development Peace River/Matlacha conditions.

Estero Bay, formerly a sleepy backwater locale, was stirring under the pressures of coastal residential development. By 1965, most finger canals on Estero Island (Ft. Myers Beach) were dredged. Land clearing for the canal subdivision at Hurricane Bay was complete, along with dredging of finger canals and an access channel. The Spring Creek subdivision canals were in place. Canal excavation was under way on the Imperial River's south shore, on the mainland side of Little Hickory Bay, and on the barrier island at Bonita Beach. By the mid-1970s, canals lined both banks of the Imperial River, and residents had moved into a waterfront subdivision on the upper Estero River.

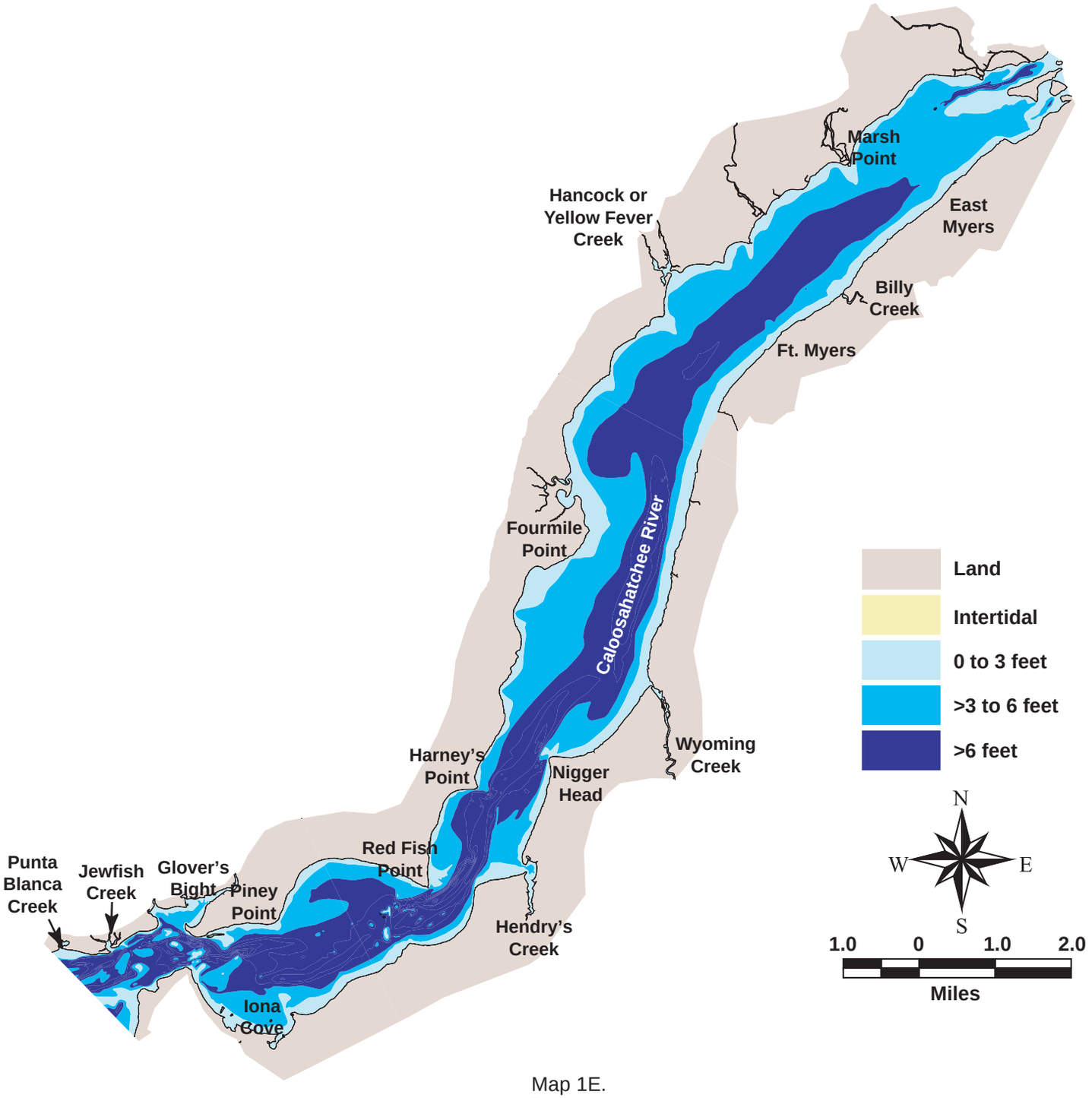
Barrier island canal development farther north, on Sanibel and Captiva Islands, began in the early 1960s, with dredging at Halloway Bayou and at South Seas Plantation (now South Seas Resort). However, the completion of the 3-mile-long causeway in May 1963, connecting Sanibel to the mainland at Punta Rassa, awakened the islands to a building boom. By 1973, most canals on the south tip of Sanibel had been dredged.



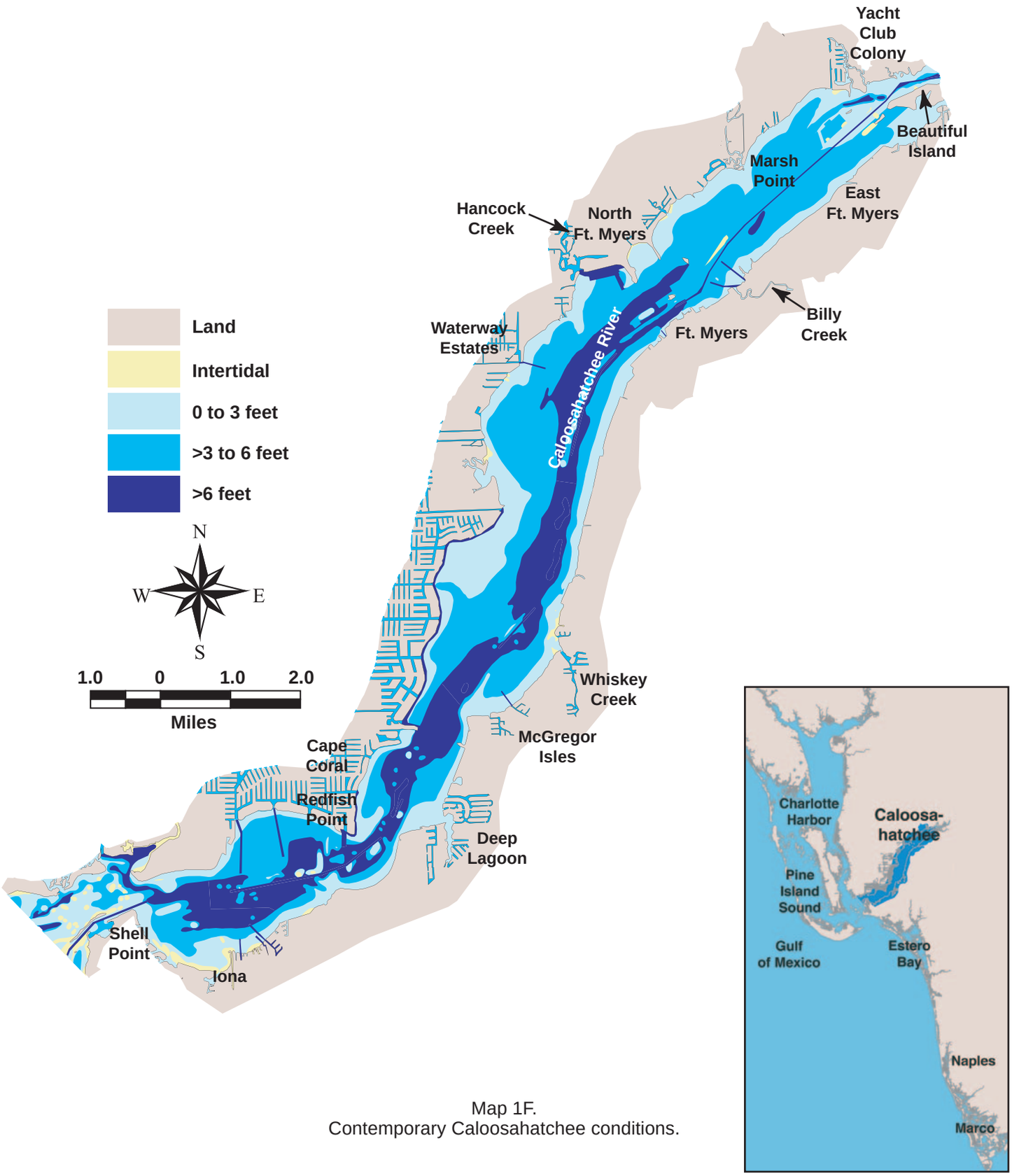


Map 1D.
Contemporary Peace River/Matlacha Pass conditions.

While the large-scale developments mentioned earlier, at Port Charlotte and Cape Coral, had their beginnings in the late 1950s and extended throughout the 1960s, similar projects were taking shape such as at Punta Gorda Isles and Alligator Creek in northeast Charlotte Harbor. Developments along the Caloosahatchee included Deep Lagoon (Hendry Creek), Hidden Harbour (Whiskey Creek, formerly Wyoming Creek), McGregor Isles (south shore), and Waterway Estates, Hancock Creek (Yellow Fever Creek), Marsh Point, and Yacht Club Colony (north shore). The Placida and Cape Haze area development began relatively late in this period, around 1969, and continued throughout the 1970s, with construction of canals along Coral Creek and Rotunda West. These canals, however, were never connected to the bay system because of growing public concern with potential environmental impacts.

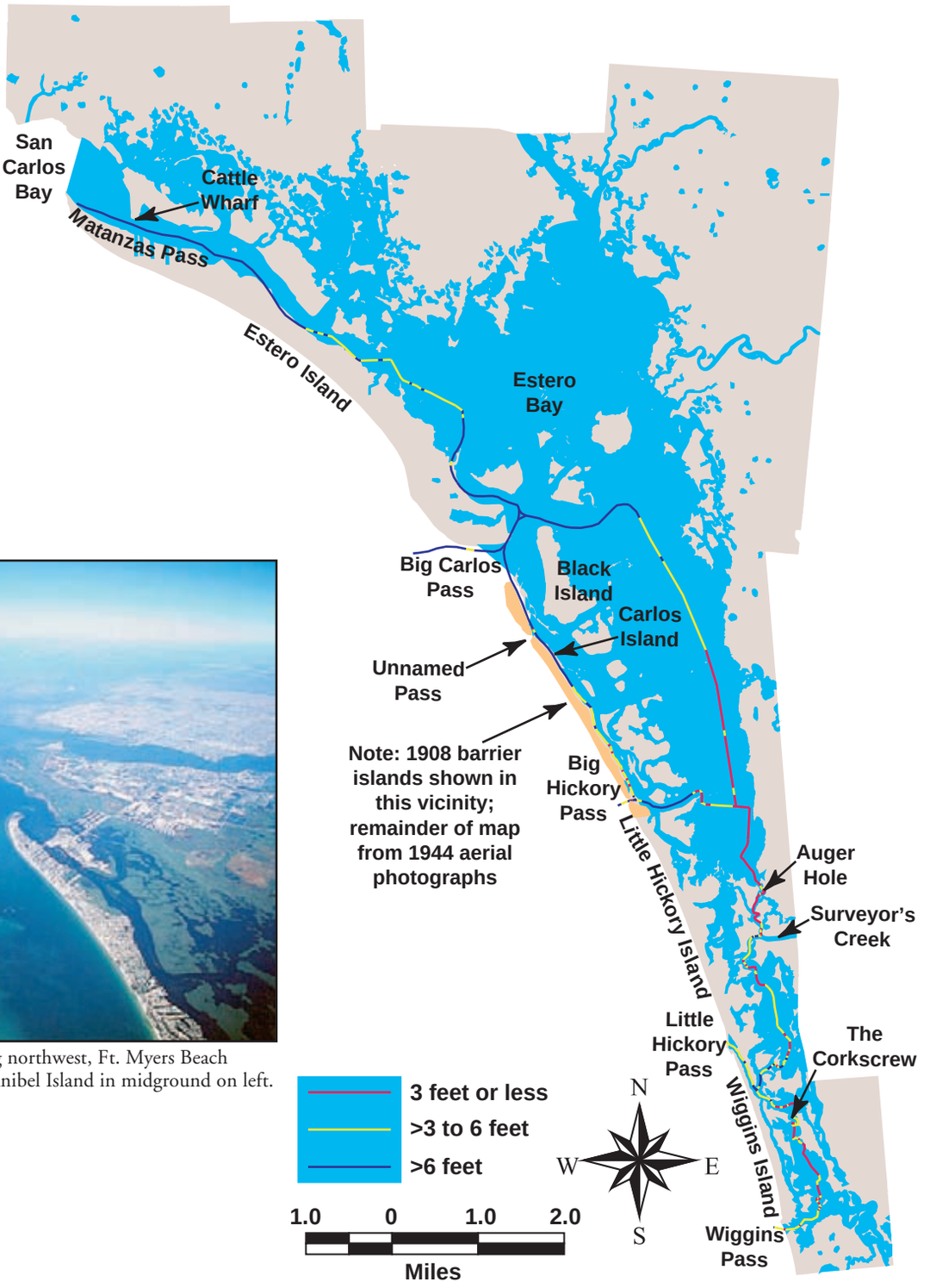


Map 1E.
Pre–development Caloosahatchee conditions.

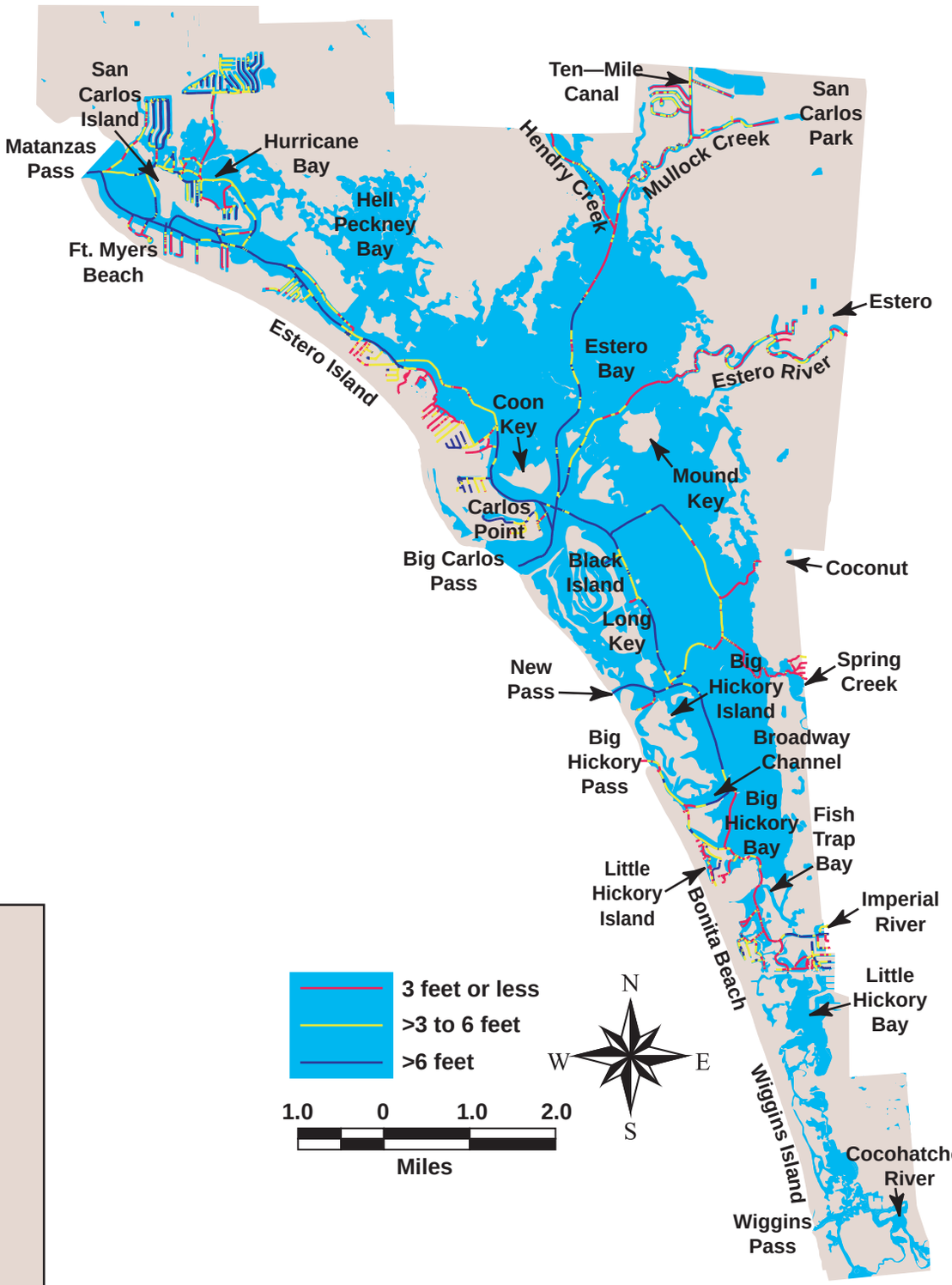


Map 1F.
Contemporary Caloosahatchee conditions.

Gulf approach to San Carlos Bay, looking northwest, Ft. Myers Beach (Estero Island) on right in foreground, Sanibel Island in midground on left.



Map 1G.
Pre–development Estero Bay conditions.



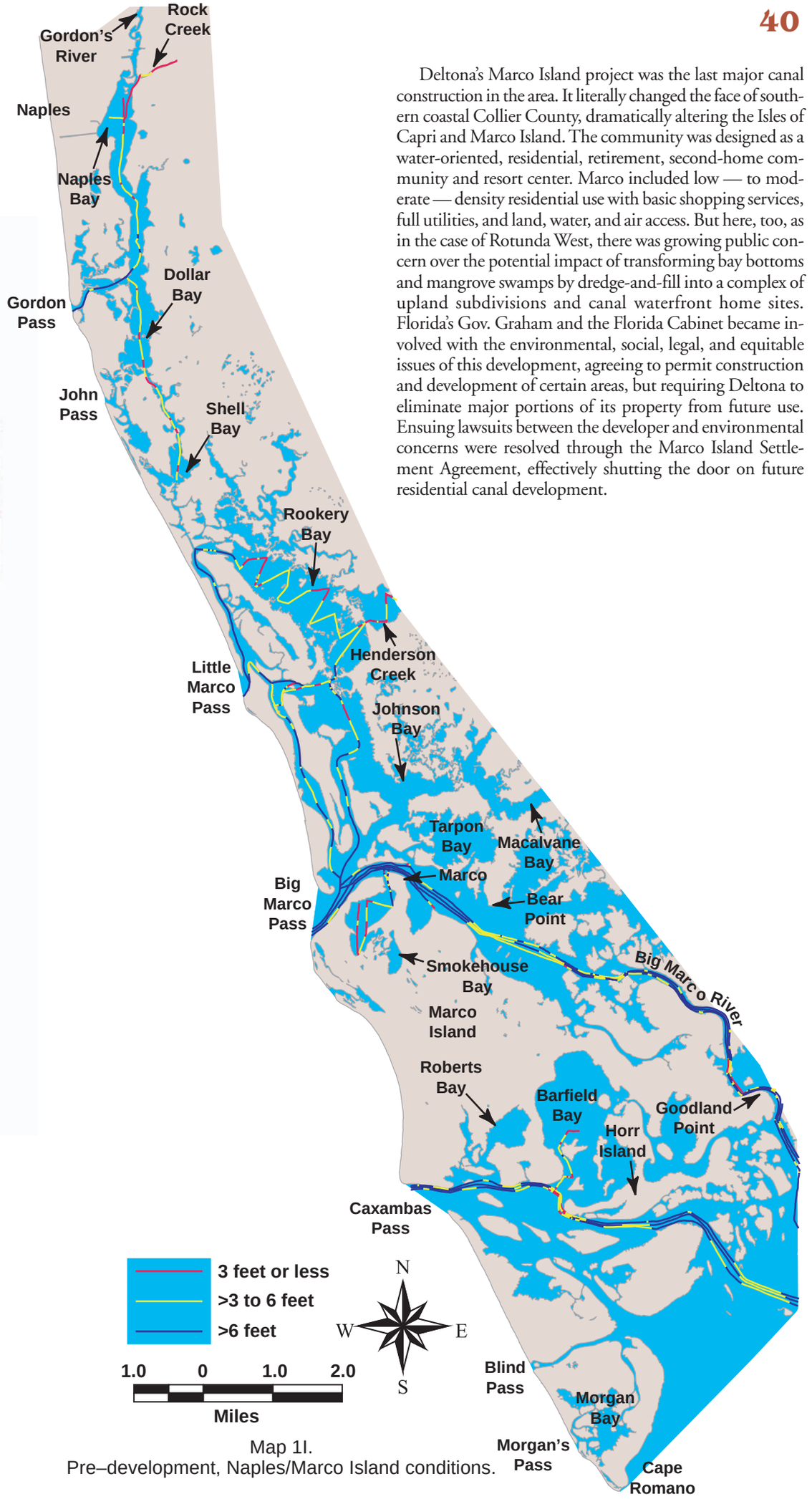
Map 1H.
Contemporary Estero Bay conditions.

Deltona's Marco Island project was the last major canal construction in the area. It literally changed the face of southern coastal Collier County, dramatically altering the Isles of Capri and Marco Island. The community was designed as a water-oriented, residential, retirement, second-home community and resort center. Marco included low — to moderate — density residential use with basic shopping services, full utilities, and land, water, and air access. But here, too, as in the case of Rotunda West, there was growing public concern over the potential impact of transforming bay bottoms and mangrove swamps by dredge-and-fill into a complex of upland subdivisions and canal waterfront home sites. Florida's Gov. Graham and the Florida Cabinet became involved with the environmental, social, legal, and equitable issues of this development, agreeing to permit construction and development of certain areas, but requiring Deltona to eliminate major portions of its property from future use. Ensuing lawsuits between the developer and environmental concerns were resolved through the Marco Island Settlement Agreement, effectively shutting the door on future residential canal development.

...Just as the sun was setting we arrived off the Great Marco Pass, the wind being so light that we were barely able to hold our own against the tide, which was setting out by the channel with a velocity of nearly three knots an hour; but at last we succeeded in passing the inner fairway buoy, and "brought up for the night." The settlement on Marco Island consists of two or three families, and here there is a post office.

—William Henn,
"Caught On A
Lee Shore,"
June 1893.

—*Tales of Old Florida*,
© 1987.



Map 1I.
Pre–development, Naples/Marco Island conditions.

South Marco Island from Caxambas Pass, looking north showing Marco's crescent-shaped Gulf beach and complex canal system.

Map 1J.
Contemporary Naples/Marco Island conditions.

Geography

This dredging history of access channels and residential canals has created 1,136 miles of boat channels from Placida Harbor to Marco Island in Southwest Florida (Table 1). These channels are concentrated in some areas more than others: most — 49 percent (549 miles) — are located in Charlotte Harbor (25 percent) and along the Caloosahatchee (24 percent). The next largest concentrations are along the Naples–Marco Waterway (13 percent), Pine Island Sound, San Carlos Bay (14 percent) and Estero Bay (11 percent). Matlacha Pass accounts for 8 percent, and the fewest channel miles are in Gasparilla Sound and Clam and Doctors Bays (5 percent).

Map 2 depicts the distribution of dredged (improved) and natural (unimproved) waterways in Southwest Florida. Seventy-four percent (843 miles) of the channels are improved (dredged) and 26 percent (293 miles) are unimproved (natural) channels. About 59 percent of the dredged waterways are in Charlotte Harbor (248 miles) and the Caloosahatchee (248 miles). Another 114 miles (13 percent) are in the Naples — Marco region. Most (33 percent) of the natural (unimproved) waterways are in Pine Island Sound and San Carlos Bay (96 miles); this is followed by Estero Bay, which has 56 miles (19 percent).

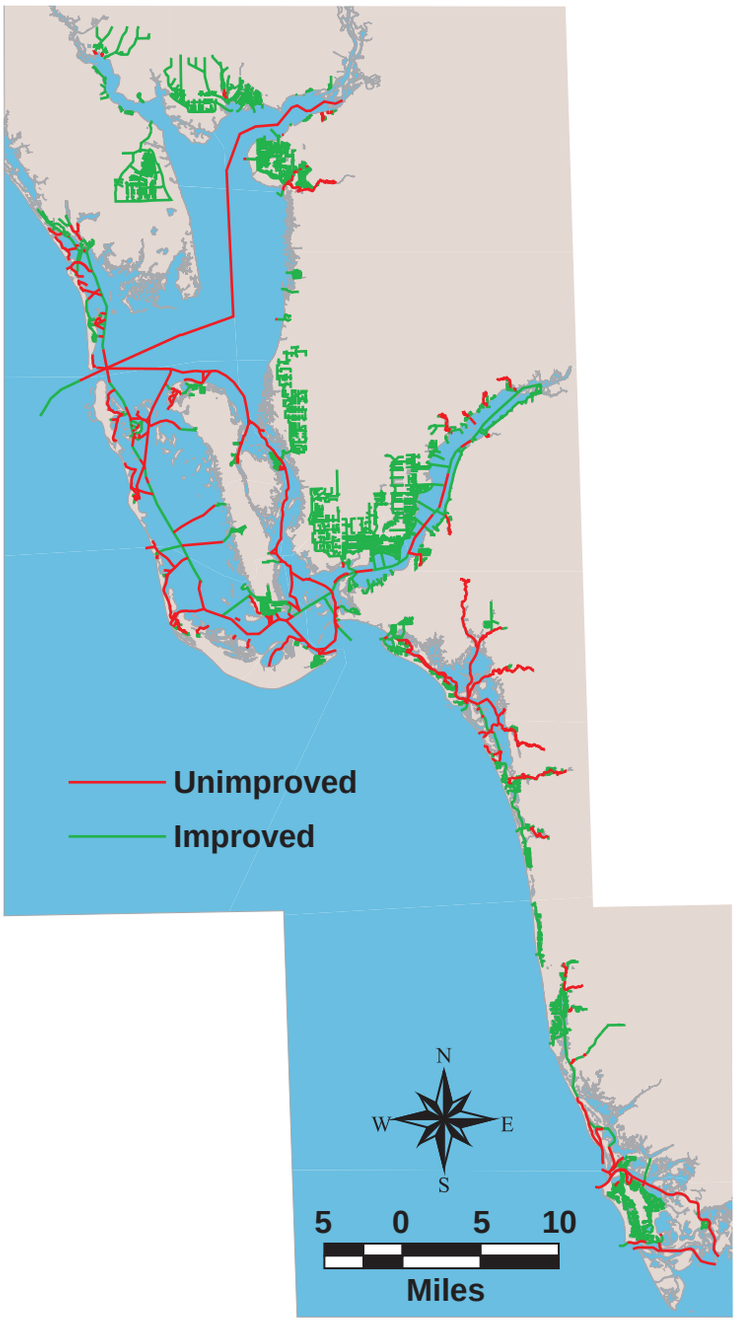
Improved (dredged) and unimproved (natural) waterways (miles).

Region	Improved	Unimproved	Total	Total (col.%)
Gasparilla Sound	23.1	24.4	47.5	4.2
Charlotte Harbor	247.7	32.4	280.1	24.7
Pine Island Sound/San Carlos Bay	66.0	96.2	162.2	14.2
Matlacha Pass	64.0	26.4	90.4	7.9
Caloosahatchee River	247.9	21.4	269.3	23.7
Estero Bay	69.7	56.1	125.8	11.1
Clam & Doctors Bays	10.9	0.0	10.9	1.0
Naples Marco Waterway	113.7	35.7	149.4	13.2
Total (miles)	843.0	292.6	1135.6	100.0
Total (row%)	74.2	25.8	100.0	

Table 1.

Aerial photograph of Marco Island under construction.

Another essential characteristic of boat channel geography is the form and spacing of channel segments.Some channels are simple, and others are complex. The channel systems include: finger canals or basins; multiple canal systems; individual shoreline channels; shoreline channels linked to finger canals; natural streams or tidal creeks; and access channels and major arteries. Figure 1 shows examples of channel forms, and the regional distributions are illustrated in Map 3 and Table 2. Fifty-six percent (630 miles) are multiple canal systems. Most are in Charlotte Harbor and the Caloosahatchee (215 miles each) and the Naples–Marco Waterway (81 miles). Another 23 percent (263 miles) is made up of access channels and major arterials, which are more evenly distributed within the region. Streams or tidal creeks represent 7 percent (74 miles); the largest



Map 2.
Distribution of improved and unimproved channels.

concentrations are in Estero Bay (29 miles) and Charlotte Harbor (24 miles). Shoreline channels linked to finger canals account for 7 percent (75 miles); 21 miles are in Pine Island Sound. Single finger canals and solitary basins total 5 percent (56 miles); Estero Bay has 14 miles of these waterways. Examples abound on Ft. Myers Beach. Channels that parallel the shoreline account for only 4 percent (39 miles) of all waterways, almost half of these (16 miles) are in Gasparilla Sound.

The varied form and distribution of these channel systems directly influences recreational boating in the region. Consider boating from a location in a multiple channel system, such as Punta Gorda Isles, where thousands of waterfront single-family homes line canals that stretch tens-of-miles inland and where a single channel provides access to open, deep water. This type of waterway system characterizes over half of the region's boating channels. An appreciation for the evolution of these waterway changes is intrinsic to understanding the need to boat in concert with nature in Southwest Florida.

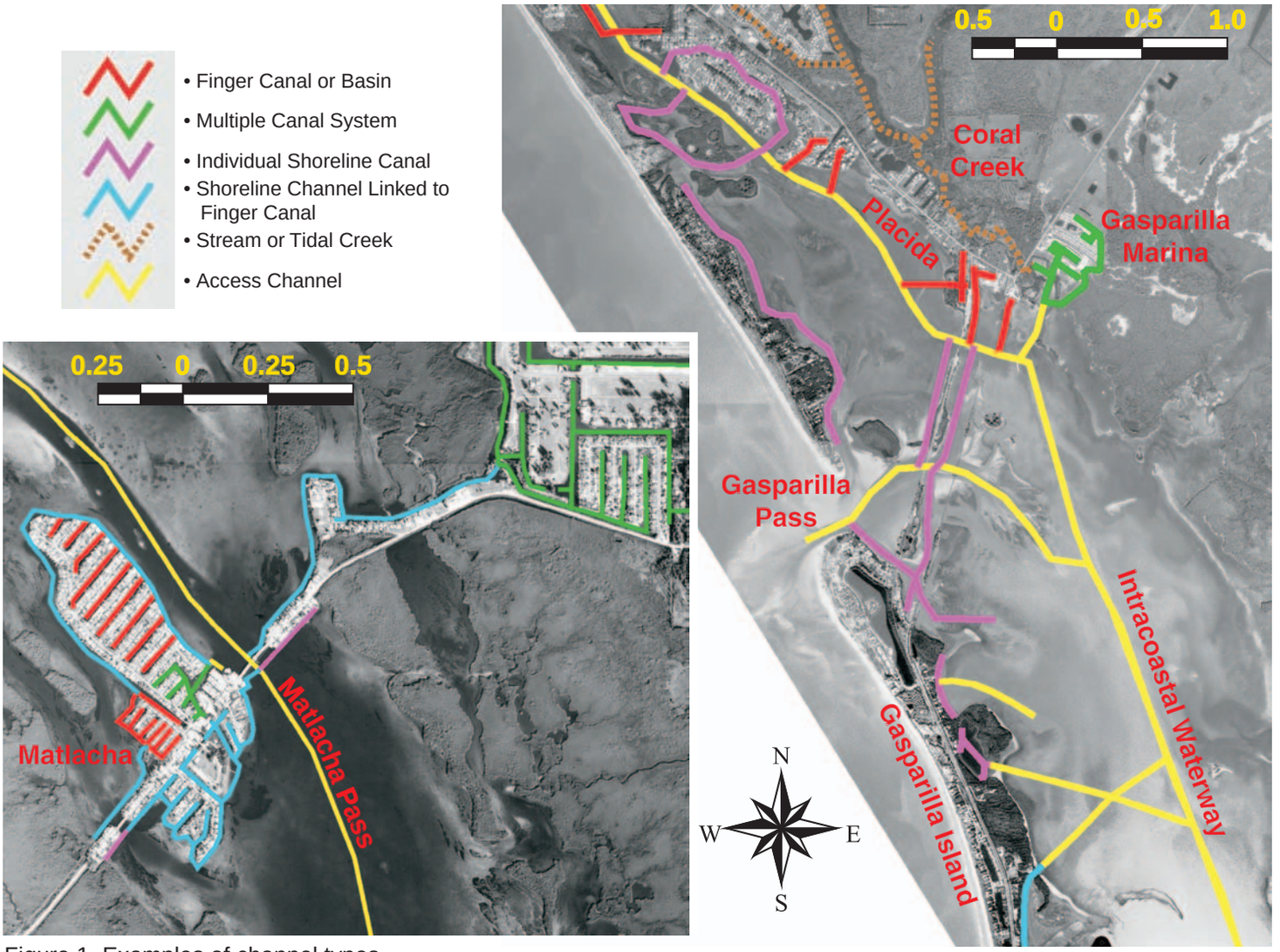


Figure 1. Examples of channel types.

Improved (dredged) and unimproved (natural) waterways

Region	Finger Canal or Basin	Multiple Canal System	Individual Shoreline Channel	Shoreline Channel Linked to Finger Canals	Stream or Tidal Creek	Access Channels and Arterials	Total (miles)	Total (row %)
Gasparilla Sound	3.5	2.1	15.9	1.4	5.5	19.1	47.5	4.2
Charlotte Harbor	11.3	215.1	1.4	7.2	24.1	21.0	280.1	24.7
Pine Island Sound/San Carlos Bay	2.7	32.4	13.7	21.1	0.0	92.3	162.2	14.2
Matlacha Pass	3.7	52.2	0.4	7.5	0.0	26.6	90.4	7.9
Caloosahatchee River	10.3	214.8	4.0	5.3	10.7	24.2	269.3	23.7
Estero Bay	14.4	30.2	3.1	16.0	29.0	33.1	125.8	11.1
Clam & Doctors Bays	0.0	1.5	0.0	7.5	0.0	1.9	10.9	1.0
Naples Marco Waterway	9.8	81.4	0.7	8.5	4.4	44.6	149.4	13.2
Total (miles)	55.7	629.7	39.2	74.5	73.7	262.8	1135.6	100.0
Total (col. %)	4.9	55.5	3.5	6.5	6.5	23.1	100.0	

Table 2.

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(Compilation [Smooth] Sheets)

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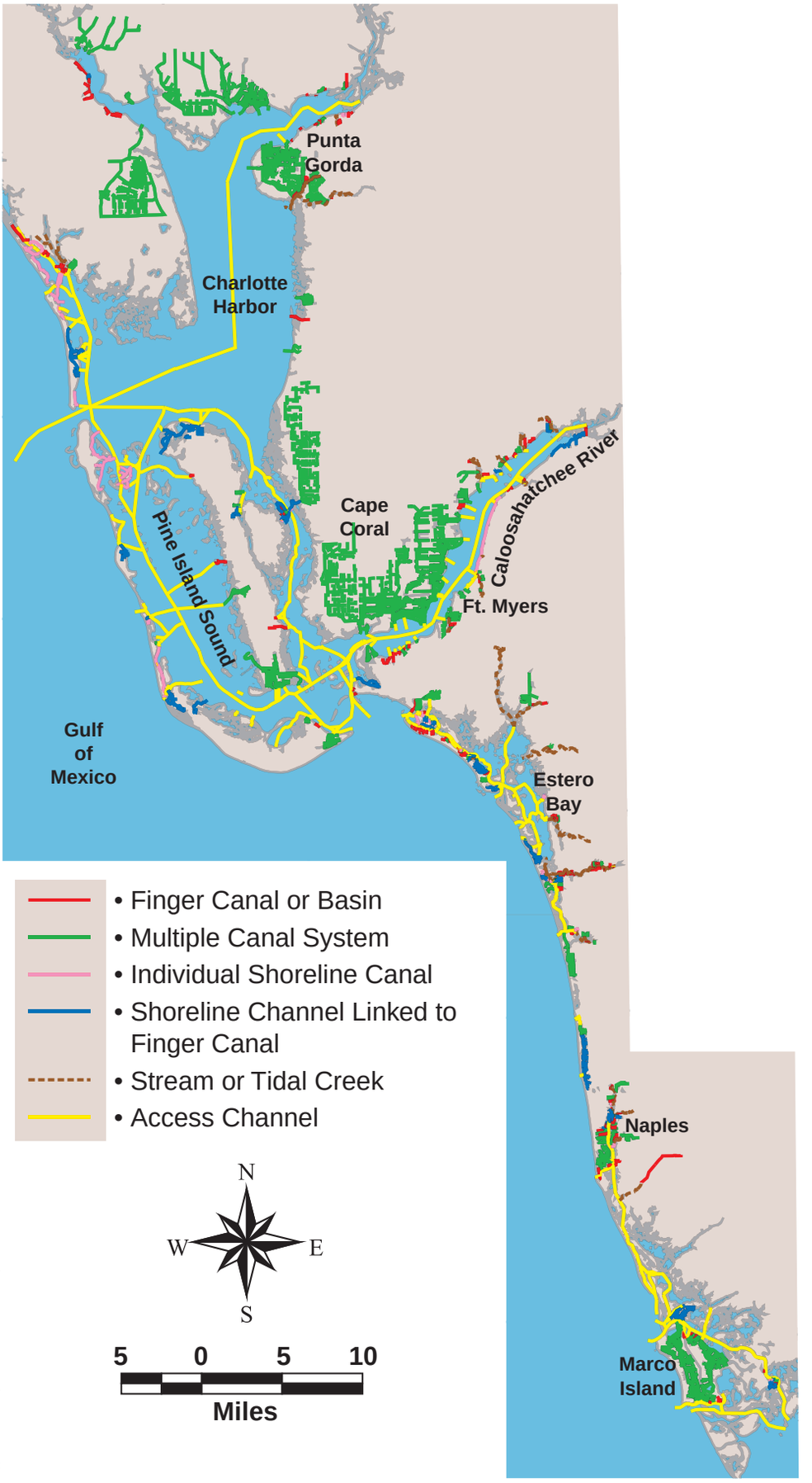


Map 3.
Distribution of channels by type.

For Your Information...

Locked Waterways in Southwest Florida

Six freshwater canal systems, totaling 108 waterway miles (10 percent of all channels), are linked to Southwest Florida's boating infrastructure (Table 3 and Map 4), separated from the bays and rivers by either a lock or berm. Systems with larger boats have gated locks. Boat lifts hoist smaller vessels over a berm. These freshwater isolation systems date from the 1970s, when federal legislation began to curtail the impacts of upland development on sensitive marine habitats.

State permitting agencies saw in the lock and berm approach a compromise with developers to reduce the impacts of stormwater runoff as point source pollution. The larger canal system designs incorporate a stormwater trap, comprising a perimeter berm and a "spreader" canal to distribute runoff behind a fringe of mangroves. In such a system, stormwater builds up behind the lock and berm, and excess flow spills over the berm into the perimeter canal, filters through the mangroves, and seeps out into the bay. This strategy is considered better for the environment than concentrated runoff from a single point source. The three large multiple canal systems — Burnt Store Isles, Cape Coral North Spreader, and Cape Coral South Spreader — fit this design.

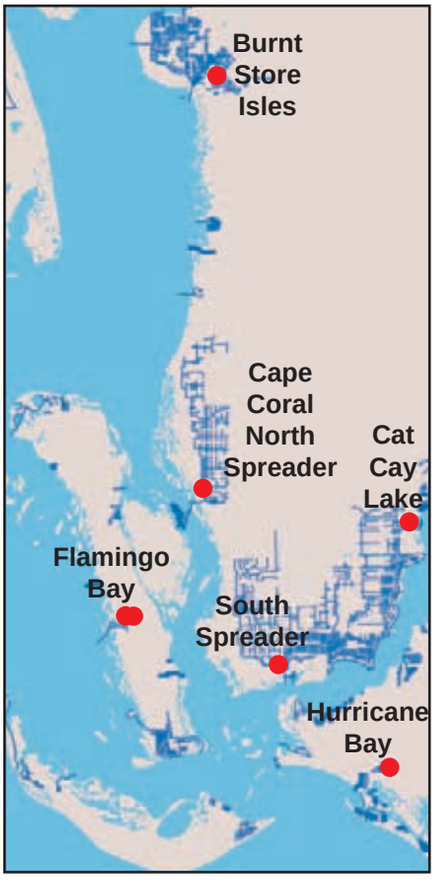
Locked waterways in Southwest Florida.

Waterway	Channel (miles)
Burnt Store Isles	11.3
Cape Coral North Spreader	47.2
Flamingo Bay	0.2
Cape Coral South Spreader	44.2
Cat Cay Lake	3.5
Hurricane Bay	1.9
Total	108.3

Table 3.

Lock at the entrance to the Cape Coral South Spreader Canal.

Boat lift at Cat Cay Lake.

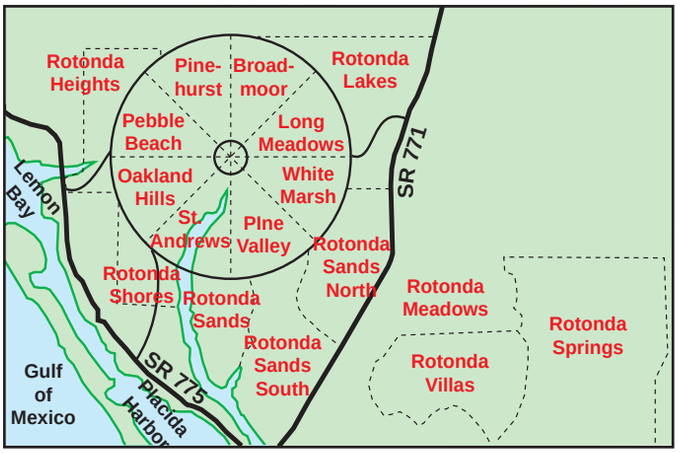


Map 4.
Locks and boat lifts.

Boat lift at Flamingo Bay.

Case Studies:
Rotonda West, Cape Coral, Marco Island

One of the most notable features of Southwest Florida waterways is the growth and development of canalfront residential communities. As discussed in the preceding chapter, dredging during the two decades following World War II led to the creation of multiple canal systems where thousands of saltwater-accessible parcels were carved out of wetlands to satisfy a market for water-oriented single-family homes. More than half of the waterways in the region are of this form. The unparalleled construction frenzy during the 1950s and 1960s which led to the creation of these canal waterfront communities, prompted public concerns about a deteriorating coastal environment, shrinking public access to waterfront areas, and fears about the loss of sensitive habitats for wildlife. Landmark legislation, passed by Congress in the early 1970s to rein in wide-scale wetland destruction, brought an abrupt halt to this canal development process. The Environmental Protection Act (1970) created the U.S. Environmental Protection Agency, the Clean Water Act (1972), and the Endangered Species Act (1973), all have fundamentally changed waterfront development practices and curtailed waterway maintenance practices. Three cases – Rotonda West (Charlotte County), Cape Coral (Lee County), and Marco Island (Collier County) — help to explain how such widespread waterway construction evolved and demonstrate the effects of multiple canal systems on the local geographic setting.



Map 1.
Rotonda subdivisions.

Rotonda (circular shape on the left side of photo); view south with Stump Pass in the foreground; Gasparilla Pass upper right, Charlotte Harbor in background.

Cape Coral looking Southwest across Redfish Point and the Caloosahatchee with Punta Rassa on the extreme right.

South Marco Island and Roberts Bay in foreground, looking Southwest out Caxambas Pass.

The Vision of Rotonda West: A Self-Contained Circular Community of 50,000

Promoted as "one of the most exciting concepts in planning," Rotonda West has made an indelible imprint, both perceived and real, on the Southwest Florida landscape. Situated on Cape Haze peninsula between Buck and Coral Creeks in Charlotte County, it epitomizes the quest for building waterfront property that dominated much of this region's residential developments of the 1960s era. Imagine — "a brand new, community-in-the-round, a unique circle of eight pie-slice-shaped subdivisions, seven with their own golf courses and marinas, the eighth with a broad waterway (Coral Creek), the whole community surrounded by a circular waterway, offering, in all, 32 miles of navigable, blue-green waterways well-stocked with freshwater fish." That "vision" — of each homesite overlooking a canal, golf course, landscaped green belt or recreational waterway, and with each homeowner provided unlimited access to a private Gulf beach on Don Pedro Island — was offered to the public in 1969 by Cavanagh Leasing Corp. Map 1 shows Rotonda's subdivisions within and outside the "wheel".

Cavanagh purchased the property from the Vanderbilt family (descendants of Cornelius Vanderbilt) who had built the 35,000 acre 2-V Ranch for breeding Santa Gertrudis cattle. The land, only a few feet above mean sea level, had been covered years earlier with pine forest, but the timber had been cut down for lumber and naval stores by a succession of owners, including the Gainesville, Ocala and Charlotte Harbor Railroad (forerunner of the Florida Southern Railway Company).

Figure 1 shows pre–development conditions that prevailed in 1951. The Vanderbilts' improvements to the land for cattle grazing included building a dam on West Coral Creek to block salt water from infiltrating the fresh water runoff from the uplands. They also developed Cape Haze, an upscale residential community adjoining the Rotonda property between Coral Creek and Placida Harbor.

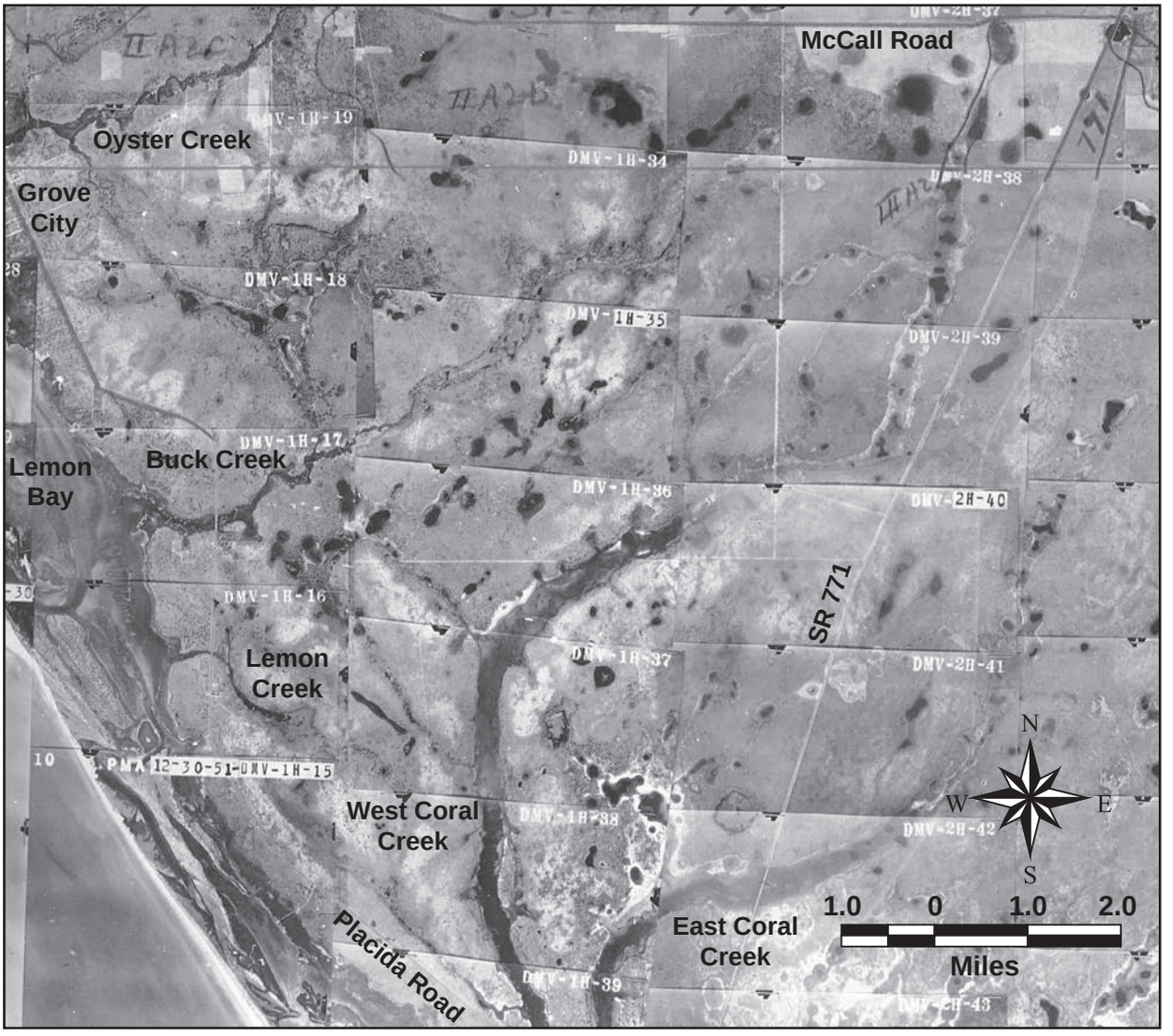


Figure 1. Rotonda aerial mosaic, 1951.

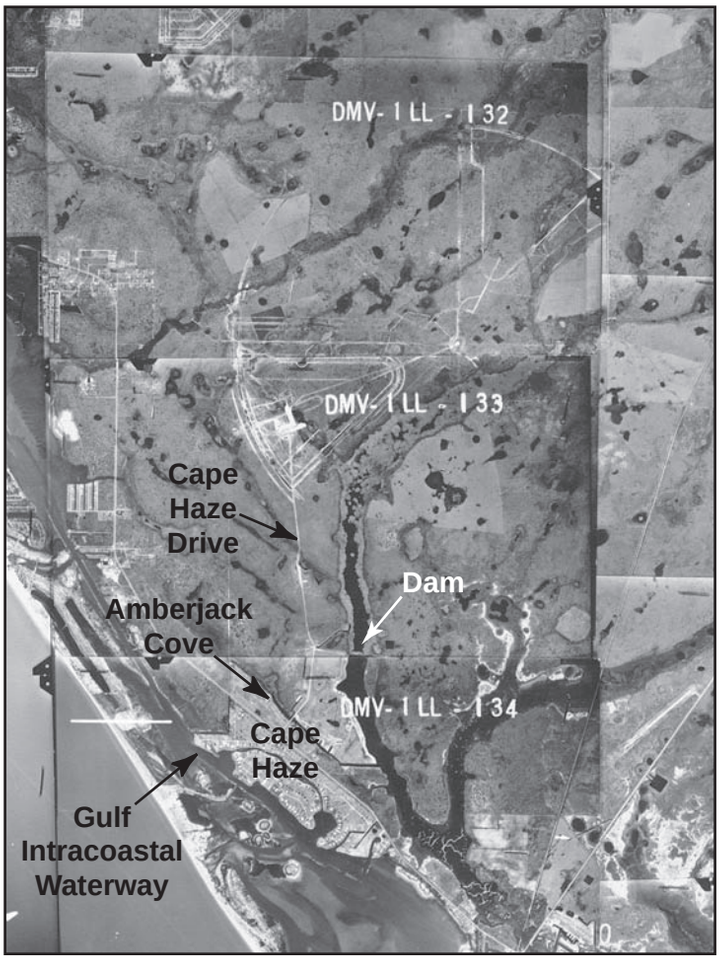


Figure 2. Rotonda aerial mosaic, 1970.

Figure 2 shows conditions in early 1970, the take-off year of Rotonda's development. The Vanderbilts' Cape Haze waterfront property had been cleared and bulkheaded, and finger canals had been dredged; the Gulf Intracoastal Waterway had established the inland waterway link between Placida Harbor and Lemon Bay; dredging was underway in Amberjack Cove (a natural slough); and the Vanderbilts' dam had been built across West Coral Creek. Parts of the Rotonda 'wheel' are visible, such as the west, north, and east sectors of Rotonda Circle, the hub, and construction within the Oakland Mills subdivision.


Figure 3. Rotonda aerial photograph, 1975.

Figure 3 shows the development in 1975. Eleven miles of canals, 6 feet deep and 60 feet wide, had been dredged in Oakland Hills, Pebble Beach and Pinehurst subdivisions. Deepwater canals crisscrossed the 2,600-acre Rotonda Sands area, between East and West Coral Creeks. About 600 homes were complete by 1976, mostly in Oakland Hills.

The Rotonda 'vision' promised an idyllic, Shangri-La lifestyle and implied access to Gulf waters. However, the developer was unable to forecast mounting public concerns about the health of the environment and passage of legislation, by 1975, that would halt unbridled destruction of wetlands. One consequence of the new laws was a decision never to dismantle the dam across West Coral Creek; Gulf access would not exist. Construction was halted on the environmentally sensitive wetlands areas, effectively blocking development of the St. Andrews and Rotonda Sands subdivisions. Figure 3 (1975) shows initial land clearance and canal construction within the subdivisions adjoining West and East Coral Creeks. In 1976, Deltona Corporation, the land development company headed by the Mackle family, assumed management of the Rotonda properties. The state eventually purchased the marginal lands in 1998 under the Environmentally Endangered Lands Act Cape Haze/Charlotte Harbor CARL (P2000) purchase.

Today's Rotonda is part of that pre-1975 "dream" and part post-legislation reality. Cavanagh's dream waterfront community, with Gulf access, is still perpetuated on some contemporary street maps. Modern (1995) aerial photography (Figure 4) shows a very different landscape: relict canals on the undevelopable St. Andrews and Rotonda Sands subdivisions outside the wheel; buildout of homesites within the wheel's western sectors of Oakland Mills and Pebble Beach; a moderate level of home-building in the northern Pinehurst and Broadmoor subdivisions; and negligible construction in the east and southeast White Marsh and Pine Valley areas. The Rotonda of today is a community shaped by a vision of outdoor living, Florida style, and attuned to pursuing that dream in an environmentally sustainable fashion.

Figure 4. Rotonda aerial photograph, 1999.

Creating a Waterfront Wonderland at Cape Coral

The Caloosahatchee Riverfront was a prime target for residential land development during the years following World War II. As service personnel returned to the United States and retirees began searching for affordable housing, the region's warm climate, laidback lifestyle, and cheap undeveloped land provided unparalleled incentives for economic growth and development. The Rosen brothers — Leonard and Jack — recognized an opportunity to profit by selling the American Dream, affordable housing on the installment plan. In 1957, they purchased for $125,000 a 1,724-acre parcel at Redfish Point on the north bank of the Caloosahatchee. The Rosens would turn that investment into a fortune of over $100 million by 1970 and create the largest land sales operation, Gulf American Corporation, in the United States. Their real estate business was a pioneer in using mail-order sales, television advertising, giveaways, and popular culture celebrities as company spokespersons.

Cape Coral looking northeast up the Caloosahatchee with Redfish Point on lower right.

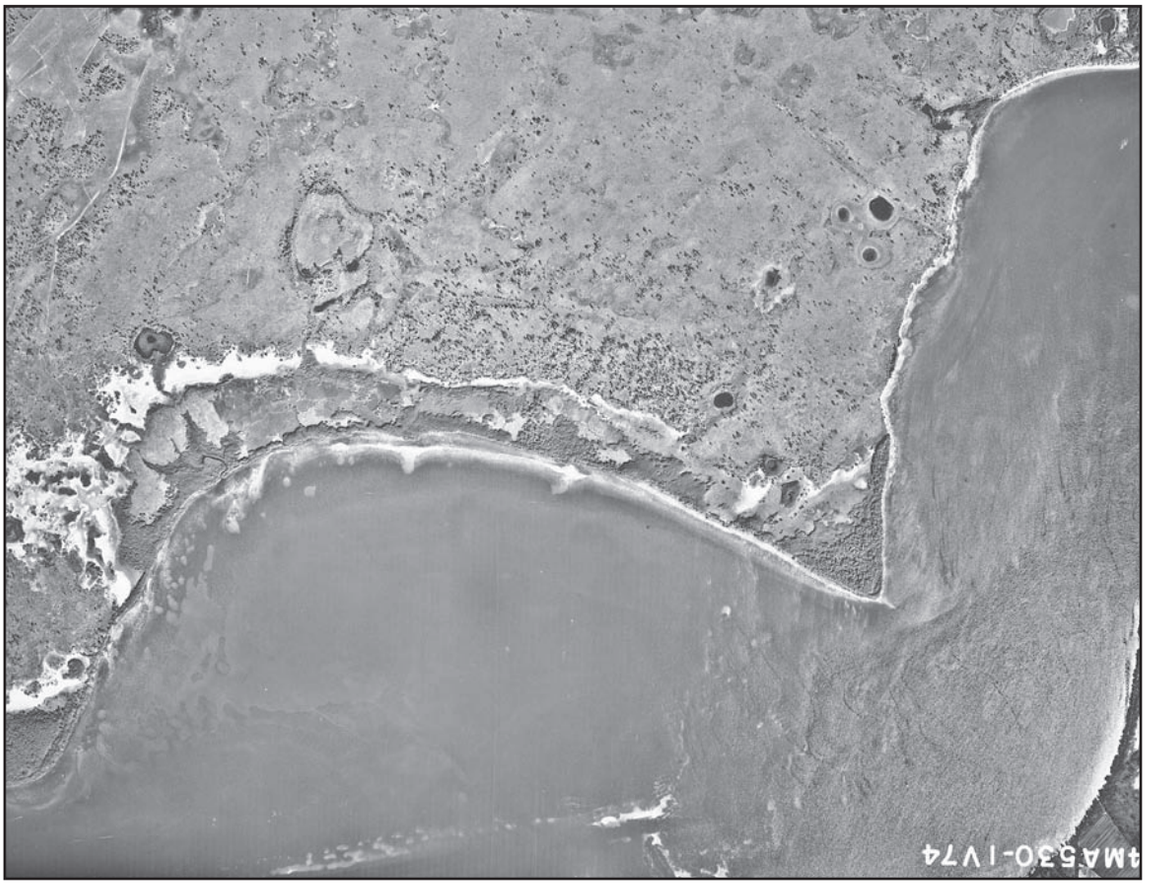


Figure 5. Redfish Point, 1944.

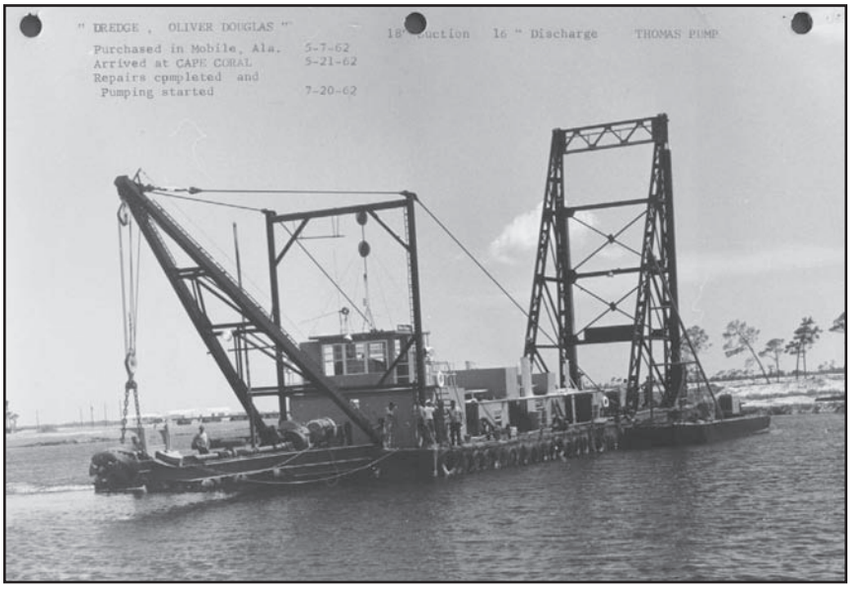


Figure 6. Dredge *Oliver Douglas,* 1962.

In the early 1940s, Redfish Point was uninhabited (Figure 5). Dense mangroves extended inland for 100 yards from the shoreline. The remainder of the property was only several feet above sea level and covered with grasslands, palmettos and second-growth pines. Since local land use regulations mandated homesite construction at a minimum 5.5 feet above sea level, the Rosens concluded that dredging would be needed to provide fill material. Gulf American refined the 'finger-islanding' dredge method of excavating canals so that most buildable lots fronted on waterways. A grid-patterned development produced the largest number of homesites. Though the main objective was to create land for home construction, the use of dredge-and-fill produced a suburban landscape of artificial canals, waterways and basins, the outlines of which were dictated by the amount of fill required at a given location. As a result, canal width and depth varies within Cape Coral: some waterways, such as in the Yacht Club area, are nearly 200 feet wide and over 30 feet deep; whereas canals located farther inland on higher elevation uplands are only 80 feet wide and 6- to 15-feet deep.

The dredge-and-fill method, which would later be criticized for its environmental impact, employed in the peak years of the early 1960s as many as four dredges and ten draglines, which at times operated around the clock. Hydraulic dredges, such as *Oliver Douglas* (Figure 6), were floating barges that pumped bay-bottom sediments in a liquid solution onto an emerging upland site. Draglines mechanically moved fill from canals to the uplands by dragging buckets across the ground (Figure 7). Building sites were bulldozed and leveled, and, in the process, nearly all vegetation was removed prior to construction (Figure 8).

By the early 1960s, over 50 million cubic yards of fill had been moved to create the Cape Coral development (Figure 9). This included dredging some 170 miles of saltwater accessible canals and three basins, as well as 14

Figure 7. Dragline at Cape Coral, 1962.

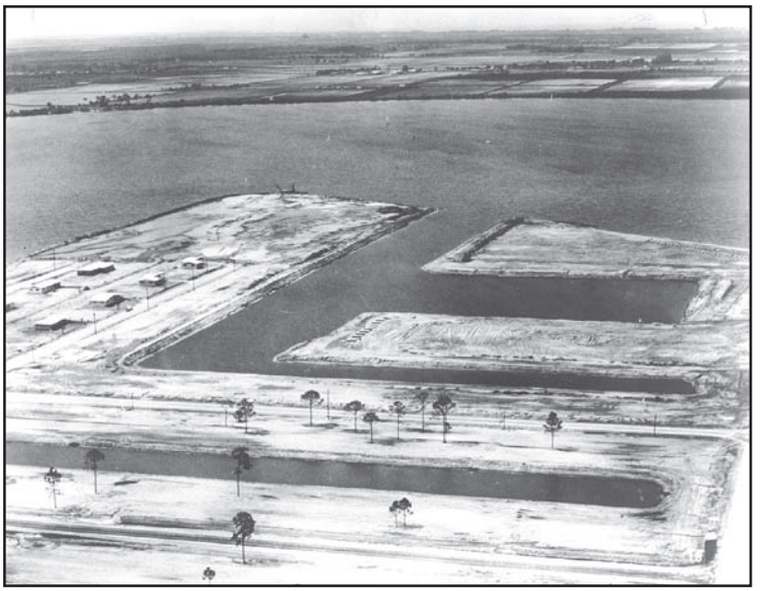


Figure 8. Cape Coral oblique aerial photograph, 1959.

Figure 9. Cape Coral at Redfish Point, oblique aerial photograph, 1961.

landlocked lakes.Waterway construction totaled about 250 miles by the mid-1970s. But Gulf American's days were numbered. Conflicts over dredging permits, due to emerging public concerns about potential environmental impacts, were costly. The company misjudged the regulatory climate. Large holdings became undevelopable, and in 1969, the Rosen brothers sold out. The City of Cape Coral, incorporated in 1970, was a community of over 20,000 residents. Its location on the north shore of the Caloosahatchee and its canalfront homesite development have retained the hallmark qualities of the American Dream through the years — waterfront living in a Florida setting (Figure10).

Figure 10. Redfish Point, 1999.

The natural waterway along the winding Caloosahatchee was widened, straightened and deepened after flood waters of the 1928 hurricane killed hundreds of people around Lake Okeechobee. Today, Ft. Myers is the largest city on Florida's "original cross-state canal," linking the east and west coasts of the state.

The Ultimate Waterfront Paradise in Southwest Florida: Marco Island

Marco Island was the single-largest undeveloped track of barrier island property in Southwest Florida in 1962 when the Mackle brothers — Elliott, Robert, and Frank — visited the site, lured by the prospect that the Colliers (descendents of Barron Collier, the advertising magnate) were interested in selling their 10,327-acre land holding, 6,700 on Marco and the rest on the mainland. The brothers purchased the Collier property for $7 million. They were experienced land developers, having created Miami's Key Biscayne, an upscale waterfront community, and through General Development Corp., developed the 118,000-acre Port Charlotte community on Charlotte Harbor's north shore. The Mackles sold General Development in 1961 and formed a new company, Deltona, which proceeded to develop homesites near Deland and Daytona Beach, Fla. The Deltona Corporation would be the corporate instrument to transform Marco into the ultimate waterfront paradise.

Figure 11, taken in December 1951, shows Marco Island in its pre–development state. Only two settlements existed: Marco Village on the north and Goodland on the east. Scrub vegetation covered most of Marco Island and an extensive mangrove shoreline fringed the river and bays in the pre–development period of time. Crescent Beach, the 5-mile sweep of Gulf shore between Big Marco and Caxambas Passes, was a vast, expanse of white sand. Mosquitoes were a constant menace of Marco Island because of the large intertidal areas on the bayside. There was a limited supply of freshwater and no sanitation infrastructure.

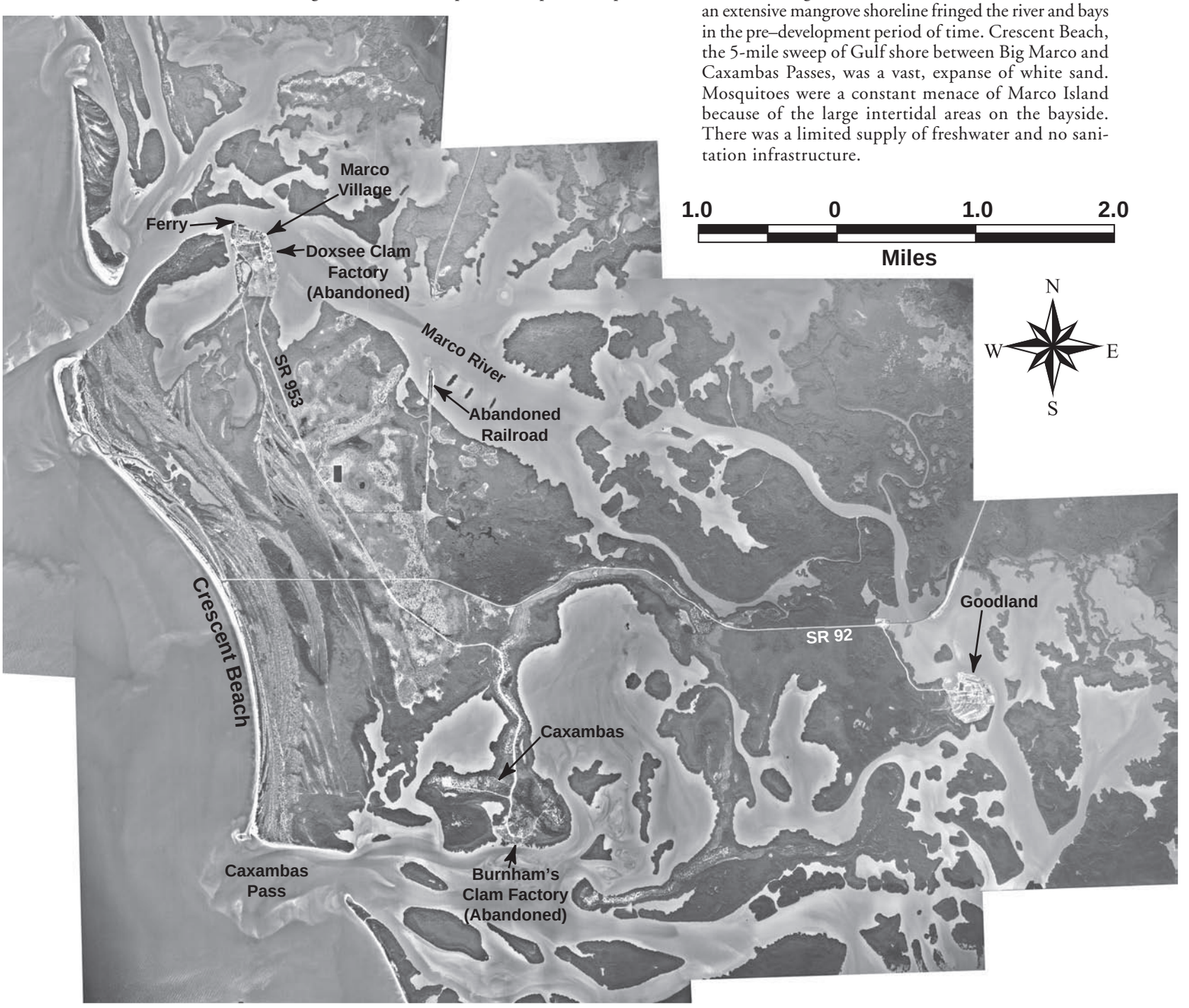


Figure 11. Marco Island aerial photomosaic, 1951.

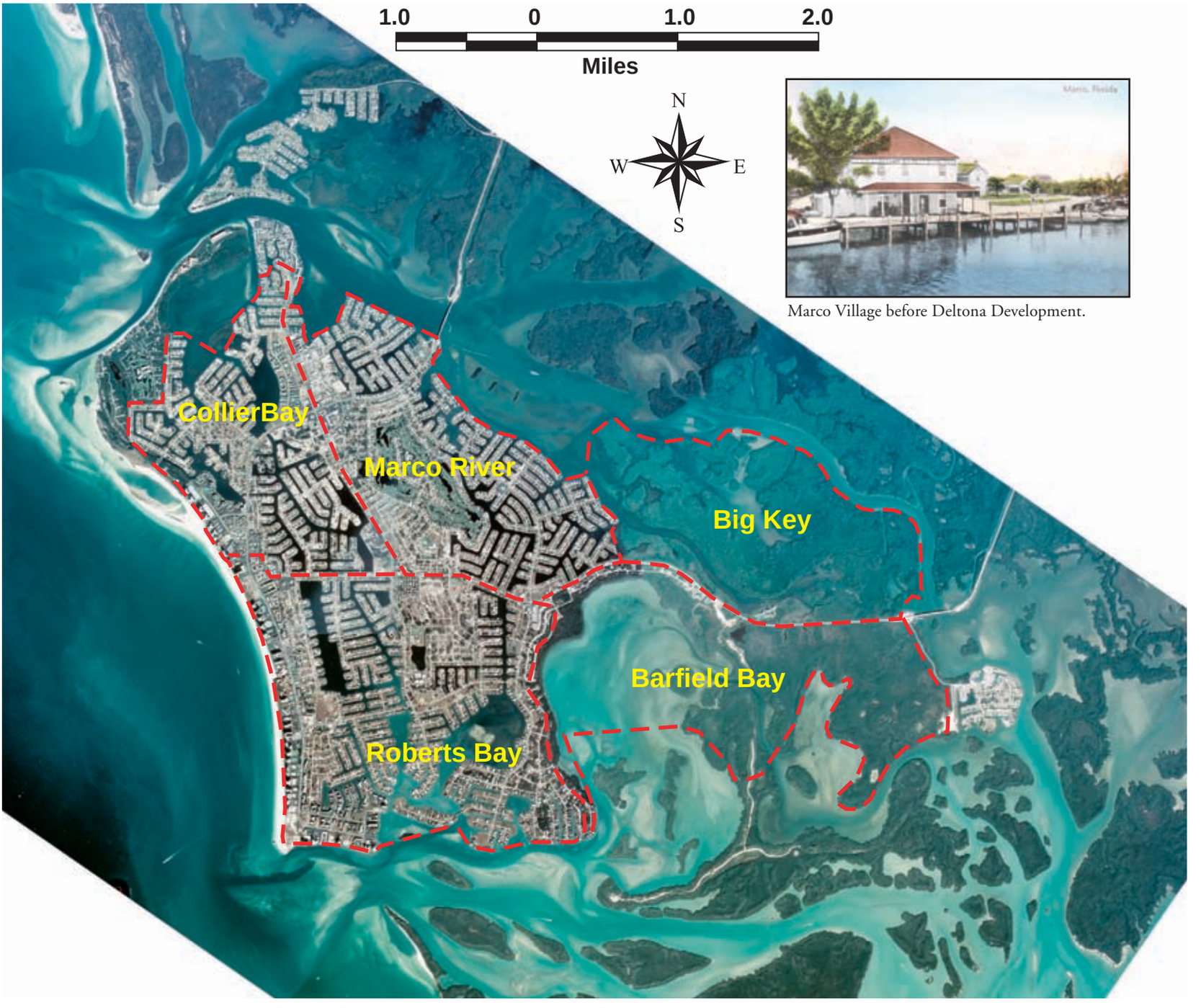
Clamming had been an economic mainstay of the island during the early 1900s, but the two major facilities — Doxsee's on Factory Bay and Burnham's at Caxambas Pass — closed when the clam beds were depleted.

The railroad, built in 1927, had been abandoned in the mid-1940s. A swing bridge over the Marco River connected Goodland with the mainland.

Villagers at Caxambas had been moved to Goodland in 1949 preceding the Colliers' attempt to develop the island. Nothing materialized from this Collier development plan. The U.S. Air Force had established a missile tracking station in the late 1950s on the southwest tip of Marco Island adjacent to Caxambas Pass.

The Mackles wanted to build a resort community from scratch and Marco Island, in 1962, presented them with such opportunity.

As land would have to be created from wetlands and bay bottom, the Mackles' 15-year development plan hinged on dredge-and-fill, a widely adopted and accepted 1960s land development method. The 6,700-acre site was subdivided into over 10,000 homesites, and other areas were set aside for commercial and public uses. Deltona's 1964 Plan (Map 2) shows the extent of the proposed development, which included 90 miles of canals with 8,000 waterfront parcels.



Marco Village before Deltona Development.

Figure 12. Marco Island permit areas (1992 aerial photograph).

The Army Engineers claimed jurisdiction and required its approval, in addition to county and state 'building' permits, since dredge-and-fill could potentially affect navigation on public waterways. Deltona subdivided the island into five areas, based on completing dredging and filling in each area within the Army Engineer three-year permit period (Figure 12). The company submitted its permit application for the Marco River area first, in 1964, and received Corps approval shortly thereafter. A Corps permit was requested for Roberts Bay in 1967, but the approval process took two years. The Collier Bay subdivision, submitted to the Corps in 1971, was not approved until 1976. The Barfield Bay and Big Key areas, which were scheduled to be developed in the late 1970s, never received Corps approval for dredging. The battle over Deltona's dredge-and-fill permit applications was an indication of a nationwide, emerging, environmental ethic that had prompted passage of landmark legislation to reign in widescale filling of wetlands, both freshwater and marine, and destruction of wildlife habitats.

The denial of permit applications by the Army Engineers made it impossible for Deltona to honor its sales contracts, since it began selling homesites in 1965 in all of the five areas based on the assumption of 'business-as-usual' in obtaining the federal permits to dredge and fill in order to create buildable waterfront properties. Though the company stopped land sales in 1973 within the unpermitted areas, it had already sold 75 percent of the sites in Collier Bay, 90 percent in Barfield Bay, and almost 100 percent in Big Key. Lawsuits and counter-suits, concerning the constitutionality of the Army Engineers decision and regarding just compensation were all decided against the company. In 1982, Deltona turned over almost all its remaining undeveloped holdings on Marco Island to the state for use as a nature preserve.

Figure 12 shows the extent of Marco's developed and undeveloped lands. The dream of an ultimate waterfront residential paradise, thus, came to an abrupt end, and under current federal, state, regional and local laws, finger-canal developments will never again be allowed in Southwest Florida.

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Dodrill, David E., 1993, *Selling the Dream: The Gulf American Corporation and the Building of Cape Coral, Florida,* The University of Alabama Press, Tuscaloosa, Alabama.

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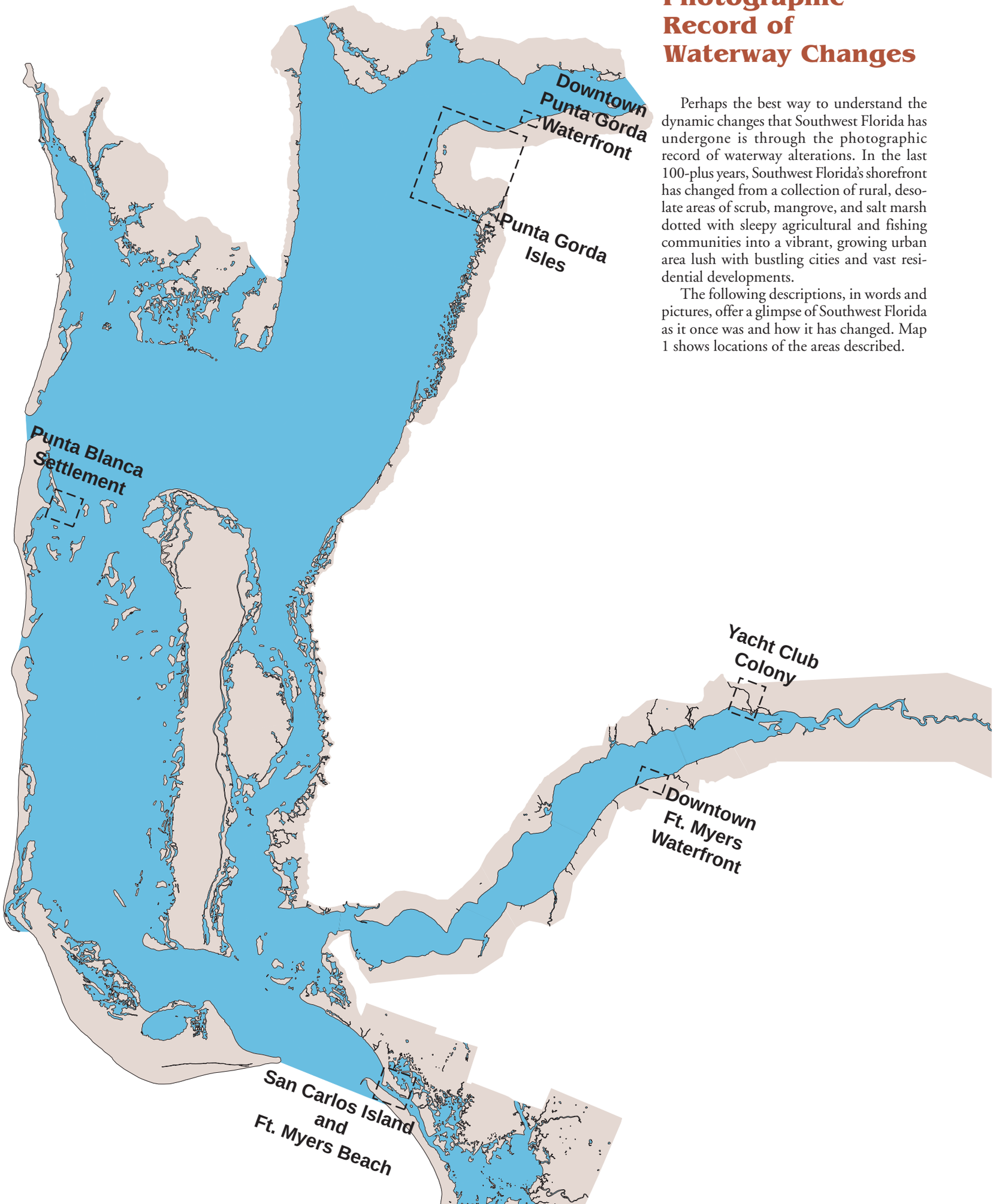
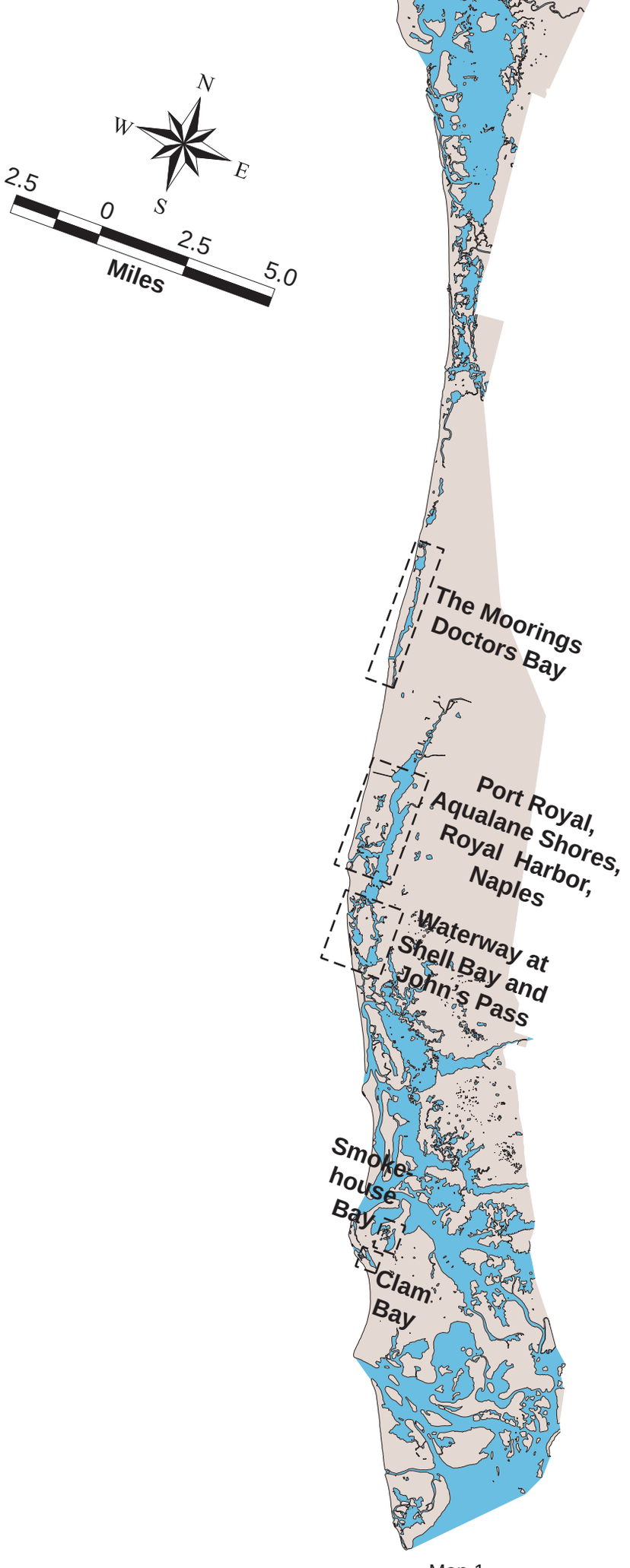
Map 2.
Marco Island development plan.

Photographic Record of Waterway Changes

Perhaps the best way to understand the dynamic changes that Southwest Florida has undergone is through the photographic record of waterway alterations. In the last 100-plus years, Southwest Florida's shorefront has changed from a collection of rural, desolate areas of scrub, mangrove, and salt marsh dotted with sleepy agricultural and fishing communities into a vibrant, growing urban area lush with bustling cities and vast residential developments.

The following descriptions, in words and pictures, offer a glimpse of Southwest Florida as it once was and how it has changed. Map 1 shows locations of the areas described.





Map 1.
Photo record case studies.

1. Downtown Punta Gorda Waterfront

Downtown Punta Gorda Waterfront changes are captured in maps and photographs from 1921 to present day. The Army Engineers 1921 maps (Figures 1A and 1B) shows existing waterfront conditions and those from an earlier time. In 1885-86, the railroad completed a spur to (a) Old Long Dock (Old Cattle Wharf on map), the first modern dock facility used by commercial fishermen to off-load fresh fish packed in ice and to ship their catch by rail to United States markets. In 1897, Long Dock was abandoned (later destroyed) for the Atlantic Coast Line railroad dock (b) at King Street. City Wharf (Figure 1A, c), at the foot of Sullivan Street (Figure 1C), was destroyed in 1921.

A fire in 1915 destroyed the fish houses on the King Street Dock, but some were rebuilt. Figure 1B shows fish houses and ship chandleries on the King Street Dock (b) and the Ice Wharf (d) at the foot of the alley to the east. The riverfront between King and Nesbit Streets was lined with small marine ways, boat repair facilities, and a blacksmith shop (e). Fishing boats, like the auxiliary-powered schooner *Roamer* (Figure 1D), operated from Punta Gorda during this era. The Nesbit Street Bridge (Figure 1B, f) was a county road that spanned the Peace River from Punta Gorda to Live Oak Point and Charlotte Harbor Town. The King Street Dock (Figure 1B, b) was removed in the late 1920s in order to build the modern bridge right of way. A residential district along Retta (Esplanade) Avenue had been laid out early in the city's history (Figure 1E).

The aerial photograph in Figure 1F shows early 1940s waterfront conditions; antecedent structures described above are outlined in red. Note the old bridge approach at the foot of Nesbit Street. The area to the west had been filled. An old landmark hotel (g) remained from bygone days, as did the abandoned railroad spur to the Old Cattle Wharf. By the early 1940s, a dredged boat basin and pier (h) occupied the present-day location of Fishermen's Village. The City's riverfront park (i) at Retta Esplanade was an open space.

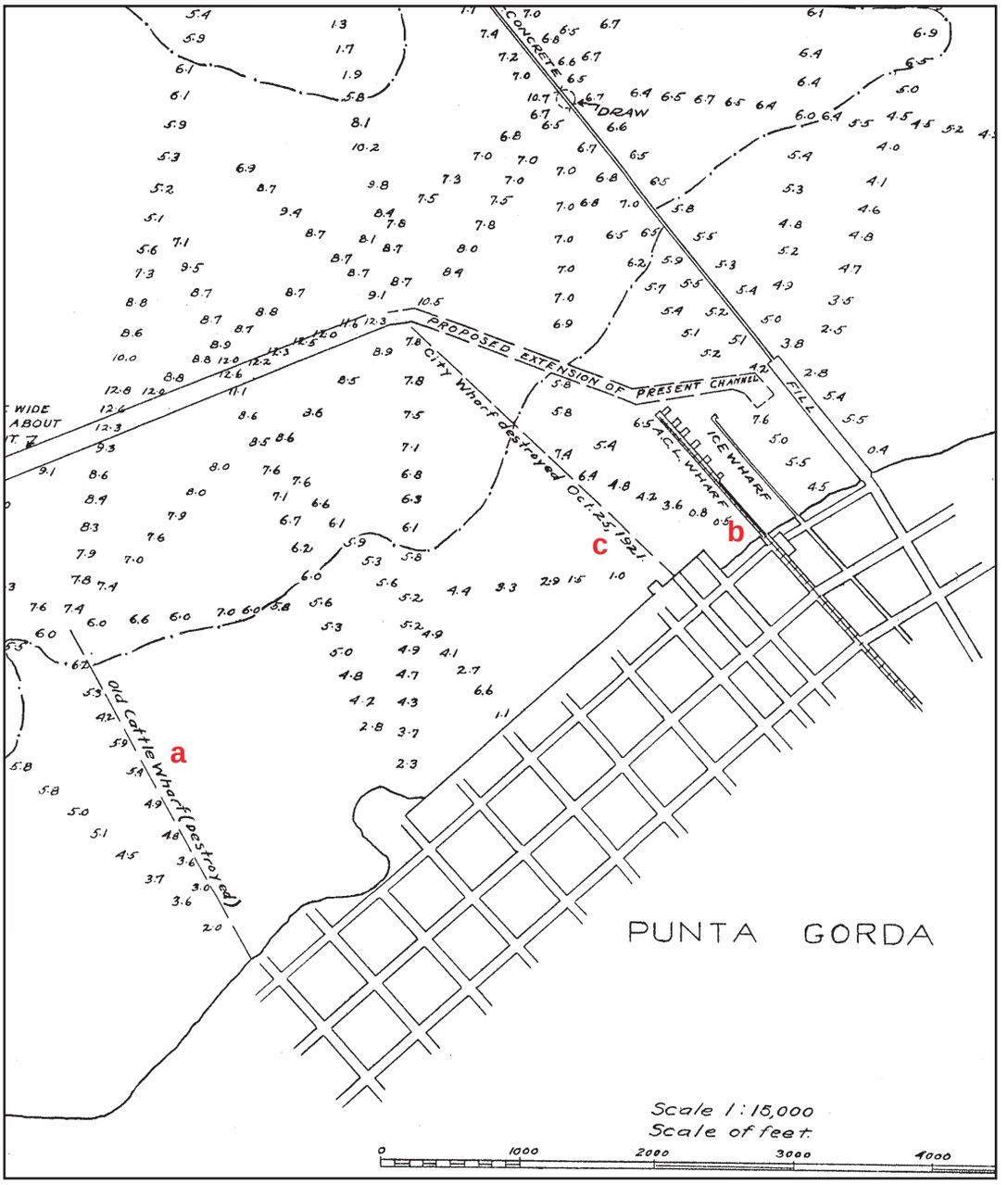


Figure 1A. Punta Gorda downtown, 1921.

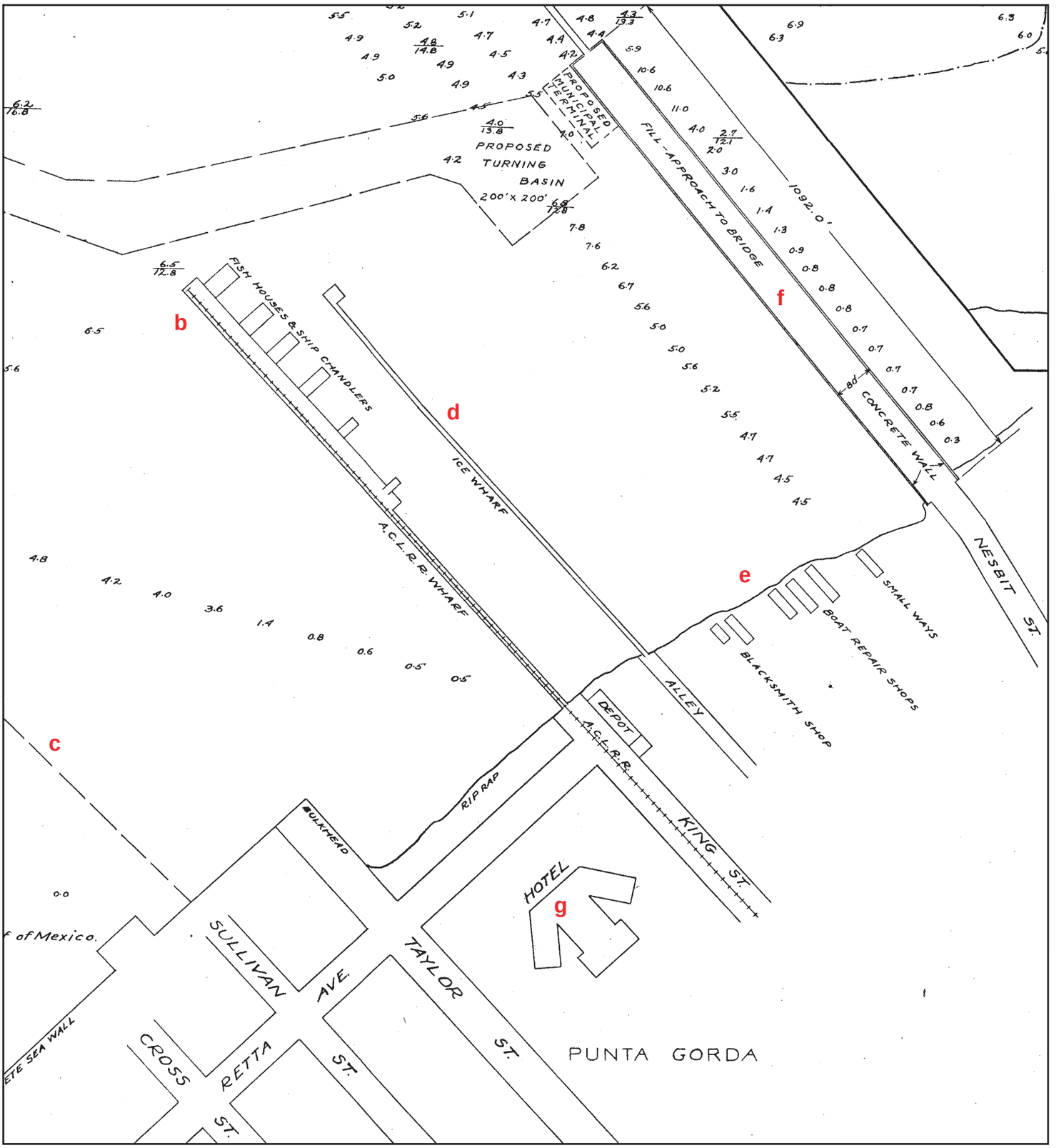


Figure 1B. Punta Gorda downtown (detailed plan), 1921.

The modern waterfront (Figure 1G) shows a completely transformed urban space. The old Nesbit Street County Bridge is replaced by two separate fixed spans — southbound traffic on Gilchrist Bridge and northbound on Collier Bridge. Commercial marine facilities have given way to service retail outlet stores and hotels. The open space along Retta Esplanade is Gilchrist Park. A time-share duplex with retail shopping, restaurants and modern marina — Fishermen's Village — occupies the commercial fish pier at the former location of the Old Cattle Dock. Land has been filled out into the river to provide buildable space for these expanding services. The old-town atmosphere and early 1900s buildings, especially old homes, are retained along Marion and Olympia and west of Nesbit.

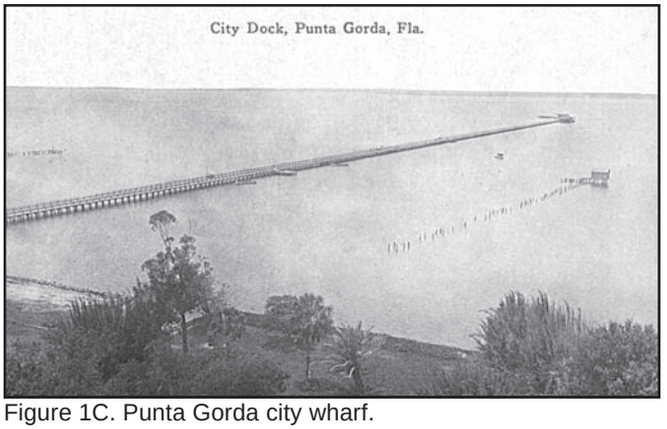


Figure 1C. Punta Gorda city wharf.

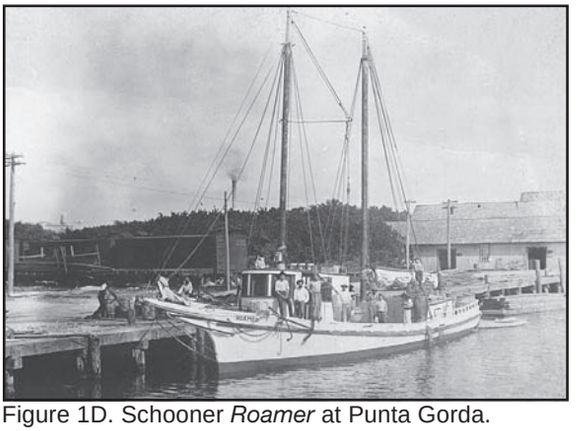


Figure 1D. Schooner *Roamer* at Punta Gorda.

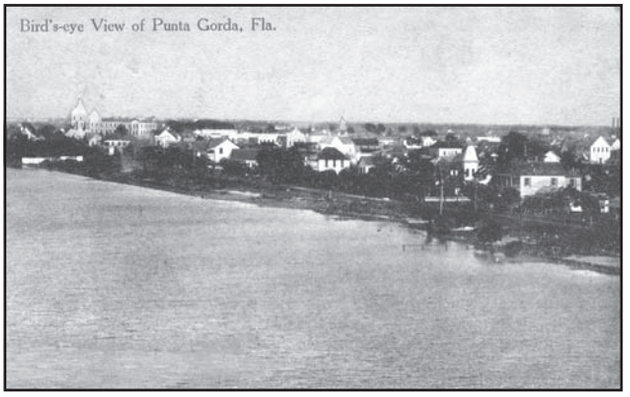


Figure 1E. Punta Gorda Retta (Esplanade) Avenue.

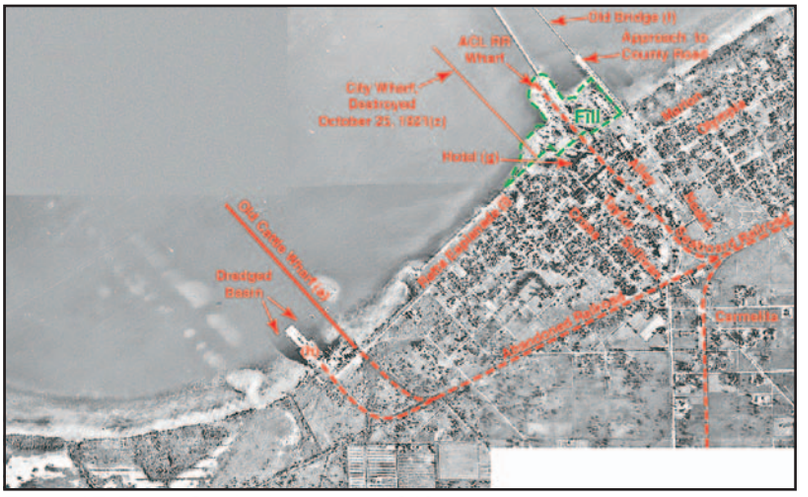


Figure 1F. Punta Gorda downtown, 1940s.

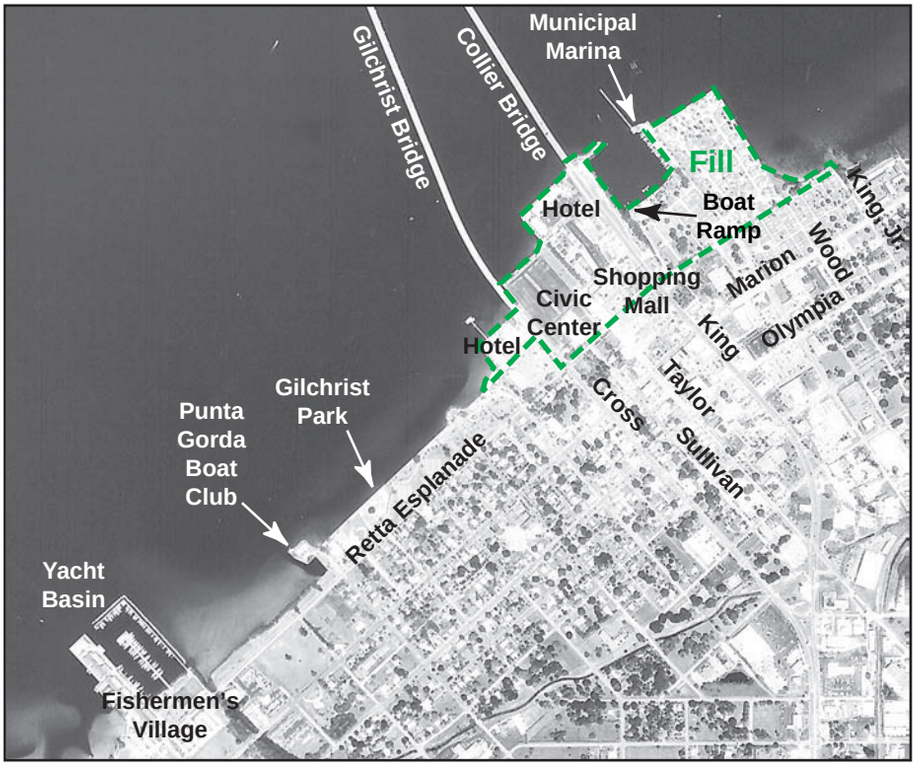


Figure 1G. Punta Gorda downtown,1992.

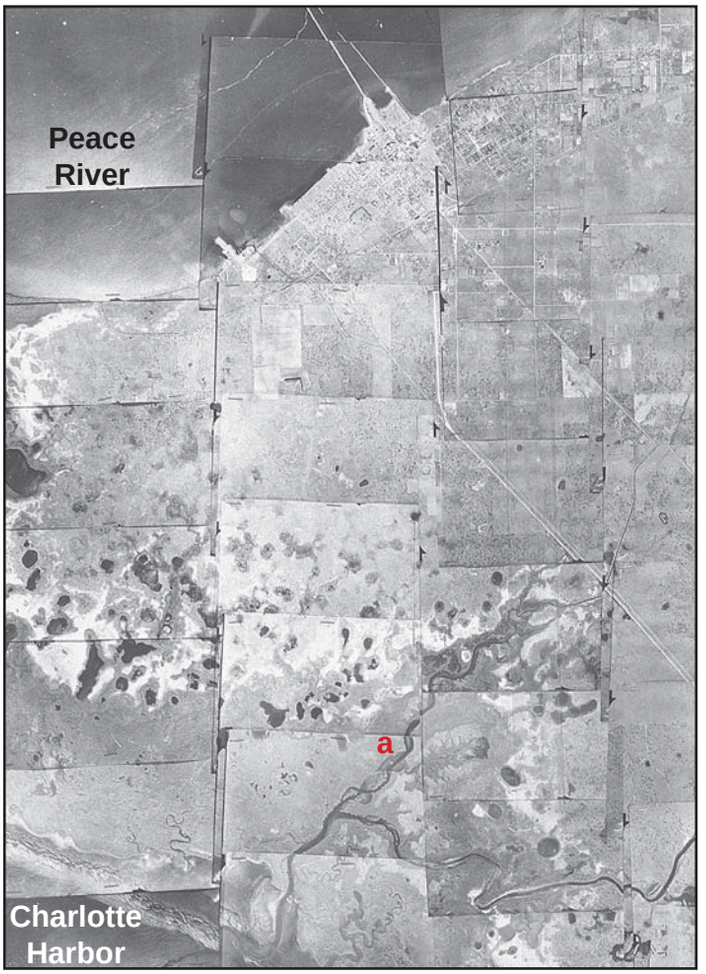


Figure 2A. Location of Punta Gorda Isles, 1944.

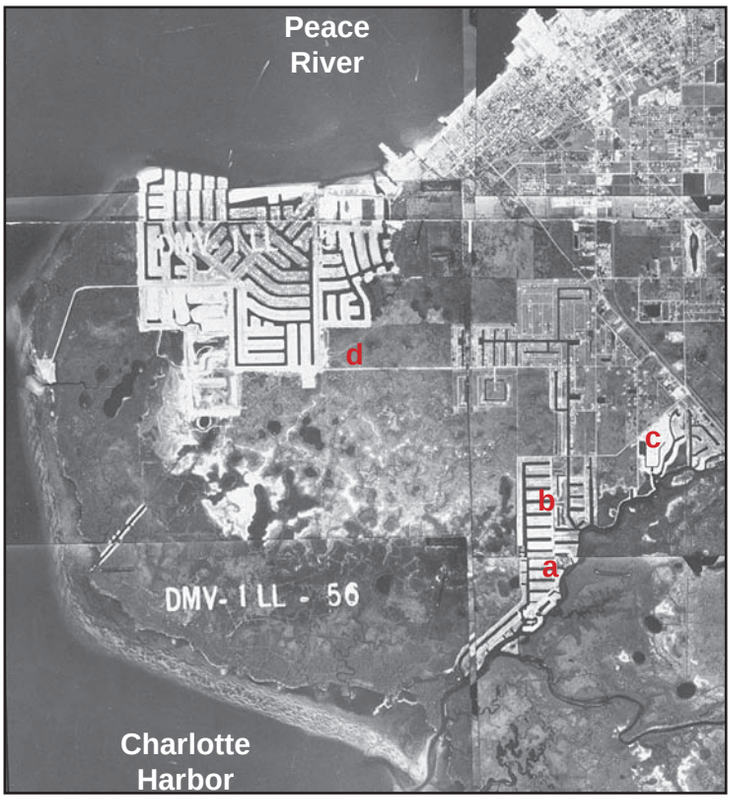


Figure 2B. Punta Gorda Isles, 1972.

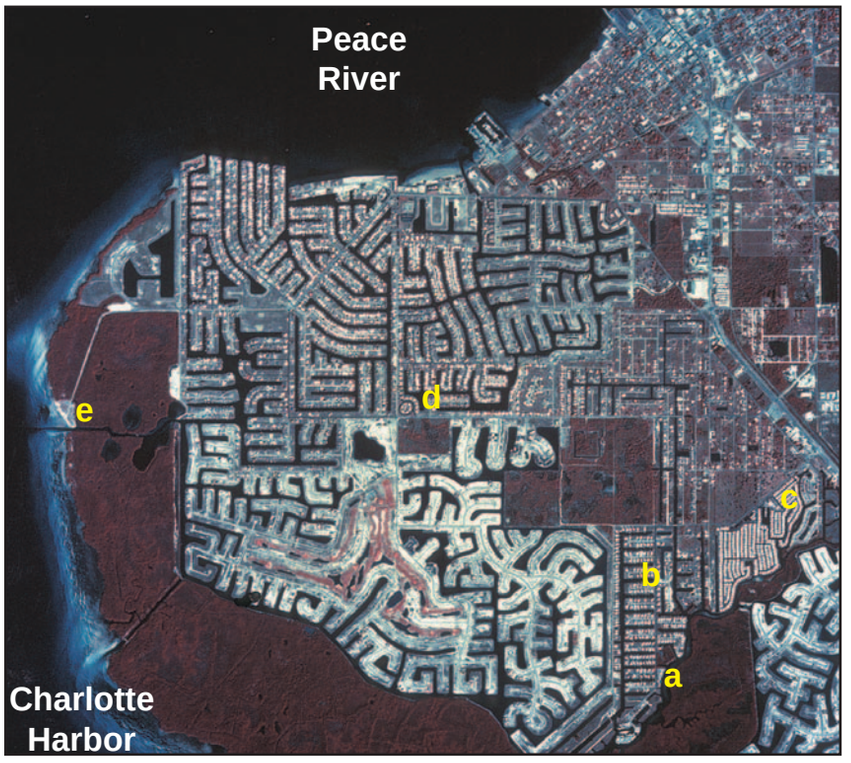


Figure 2C. Punta Gorda Isles, 1995. (False-color Infrared Image)

Punta Gorda Isles

Punta Gorda Isles is illustrative of the most dramatic changes in waterway development — namely, those directly tied to dredge-and-fill — which made land available for residential use. In 1944 (Figure 2A), much of the area was scrub, unimproved pasture, and wetland. By 1972 (Figure 2B), Alligator Creek (a) had artificial canals extending north into Charlotte Park (b) and Riviera (c), while most of the canals north of Aqui Esta Drive (d) in Punta Gorda Isles had been created. By 1995 (Figure 2C), the entire canal system, as its exists today, comprised over 2,000 salt-water parcels with access channels north to the Peace River, or through Ponce de Leon Channel (e) and Alligator Creek (a) to Charlotte Harbor.

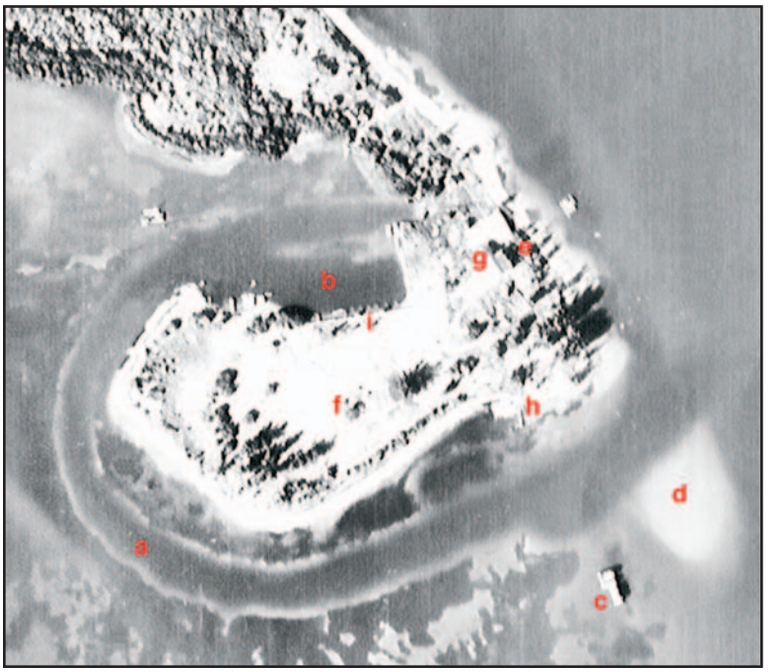


Figure 3A. Punta Blanca, 1944.

Punta Blanca Settlement

Punta Blanca's Settlement, which occupied the south tip of the island until the late 1950s, typifies the smaller, self-contained fishing communities that dotted the Charlotte Harbor shoreline in the early 20th century. Settled by some of the same fishing families that populated Cayo Costa, Boca Grande, and Pine Island, some 15 households lived there in the years preceding World War II. The village included a schoolhouse and general store. Small-boat repairs and fishing were the mainstays of the economy.

The aerial view taken in 1944 shows many features of the historic settlement (Figure 3A). The dredged approach channel (a) and boat basin (b) are prominent elements. Note the fish-house (c) south of the entrance to the approach channel, which was a favorite photo subject of boaters heading down Pine Island Sound channel until it burned in 1995 (Figure 3B). Prop-wash of the run-boats, as they came alongside and serviced the fish-house, created the shoal (d). The boat building shed at (e) had a marine ways used for launching. Other structures shown on the photo are the school (f), general store (g), community dock (h) and out-houses (i).

The settlement had one telephone, connected to Boca Grande by an underwater cable crossing the inlet and overhead wires strung on poles across Pelican Bay. School-age children from neighboring islands were shuttled to and from Punta Blanca until the school burned down in the late 1950s and Lee County terminated boat pickup service.

Today, little remains of this pioneer fishing community (Figure 3C). The site is overgrown with exotic vegetation, mostly Australian pine. The wellhead pipe of an artesian spring that once supplied drinking water rotted out years ago. The dredged entrance channel still accommodates deep-draft boats that venture into the basin and seek shelter from northers during the winter season.


Figure 3C. Punta Blanca, 1999.


Figure 3B. Fish house at Punta Blanca, 1970.

Downtown Ft. Myers Waterfront

Downtown Ft. Myers waterfront today (Figure 4A) is a different world from how it appeared in 1887 (Figure 4B) when Capt. W. M. Black of the Army Engineers undertook the first hydrographic survey of the Caloosahatchee. Only one dock extended into the river from the southwest shore between the Edison home and Billy's Creek. In the 1880s, improvements by the federal government to the lower reach of the river, along with land drainage efforts by private interests in the upper Caloosahatchee valley that allowed growing citrus, provided the basis for downtown waterfront development. Ft. Myers evolved into a shipping hub for outbound produce and incoming agricultural supplies. Docks, such as the City Dock at the foot of Jackson Street and Ireland's Dock off Hendry Street, were elaborate structures extending far out to deep water in the river (Figure 4C). The

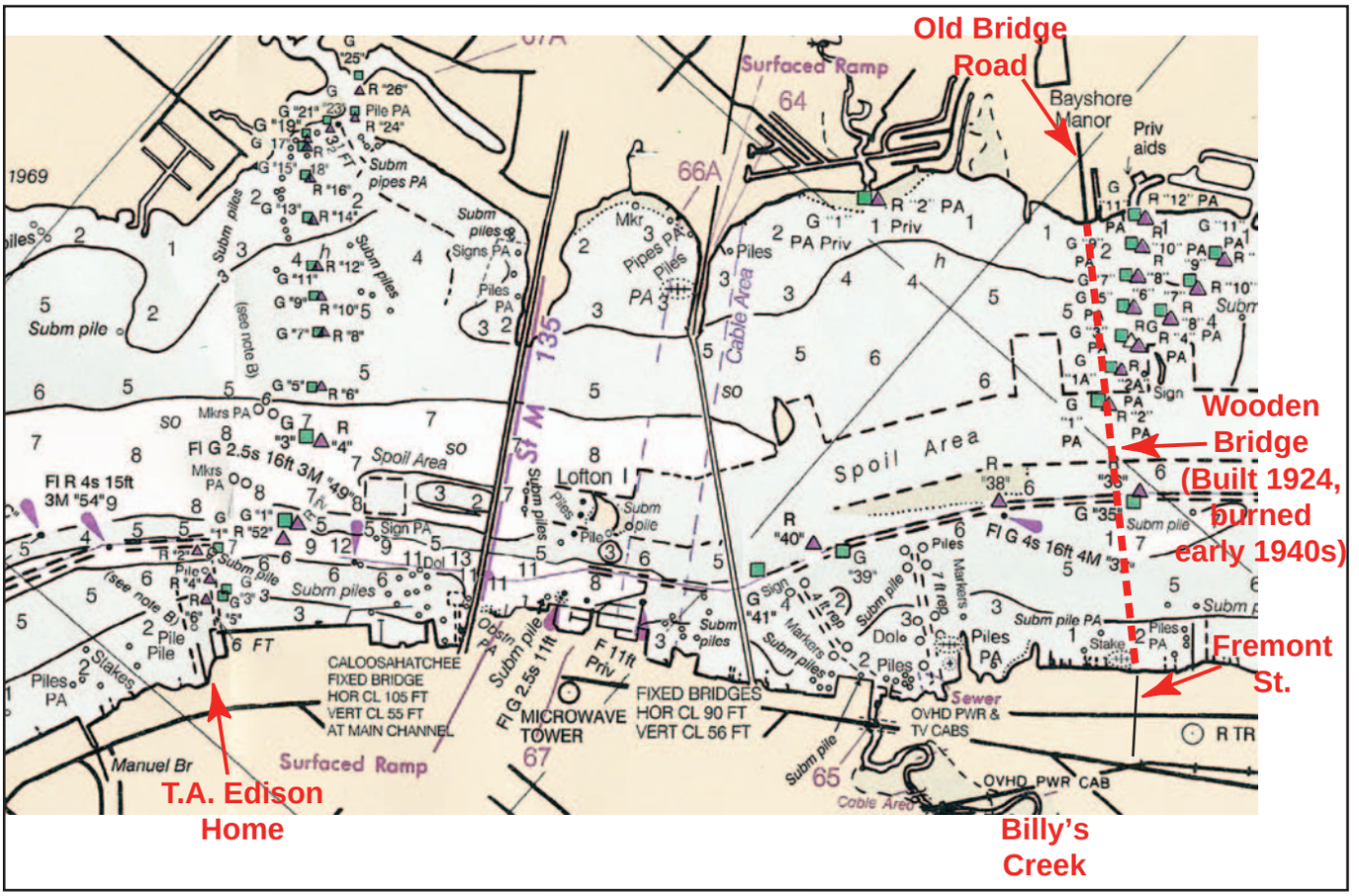


Figure 4A. Downtown Ft. Myers waterfront from nautical chart 11427, 1998.

Figure 4B. Location of Ft. Myers (from U.S. Army Corps map of 1887).

Ice houses were located at strategic points around Charlotte Harbor, near the favorite fishing grounds and in water deep enough for the run boats from the fish companies. The run boat brought a load of ice and exchanged it for a load of fish. Fishers were able to quickly bring their catches to the ice house as soon as they were netted. The run boats also brought groceries and other supplies to the fishers and left them at the ice house to be picked up.

City Dock housed a variety of services, such as a fish market, Chinese laundry, machine shop and boatways. With the arrival of the railroad to Ft. Myers in 1904, rail spurs and packing houses on docks off Monroe Street accommodated produce shipped downriver (Figure 4D). A wooden bridge crossed the river in 1924, upstream from the modern bridges (Figure 4A); it was destroyed by fire in the 1940s.

The 1930s Works Progress Administration (WPA) Depression-era project built the $350,000 Yacht Basin, transforming the historic working waterfront, with its long docks and packing houses, into a recreational boating hub featuring a palm tree-lined park and promenade. A 1940s aerial photograph (Figure 4E) shows the early development of this new waterfront. Bay Street was the closest street parallel to the riverfront. Packing houses at the foot of Monroe Street still existed; a fire destroyed them in the early 1950s. The new Edison Bridge at Fowler Street is visible.

Wooded Lofton Island is in the upper left corner. J.F. Lofton dredged the earlier downtown boat basin (Figure 4F) and created a spoil bank (island), which he claimed by squatter's rights. A 1951 photo (Figure 4G) shows the home of J.L. Hunt on Lofton Island. (Lofton Island is now Pleasure Key.) Today's waterfront (Figure 4H), spanning the Caloosahatchee and Edison (southbound) bridges, includes Centennial Park and the Yacht Basin. More land was filled on the riverfront, and Edwards Drive was built to provide a scenic drive and access to the city's shoreline recreational facilities. The federally maintained Okeechobee Waterway flanks the waterfront and connects downtown Ft. Myers with the U.S. Eastern Seaboard and the Gulf of Mexico.

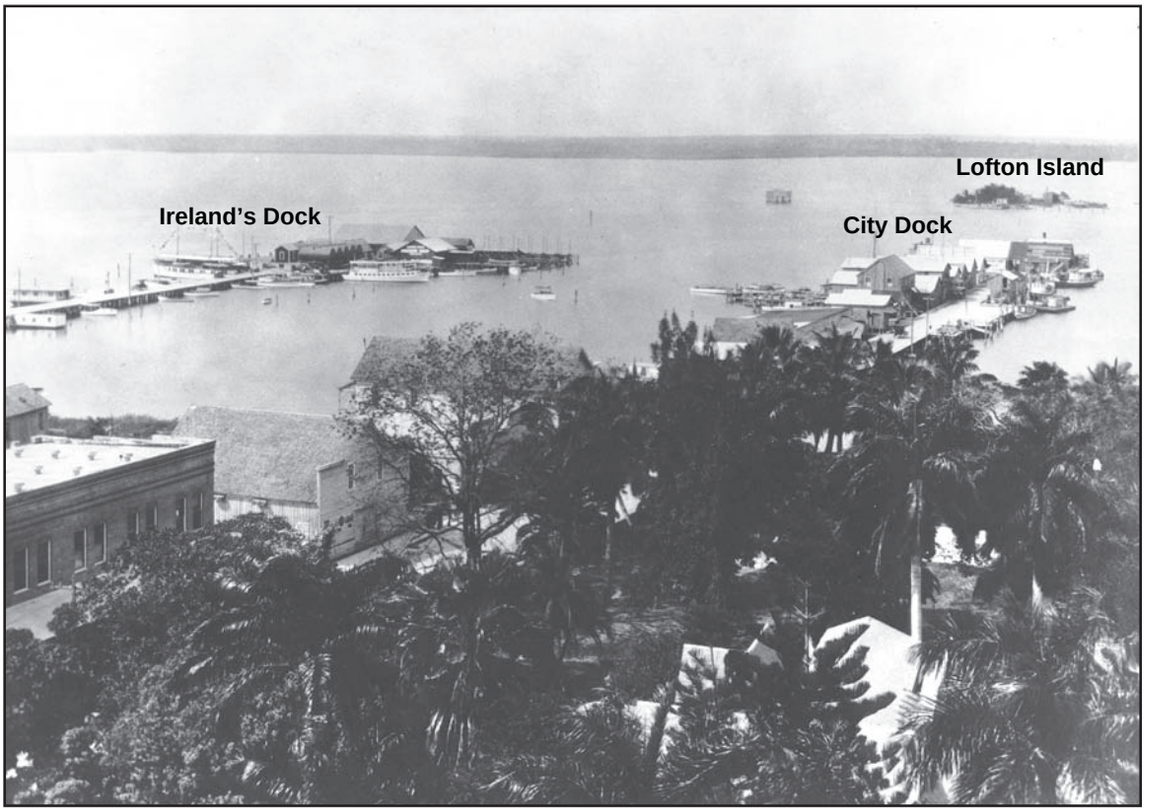


Figure 4C. Ireland's dock and city dock at Ft. Myers, 1914.

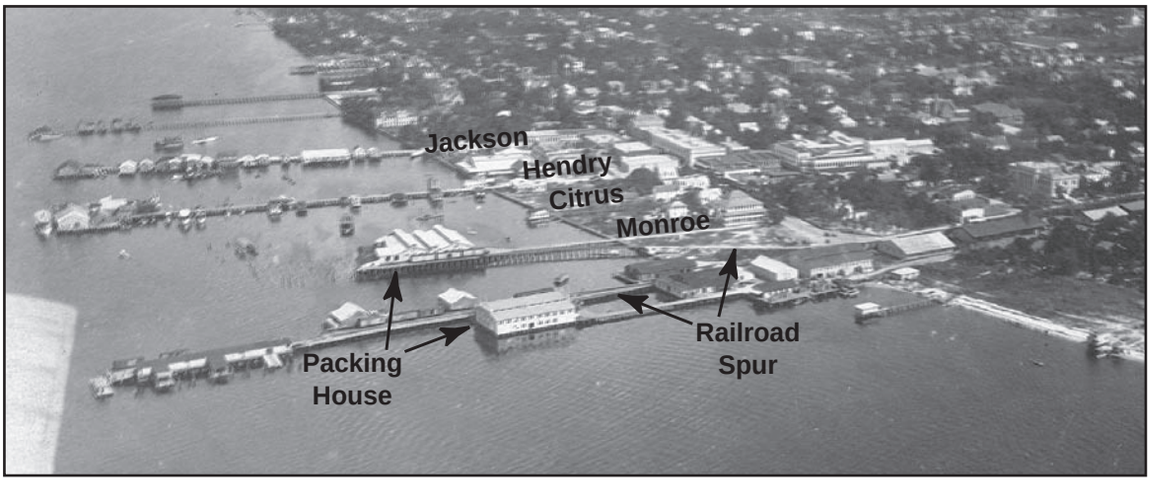


Figure 4D. Packing houses at Ft. Myers, 1929.

Figure 4E. Downtown Ft. Myers waterfront, 1940s.

Figure 4F. Downtown Ft. Myers waterfront, 1929.

Figure 4G. J. L. Hunt home on Lofton Island, 1951.

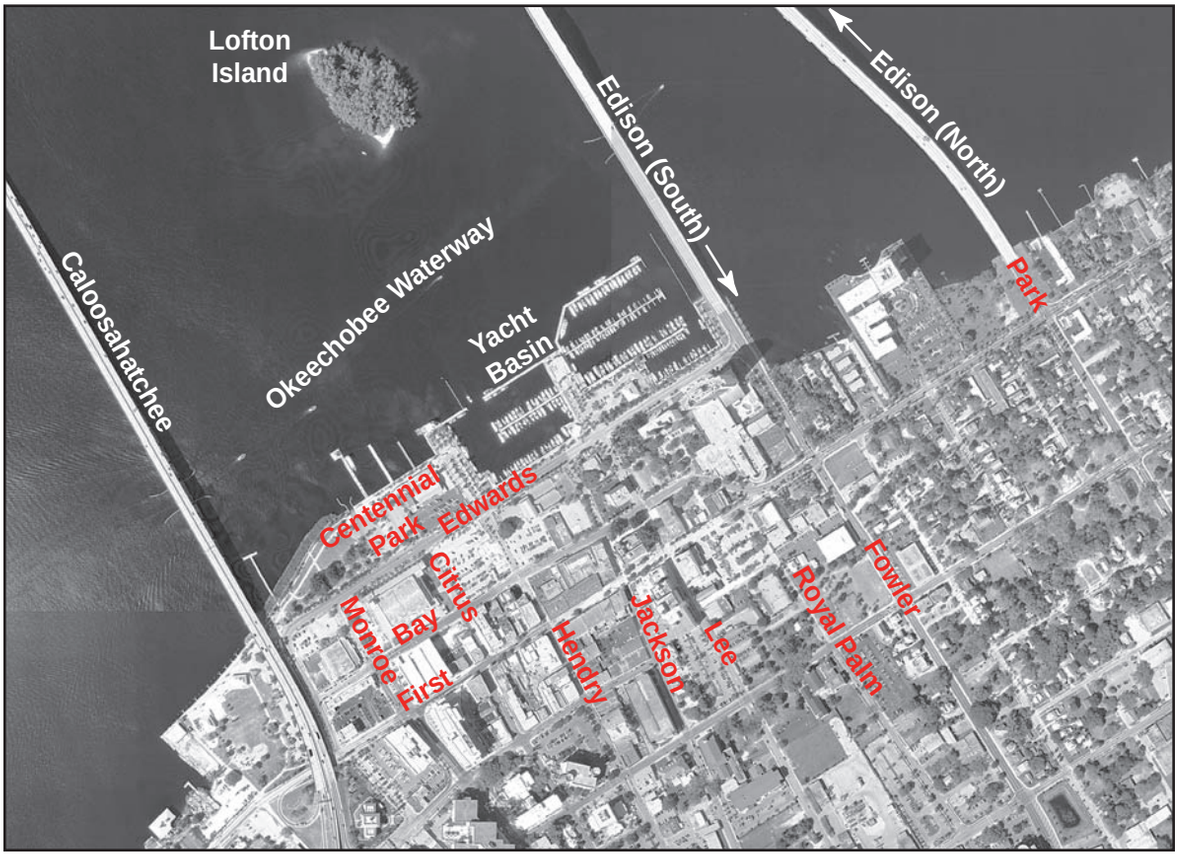


Figure 4H. Downtown Ft. Myers, 1998.

Yacht Club Colony

Aerial photographs show 1940s (Figure 5A) and 1998 (Figure 5B) conditions. Daughtrey Creek, a tributary of the Caloosahatchee, is a meandering stream with numerous distributary (interlocking) channels, which forms a delta as it approaches the river. The surrounding area in the 1940s was scrub and brushland vegetation used for extensive cattle grazing, with no visible habitation. The light-colored intersecting lines running north–south and east–west in Figure 5A are square-mile "sections" of townships (divisions of the U.S. Land Office Survey) and probably represent cleared, unpaved tracks. Figure 5B shows the multiple canal system, Yacht Club Colony, with some 200 residential parcels. The main entrance channel (a) has been dredged and linked to use Daughtrey Creek as the trunk artery (b) for a series of dredged finger canals (c). A second entrance channel (d) connects with a single finger canal (e) running north from the river. Most of the canals were dredged to 6 feet or less. However, those on either side of Cape Way (f) reach depths of 9 to 15 feet, likely to supply fill for building up the land surface to a higher elevation.

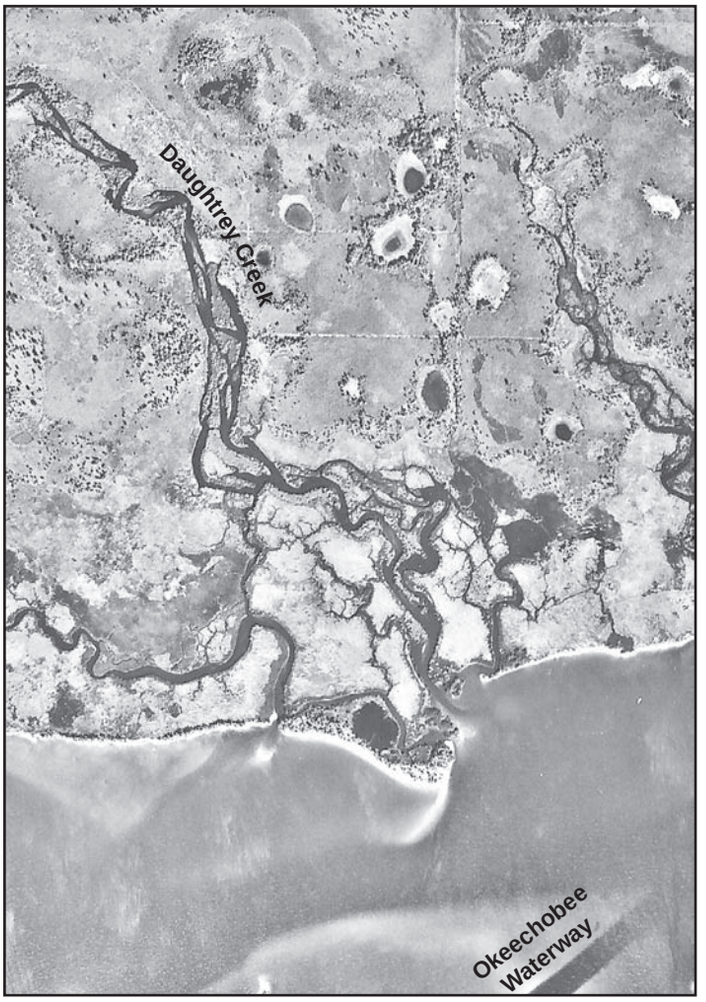


Figure 5A. Location of Yacht Club Colony, 1940s.

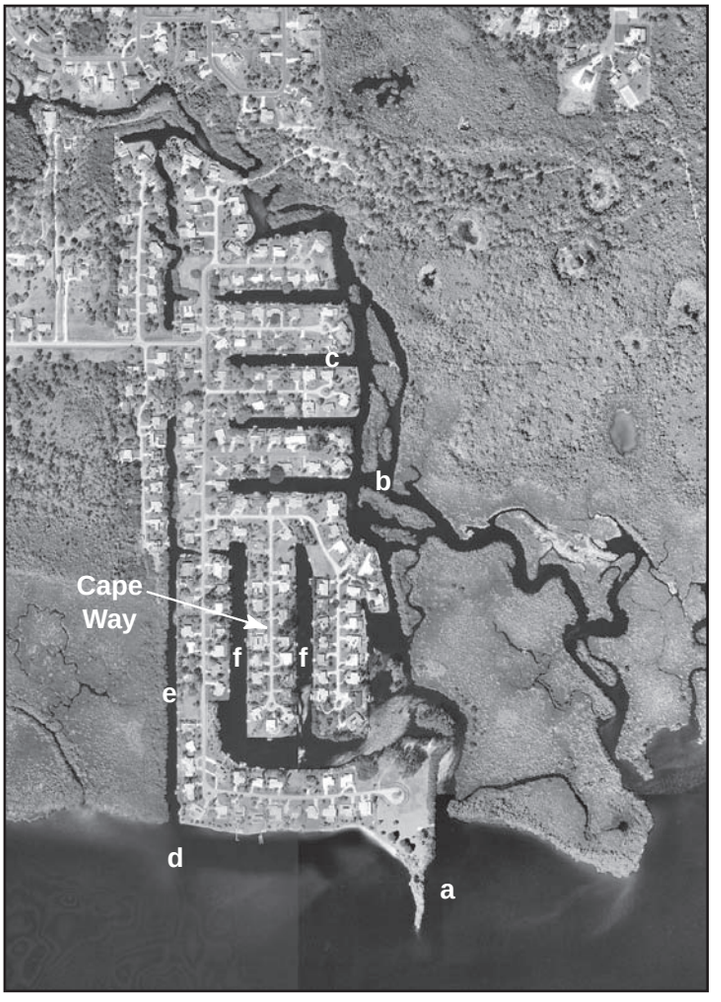


Figure 5B. Yacht Club Colony, 1998.

Figure 6A. San Carlos Island and Ft. Myers Beach, 1940s.

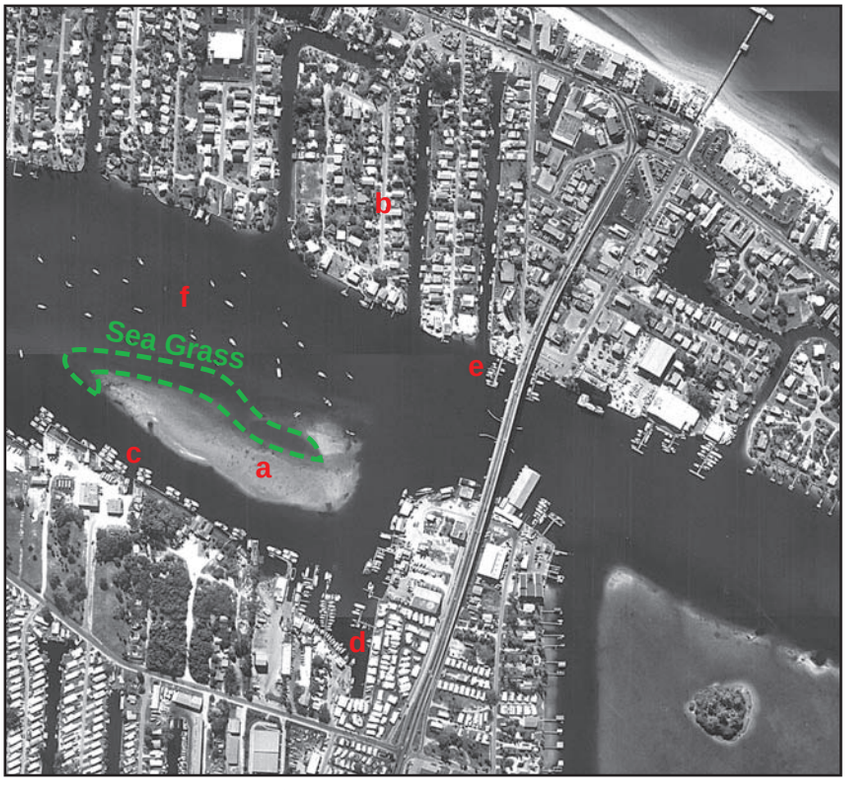


Figure 6B. Ft. Myers Beach, 1992.

San Carlos Island and Ft. Myers Beach

The low, oblique aerial photograph taken in 1940 (Figure 6A) shows Matanzas Harbor before arrival of the large-scale shrimp trawler fleet operations at San Carlos Island. Note the net spreads drying on platforms built on the mud flat (a). Much of the traditional bay fishing of this era was for mullet, with fishers using small skiffs either poled or powered with outboard engines. Also, note the many vacant lots lining the finger canals on Ft. Myers Beach (b). The 1992 photograph shows some remarkable changes (Figure 6B). There are many docks, two or more boats rafted alongside each other, lining the San Carlos shoreline (c). This is the shrimp trawler fleet. There is an absence of any structures on the mud flat (a). Most of the Ft. Myers Beach finger canal lots have homes (b). A number of full-service marinas (d) and waterfront restaurants with transient docks (e) cater to recreational boaters. The harbor also serves as an anchorage (f) for transiting boaters, accommodating upwards of 100 boats during the winter season. (The town of Ft. Myers Beach is in the process of developing an anchorage management plan).

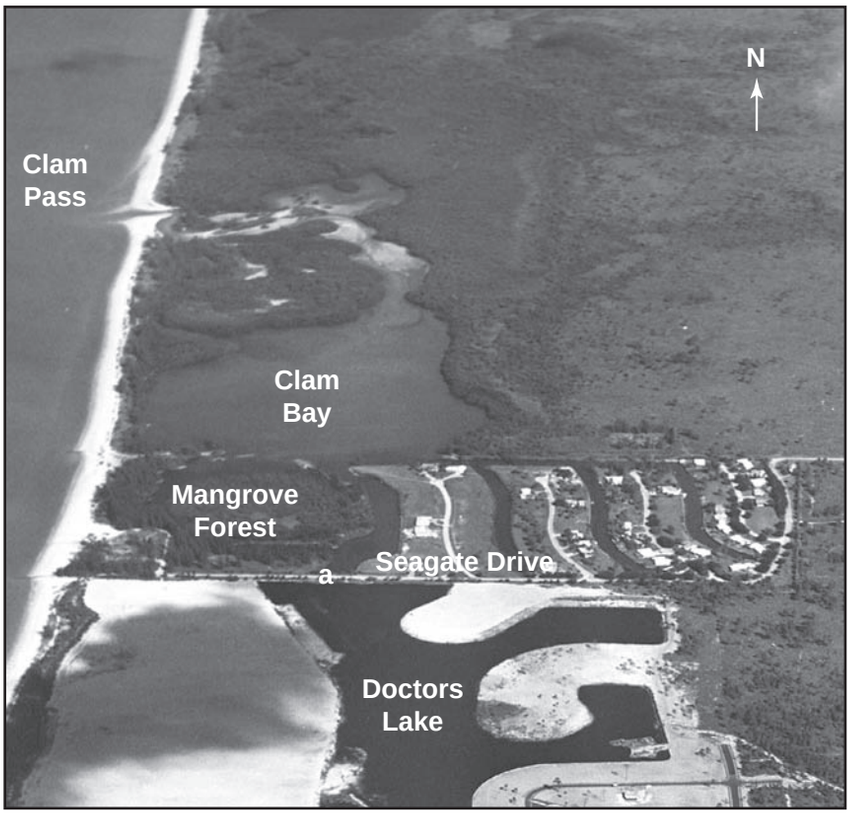


Figure 7A. Seagate Drive, Naples, 1958.

The Moorings, Doctors Bay

Pre–development (1958) conditions included Doctors Pass, a small natural tidal inlet subject to migration and closure, which fed relatively open water back-bays fringed by mangroves and connected to Clam Bay to the north. Collier County, in 1958, constructed Seagate Drive (Figure 7A, a) and effectively severed tidal flow between Doctors and Clam Passes; culverts built in 1976 to reconnect the back-bays have done little to improve flushing. Beginning in 1959, Moorings Development Company of Canada began large-scale improvements, including removal of the mangrove fringe, deep dredging of the bay to create spoil for land fill, construction of seawalls along the entire perimeter of the bay, and straightening, jettying, and dredging Doctors Pass. Figure 7B shows the extent of this comprehensive development, which dramatically altered the natural system, in the 1970s.

The jetties (b) at Doctors Pass interrupt south-flowing longshore transport of beach sand, which contributes to deposition along the north jetty and creation of an offshore shoal, a hazard to navigation. Maintenance dredging periodically alleviates this problem. The beach south of the jetties is starved of beach sand, which has led to the placement of a groin field (c) to catch and retain drifting sand.

Single-family residences (d) line the east side of Doctors Bay, while the west side accommodates multi-family residences and high-rise residential condominiums. The population fluctuates seasonally.

Figure 7B. Doctors Bay, Naples, 1970s.

Port Royal, Aqualane Shores, and Royal Harbor, Naples

The 1930 hydrographic chart (Figure 8A) shows mangrove and swamp covering much of today's exclusive finger-canal residential areas that border Naples Bay. But, even then, a canal (red-line) had been dredged in Aqualane Shores. Though some development occurred just before World War II in the Port Royal subdivision, the 1950s signaled massive finger-islanding in Aqualane Shores, Royal Harbor, and Port Royal (Figure 8B). Figure 8C shows dredging operations during 1950 at Aqualane Shores. Note the suction dredge (a) transferring slurry by pipeline (b) to upland sites (c). The pre-1930 canal, shown in Figure 8A, is at (d). By 1969, all of the canals had been dredged and seawalled, and much of the building was well under way in this region of exclusive, single-family residences (Figure 8D).

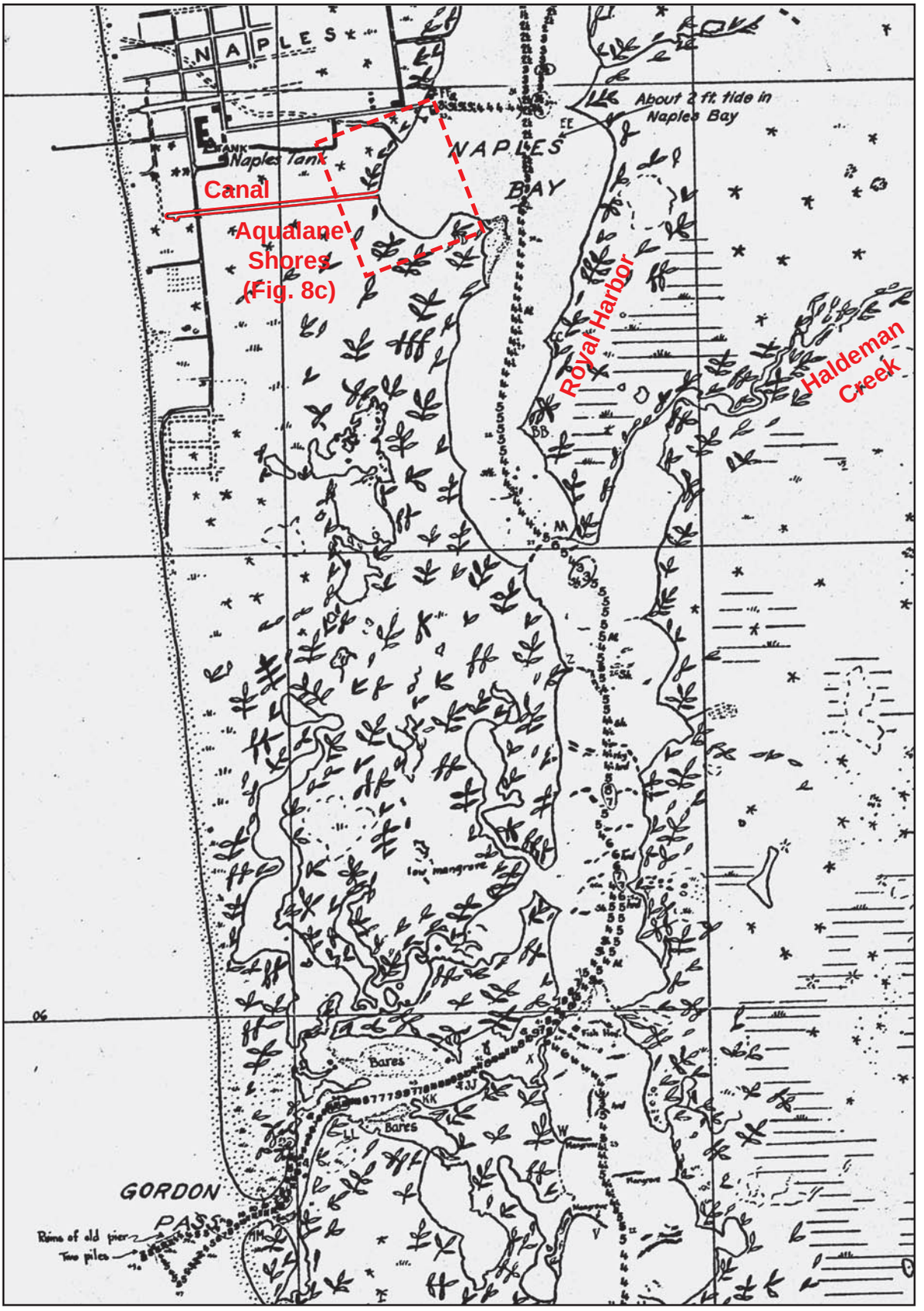


Figure 8A. Naples Bay, 1930, (from H-sheet 5067).

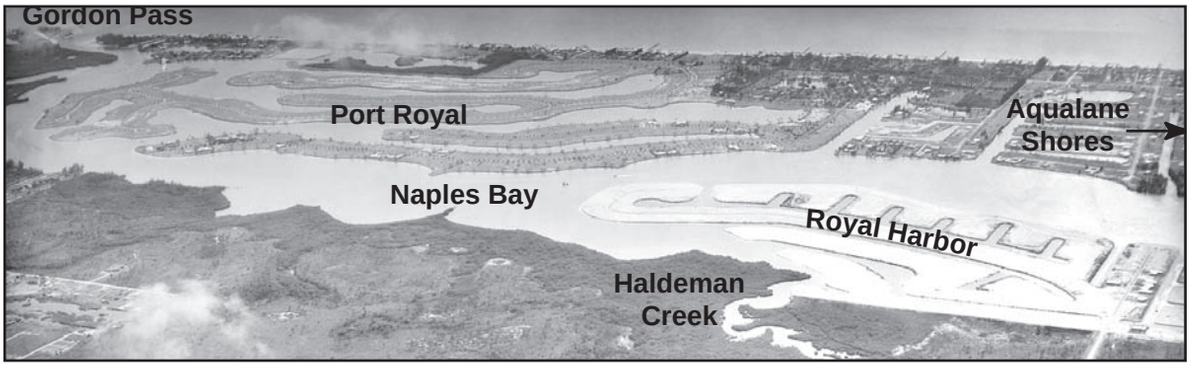


Figure 8B. Naples, 1959-60: Port Royal and Royal Harbor.

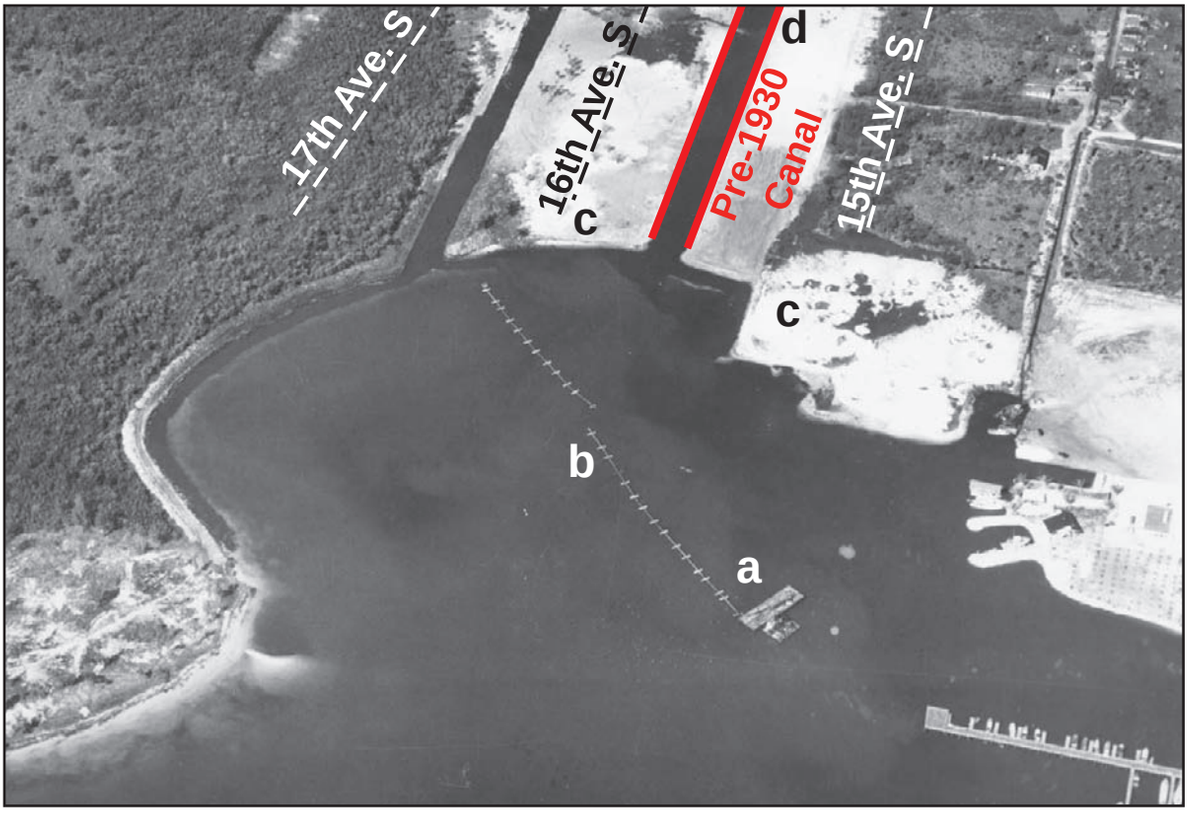


Figure 8C. Dredging at Aqualane Shores, 1950.

Figure 8D. Port Royal, Royal Harbor, and Aqualane Shores, 1969.

Waterway at Shell Bay and John's Pass

The hydrographic chart of 1930 (Figure 9A) and a 1952 aerial photograph (Figure 9B) show both naturally occurring and human-induced changes in waterway conditions. John's Pass (a), a "wild," wave-dominated inlet, shows a north-trending recurved spit with barely open channel conditions on the 1930 chart. This inlet had a history of openings and closures. By 1952, the inlet had closed; it is believed to have opened briefly with the passage of Hurricane Donna in 1960, but closed shortly thereafter.

The Naples–Marco waterway (Figure 9A, b) was in a natural condition when the Coast Survey mapped the area in 1930. Numerous oyster bars impeded boat traffic. Local interests made some improvements in the 1930s, but the federal government assumed responsibility in 1940 and systematically dredged the waterway. The dredged material, or spoil (Figure 9B, c), was placed side-cast and parallel to the channel, on the fringing mangroves, creating a linear northwest-southeast trending series of conical hillocks, where upland exotic vegetation is now the predominant cover.

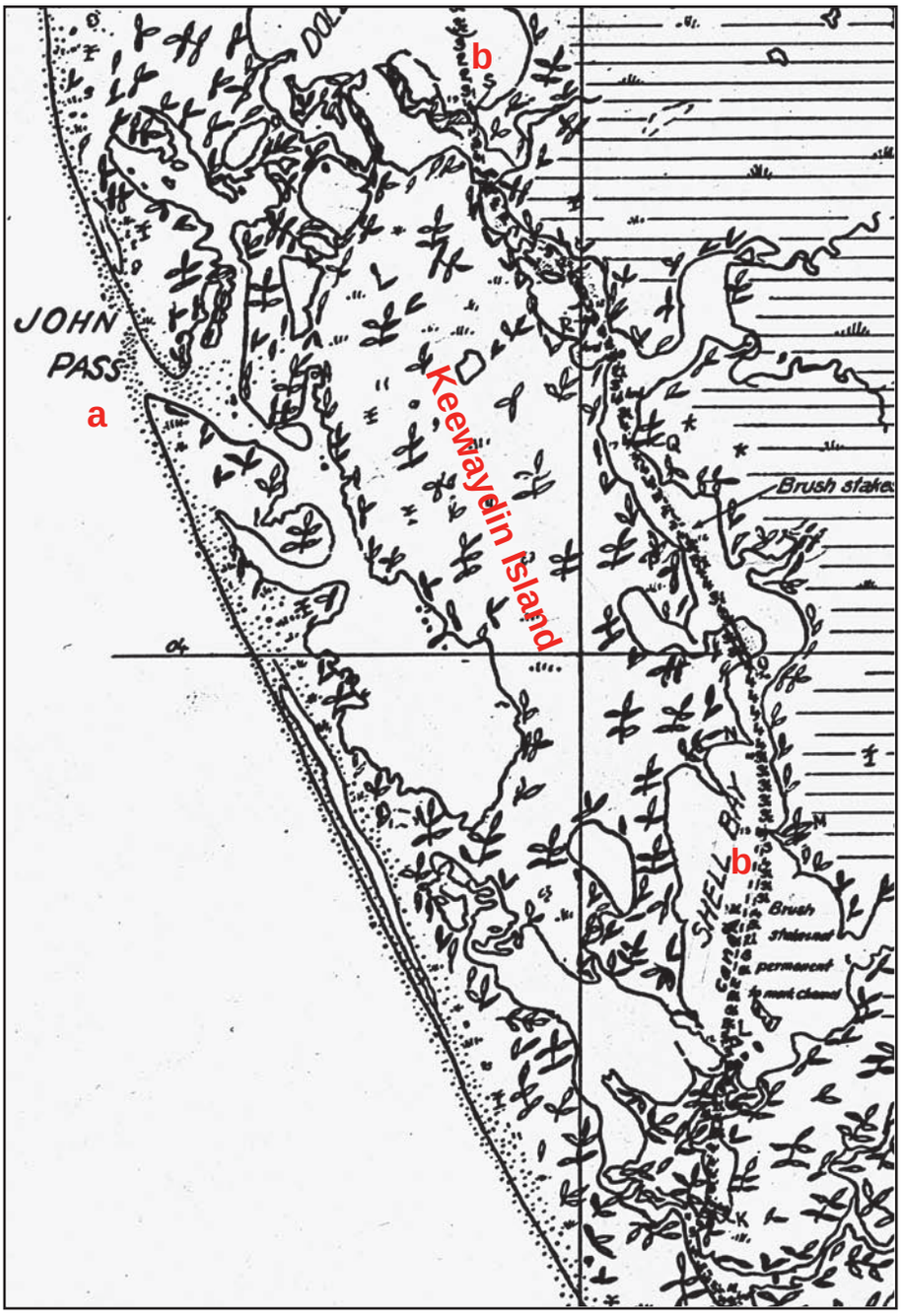


Figure 9A. Shell Bay and John's Pass, 1930, (from H-Sheet 5067).

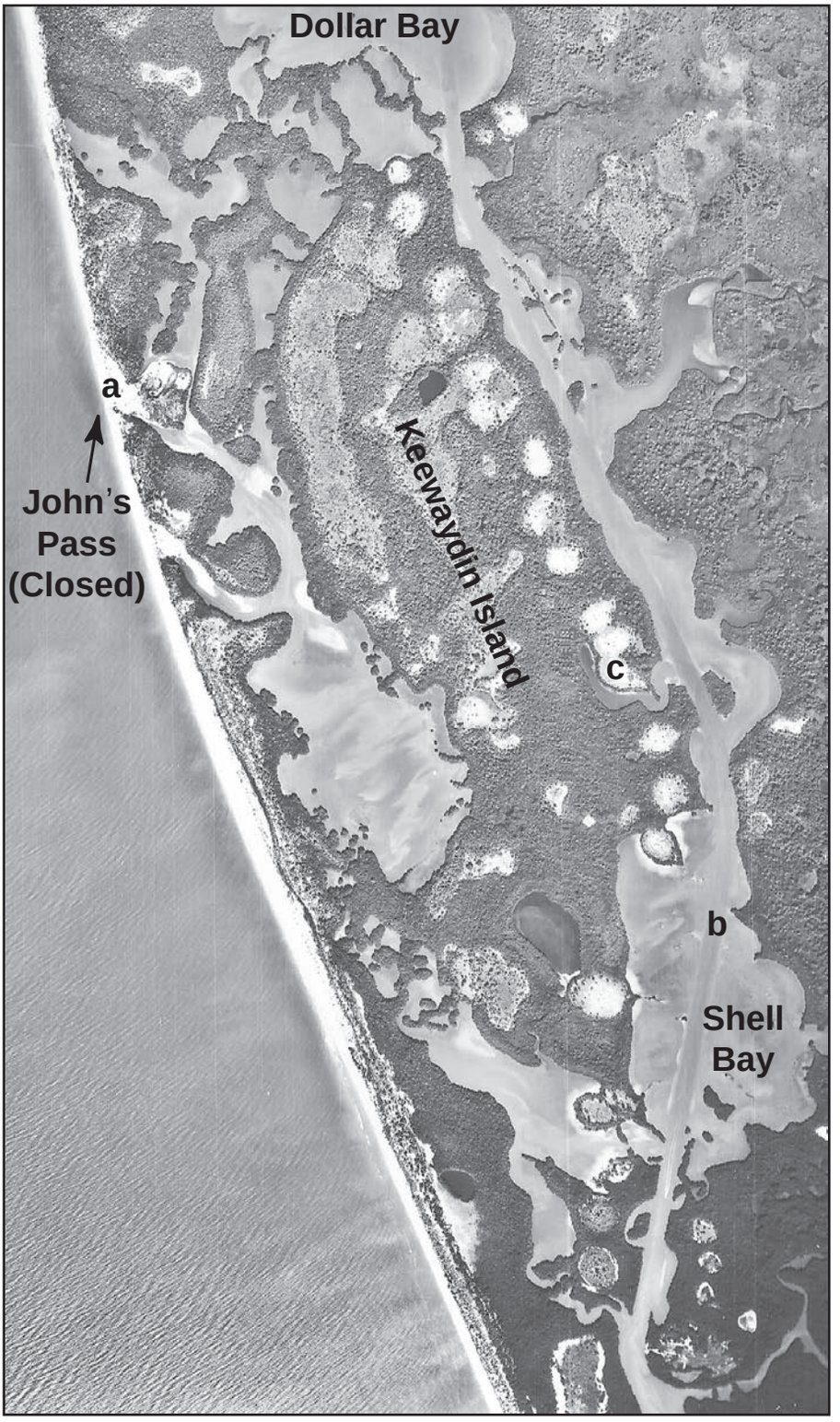


Figure 9B. Shell Bay and John's Pass, 1940s.

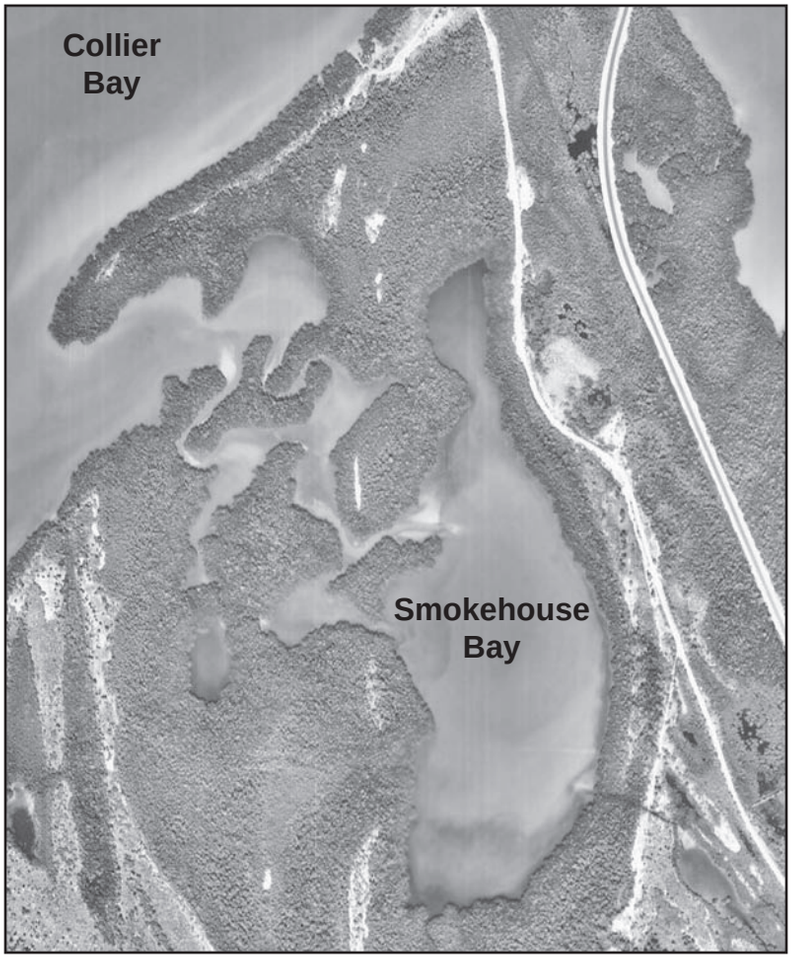


Figure 10A. Smokehouse Bay, 1952.

Smokehouse Bay

Smokehouse Bay is a back-bay of Collier Bay, which is located west of Marco Village and connects with the mouth of the Marco River at Big Marco Pass. Smokehouse Bay in the pre–development period encompassed an extensive intertidal area, which was a prime breeding ground for mosquitoes (Figure 10A). An initial step in dredge-and-fill operations was to build a dike around the construction site and seal it off from tidal fluctuations, thus eliminating a critical larval breeding requirement. An aerial photograph taken in October 1976 (Figure 10B) shows dikes at (a). A suction dredge is operating at (b). Figure 10C shows the dredge (b) and pipeline (c), which was operating near the intersection of North Collier Boulevard and Tigertail Court. Slurry, dredged from Smokehouse Bay, is being deposited at upland sites (Figure 10B, d). The final dredge-and-fill construction stage included filling a land-bridge at Giralda Court (e) and removing the dike at the distal end of Tigertail Court (Figure 10D, f). Figure 10D shows waterway conditions upon completion of dredging and home construction.

Figure 10B. Smokehouse Bay, 1976.

Figure 10C. Dredging in Smokehouse Bay, 1976.

Figure 10D. Smokehouse Bay, 1992.

Clam Bay

Prior to development, a tidal creek (Figure 11A, a), often not more than mid-thigh deep, connected Clam Bay to the Gulf of Mexico. Mangrove forest (b) surrounded Clam Bay. The natural drainage system to the Gulf, which periodically closed was augmented in the canal development process with two new water connections (Figure 11B), through Smokehouse Bay (c) and Collier Bay (d), both of which drain into the Marco River. The 1976 aerial photograph (Figure 11C) shows an intermediate stage in the development process, with Clam Bay sealed off from tidal exchange and seawalls (e) constructed around the perimeter. The upland behind the seawalls would be gradually filled in: Kendall south of Hernando is filled with recent spoil (white on photo), whereas Kendall north of Century still retains some of the mangrove fringe. In its final development stage (Figure 11D), Clam Bay is completely lined with sea walls and surrounded by single- and multi-family residences.

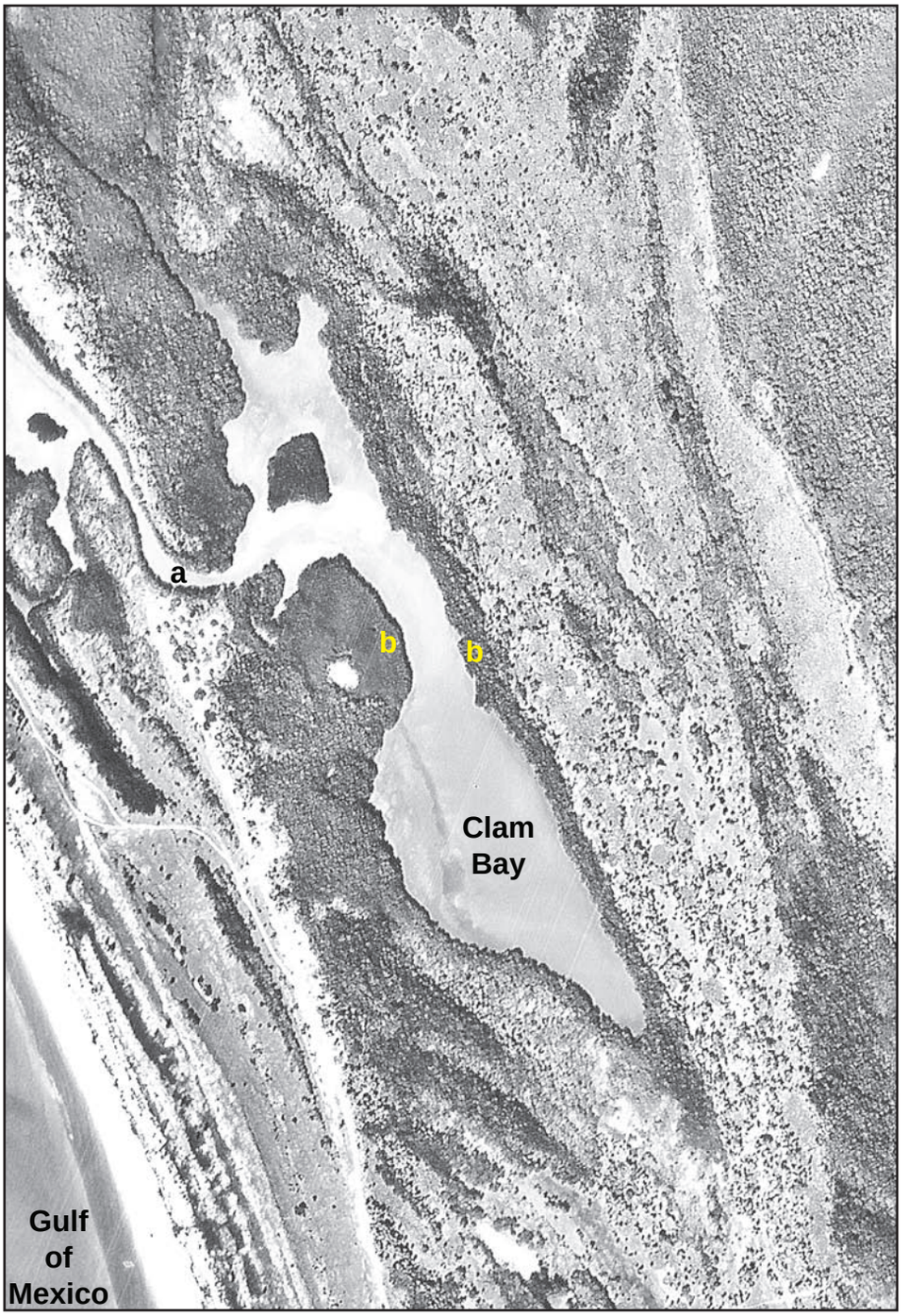


Figure 11A. Clam Bay, 1952.

Figure 11B. Clam Bay drainage, 1992.

Figure 11C. Clam Bay, 1976.

Figure 11D. Clam Bay, 1992.