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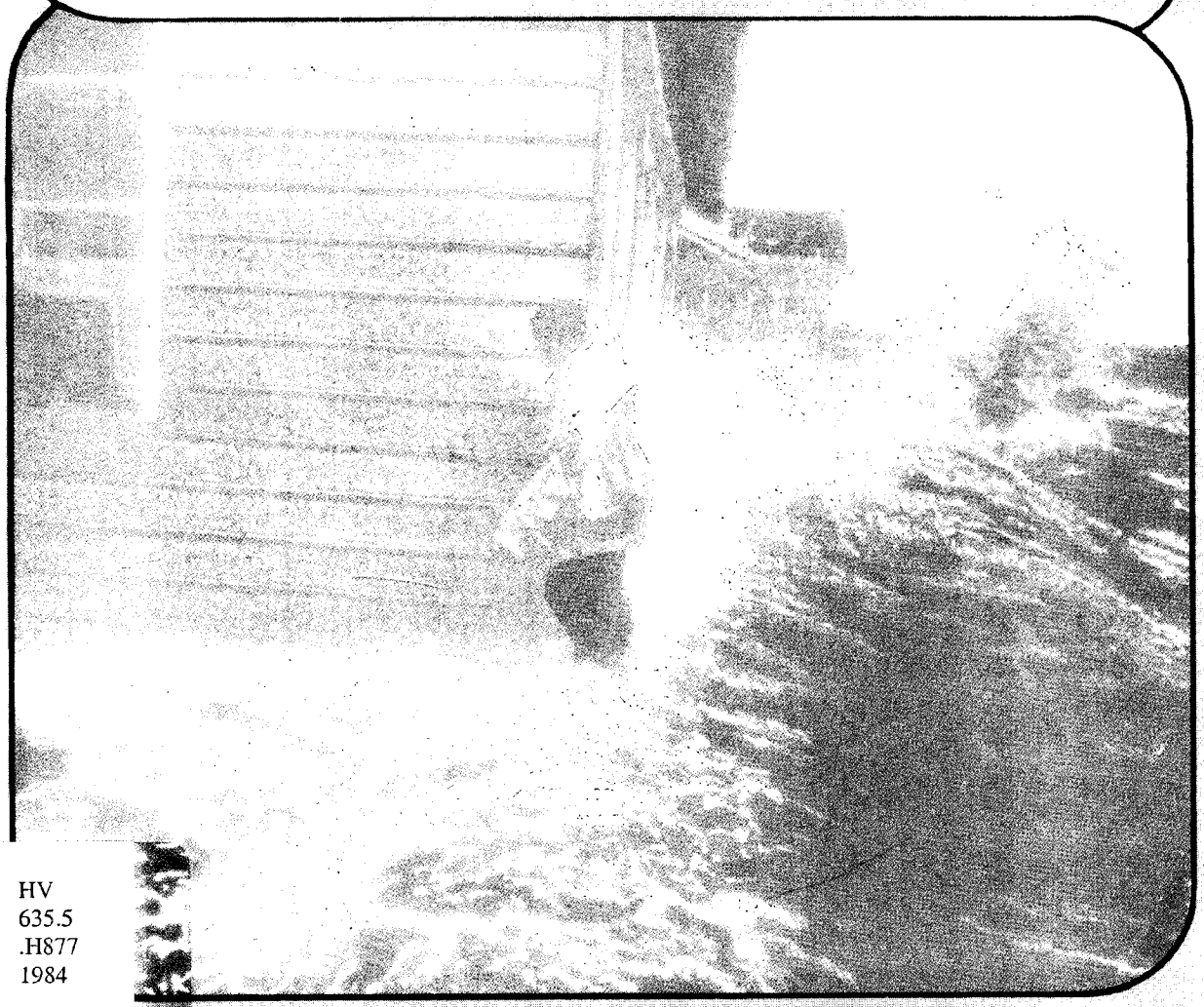
Mitigation and Assistance



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HURRICANE LOSS STUDY 1984

Mitigation and Assistance

Photograph of Hurricane Donna 1960-courtesy of Fort Myers News-Press

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INTRODUCTION

Hurricanes can have devastating effects upon a community, in terms of loss of life as well as property damage, unemployment and other economic impacts. Although loss of life due to hurricanes has declined in recent years, property damage has continued to increase drastically. Potential damage is especially great due to rapid population growth and location of buildings in coastal areas that are vulnerable to hurricane damage. In Southwest Florida, where 95% of the residents live in coastal areas,[1] this is particularly true.

The initial Hurricane Loss Study[2] provided an analysis of the economic consequences of potential hurricanes in Southwest Florida, including potential property loss, employment loss and loss to other important sectors of the economy, such as agriculture. Losses can be extremely significant, totaling billions of dollars. This report, the second phase of the Hurricane Loss Study, will formulate policies and strategies to mitigate these impacts or prevent them.

SCOPE AND OBJECTIVE OF THE STUDY

The goal of the second phase of the Hurricane Loss Study is to establish long-range strategies for hurricane response and recovery to be followed by Federal, State and Local disaster assistance organizations. In addition, it will provide geographically specific hurricane hazard mitigation policies both for future development and post-disaster redevelopment for use by local planning agencies and disaster assistance agencies at the local, state and federal levels. The policies are intended to guide future development in ways that reduce or eliminate future property damage caused by hurricanes.

The study is divided into two distinct portions; the first addresses allocation of post-hurricane resource assistance while the second develops mitigation policies. Specific tasks that were accomplished in the first portion of the study (Long-Term Response/Recovery Plan: Allocation of Post-Hurricane Resource Assistance) include a description of disaster relief programs and needs for these programs, divided into the following:

* An assessment of field assistance which includes potential locations for both disaster assistance centers and disaster field offices.

* An inventory of temporary housing stock for potential use after storms, as well as the demand for assistance from temporary housing programs.

* The need for programs for individuals and businesses.

* The need for assistance to local governments.

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[1] Southwest Florida Regional Planning Council, Southwest Florida Economy 1982, SWFRPC, p. 19.
[2] Southwest Florida Regional Planning Council, November 1982.

Tasks accomplished in the second portion of the study (Hurricane Hazard Mitigation Policy Plan: Prevention of Future Loss) include the formulation of specific policies to guide future development and post-disaster redevelopment in ways that reduce or eliminate future property damage due to hurricanes. Specific tasks follow:

* The development of regionwide hurricane hazard mitigation policies to guide future development in identified vulnerable areas.

* The development of a methodology for reviewing future development projects that gauges the impact of their vulnerability to hurricane hazards.

* The identification of potential sites in the Region suitable for the relocation of land uses including damaged housing, water facilities, wastewater treatment facilities, electric facilities, and transportation facilities.

* The identification of potential sites in the Region suitable for the location of future hurricane-vulnerable development

* The identification of high hazard sites for future public acquisition.

* The identification of applicable growth management tools or mechanisms that local governments could use to promote the location and relocation of hurricane-vulnerable development.

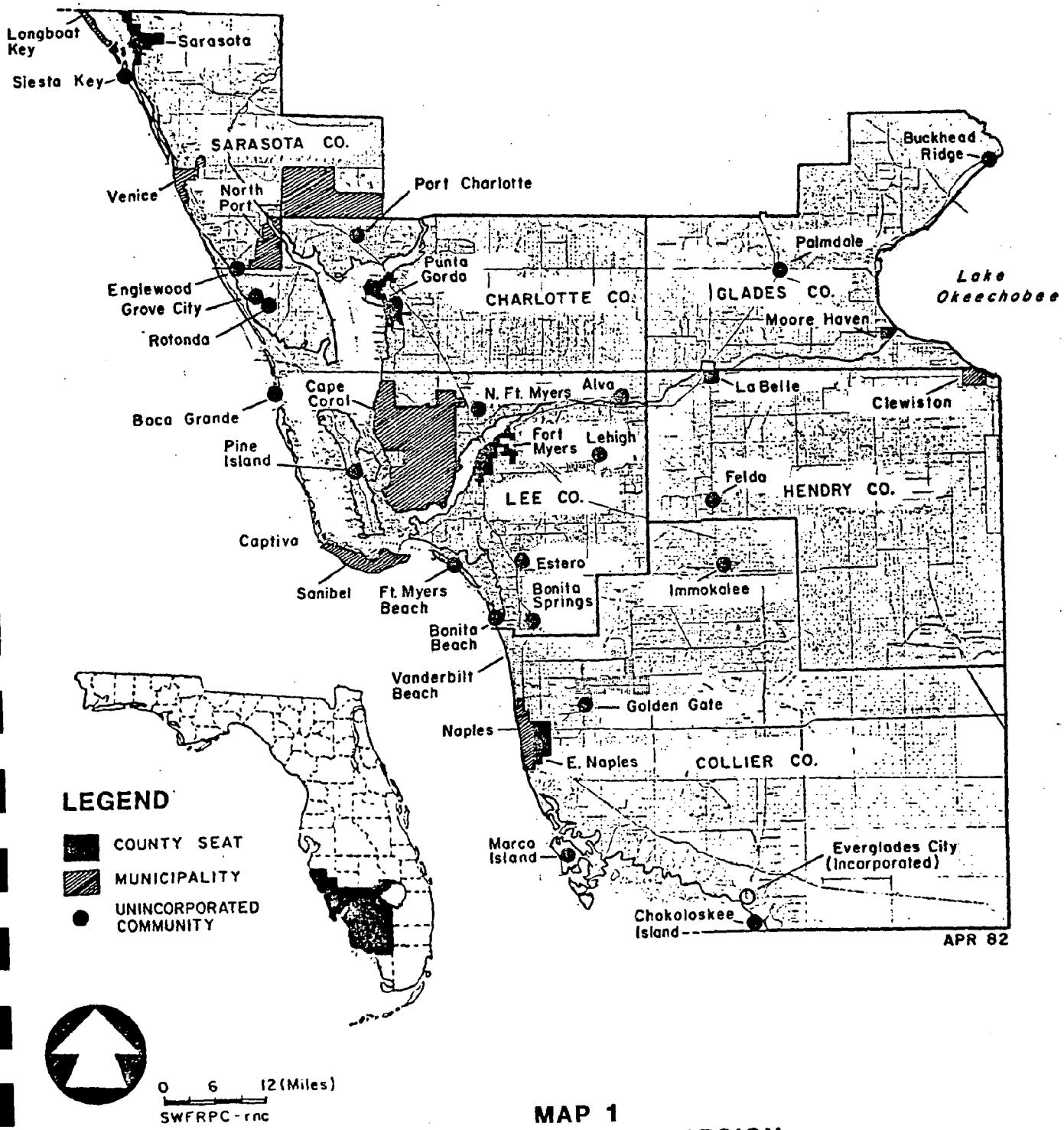
STUDY AREA

The Southwest Florida Region includes the six counties of Charlotte, Collier, Glades, Hendry, Lee and Sarasota, and their thirteen municipalities (See Map 1). The Region encompasses 6,021 square miles, including approximately 1,676 miles of coastal shoreline. Four of the six counties (Charlotte, Collier, Lee and Sarasota) border the Gulf of Mexico while the two inland counties of Glades and Hendry are located adjacent to Lake Okeechobee.

Population in the Region has grown rapidly over the past decade, especially in the coastal counties, where population has more than doubled since 1970. This rapid population growth and consequent development in low-lying coastal areas could result in potentially great destruction from hurricanes.

PRIOR AND FUTURE PLANS

All plans are based upon the Regional Hurricane Evacuation Plan, published by the Southwest Florida Regional Planning Council in November, 1981 and updated in July, 1983. This was a quantitative regional hurricane evacuation plan designed to be used by local governments in the six-county area during emergencies. This plan defined the geographic vulnerability zones which are used in the Hurricane Loss Study.



MAP 1
SOUTHWEST FLORIDA REGION

The Hurricane Loss study, published in November, 1982, was the first portion of the Hurricane Loss and Contingency Planning Study. The first such study completed in the United States, it addressed the economic impacts of various types of hurricanes, by vulnerability zone. The second phase of the Hurricane Loss Study addresses ways to mitigate potential damages that were addressed in the first study.

REPORT ORGANIZATION

Phase II of the Hurricane Loss Study is divided into two major portions. The first quantifies needs for various types of assistance after a hurricane, while the second part addresses ways of implementing or mitigating the potential damages that have previously been quantified, through various methods and recommended policies.

This report is divided into several chapters. In the first section, the methodology used in the study is described. Second, field assistance is discussed. Major disaster-related assistance programs are examined. Temporary housing needs and programs are also evaluated, as well as the need for individual assistance to families and businesses. Finally, assistance to local governments is described. In the second half of the study, a methodology for reviewing future development projects in relation to hurricane impacts is developed. Next potential sites for relocation of different types of land uses are identified, and sites for the location of future hurricane-vulnerable development are assessed. Potential sites for future public acquisition are also reviewed. In addition, various growth management techniques to mitigate potential hurricane losses are examined. Finally, policies for hurricane mitigation are provided.

PLAN COORDINATION AND REVIEW

Coordination was a integral part of both phases of the Hurricane Loss Study. Numerous agencies were involved in this effort, in various stages of plan preparation and review. Meetings of the Regional Disaster Preparedness Advisory Committee were held throughout the project's development to review various facets of the plan. Invaluable assistance and suggestions were submitted by county civil defense and disaster preparedness offices, as well as by local government planning departments and the Red Cross.

Coordination was also maintained with agencies outside the Region, including other Regional Planning Councils, as well as State offices.

A list of agencies involved in the development of the Plan is provided in Appendix A.

METHODOLOGY

The methodology used to determine the needs for various types of assistance is based upon the methodology employed in the initial Hurricane Loss Study. Potential losses (and potential needs) are quantified for each of five different types of storms (categories 1-5 on the Saffir Simpson Scale), ranging from minimal to extreme. Thus, a range of assistance can be estimated for each type of program. Vulnerability zones have been defined for the coastal counties, based upon the expected levels of flooding (see Maps 2-5). Once these zones were defined, projected dollar losses were estimated for each zone. Then, the need for assistance was quantified based upon these projected losses. Specific methodologies are described in individual chapters.

SUMMARY OF HURRICANE LOSS STUDY (PHASE I)

The initial Hurricane Loss Study demonstrated that the majority of land in the Region is located in areas vulnerable to hurricane flooding, especially in Charlotte, Collier and Lee Counties. Even areas that are not subject to saltwater flooding are subject to damage from sustained rainfall (freshwater flooding) and wind impacts. In addition, most structures (especially residential) are located in the most vulnerable areas.

Dollar losses from potential storm damage could be significant, according to the Hurricane Loss Study. Building damage accounts for the greatest type of damage by far, amounting to 84% of the total damage in all types of storms. Figure 1 illustrates the relative importance of three major types of damage in the Region.

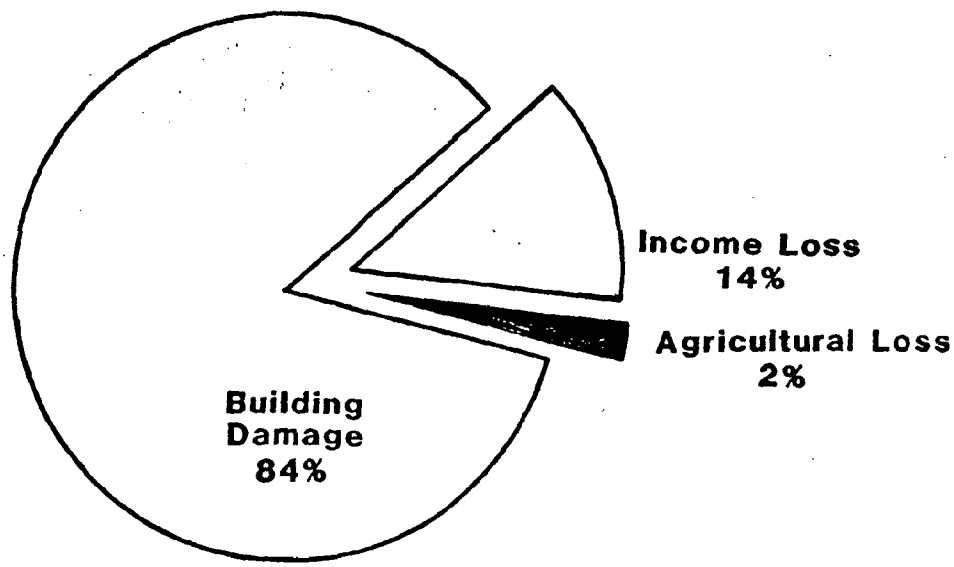
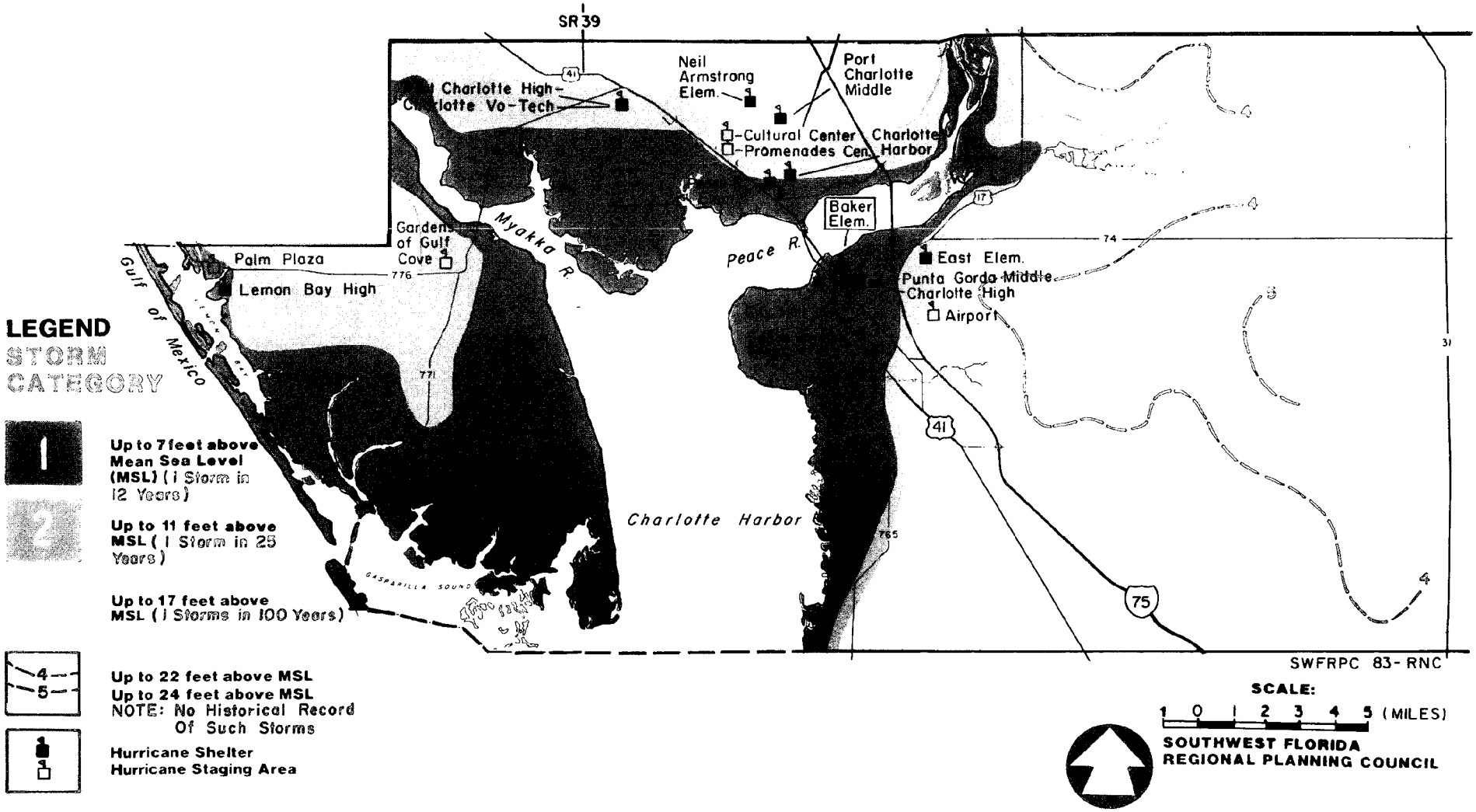
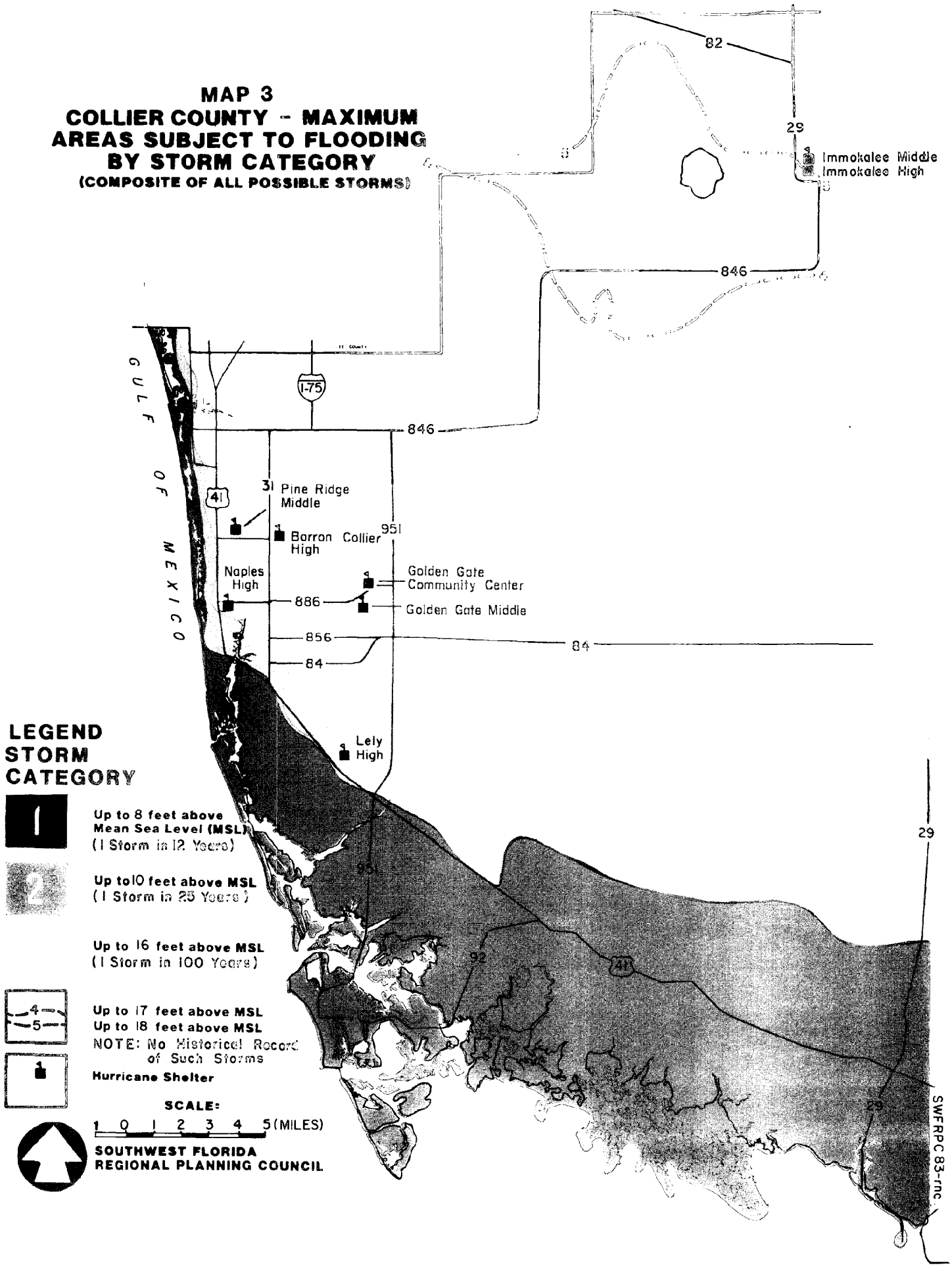


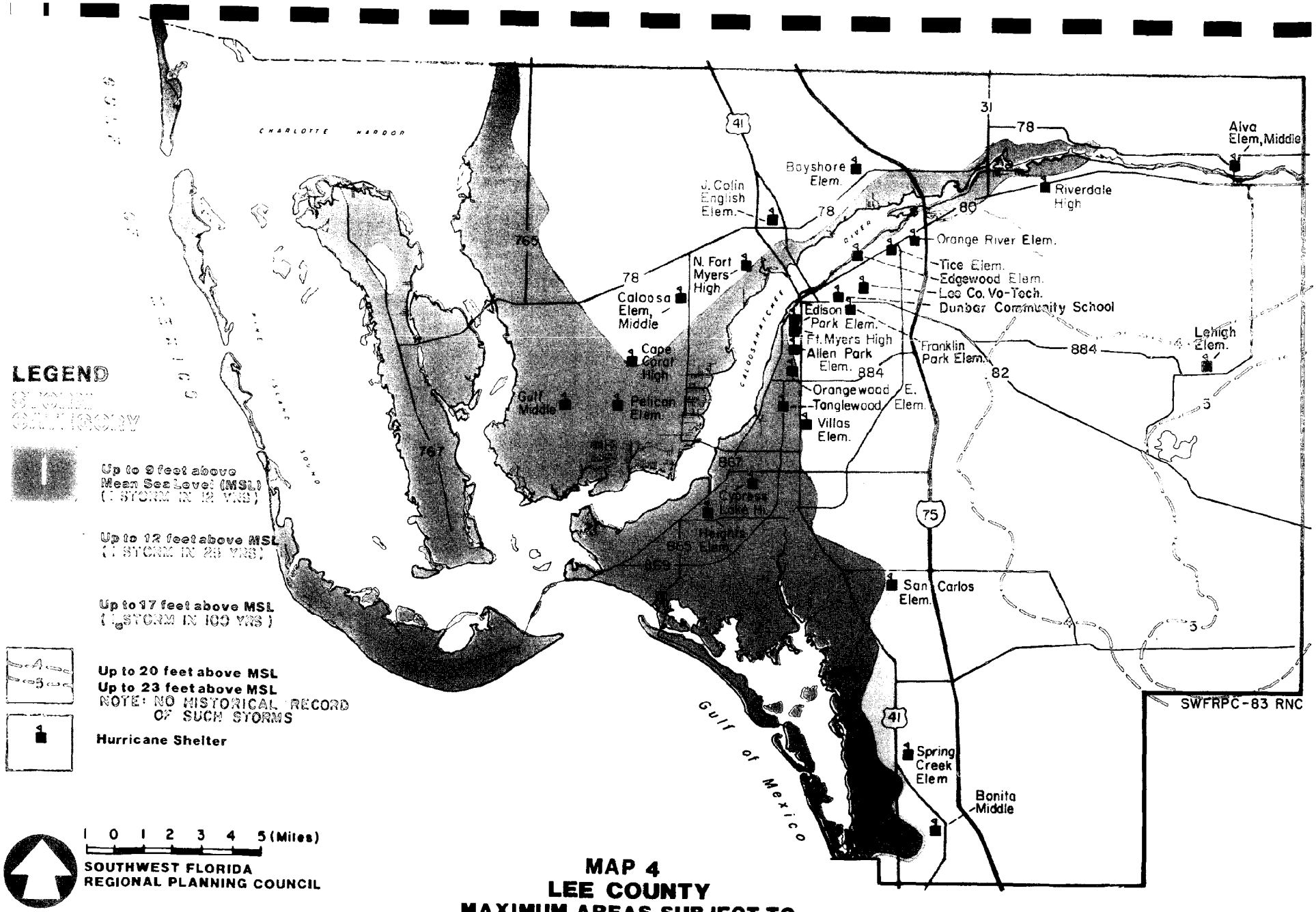
FIGURE 1
TOTAL HURRICANE DAMAGE BY TYPE, SOUTHWEST FLORIDA
(CATEGORY 3 STORMS)



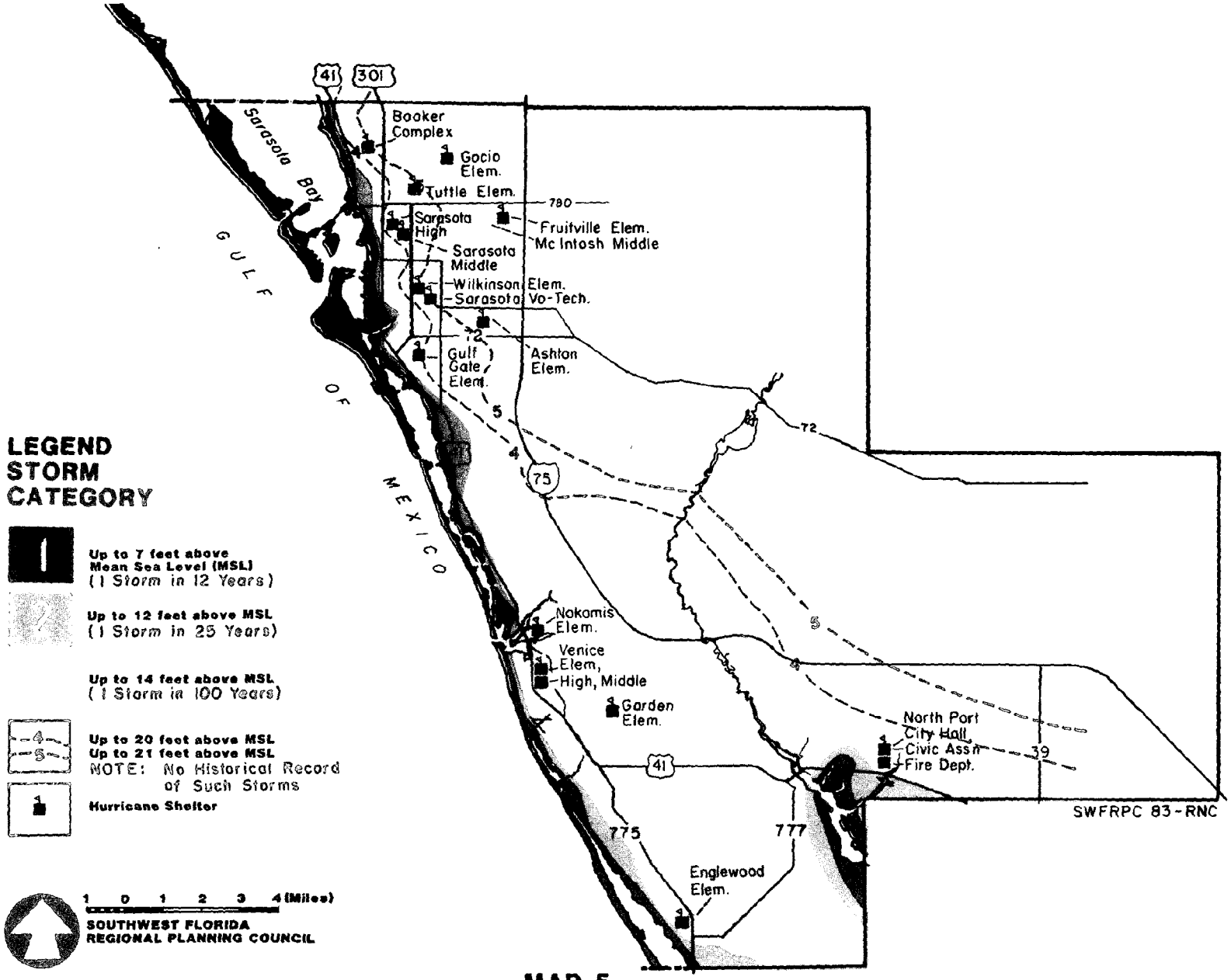
MAP 2
CHARLOTTE COUNTY
MAXIMUM AREAS SUBJECT TO FLOODING BY STORM CATEGORY
(COMPOSITE OF ALL POSSIBLE STORM TRACKS)

MAP 3
COLLIER COUNTY - MAXIMUM AREAS SUBJECT TO FLOODING BY STORM CATEGORY
(COMPOSITE OF ALL POSSIBLE STORMS)





MAP 4
LEE COUNTY
MAXIMUM AREAS SUBJECT TO FLOODING BY STORM CATEGORY
(COMPOSITE OF ALL POSSIBLE STORM TRACKS)



MAP 5
SARASOTA COUNTY
MAXIMUM AREAS SUBJECT TO FLOODING BY STORM CATEGORY
(COMPOSITE OF ALL POSSIBLE STORM TRACKS)

It is apparent that damage to structures accounts for the greatest potential loss. Building damage can account for one-third of the total building value in major storms. Total damage, including building damage, income loss due to unemployment, and agricultural damages, would be most severe in the coastal counties, totaling over $3.1 billion in Southwest Florida in category 3 storms. This amount is equivalent to $5,271 of damage for each resident in Southwest Florida. Total damage for each county is illustrated below.

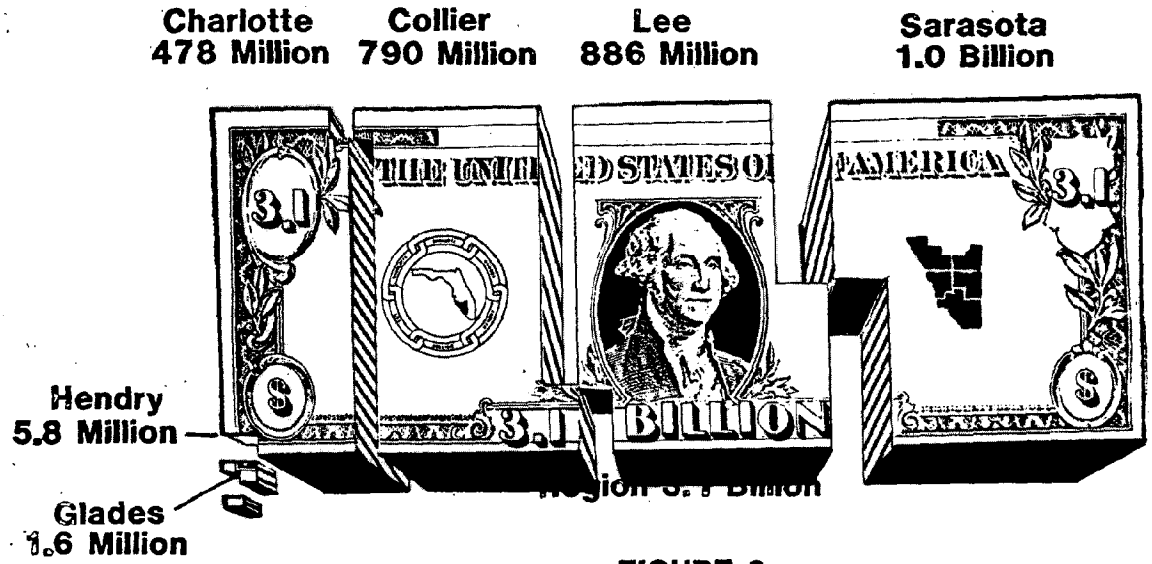


FIGURE 2
TOTAL HURRICANE DAMAGE ($) BY COUNTY
SOUTHWEST FLORIDA
(CATEGORY 3 STORMS)

COMPARISON OF HURRICANE ALICIA DAMAGES

Losses from a potential hurricane affecting Southwest Florida could be extensive, ranging from over $500 million in minor (Category 1) storms to $3.1 billion in category 3 storms and up to $4.6 billion in catastrophic (category 5) storms.[1] (See Appendix B for a description of Hurricane categories based on the Saffir/Simpson Scale).

Preliminary damage estimates for Hurricane Alicia, which battered the Texas coast (primarily the Galveston Island area) with a surge of up to 14 feet, totaled $1.2 billion. Although Alicia was a category 3 storm, it was not a severe one. Thus, these figures are comparable to those for Southwest Florida, which indicate damage for the "worst case" category 3 storm. Other relevant statistics for Hurricane Alicia are provided below.

HURRICANE ALICIA

Date: August 18, 1983
Storm Category: 3
Surge: Up to 14 feet

Area Affected: Six county area, including major cities of Galveston and Houston

Preliminary Damage Estimate: $1.2 billion (includes damage to public and private property and agriculture)

Injuries and Fatalities: 32,343 injuries; 17 fatalities

Shelter Information: 109 shelters opened; 20,000+ persons sheltered

Post-Hurricane Resource Assistance: Six disaster assistance centers opened; 10,000 people registered for assistance

Units Damaged or Destroyed:

Units Destroyed - 1,209 homes
455 mobile homes
633 multi-family units

Major or Minor Damage - 12,472 homes
1,034 mobile homes
2,857 multi-family units

Source: Interagency Flood Hazard Mitigation Report, 1983.

[1] Southwest Florida Regional Planning Council, Hurricane Loss Study 1982, Executive Summary, p. 28.

PART 1

LONG-TERM RESPONSE/RECOVERY PLAN: ALLOCATION OF POST HURRICANE RESOURCE ASSISTANCE

INTRODUCTION

This section, entitled Long-Term Response/Recovery Plan: Allocation of Post-Hurricane Resource Assistance, describes disaster assistance programs and the need for such programs, based upon quantitative loss estimates developed in the 1982 Southwest Florida Regional Planning Council Hurricane Loss Study.

FIELD ASSISTANCE

After a hurricane, it is necessary to provide assistance to persons affected by the storm in an efficient and timely manner. The provision of assistance is often the responsibility of the federal government, especially in severe storms. Federal disaster assistance is deployed and administered through temporary offices established in the area of the disaster. Disaster field offices manage federal disaster assistance in the declared area while disaster assistance centers serve as "one-stop" centers for dealing with the losses and needs of individuals.

Identifying appropriate locations for these offices and centers is necessary to ensure smooth post-hurricane operations and is an important part of developing a long-term response/recovery plan for allocation of post-hurricane resource assistance.

DEFINITIONS

Federal disaster assistance is administered through temporary offices established in the vicinity of the disaster. When the President declares a major disaster or emergency, a Federal Coordinating Officer (normally a member of FEMA staff) is appointed. He coordinates the federal response and works with the State Coordinating Officer to provide assistance. Operations are undertaken from a Disaster Field Office located in the designated disaster area. In addition, Disaster Assistance Centers are established to meet the needs of those persons affected by the storm. Representatives of various relief agencies that have programs designed to assist disaster victims will be located in these centers.

PURPOSE

This chapter will identify potential disaster assistance centers and disaster field offices for the Region. Development of a list of potential locations meeting basic criteria and standards will assist federal officials and enable them to designate locations in a quick and efficient manner in emergencies, when time is extremely important.

CRITERIA

Although counties are required to designate potential locations for disaster assistance centers and disaster field offices in their Peacetime Emergency Plans, only a few have done so. In addition, few if any criteria for determining their locations have been utilized.

Criteria to be used in determining suitable locations for disaster field offices generally include the following:

* suitable location (in relation to hurricane vulnerability zones)

* structural suitability (type of construction, building codes, etc.)

* type of ownership

* adequacy of facilities (such as telephone systems, etc. for use by disaster assistance staff)

* accessibility to disaster areas

* adequate parking facilities

* adequate space (5,000 square feet minimum)

Location is extremely important, in relation to vulnerability zones. Areas that are designated as potential disaster field offices should optimally be located outside areas affected by category 1-3 storms to avoid flooding. (If a minor hurricane were to strike, other locations in category 2 and 3 areas might be utilized, but these would not be preferred). In addition, the building to be used should be structurally sound, contain adequate parking facilities, and be accessible to disaster areas (so staff can make site visits). The building should contain a minimum of 5,000 square feet of office space, and should be equipped with adequate facilities (such as telephones, supplies, etc.). The type of ownership (federal, county, private, etc.) is also considered in selecting sites. These factors are all important but it must also be recognized that it may be difficult to meet all these criteria. As with denoting shelters, centers meeting all these criteria are preferred, but if not all criteria can be met, then the locations meeting the most criteria should be chosen. Primary consideration should be given to federally-owned buildings if possible, for disaster field offices.

A list of suitable site criteria for disaster assistance centers should include the following:

* number and distribution of sites

* suitable location (in relation to hurricane vulnerability zones)

* structural suitability

* type of ownership

* adequate facilities (chairs, tables, telephones, lighting, child care, waiting areas, bathrooms)

* accessibility

* access to public transportation

* adequate parking facilities

* handicapped facilities

* adequate size (5,000 square feet open space)

* security

* utilities

* centralized location in relation to damaged areas

Criteria are similar to those used in identifying disaster field offices. Location in relation to hurricane vulnerability is very important. Recommended areas should be located outside categories 1-3. Government-owned buildings are preferred, for ease of use and avoidance of legal problems. The structure itself should be sound, to withstand potential hurricane damage. Facilities should be adequate inside the building for the processing of applicants. Also, the buildings should be easily accessible to persons seeking aid (preferably with handicapped facilities) and preferably be community buildings or similar structures that are identifiable to community residents. Areas with access to public transportation are recommended.

In addition, the building should be of adequate size and contain a large open space area for processing. Parking facilities should also be sufficient. Other features include provision of security, utilities, and centralized location with respect to damage sites.

The major differences between disaster assistance centers and field offices are that, for disaster field offices, one location in or near the government center would be desirable, while disaster assistance centers should be distributed throughout the county, near disaster sites. Thus, more locations need to be identified for disaster assistance centers, since the actual disaster area is unknown. Some county Peacetime Emergency Plans contain a list of basic criteria for determining potential disaster assistance center sites.

LOCATION

Potential locations for both disaster assistance centers and disaster field offices have been determined based upon the preceding criteria, designation in Peacetime Emergency plans, and discussions with local disaster preparedness and Red Cross officials. Locations are listed in the following two tables, and identified in the subsequent map. It should be noted that the sites are potential locations; the ultimate designation of disaster field offices and assistance centers will be made by the federal government in conjunction with the State.

The following is a list of recommended disaster assistance centers for Southwest Florida's counties.

TABLE 1

POTENTIAL LOCATIONS
DISASTER ASSISTANCE CENTERS
SOUTHWEST FLORIDA

County	Map	Disaster Assistance Center	Location
Charlotte	1	Port Charlotte Cultural Center	801 Aaron Street, N.W., Port Charlotte
Collier	2	Social Services Building (Courthouse Complex Bldg. G)	Courthouse Complex, East Naples
Glades	3	Moore Haven High School	Moore Haven
	4	Buckhead Ridge Community Center	Buckhead Ridge
	5	Ortona Fire Department	Ortona
Hendry	6	Clewiston High School	Clewiston
	7	LaBelle High School	LaBelle
Lee	8	Lee County Civic Center	Bayshore Road, North Fort Myers
	9	Page Field Airport Terminal*	Airport Road, Fort Myers
	10	San Carlos Community Center	Lee Road, South Fort Myers
Sarasota	11	Sarasota County Admin. Center	South Washington Blvd. Sarasota
	12	Sarasota City Community Center	717 N. Tamiami Trail, Sarasota
	13	Venice Community Center	326 Nokomis Avenue, Venice
	14	North Port Community Center	301 North Port Blvd., North Port
	15	Longboat Key City Hall	501 Bay Isles Road, Longboat Key

* No longer in use for airport activity.

Recommended disaster field offices are listed in Table 2.

TABLE 2

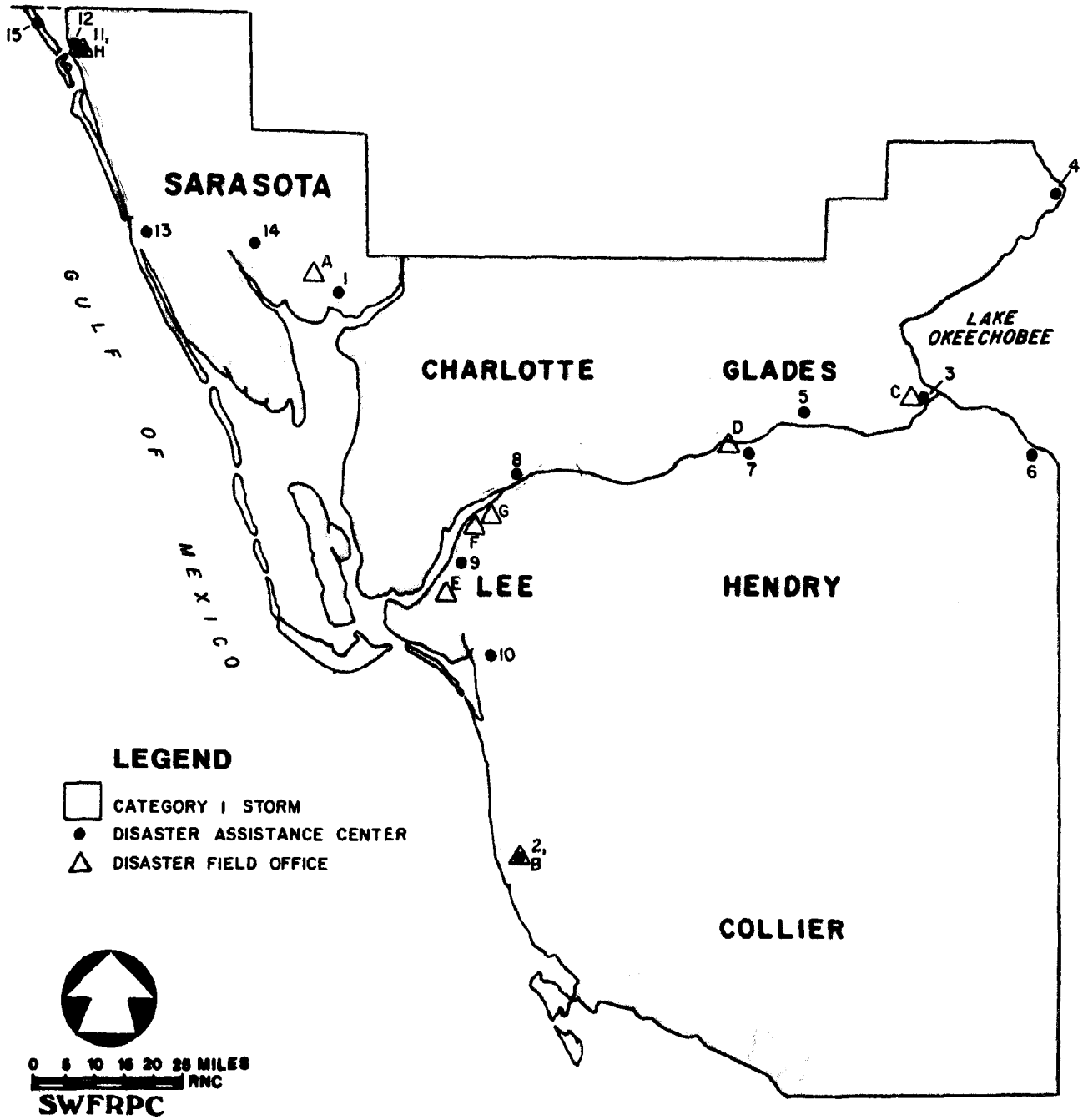
POTENTIAL LOCATION OF
DISASTER FIELD OFFICES
SOUTHWEST FLORIDA

County	Map	Disaster Field Office	Location
Charlotte	A	Charlotte County Courthouse	Murdock
Collier	B	Emergency Operations Center	Courthouse Complex, Tamiami Trail, East Naples
Glades	C	County Courthouse (alternate)	U.S. 27, Moore Haven
Hendry	D	County Courthouse (alternate)	Hicpochee Avenue, LaBelle
Lee	E	*University of South Florida/ Edison Community College	College Parkway, Fort Myers
	F	Division of Community Development	Hendry Street, Fort Myers
	G	Lee County Emergency Operations Center (alternate)	Ortiz Avenue, Fort Myers
Sarasota	H	*Sarasota County Administration Center	South Washington Blvd., Sarasota

* Preferred Locations

The specific offices to be used would be dependent upon the type of hurricane and actual area affected. Two locations are preferred,[1] to centralize operations in the northern and southern section of the Region. The preferred locations are in Sarasota County (Administration Center) and the University of South Florida/Edison Community College joint campus in Lee County. Although the courthouses for Glades and Hendry County (located in the cities of Moore Haven and LaBelle, respectively) would be suitable for use, from a practical standpoint, operations from the Fort Myers area could cover these two counties. If all counties were declared a disaster area, the disaster field office would be as centrally located as possible.

[1] Two locations are identified as "preferred", although in a disaster it is probable that only one location will be designated.



MAP 6
POTENTIAL DISASTER ASSISTANCE CENTERS AND FIELD OFFICES
SOUTHWEST FLORIDA

DISASTER ASSISTANCE PROGRAMS

There are numerous disaster-related programs administered by various agencies, but primarily by the Federal Emergency Management Agency (FEMA), the Farmers Home Administration (FmHA), the Small Business Administration (SBA), and the U.S. Department of Housing and Urban Development (HUD). Several types of assistance are available, including assistance to individuals, families, businesses and local governments. Assistance can take the form of either grants or loans.

The greatest single source of Federal Disaster Assistance is provided under the authorities of the Disaster Relief Act of 1974 (P.L. 93-288), implemented by the Federal Emergency Management Agency. Federal resources are made directly available to disaster-stricken areas through provision of services, supplies, equipment, manpower, and by the expenditure of congressionally authorized funds for relief, rehabilitation and construction purposes.

Four classifications of disaster exist, indicating the extent of federal involvement. These include:

1. Major disasters declared by the President
2. Disasters declared by the SBA
3. Disasters declared by the FmHA
4. Disasters in which no formal declaration is made

The types and amounts of aid vary according to the above disaster classifications.

The following sections summarize the programs that are currently available. Programs are divided into three major categories; temporary housing, individual assistance, and public assistance. A more complete listing of programs, including name, agency, purpose, and type of assistance, is provided at the end of this chapter.

TEMPORARY HOUSING

The major program in this category is Temporary Housing, a program administered by FEMA. Other programs include Adjustments to Federal Loans (although this program is not directly related to the provision of temporary housing), Mortgage Insurance, and Manufactured Home Loans Insurance (this would provide both temporary

and permanent housing for disaster victims). These programs are listed and described at the end of the chapter.

INDIVIDUAL ASSISTANCE

Individual assistance includes the need for disaster relief programs for individuals or businesses, excluding temporary housing programs. Major types include:

1. Individual and Family Grants (a program intended to provide funds to disaster victims to permit them to meet necessary expenses and serious needs for which other assistance is either unavailable or inadequate).

2. Low Interest Disaster Assistance Loans for diverse purposes (including compensation for destroyed crops, repair/replacement of real and personal property, reduction of economic losses, and re-establishing operation of major sources of employment).

Major agencies providing individual assistance include FEMA, SBA, and FmHA.

Individual and Family Grants

The Individual and Family Grants Program of FEMA provides grants to both individulas and families, in the case of a major disaster declared by the President. The costs are shared by both the Federal and State Government, with a 75/25 percent share. A state agency is designated by the governor to administer the program.

Other types of programs that deal with individual and family needs include the Food Stamp Program-Emergency Issue, Food distribution Program-Emergency Assistance and Legal Services (specifically for low-income persons).

Low Interest Disaster Assistance Loans

These programs can be utilized by individuals, as well as businesses. Individual programs primarily include Unemployment Assistance. Aid to businesses takes the form of Aid to Major Sources of Employment, Economic Injury Disaster Loans, and Physical Disaster Loans. Agricultural programs include Economic Injury Disaster Loans, Emergency Loans, the Emergency Feed Program and the Emergency Conservation Program.

PUBLIC ASSISTANCE

Public assistance is defined as assistance to local governments, including municipalities and counties, to meet the needs of communities after a disaster.

This type of assistance can be divided into the following categories:

* Water
* Wastewater
* Public Facilities (Electricity, Phone, etc.)
* Transportation
* Health Care
* Other (Other government-owned buildings, such as schools, etc.)

Community Facilities Loans can be used by small communities for constructing various types of community facilities. The Repair or Restoration of Public Facilities Program of FEMA applies to public facilities in the categories of water, wastewater, airports roads, education, recreation and public power. State and Community Highway Safety provides assistance in some emergency situations. Two programs apply specifically to schools; School Construction and School Maintenance and Operation Assistance. Health care facilities are found under the FEMA Program Repair or Restoration of Public Facilities. A more detailed listing of each specific program is provided on the following pages.

OTHER PROGRAMS

Other programs include Tax information and Education (individuals can claim casualty losses on income tax returns) as well as private insurance programs. In addition, the Red Cross, an independent voluntary body with local chapters throughout the Nation, provides services to individuals and families, including food, shelter, and rehabilitation. Its efforts, however, are limited to that which is not covered by other programs.

DISASTER ASSISTANCE PROGRAMS-HOUSING

TEMPORARY HOUSING

Purpose of Assistance	To provide temporary housing for individuals and families displaced as a result of a disaster.
Federal Agency	Federal Emergency Management Agency
Assistance Available	After a Presidential declaration of a major disaster or an emergency, temporary housing in the form of government, private and commercial resources or grants for minor repairs to owner-occupied damaged structures is provided. Temporary assistance with mortgage or rental payments for persons faced with loss of their residence because of disaster-created financial hardship.
Eligible Applicants	Individuals and families displaced from their homes by a disaster.

ADJUSTMENTS TO FEDERAL LOANS-DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Purpose of Assistance	To allow adjustments on loan requirements which will assist the victim of a major disaster.
Federal Agency	Department of Housing and Urban Development.
Assistance Available	After a Presidential declaration of a major disaster, the Secretary of Housing and Urban Development is authorized to refinance any note or other obligation which is held by the Agency in connection with any loan made by Department of Housing and Urban Development or its predecessor where refinancing is necessary because of damage or destruction of private property caused by a major disaster.
Eligible Applicants	Holders of loans described above.

MANUFACTURED (MOBILE) HOME LOANS INSURANCE - FINANCING PURCHASES OF MOBILE HOMES AS PRINCIPAL RESIDENCES OF BORROWERS

Purpose of Assistance	To make available reasonable financing of mobile home purchases.
Federal Agency	Office of Housing, Department of Housing and Urban Development.
Assistance Available	After a Presidential declaration of a major disaster or under regular program authorities, insured loans to persons intending to use the mobile homes as their principal place of residence.
Eligible Applicants	Any family displaced by a disaster or any prospective mobile home purchaser.

MORTGAGE INSURANCE - HOMES FOR DISASTER VICTIMS

Purpose of Assistance	To help victims of a major disaster undertake homeownership on a sound basis.
Federal Agency	Office of Housing, Department of Housing and Urban Development.
Assistance Available	After a Presidential declaration of a major disaster, insured loans to finance the purchase of proposed, under construction, or existing single-family housing for the occupant-mortgagor who is a victim of a major disaster.
Eligible Applicants	Any family which is a victim of a major disaster as designated by the President.

DISASTER ASSISTANCE PROGRAMS - INDIVIDUAL AND FAMILY GRANTS

INDIVIDUAL AND FAMILY GRANTS

Purpose of Assistance	To provide grants to meet disaster-related necessary expenses or serious needs of individuals or families adversely affected by a major disaster.
Federal Agency	The State, funded by the Federal Emergency Management Agency after a request from the Governor.
Assistance Available	After a Presidential declaration of a major disaster, grants up to $5,000 per individual or family. The program is funded by 75/25, Federal/State cost sharing.
Eligible Applicants	Individuals or families with disaster-related necessary expenses or serious needs which cannot be met through assistance under other provisions of the Disaster Relief Act of 1974 or from other means.

FOOD STAMP PROGRAM - EMERGENCY ISSUE

Purpose of Assistance	To provide for emergency issuance of food stamps to households who are victims of a disaster which disrupts normal channels of food distribution.
Federal Agency	Food and Nutrition Service, U.S. Department of Agriculture.
Assistance Available	After a national level approval by the Food and Nutrition Service, maximum food stamps allotment for household size.
Eligible Applicants	Victims of natural disasters who are otherwise eligible.

FOOD DISTRIBUTION PROGRAM - EMERGENCY ASSISTANCE

Purpose of Assistance	Provide commodities for the mass feeding of disaster victims.
Federal Agency	Food and Nutrition Service, U.S. Department of Agriculture.
Assistance Available	Food Commodities*
Eligible Applicants	Eligible victims of natural disasters.

*NOTE: Commodities are distributed for mass feeding purposes. Distribution of food to families in locations where commercial food sources have been disrupted must be approved by the Secretary of Agriculture.

LEGAL SERVICES

Purpose of Assistance	To provide assistance to low-income individuals who require legal services as a result of a major disaster.
Federal Agency	Appropriate Federal agencies, State and local bar associations and the Young Lawyers Division of the American Bar Association.
Assistance Available	After a Presidential declaration of a major disaster, legal services can be provided.
Eligible Applicants	Low-income individuals affected by a major disaster who require legal services.

UNEMPLOYMENT ASSISTANCE

Purpose of Assistance	To provide financial assistance to persons unemployed as a result of a major disaster.
Federal Agency	Department of Labor, funded by the Federal Emergency Management Agency
Assistance Available	After a Presidential declaration of a major disaster, job placement and disaster unemployment assistance administered through a State Employment Security Agency by the U.S. Department of Labor. The compensation received will not exceed the maximum amount of payment under the unemployment compensation program of the State in which the

	disaster occurred. Assistance may be provided until an individual is re-employed, but no longer than one year after the major disaster is declared.
Eligible Applicants	Individuals unemployed as a result of a declared major disaster.

AID TO MAJOR SOURCES OF EMPLOYMENT

Purpose of Assistance	To enable major sources of employment to resume operations in order to assist in restoring the economic viability of a disaster area.
Federal Agency	Small Business Administration and Farmers Home Administration, U.S. Department of Agriculture.
Assistance Available	After a Presidential declaration of a major disaster, loans from the Small Business Administration in the case of a nonagricultural enterprise, and the Farmers Home Administration in the case of an agricultural enterprise.
Eligible Applicants	Any industrial, commercial, agricultural or other enterprise which has constituted a major source of employment in an area suffering a major disaster and which is no longer in substantial operation as a result of such a disaster.

ECONOMIC INJURY DISASTER LOANS

Purpose of Assistance	To assist small business concerns suffering economic injury as a result of a disaster.
Federal Agency	Small Business Administration.
Assistance Available	After a Presidential declaration of a major disaster of a declaration by the Administrator, Small Business Administration, guaranteed, immediate participation or direct loans to any one small concern or group of affiliated concerns to pay current liabilities which could have been paid if the disaster had not occured. Working capital can be provided to continue the business in operation until

	conditions return to normal. No funds are available for realty, equipment repair or acquisition.
Eligible Applicants	Must be a small business concern as described in Small Business Administration rules and regulations and must furnish evidence of the extent of economic injury claimed.

PHYSICAL DISASTER LOANS

Purpose of Assistance	To provide loan assistance for the refinancing, repair, rehabilitation, or replacement of property damaged as a result of a natural disaster.
Federal Agency	Small Business Administration
Assistance Available	After a Presidential declaration of a major disaster or a declaration by the Administrator, Small Business Administration, guaranteed, immediate participation or direct loans to repair or replace damaged or destroyed realty, machinery, and equipment, household and other personal property not covered by insurance, or in some instances to refinance a mortgage or lien on destroyed or damaged real property if it is to be repaired or replaced.
Eligible Applicants	Homeowners, renters with personal property loss, business concerns, churches, private schools, colleges and universities, and hospitals which have suffered physical property loss in an area designated as eligible for disaster assistance.

EMERGENCY LOANS

Purpose of Assistance	To assist farmers, ranchers and aquaculture operators cover losses resulting from a natural disaster and return the operation to a financially sound position.
Federal Agency	Farmers Home Administration, U.S. Department of Agriculture.
Assistance Available	Guaranteed/insured loans to (1) repair restore, or replace damaged or destroyed

farm property and supplies which were lost or damaged, (2) provide annual operating expenses for up to three full crop years following the disaster to enable the disaster victims time to recover from their losses and return to conventional credit, (3) under certain conditions, refinance secured and unsecured debts made necessary by the disaster, (4) finance adjustments in the farming, ranching, or aquacultural operation(s) determined necessary to restore or maintain applicants on a sound financial position equivalent to their predisaster situations. Emergency loans are made in counties (a) named by the Federal Emergency Management Agency as eligible for Federal Assistance after a Presidential declaration of a major disaster, or (b) designated as emergency loan areas by the Secretary of Agriculture, or (c) authorized by the Farmers Home Administration State Director when not more than 25 farmers or ranchers in a county have been affected.

Eligible Applicants	Farmers, ranchers, or aquaculture operators who have suffered severe crop losses or property damage caused by a designated natural disaster, not compensated for by insurance or otherwise.

EMERGENCY FEED PROGRAM

Purpose of Assistance	To assist in the preservation and maintenance of livestock by sharing with livestock owners the cost of feed purchased in quantities above normal where, because of a natural disaster, it is determined that an emergency exists.
Federal Agency	Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture.
Assistance Available	Direct payments to eligible livestock owners who have suffered a substantial loss in the production of livestock feed and do not have sufficient feed for the livestock for the estimated

period of the emergency. The assistance is limited to 50 percent of the cost of feed purchased, not to exceed 3 cents per pound of feed grain equivalent and not to exceed the amount of feed loss.

Eligible Applicants	Owners of livestock who suffered a substantial loss in livestock feed normally produced on the farm, do not have sufficient feed, and must purchase feed in quantities greater than normal.

EMERGENCY CONSERVATION PROGRAM

Purpose of Assistance	To enable farmers and ranchers to perform emergency conservation measures.
Federal Agency	Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture.
Assistance Available	To share the cost of approved emergency conservation measures with farmers and ranchers who act to control wind erosion on farmlands, or to rehabilitate farmlands damaged by wind erosion, flood, hurricane, or other natural disasters; and to carry out emergency water conservation or water enhancing measures during periods of severe drought.
Eligible Applicants	Any owner, landlord, tenant, or sharecropper on a farm or ranch who bears a part of the cost of an approved conservation practice in a disaster area.

TAX INFORMATION AND EDUCATION

Purpose of Assistance	To ensure that taxpayers who suffered losses received the most current information regarding casualty loss claims and the filing of amended tax returns.
Federal Agency	Internal Revenue Service Department of Treasury
Assistance Available	After a Presidential declaration of a major disaster or an emergency, advisory services, conseling and guidance on tax matters, including assistance in the preparation of returns. Assistance is

	also provided in obtaining copies of prior year returns, when necessary, to file amended returns.
Eligible Applicants	Any taxpayer who suffered a loss as a result of a major disaster or an emergency.

DISASTER ASSISTANCE PROGRAMS - PUBLIC ASSISTANCE

COMMUNITY FACILITIES LOANS

Purpose of Assistance	To construct, enlarge, extend, or otherwise improve community facilities providing essential services to residents of open country and rural towns of not more than 20,000 population.
Federal Agency	Farmers Home Administration, U.S. Department of Agriculture.
Eligible Applicants	Public bodies, nonprofit corporations, and federally recognized Indian tribes, which are unable to finance the proposed project from their own resources or through commercial credit at reasonable rates and terms.

REPAIR OR RESTORATION OF PUBLIC FACILITIES

Purpose of Assistance	To provide funds for repair, restoration, reconstruction, or replacement of public facilities which have been damaged or destroyed by a major disaster.
Federal Agency	Federal Emergency Management Agency.
Assistance Available	After a Presidential declaration of a major disaster, Federal contributions for repairing, restoring, reconstructing or replacing any public facility belonging to a State or local government. The Federal contribution is made on the basis of the design of the facility as it existed immediately prior to the disaster and in conformity with applicable codes,specifications, and standards. "Public facility" includes: any publicly owned flood control, navigation, irrigation, reclamation, public power, sewage treatment and collection, water supply and distribution, watershed development, or airport facility; any non-Federal-aid street, road or

	highway; any other public building, structure, or system including those used for education and recreation purposes.
Eligible Applicants	State or local governments in areas designated elibible for assistance under the President's declaration of a major disaster.

STATE AND COMMUNITY HIGHWAY SAFETY

Purpose of Assistance	To provide a coordinated national highway safety program to reduce traffic accidents, deaths, injuries, and property damage.
Federal Agency	National Highway Traffic Safety Administration (NHTSA)/Federal Highway Administration (FHWA), Department of Transportation.
Assistance Available	Grants for highway features and facilities (FHWA) and programs and services (NHTSA) to reduce highway traffic accidents, deaths, injuries, and property damage. (Some of the programs and services fundable, such as emergency medical services and police traffic services, may be applicable in emergency situations such as population evacuation and deployment of medical resources and supplies for disaster response or other contingencies.)
Eligible Applicants	Highway safety program managers in State agencies and in State political subdivisions.

SCHOOL CONSTRUCTION

Purpose of Assistance	To provide assistance for the replacement or restoration of urgently needed school facilities in school districts where such replacement or restoration has been made necessary because of major disaster. Also the construction for the public school district of minimum school facilities, if necessary, when a nonpublic school has been destroyed and will not be replaced.

Federal Agency	Office of Elementary and Secondary Education, Department of Education.
Assistance Available	After a Presidential declaration of a major disaster, project grants to construct and equip school facilities, including additional facilities for children who attend private schools destroyed by a major disaster but which have not been and will not be rebuilt.
Eligible Applicants	Local educational agencies and certain public education agencies which provide technical, vocational, or other special education to children of elementary or secondary school age.

SCHOOL MAINTENANCE AND OPERATION ASSISTANCE

Purpose of Assistance	To assist in replacing or repairing supplies, equipment or facilities damaged or destroyed by a major disaster.
Federal Agency	Office of Elementary and Secondary Education, Department of Education.
Assistance Available	After a Presidential declaration of a major disaster, grants for maintenance and operation expenditures: To maintain the level of education which existed before the disaster when a deficiency occurs due to increased costs and loss of revenue. For additional costs to educate children who formerly attended private schools. For debris removal and clenaup, minor repairs to buildings and the repair or replacement of equipment and supplies. For temporary facilities.
Elibible Applicants	Local educational agencies which provide free public elementary or secondary education.

Source: Digest of Federal Disaster Assistance Programs, Federal Emergency Management Agency, 1982.

INTRODUCTION

TEMPORARY HOUSING

Following a natural disaster such as a hurricane, housing damage can be significant, especially in Southwest Florida where residential structures account for the majority of total potential building damage. Temporary housing (in the form of rental units, mobile homes, etc.) may be needed beyond the period of emergency shelter to accommodate those individuals and families made homeless by the disaster. Housing may be needed for the short-term (immediate post-hurricane period) as well as longer term period. Local government and nongovernment relief agencies provide the first response to housing needs, within the limits of their capabilities. Depending upon the magnitude of the disaster, additional resources may be required from higher levels of government.

This chapter will address the potential demand for assistance from State and Federal temporary housing programs, as well as available housing resources. In addition, an inventory of potential temporary housing stock at the disposal of each local government after each hypothetical storm, and the need to supply mobile homes or other temporary structures to disaster-stricken communities, will be estimated.

An inventory of existing housing units for the Region and its six counties is provided in the subsequent table. A more detailed listing is found in Appendix C.

TABLE 3

INVENTORY OF RESIDENTIAL STRUCTURES
SOUTHWEST FLORIDA

COUNTY	SINGLE FAMILY	MOBILE HOME	APARTMENT	CONDO-MINIUM	DUPLEX	TOTAL (% Of Region)
Charlotte	26,200	7,867	1,363	4,125	178	39,733 (11.2%)
Collier	23,955	6,694	2,612	21,379	508	55,148 (15.6%)
Glades	1,886	1,989	61	0	*	3,936 (1.1%)
Hendry	5,355	2,399	308	0	*	8,062 (2.3%)
Lee	55,242	26,767	6,741	25,088	5,020	118,858 (33.6%)
Sarasota	66,208	18,638	7,884	32,931	2,598	128,259 (36.2%)
Region	178,846	64,354	18,969	83,523	8,304	353,996 (100.0%)

Source: SWFRPC Hurricane Evacuation Plan Update 1983

Excluding travel trailers and hotels/motels.

* Included in single-family.

There are nearly 354,000 housing units in the six-county area. Many of these units are located in areas that are subject to hurricane impacts and thus could be damaged or destroyed in the event of a storm. The following table shows the number of housing units for each storm category, ranging from category 1 (minimal) to category 5 (catastrophic) storms. Appendix D provides housing units by type and vulnerability zone for specific areas of each county.

TABLE 4

RESIDENTIAL STRUCTURES*
BY VULNERABILITY ZONE
SOUTHWEST FLORIDA

County	Storm Category 1	2	3	4	5	Outside Vulnerable Areas
Charlotte	17,270	11,806	8,980	1,477	---	200
Collier	25,425	11,272	14,787	405	3,151	108
Glades	3,936					
Hendry	8,062					
Lee	55,314	33,964	23,242	1,377	4,892	69
Sarasota	30,634	13,082	19,154	24,604	10,259	30,526

* Excluding travel trailers and hotel/motel units.

NOTE: Table is not cumulative.

It is evident that the majority of units, especially in Charlotte, Collier and Lee Counties, are located in the areas most vulnerable to hurricane impacts (categories 1 through 3); thus, damage to these units would be more severe.

METHODOLOGY FOR DETERMINING TEMPORARY HOUSING NEEDS

To determine the need for temporary housing first, the number of damaged homes must be assessed. Only those homes that are damaged beyond habitability will be considered. These are defined as units that have sustained major electrical and/or structural damage and thus are unlivable. Damage to the units is greater than 50% and extensive repairs are necessary.

To determine the number of such structures, depth-percent damage statistics from the Federal Emergency Management Agency were utilized. The basic criteria used to delineate the 50% damage figure varied according to location and type of unit. For surge areas (velocity zones) as defined by the Flood Insurance Administration, 3 feet of flooding would cause 50% damage for all structures. Outside surge areas, the following criteria were used: 2 feet of flooding for mobile homes, and 14 feet of flooding for single-family homes. For the purposes of this study, it was assumed that multiple-family

units outside velocity zones would not be damaged beyond the 50% level.[1] It is also assumed that the majority of damage will be caused by flooding. Wind damage accounts for a very minor proportion of total damage and in most cases flooding would have caused the greatest amount of destruction.[2]

The FEMA depth/percent damage standards were applied for each category storm. Average flooding by vulnerability zone (see Table 34 in SWFRPC Hurricane Loss Study for average flooding by vulnerability zone) was used to determine which units would be affected for each storm category, as follows:

Category 1 storms -
- a) all single-family, duplex and multi-family units in surge areas
- b) all homes in category 1 areas outside surge areas
- c) all mobile homes outside of flooded areas

Category 2 storms -
- a) all single-family, duplex and multi-family units in surge areas
- b) all homes in category 1 and 2 areas outside surge areas
- c) all mobile homes outside of flooded areas

Category 3 storms -
- a) all single-family, duplex and multi-family units in surge areas
- b) all homes in category 1, 2, and 3 areas outside surge areas
- c) all mobile homes outside of flooded areas

Category 4 storms -
- a) all single-family, duplex and multi-family units in surge areas
- b) all homes in category 1, 2, 3, and 4 areas outside surge areas
- c) all mobile homes outside of flooded areas

Category 5 storms -
- a) all single-family, duplex and multi-family units in surge areas
- b) all homes in category 1, 2, 3, 4, and 5 areas outside surge areas
- c) all mobile homes outside of flooded areas

STRUCTURES DAMAGED BEYOND HABITABILITY OR ISOLATED WITHOUT SERVICES

The following table indicates the number of potential structures that could be damaged beyond the point of habitability[3] for various types of storms, based upon the previous methodology, by county. (This assumes that equal flooding would occur along the entire shoreline of the county.) Appendix E illustrates the calculations used to determine these figures.

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[1] According to FEMA data which is based on actual claims.

[2] See Don G. Friedman, Computer Simulation in Natural Hazard Assessment, Boulder, Colorado, 1975, p. 73.

[3] Upper level multiple-family units on barrier islands which may not be damaged more than 50% were also included because access to the units will be cut off and public services (such as water, sewer, etc.) will not be available; thus, these units would be isolated and therefore be uninhabitable.

TABLE 5

NUMBER OF RESIDENTIAL* STRUCTURES RENDERED UNINHABITABLE BY STORMS

County	Storm Category 1	2	3	4	5
Charlotte	4,917	7,125	7,836	9,162	9,162
Collier	14,628	15,835	17,464	17,594	18,829
Glades	---	---	---	1,989	1,989
Hendry	---	---	---	2,399	2,399
Lee	26,172	35,410	41,068	41,506	41,545
Sarasota	21,987	23,698	27,154	32,827	33,382
Region	67,704	82,068	93,522	105,477	107,306

Note: Structures rendered uninhabitable includes structures that are either destroyed, incur major damage, or are isolated without services.

SOURCE: SWFRPC

* Excluding travel trailers and hotel/motel units.

A significant proportion of total units would be damaged beyond habitability, ranging from 19% of total units in minor storms to 29% in major hurricanes. The greatest number of damaged units are located in Lee County for all types of storms. The majority of affected units would be located primarily along surge areas of barrier islands. In more severe storms, the number of homes damaged would be proportionally greater. Forms used by disaster preparedness agencies for temporary housing are contained in Peacetime Emergency Plans.

TEMPORARY HOUSING NEEDS

The number of units destroyed or damaged beyond habitability is equivalent to the gross number of units needed. To determine the actual number of units required, however, vacant seasonal homes must be subtracted (since the owners of these homes would have other housing available elsewhere). This resultant figure would indicate the need for housing.

In addition, it must be determined if sufficient housing is available within the Region to satisfy the potential demand, or whether alternate housing will have to be imported from outside the Region. The number of vanant units is subtracted from housing needs to determine whether there is a deficiency or surplus of units in relation to overall need. (It must be noted that the number of both vacant seasonal homes and vacant rental housing must be adjusted to account for units that may also have been rendered uninhabitable by storms).[1]

[1] This was calculated by dividing the number of units damaged more than 50% by the total number of structures, and multiplying the resultant percentage by vacant seasonal and rental units.

Adjustments for these units are found in Appendix F. Temporary housing needs are quantified in the following table.

TABLE 6

TEMPORARY HOUSING NEEDS, SOUTHWEST FLORIDA

County	Category	Uninhabitable Units	Habitable Seasonal Units[1]	Temporary Units Needed[2]	Available Rental Units[3]	Number Additional Units Required
Charlotte	1	4,917	5,079	N/A	905	N/A
	2	7,125	5,348	1,777	848	929
	3	7,836	5,230	2,606	829	1,777
	4	9,162	5,012	4,150	795	3,355
	5	9,162	5,012	4,150	795	3,355
Collier	1	14,628	9,078	5,550	1,499	4,051
	2	15,835	8,801	7,033	1,453	5,580
	3	17,464	8,444	9,020	1,394	7,626
	4	17,594	8,413	9,181	1,389	7,792
	5	18,829	8,136	10,693	1,344	9,349
Glades	1	--	51	N/A	63	N/A
	2	--	51	N/A	63	N/A
	3	--	51	N/A	63	N/A
	4	1,989	25	1,964	31	1,933
	5	1,989	25	1,964	31	1,933
Hendry	1	--	314	N/A	185	N/A
	2	--	314	N/A	185	N/A
	3	--	314	N/A	185	N/A
	4	2,399	220	2,179	129	2,050
	5	2,399	220	2,179	129	2,050
Lee	1	21,987	12,607	13,565	5,005	8,560
	2	35,410	11,345	24,065	4,504	19,561
	3	41,068	10,579	30,489	4,200	26,289
	4	41,506	10,527	30,979	4,179	26,800
	5	41,545	10,511	31,034	4,173	26,861
Sarasota	1	21,987	12,539	9,448	4,675	4,773
	2	23,698	12,339	11,359	4,600	6,759
	3	27,154	11,930	15,224	4,448	10,776
	4	32,827	11,264	21,563	4,200	17,363
	5	33,382	11,191	22,191	4,172	18,019
Region	1	67,704	40,298	38,563	12,332	17,384
	2	82,068	38,199	44,234	11,653	32,829
	3	93,522	36,548	57,339	11,119	46,468
	4	105,477	35,461	70,016	10,723	59,293
	5	107,306	35,095	72,211	10,644	61,567

[1] Adjusted to exclude units that are uninhabitable (due to damage or isolation from services)
[2] Uninhabitable units minus habitable seasonal units.
[3] Adjusted to exclude damaged units.

Temporary housing needs, as seen in the preceding table, can amount to 17,384 - 61,567 units for the Region, depending upon storm intensity. The need would be greatest in Lee County, where the number of damaged units is greatest. The need for additional units that cannot be supplied within the Region ranges from none to 3,355 units in Charlotte County; 4,051 to 9,349 in Collier County; 8,560 to 26,861 in Lee County; 4,733 to 18,019 in Sarasota County; and 1,933 and 2,050 in Glades and Hendry Counties, respectively. There would be a need for assistance from outside the Region in all counties, indicating that the number of available units is less than the demand for those units. (One reason is the small amount of vacant rental units.) However, in category 1 storms in Charlotte County, and Category 1, 2, and 3 storms in Glades and Hendry Counties, the supply of available units for temporary housing will exceed the demand.

It should be noted that housing needs could be smaller in certain circumstances. A category 3 storm hitting Lee County, for example, may only cause category 2 damage to Charlotte County and only category 1 damage in Sarasota County. In this instance, needs would be greatest in Lee County but less than those indicated for Charlotte and Sarasota Counties.

Temporary housing can be in the form of conventional vacant dwelling units, or mobile homes, tents, etc. For purposes of this study, however, hotel and motel units were excluded as a form of temporary housing, as well as the homes of friends and relatives, because these would probably only be used for short periods of time. In addition, many hotels and motels are located on the barrier islands and vulnerable surge areas and would probably also incur severe damage as the result of a hurricane.

Programs addressing temporary housing are varied. These were discussed in Chapter 4 .

INDIVIDUAL ASSISTANCE

Temporary housing needs and programs were reviewed in the last chapter. This chapter will examine the need for disaster relief programs for individuals or businesses, by storm scenario. Two primary categories will be considered: individual and family grants and low-interest disaster assistance loans (for various purposes). (The description of various assistance programs was given in a previous chapter).

Individual and family grants is a program intended to provide funds to disaster victims to permit them to meet necessary expenses and serious needs for which other assistance is either unavailable or inadequate, while low-interest disaster assistance loans are available for purposes such as compensation for destroyed crops, repair/replacement of property, reduction of economic losses, and re-establishing operation of major sources of employment.

To determine the need for assistance from programs such as those described above and listed in Chapter 4, first, the total potential damage to residential and commercial structures must be assessed. This was calculated in the Southwest Florida Hurricane Loss Study, for the Region as well as its individual counties. Damage to residential buildings is presented in the table below, for each storm category..

TABLE 7

DAMAGE TO RESIDENTIAL STRUCTURES ($000)
SOUTHWEST FLORIDA

County	Storm Category 1	2	3	4	5
Charlotte	53,325	180,186	345,276	424,176	455,632
Collier	112,878	310,513	597,013	730,946	806,343
Glades	89	361	1,031	2,456	5,897
Hendry	342	1,394	3,987	9,504	22,855
Lee	91,952	264,269	531,998	674,669	732,551
Sarasota	138,950	380,702	700,430	892,938	1,093,550
Region:	397,536	1,137,425	2,179,735	2,734,689	3,116,828

Source: SWFRPC Hurricane Loss Study.

Potential damage could range from $397 million to $3.1 billion, depending upon storm severity, the direction of the storm, the number of counties affected, and the degree to which the counties are affected.

Residential assistance needs are calculated based upon damage totals listed in the preceding table, as well as flood insurance policy information (contained in Table 8). Total needs for assistance have been adjusted to reflect only those losses that are not insured. The methodology is similar to that used in determining needs for temporary housing. First, the number of residential policies (equivalent to number of buildings) is divided by the number of total residential buildings for each vulnerability zone (cumulative), to determine the percentage of buildings that is insured. Then the percentage of uninsured buildings (100% minus percent insured) is multiplied by total projected damage to determine the dollar amount of assistance needed for each storm category. This method was used because the number of policies was not available for each specific flood zone.[1]

The following table contains general information on the number of flood policies for cities and counties in the Region, as well as the amount of coverage. Table 9 indicates the number of policies for each county, as well as the percent insured and uninsured, projected damage and assistance needed in dollar amounts. Assistance needs for individual counties and the Region are then summarized in Table 11.

Estimates of insured and uninsured losses vary according to county. The percentage of uninsured structures ranges from 45% to 76% in Charlotte County; 43% to 74% in Collier County; 38% to 71% in Lee County; and 45% to 83% in Sarasota County.

Estimates of insured losses from past hurricanes have been provided for comparison purposes in Table 10. It is evident that there is a wide disparity in the percentage of insurance coverage, depending upon the type of storm, date of occurrence and area affected.

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[1] If it is assumed, for example, that one policy is equivalent to one building, then dividing the number of policies (buildings) in the county by the number of buildings in a specific flood zone will indicate the percentage of buildings that are insured for that particular vulnerability zone (storm category).

TABLE 8

FLOOD INSURANCE POLICIES
SOUTHWEST FLORIDA

COUNTY or CITY	NUMBER	AMOUNT OF COVERAGE ($)
Charlotte County	8,235	413,587,200
Punta Gorda	1,502	112,529,400
	9,737	526,116,600
Collier County	9,022	591,371,000
Everglades City	115	4,995,200
Naples	5,858	450,213,900
	14,995	1,046,580,100
Glades County	32	1,367,400
Moore Haven	21	526,100
	53	1,893,500
Hendry County	221	6,766,100
Clewiston	138	8,900,000
LaBelle	377	12,447,300
	736	28,113,400
Lee County	19,693	731,864,600
Cape Coral	10,145	69,637,300
Fort Myers	1,184	616,426,200
Sanibel	3,965	302,297,500
	34,987	1,720,225,600
Sarasota County	11,743	758,938,300
North Port	1,447	55,548,500
Sarasota	2,589	194,886,800
Venice	1,532	101,013,500
	17,311	1,100,387,100

SOURCE: Federal Emergency Management Agency, 1984.

TABLE 9

RESIDENTIAL DAMAGE AND ASSISTANCE NEEDED - Southwest Florida

COUNTY	STORM CATEGORY	# POLICIES[1]	# BUILDINGS[1]	PERCENT INSURED/(UNINSURED)[2]	RESIDENTIAL DAMAGE ($000)[3]	ASSISTANCE NEEDED ($000)[4]
Charlotte	1	9,542	17,270	55 (45)	53,325	23,996
	2	9,542	29,076	33 (67)	180,186	120,725
	3	9,542	38,056	25 (75)	345,276	258,957
	4	9,542	39,533	24 (76)	424,176	322,374
	5	9,542	39,533	24 (76)	455,632	346,280
Collier	1	14,545	25,425	57 (43)	112,878	48,538
	2	14,545	36,697	40 (60)	310,513	186,308
	3	14,545	51,484	28 (72)	597,013	429,849
	4	14,545	51,889	28 (72)	730,946	526,281
	5	14,545	55,040	26 (74)	806,343	596,694
Glades	1	N/A SEE NOTE BELOW			89	24
	2				361	99
	3				1,031	283
	4				2,456	675
	5				5,897	1,622
Hendry	1	N/A SEE NOTE BELOW			342	94
	2				1,394	383
	3				3,987	1,096
	4				9,504	2,614
	5				22,855	6,285
Lee	1	34,287	55,314	62 (38)	91,952	34,942
	2	34,287	89,278	38 (62)	264,269	163,847
	3	34,287	112,520	30 (70)	531,998	372,399
	4	34,287	113,887	30 (70)	674,669	472,268
	5	34,287	118,789	29 (71)	732,551	520,111
Sarasota	1	16,965	30,634	55 (45)	138,950	62,528
	2	16,965	43,716	39 (61)	380,702	232,228
	3	16,965	62,870	27 (73)	700,430	511,314
	4	16,965	87,474	19 (81)	892,938	723,280
	5	16,965	97,733	17 (83)	1,093,550	907,647

NOTE: Damage in Glades and Hendry Counties results from wind damage or freshwater flooding; however, only wind damage has been estimated. For purposes of this report, an insured ratio of 72.5% (General Reinsurance Co. Report) was used to calculate assistance needed. This ratio is higher because wind damage would be covered under homeowners insurance

[1] Residential policies and buildings (# buildings is cumulative for each storm category)

[2] # Policies ÷ # Buildings = % insured

[3] Source: SWFRPC Hurricane Loss Study, pp 78, 81, 83, 85, 88, 91.

[4] % uninsured (100% - % insured) X Residential Damage

TABLE 10

INSURED LOSS SELECTED HURRICANES
1954-1979

Date	Name of Hurricane	Place	Total Damage (Millions of $)	Insurance Payments (Millions of $)	Percent Insured
September 1979	Hurricane Frederic	Alabama, Mississippi	3,000	1,500.0	50%
August 1976	Hurricane Belle	New England	100	23.0	23%
September 1975	Hurricane Eloise	South and middle Atlantic states	500	119.0	24%
June 1972	Hurricane/flood Agnes	East coast, Florida to New England	3,098	98.0	3%
August 1970	Hurricane Celia	Texas	450	309.0	69%
August 1969	Hurricane Camille	Louisiana, Mississippi, Florida, and Alabama	1,800	225.0	13%
September 1967	Hurricane Beulah	Texas	200	34.0	17%
September 1965	Hurricane Betsy	Florida, Louisiana, and Mississippi	1,420	715.0	50%
October 1954	Hurricane Hazel	North and South Carolina and middle Atlantic states	232	122.1	53%
September 1954	Hurricane Carol	Long Island and Southern New England	456	129.7	28%

Source: Alan L. Sorkin, Economic Aspects of Natural Hazards, 1982, p. 125 and SWFRPC estimates (% insured).

TABLE 11
SUMMARY OF RESIDENTIAL ASSISTANCE NEEDS ($000)
SOUTHWEST FLORIDA

County	Storm Category 1	2	3	4	5
Charlotte	23,996	120,725	258,957	322,374	346,280
Collier	48,538	186,308	429,849	526,281	596,694
Glades	24	99	283	675	1,622
Hendry	94	383	1,096	2,614	6,285
Lee	34,942	163,847	372,399	472,268	520,111
Sarasota	62,528	232,228	511,314	723,280	907,647
Region	170,122	703,590	1,573,898	2,047,492	2,378,639

Source: SWFRPC

Residential assistance needs amount to a significant proportion of projected residential damage. However, if the ratio of insured to uninsured property changes, this could dramatically change requirements for assistance. For example, if more people were insured, then the requirements for assistance would be less.

Requirements for assistance are significant in the Region, ranging from $170 million in category 1 storms to $2.3 billion in category 5 storms. Demands for assistance would be greatest in Sarasota County, ranging from $62 million to $907 million (Category 1 - 5), followed by Collier County ($48 million to $597 million).

The following table illustrates damage to commercial structures for each of the Region's six counties. Damages can range from over $40 million in minor storms to $426 million in major storms. Special programs addressing business assistance were discussed in Chapter 4.

TABLE 12
DAMAGE TO COMMERCIAL STRUCTURES
SOUTHWEST FLORIDA ($000)

County	Storm Category 1	2	3	4	5
Charlotte	6,026	21,594	41,171	50,037	52,816
Collier	10,420	34,751	67,921	84,023	92,879
Glades	7	30	91	222	570
Hendry	33	140	429	1,045	2,686
Lee	14,706	52,164	102,480	126,977	138,240
Sarasota	9,645	37,747	81,851	111,754	139,147
Region	40,837	146,426	293,943	374,058	426,338

Source: SWFRPC Hurricane Loss Study

The need for assistance for businesses is based upon damages provided in the preceding table, utilizing the same methodology as in calculating residential assistance needs. The percentage of insured buildings is lower, however, as noted in Table 13.

TABLE 13

COMMERCIAL DAMAGE AND ASSISTANCE NEEDED

County	Storm Category	Number Policies[1]	Number Bldgs.[2]	Percent Insured (Uninsured)[3]	Commercial Damage ($000)[4]	Assistance Needed ($000)[5]
Charlotte	1	195	554	35 (65)	6,026	3,917
	2	195	984	20 (80)	21,594	17,275
	3	195	1,196	16 (84)	41,171	34,584
	4	195	1,246	16 (84)	50,037	42,031
	5	195	1,246	16 (84)	52,816	44,365
Collier	1	450	1,144	39 (61)	10,420	6,356
	2	450	1,889	24 (76)	34,751	26,411
	3	450	2,549	18 (82)	67,921	55,695
	4	450	2,580	17 (83)	84,023	69,739
	5	450	2,849	16 (84)	92,879	78,018
Glades	1	N/A See Note Below			7	2
	2				30	8
	3				91	25
	4				222	61
	5				570	157
Hendry	1	N/A See Note Below			33	9
	2				140	39
	3				429	118
	4				1,045	287
	5				2,686	739
Lee	1	700	1,963	36 (64)	14,706	9,412
	2	700	3,098	23 (77)	52,164	40,166
	3	700	3,851	18 (82)	102,480	84,034
	4	700	3,883	18 (82)	126,977	104,121
	5	700	3,927	18 (82)	138,240	113,357
Sarasota	1	346	968	36 (64)	9,645	6,173
	2	346	2,029	17 (83)	37,747	31,330
	3	346	2,600	13 (87)	81,851	71,210
	4	346	3,129	11 (89)	111,754	99,461
	5	346	4,096	8 (92)	139,147	128,015

Note: Damage in Glades and Hendry Counties is due to wind damage or freshwater flooding; however, only wind damage has been estimated. For purposes of this report, an insured ratio of 72.5% (General Reinsurance Company Report) was used to calculate assistance needed. This ratio is higher because wind damage would be covered under homeowners insurance.

[1] Non-residential policies - Source: FEMA
[2] Non-residential buildings - Source: SWFRPC Hurricane Loss Study and U.S. Bureau of the Census, County Business Patterns, 1981. (# buildings is cumulative)
[3] Number of policies ÷ Number of buildings for each zone.
[4] Source: SWFRPC Hurricane Loss Study, pp. 78,81,83,85,88,91.
[5] Percent of uninsured X damage.

The amount of insurance payments received are deducted from the damage to determine the amount of assistance required. These amounts are found in the following table, by county and storm category.

TABLE 14
COMMERCIAL ASSISTANCE NEEDS ($000)
SOUTHWEST FLORIDA

	STORM CATEGORY				
County	1	2	3	4	5
Charlotte	3,917	17,275	34,584	42,031	44,365
Collier	6,356	26,411	55,695	69,739	78,018
Glades	2	8	25	61	157
Hendry	9	39	118	287	739
Lee	9,412	40,166	84,034	104,121	113,357
Sarasota	6,173	31,330	71,210	99,461	128,015
Region	25,869	115,229	245,666	315,700	364,651

Source: SWFRPC

Needs for commercial assistance could range from $25 million to $364 million depending upon storm severity. The greatest needs are in Lee and Sarasota Counties. Needs for assistance for businesses are relatively small in comparison to the projected demand for assistance for residences due primarily to the fact that residential land uses are predominant in the Region.

In summary, the needs for individual assistance consist of both needs for individuals as well as businesses. (Needs for assistance for public facilities are discussed in the subsequent chapter). These total needs are quantified in the following table. It should also be noted that there may be needs for other types of assistance, such as for industrial and institutional facilities, that have not been considered. These are relatively small, however, in comparison to requirements for monetary assistance for residences and businesses.

TABLE 15
TOTAL INDIVIDUAL ASSISTANCE NEEDS ($000)
SOUTHWEST FLORIDA

	STORM CATEGORY				
County	1	2	3	4	5
Charlotte	27,913	138,000	293,541	364,405	390,645
Collier	54,894	212,719	485,544	596,020	674,712
Glades	26	107	308	736	1,779
Hendry	103	422	1,214	2,901	7,024
Lee	44,354	204,013	456,433	576,389	633,468
Sarasota	68,701	263,558	582,524	822,741	1,035,662
Region	195,991	818,819	1,819,564	2,363,192	2,743,290

Source: SWFRPC.

PUBLIC ASSISTANCE

Public assistance is defined as the amount and type of aid needed by local governments to meet the needs of the entire community. This chapter will examine the needs for various types of public assistance in the Region for the following facilities:

* water
* wastewater
* public utilities (electricity, telephone etc.)
* transportation
* health care
* other government owned buildings (schools)

In the Region, there are over 900 public service facilities. The majority of these are located in the coastal counties, especially in the most populous counties of Lee and Sarasota. The number of each type of facility for each county, as well as the Region, is given below.

TABLE 16

PUBLIC FACILITIES
SOUTHWEST FLORIDA

County	Water	Waste-water	Public Utilities	Transpor-tation	Health Care	Schools	Total
Charlotte	16	81	5	4	9	16	131
Collier	22	80	11	9	8	26	156
Glades	9	16	3	1	3	3	35
Hendry	8	17	3	6	7	9	50
Lee	38	189	30	6	18	63	344
Sarasota	35	75	15	9	28	47	209
REGION	128	458	67	35	73	164	925

Source: SWFRPC Hurricane Loss Study

Wastewater treatment facilities by far comprise the largest category of public facilities in the Region, followed by schools and water facilities.

The SWFRPC Hurricane Loss Study estimated potential damage to public facilities for each of the Region's six counties. Public facilities are defined as those facilities providing services that are necessary for the public health, safety and welfare. Damage totals vary by county according to storm intensity. Since public facilities are not eligible for flood insurance, total damage is equivalent to the amount of assistance needed. The subsequent tables indicate the monetary assistance needed for each category of public facilities in each of the Region's six counties, by storm type.

TABLE 17

AMOUNT OF PUBLIC ASSISTANCE REQUIRED
CHARLOTTE COUNTY ($000)

Land Use Category	Storm Category 1	2	3	4	5
Water	39	118	194	216	222
Wastewater	133	405	670	746	766
Public Utilities	38	116	192	214	220
Transportation	210	639	1,056	1,176	1,208
Health Care	836	4,596	10,557	13,960	14,675
Schools	1,217	3,880	7,247	8,727	9,482
TOTAL	2,473	9,754	19,916	25,039	26,573

Source: SWFRPC

As seen in the previous table, assistance needs would be the greatest in Charlotte County in the health care and education sectors, while other categories would be relatively less affected in terms of total damage and assistance needed.

In Collier County, assistance needs are greatest for schools and health care facilities, as noted in the table below.

TABLE 18

AMOUNT OF PUBLIC ASSISTANCE REQUIRED
COLLIER COUNTY ($000)

Land Use Category	Storm Category 1	2	3	4	5
Water	9	66	200	3	340
Wastewater	18	126	381	558	648
Public Utilities	5	38	116	169	197
Transportation	62	209	375	440	456
Health Care	725	2,241	3,870	4,438	4,659
Schools	388	1,080	2,368	3,034	3,700
TOTAL	1,207	3,760	7,309	8,642	10,000

Source: SWFRPC

Note: Collier County damages are less than those in Charlotte County due to differences in tax assessment values and resultant damage totals.

Glades and Hendry Counties are subject only to wind damage which is much less significant than flooding damage. In addition, facilities in these rural counties are limited. (There are only 50 facilities in Hendry County and 35 in Glades County.) As a result, damage totals and assistance needs are relatively small. Glades County totals are as follows:

TABLE 19

AMOUNT OF PUBLIC ASSISTANCE REQUIRED
GLADES COUNTY ($000)

Public Facility (Related Land Use)	Storm Category 1	2	3	4	5
Transportation Commercial)	7	30	91	222	570
Schools, hospitals (Government)	18	74	227	554	1,424
Schools, hospitals (Institutional)	1	3	10	24	62
Electricity, water & sewer (Miscellaneous)	8	34	195	256	659
TOTAL*	34	141	523	1,056	2,715

* Since these land use categories also contain other types of uses, they are not mutually exclusive; thus, damage estimates may be slightly overstated. It should also be noted that schools and hospitals are found under two different land use categories (governmental and institutional).

SOURCE: SWFRPC.

Assistance needs in Hendry County are greater than that of Glades County although totals are minor in comparison to damage in the coastal counties.[1] Totals, which amount to less than $10 million in the worst case situation, are noted below.

TABLE 20

AMOUNT OF PUBLIC ASSISTANCE REQUIRED
HENDRY COUNTY ($000)

Public Facility (Related Land Use)	Storm Category 1	2	3	4	5
Transportation (Commercial)	33	140	429	1,045	2,686
Schools, etc. (Government)	76	319	973	2,374	6,099
Schools, hospitals (Institutional)	8	35	108	264	677
Electricity, sewer & water (Miscellaneous)	2	10	32	78	200
TOTAL	120	505	1,542	3,761	9,662

Source: SWFRPC

[1] Although total amounts are small compared to larger inland counties, damages account for a significant portion of the county's resource base.

Needs for assistance area greatest in the two most populous counties of Lee and Sarasota. Millions of dollars worth of damage could be incurred, even in minor storms. Total needs for Lee County are quantified in Table 21.

TABLE 21

AMOUNT OF PUBLIC ASSISTANCE REQUIRED
LEE COUNTY ($000)

Land Use Category	Storm Category 1	2	3	4	5
Water	79	274	566	725	834
Wastewater	87	299	617	790	909
Public Utilities	399	1,378	2,845	3,644	4,193
Transportation	20	58	93	101	104
Health Care	1,933	6,680	13,759	17,637	20,252
Schools	991	4,325	11,888	17,027	20,358
TOTAL	3,509	13,014	29,768	39,924	46,650

SOURCE: SWFRPC

Education and health care facilities would be most impacted by hurricanes, while impacts on other sectors such as water and wastewater facilities would be much less.

Total needs in Sarasota County are the greatest, as noted below. Health care facilities would be most impacted.

TABLE 22

AMOUNT OF PUBLIC ASSISTANCE REQUIRED
SARASOTA COUNTY ($000)

Land Use Category	Storm Category 1	2	3	4	5
Water	24	165	412	583	670
Wastewater	223	1,504	3,753	5,313	6,108
Public Utilities	16	105	261	370	425
Transportation	3	15	503	973	15,006
Health Care	7,703	22,829	39,399	45,640	50,313
Schools	1,166	3,448	7,643	11,047	16,599
TOTAL	9,134	28,066	51,971	63,925	89,121

Source: SWFRPC

The amount of assistance necessary in Southwest Florida is summarized in the following table.

TABLE 23

AMOUNT OF PUBLIC ASSISTANCE REQUIRED
SOUTHWEST FLORIDA ($000)

County	Storm Category 1	2	3	4	5
Charlotte	2,473	9,754	19,916	25,039	26,573
Collier	1,207	3,760	7,309	8,932	10,000
Glades	34	141	433	1,056	2,715
Hendry	120	505	1,542	3,761	9,662
Lee	3,509	13,014	29,768	39,924	46,650
Sarasota	9,134	28,066	51,871	63,925	89,121
REGION	16,477	55,240	110,839	142,637	184,721

Note: Damage in Glades and Hendry Counties is due to wind damage
Source: SWFRPC Hurricane Loss Study

The total amount of assistance that may be needed, ranges from $16.4 million in minor storms to over $184 million in major hurricanes. These figures are relatively low in relation to total projected losses for other structures (such as residences and businesses).

Dollar amounts of assistance needed would be the greatest in Sarasota County due to the value of structures in vulnerable areas and projected damage. Damages and assistance needed are relatively less in the other counties. Damage in the inland counties is due to wind only; freshwater flooding damages have not been estimated.

PART 2

HURRICANE HAZARD MITIGATION POLICY PLAN: PREVENTION OF FUTURE LOSS

INTRODUCTION

This section, entitled Hurricane Harard Mitigation Policy Plan: Prevention of Future Loss, consists of policies to guide future development and post-disaster redevelopment in ways that reduce or avoid future property damage due to hurricanes. Policies are based upon flooding information and potential losses identified in the SWFRPC Hurricane Evacuation Plan and Hurricane Loss Study.

This portion of the report is divided into six major chapters. The first chapter develops a methodology for reviewing future development projects by measuring the impact of their vulnerability to hurricane hazards. Next, potential sites in the region suitable for the relocation of various land uses are examined. Potential sites suitable for the location of future hurricane-vulnerable development are assessed. High hazard sites suitable for future public acquisition are also identified. Growth management techniques that could be utilized by local governments to promote the location of hurricane-vulnerable development are discussed. Finally, policies are provided as recommended guidelines for local governments to guide future development in identified vulnerable areas and to prevent or mitigate hurricane impacts. The term "migitation" is defined as preventing or reducing the adverse effects of a disaster (in this case a hurricane). Although the actual hazard (hurricane) cannot be mitigated, its impacts can. Mitigation includes preventing or reducing both loss of life and building damage, although this study will primarily address building and related damage.

REVIEW OF FUTURE DEVELOPMENT

This chapter consists of a methodology to review future development projects in relation to their impacts and vulnerability to hurricane hazards. Basically, the methodology includes a means of assessing the the development's potential impacts upon life and property, according to its location and vulnerability to hurricanes. (Flooding levels and vulnerability zones have been described previously in the SWFRPC's Hurricane Evacuation Plan). Once these impacts are identified, measures can be taken to reduce their severity.

PROCEDURE

Potential impacts upon life and property are examined through assessment of a project's impact upon the following characteristics: overall evacuation times, population, evacuation routes, and shelters. The first step involves determining the project location in relation to hurricane vulnerability zones. The project is located on maps provided by the National Hurricane Center that indicate maximum flooding levels for five categories of storms (1-5). First, the vulnerability zone is determined. (If a project, for example, is located in areas that is subject to flooding in category 2-5 storms, then it is located in zone 2). Secondly, the maximum flooding levels for category 1 through 3 storms are determined. (Category 4 and 5 storms would require evacuation of the majority of the Region, therefore, they are not included in this analysis).

ASSESSMENT OF EVACUATION TIME

The first step in determining a project's impacts upon evacuation time is to determine the zone in which the project's location and the storms that the development would be vulnerable to (storm categories 1-5). The impacts and types of recommendations are dependent upon the project's geographic location. Thus, each category will be discussed separately.

Category 1 (Vulnerability Zone 1) - Barrier Islands and Low-Lying Shoreline Areas Subject to Isolation by Storm Action

Evacuation is the only feasible alternative for these areas, due to the high probability of severe flooding, the uncertainty of the appropriateness of on-site preparedness measures, and the distinct possibility that transportation routes will be cut off and public facilities will be damaged or rendered useless in storms.

In such areas, the impact of future development on evacuation times is the most important and critical factor to be considered in the impact analysis.

The methodology for evaluating impacts is the following:

(1) Assess existing evacuation time for the zone(s) in which the project is located.

(2) Determine the evacuation time for the proposed project and the subsequent increase in evacuation time for the zone with the project added.

(3) Assess the impact that transportation improvements provided by the applicant (if any) will have upon evacuation times.

If the overall evacuation time (with the project added and any transportation improvements factored in) is 0.1 hours (6 minutes) greater than existing evacuation times and if existing evacuation times are inadequate, then it is improbable that the project will be recommended for approval. Conversely, if overall evacuation times (with the project included) increase, but proposed transportation improvements negate this increase, the project probably will be recommended for approval.

Other Category 1 Areas, and Category 2 and 3 Flood Zone Areas

For these areas, there are three feasible options:

1) evacuation
2) provision of on-site shelters
3) adequate elevation

The evacuation methodology is the same as that previously discussed for barrier islands and low-lying category 1 areas. In the case of other category 1 areas, and category 2 and 3 zones, the other two options may be utilized to mitigate or eliminate adverse impacts upon evacuation times.

For example, the on-site shelter option is promoted for use in those projects in suitable areas where adverse impacts would occur either to evacuation times or shelters. The project would have to provide adequate shelter space on-site through the utilization of either existing structures or special shelter structures built to accommodate those people who would otherwise have to evacuate. The structures provided must have minimum floor elevations at or above the category 3 storm flood height caculated for the site (to avoid flooding in the shelter). In addition, sufficient space must be provided to accommodate all residents.

The elevation option basically insures that habitable areas within the project are constructed at heights that are, as a minimum, within 1 foot of category 3 flooding levels at the site. This figure will generally be greater than the FEMA calculated storm height used for insurance purposes.

ASSESSMENT OF SHELTER ADEQUACY

The vulnerability of residents of a proposed development to the force of a hurricane also includes an analysis of any designated shelters for such residents. The methodology for determining this impact includes the following:

(1) An assessment of available shelter capacity for the zone(s) in which the project is located is made. This assessment includes a review of all storm scenarios up to and including Category 3 storms. If there is already inadequate shelter

space for existing residents, any proposed project has the responsibility of participating in providing new shelters or shelter space, either on or off site.

(2) Assuming that adequate shelter space is available for existing residents, the proposed project's population impacts are then analyzed. This analysis reviews the project's expected population (peak population during hurricane season) that will seek shelter and assumes that from 24% to 45% of the population will be required to seek shelter if the project has to be evacuated in the event of a hurricane.

(3) This evacuating population is assigned to the shelters designated for the zone(s) in which the project is located. If the shelters exceed capacity, and if no other allocation system results in the shelters not exceeding capacity, then the project will either be required to participate in the creation of new shelters, either on or off site, or it will be recommended for denial.

Recommendations for mitigating the impacts of potential hurricanes are incorporated into each Development of Regional Impact (DRI) review and subsequent Development Order. Examples of conditions and recommendations incorporated into DRI's to mitigate the impacts of hurricanes are found below.

HURRICANE EVACUATION RECOMMENDATIONS

a. The applicant shall use a minimum first floor living area elevation at or above the maximum category 3 flooding level (determined by the SLOSH model)

b. Refuge space shall be provided at a ratio of 20 square feet per person in common areas or other shelter areas (if on-site shelter is recommended).

c. Provisions shall be made in deeds and covenants that temporary shelter in minor storms shall be made in upper floor areas. Designated refuge space shall be located in the interior hallways of upper story structures or similarly protected areas with no openings leading directly to the exterior. (for projects not located in surge areas or on barrier islands)

d. Any on-site shelters shall fulfill the following conditions:
   - Shelters shall be designed and constructed to withstand winds of at least 140 miles per hour, and shall be certified by a professional engineer, licensed and registered by the State of Florida.
   - Shelters shall be equipped with emergency power and potable water supplies (generators and storage tanks)
   - Shelters shall be constructed with as little glass as possible and glass shall be protected by shutters or boards.

- Shelters shall provide adequate ventilation, sanitary facilities, and first aid equipment.

e. A homeowners association shall be established to provide education to residents concerning hurricane evacuation, shelters, etc.

CONCLUSION

The preceding methodology is useful for determining any detrimental impacts resulting from major projects (those meeting DRI thresholds). However, the majority of developments in the Region are of a smaller scale and are not reviewed by the Council. Application of this methodology to other large but sub-DRI scale projects above a specific threshold would ensure that disaster preparedness needs are met throughout the Region. This could be accomplished through local ordinances or other appropriate measures. Lee County, for example, has established a Development of Community Impact process for reviewing such projects. This review incorporates an evaluation of hurricane impacts as well as other project impacts.

POTENTIAL RELOCATION SITES

After a hurricane or other type of natural disaster occurs, a period of rebuilding will take place. The pattern of rebuilding may or may not be similar to the pattern of development that existed before the disaster. It may in some instances be more appropriate to relocate certain land uses to avoid a similar reoccurrence of destruction in the future.

In this chapter, potential sites in Southwest Florida that are suitable for the relocation of the following land uses are identified:

* Damaged Housing
* Water Facilities
* Wastewater Treatment Facilities
* Electric Facilities
* Transportation Facilities

To determine potential sites suitable for relocation of various land uses, first, two factors must be considered: safety and economics. The safety factor is assessed by the degree of danger to lives of individuals and to the public at large through continual exposure to some hazard, such as a hurricane. The economic factor is whether it is ultimately less expensive to move a particular facility to a safer location than to rebuild it, with the probability of having to rebuild it again before it serves its useful life. The facilities facing the greatest degree of threat (in terms of economy, i.e. potential dollar damage) are those located in the Category 1 (most vulnerable) flood zone. These facilities are subject to damage from all categories of storms, and, therefore, are the most appropriate candidates for relocation.

There are five categories of land uses being examined for their relocation potential and desirability. These are housing, water facilities, sewer facilities, electrical facilities, and transportation facilities. The criteria for each category are different, and will be discussed individually below.

HOUSING

Hurricanes can destroy housing and also endanger the lives of individuals. Consequently, identifying potential sites for relocation of housing in non-vulnerable or less vulnerable areas would reduce the overall damage in the community resulting from storm flooding (both in terms of economy and human life). However, only two types of residential buildings (mobile homes and some types of single family) are capable of being relocated. (Multiple family housing will not be considered, since it is impractical, if not impossible, to move larger buildings such as condominiums and apartment complexes.)

Finding adequate sites for the relocation of single-family housing and mobile homes is not a problem for most of Southwest Florida. There are in each coastal county of Southwest Florida large subdivisions with vast expanses of undeveloped lots with rudimentary services. These subdivisions, indicated on Map 7, provide an adequate number of lots for virtually any relocation program. There is only one coastal area that does not have direct access to such a subdivision, northern Sarasota County. The County's Comprehensive Plan, however, has targeted future growth areas which may be used for such a purpose. (Mobile homes, however, may be restricted from certain areas through local zoning regulations; thus, it may be more difficult to find adequate sites for this type of housing in specific areas.)

WATER FACILITIES

The region's water treatment plants are "resource dependent" uses of land. In all cases, the water treatment plants subject to storm damage are located at the source of water for the community being served. The question of relocating such facilities, then, is in fact, a question of finding a new water source for the community.

Water supply sources are of two types: groundwater and surface water. The groundwater sources may in themselves be considered of two types, surficial aquifer sources (recharged directly by rainfall) and sub-surficial aquifers. Both the surface water source and sub-surficial aquifer source of water may be immediately contaminated by hurricane-induced flooding from the coast. Consequently, the determining factor for replacing water facilities from a safety viewpoint would be if the water supply source may be lost.

Each water system in Category 1 (the most vulnerable) flood areas that has a water supply source within that area is identified in Table 24. These systems are listed by county and water source. These facilities are identified on Maps 8 through 11. There are 36 such major facilities[1] in the coastal counties of Southwest Florida. Most are located in Lee County (17), although Collier County has a significant amount in vulnerable locations. Sarasota County only has five facilities in the Category 1 zone.

Those facilities which would have their supplies degraded by saltwater inundation have a number of options. These are:

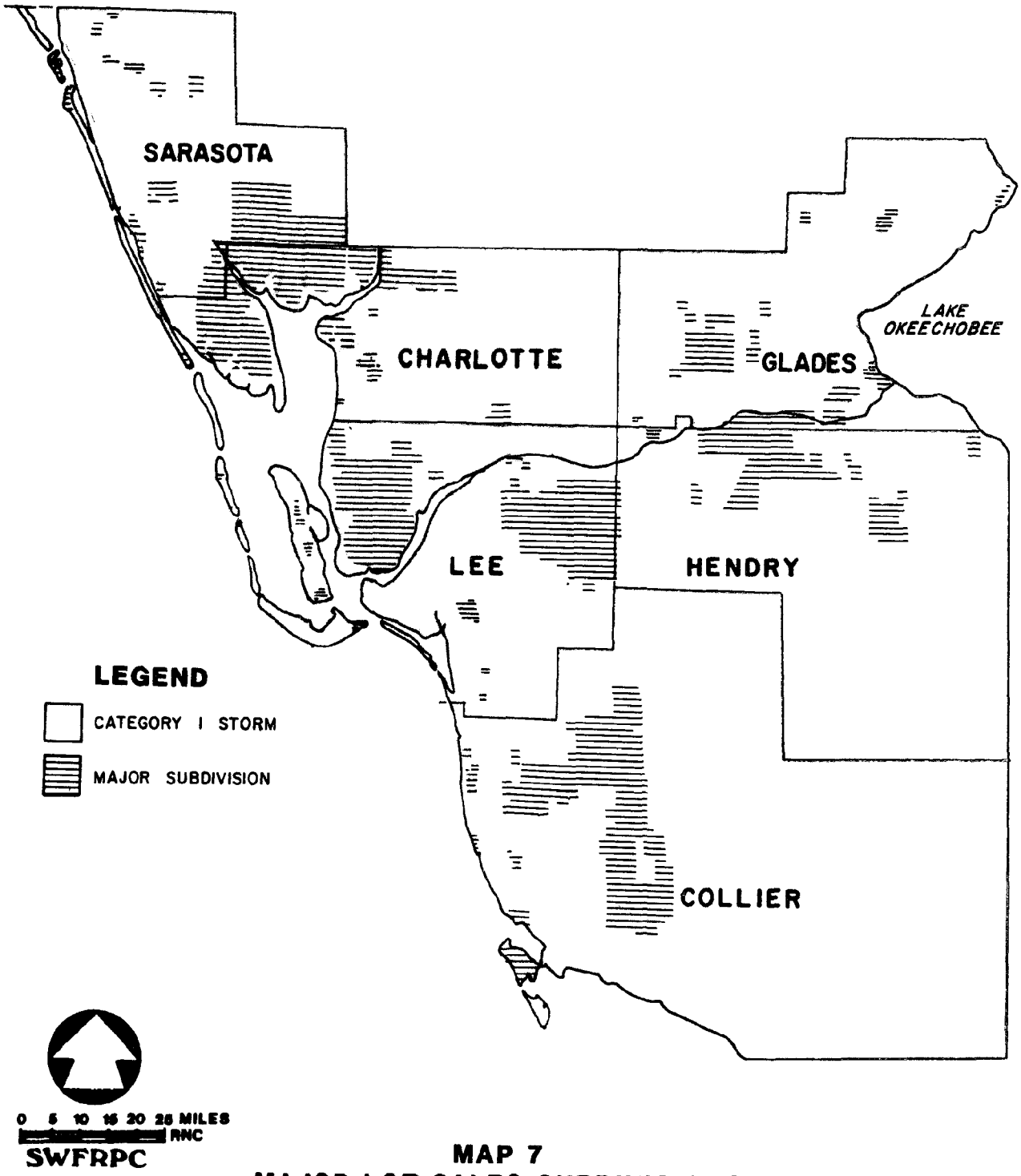
(1) to either wait through an emergency period until the source quality is restored,

(2) change their treatment technology, or

(3) attempt to connect to a better water source.

Connecting to a better water source would involve either physical relocation or a phasing out of the existing system in favor of regional suppliers. Some of these alternatives, however, could be either infeasible or too costly to utilize.

[1] capacity greater than 10,000 gallons per day.



MAP 7
MAJOR LOT SALES SUBDIVISIONS
SOUTHWEST FLORIDA

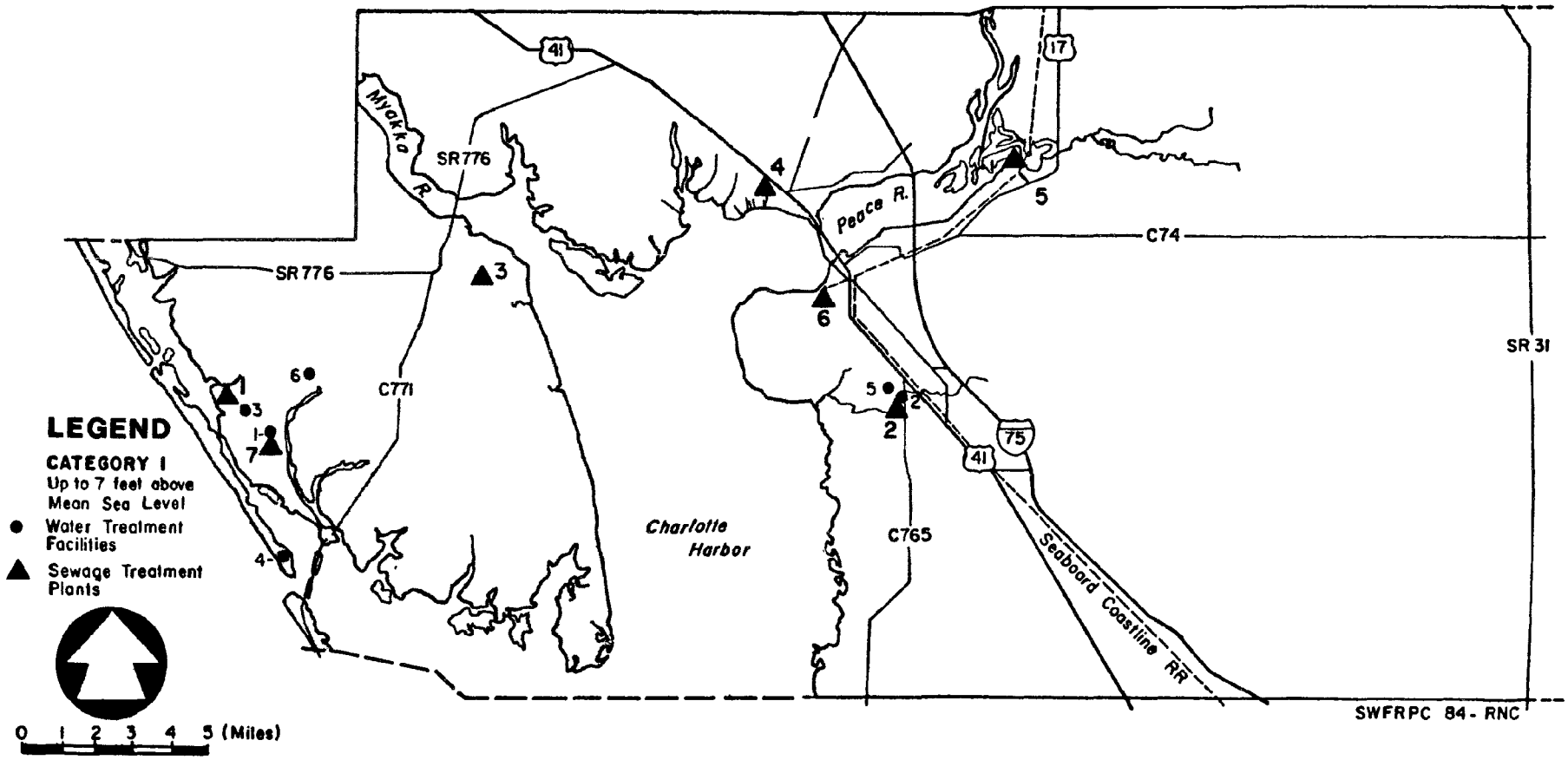
TABLE 24

Water Facilities and Sources - By County
Category 1 Flood Zone

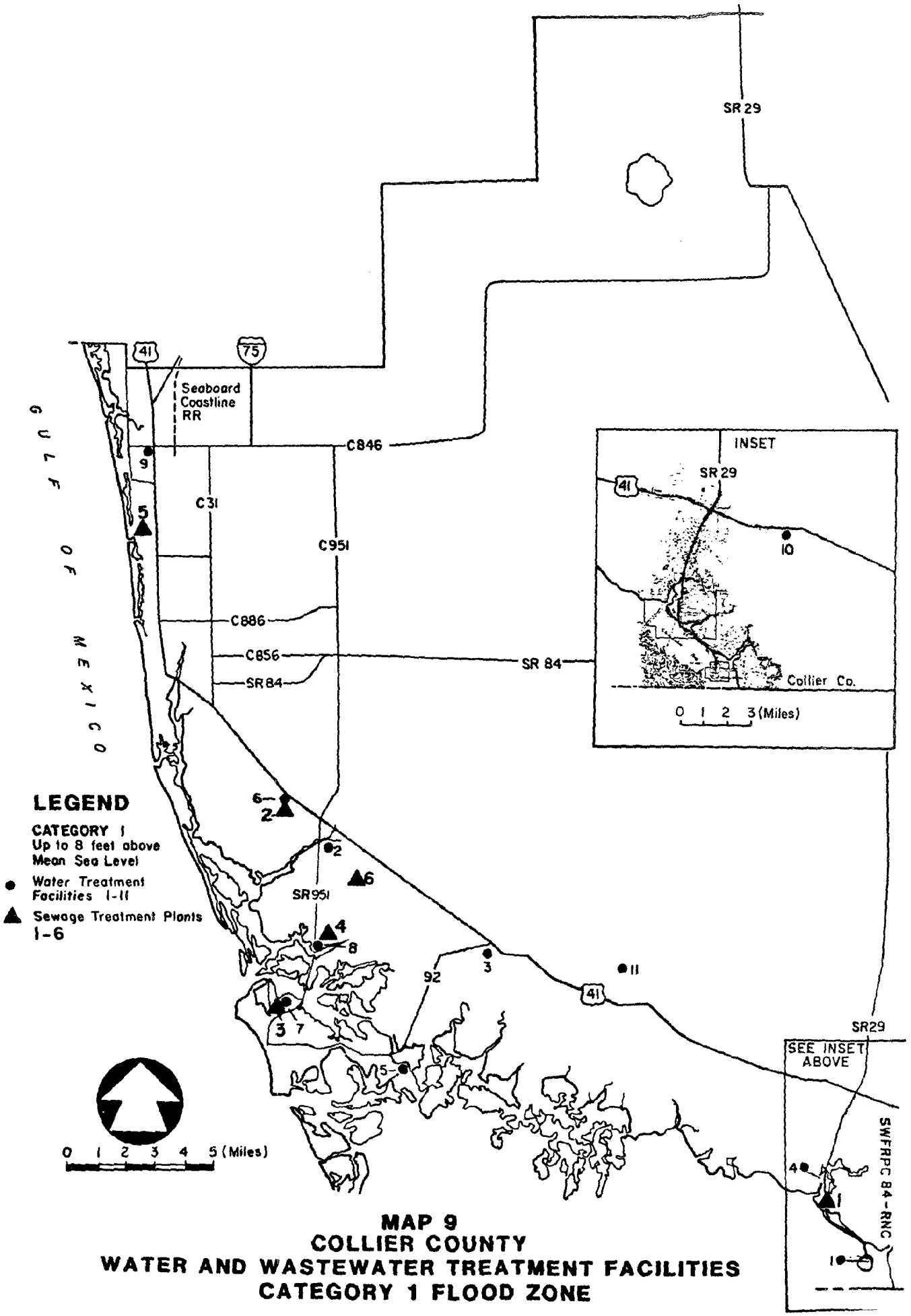
County	Map #	Facility	Source*
Charlotte	1	Cape Haze	G
	2	Eagle Point	S
	3	Five Lands	G
	4	Little Gasparilla Island	G
	5	PGI Burnt Store	S
	6	Rotonda West	G
Collier	1	Anglers Motel	G
	2	Capri Water Works	G
	3	Collier Seminole State Park	G
	4	Everglades City	G
	5	Goodland Water	S
	6	Hitching Post MHP	S
	7	Marco Island Utilities	S
	8	Marco Island Utilities (March Shores)	S
	9	Naples Drive In	S,G
	10	Ochopee	G
	11	Remuda Ranch	G
Lee	1	Bayshore Utilities	S
	2	Cabbage Key	G
	3	Cape Coral R.O.	G
	4	Cape Coral Lime	G
	5	Florida Cities Water (Cypress Lake)	G
	6	Florida Cities Water (Waterway Estates)	G
	7	Iona Trailer Ranch	G
	8	Island Water Association	G
	9	Logans Trailer Park	S
	10	Mariner's Cove	G
	11	Orange Harbor	S
	12	Palmetto Pines	G
	13	Pine Island Water Association	G
	14	Shady Acres	G
	15	Spring Creek Village	G
	16	Tahiti MHP	G
	17	Useppa Island Club	G
Sarasota	1	Fairwinds Condo	S
	2	Sorrento Utilities	S

SOURCE: SWFRPC

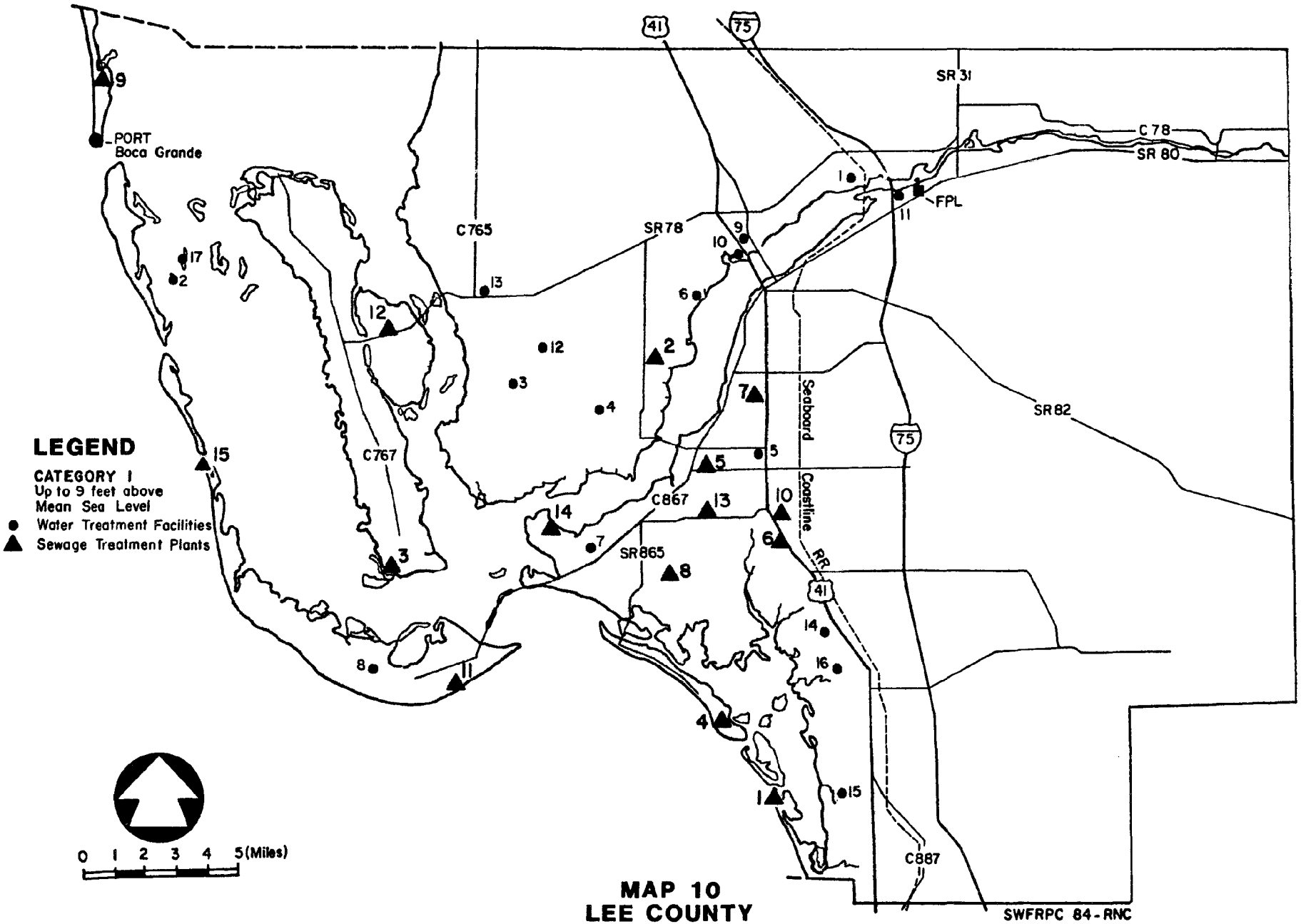
* G = Groundwater
S = Surface water



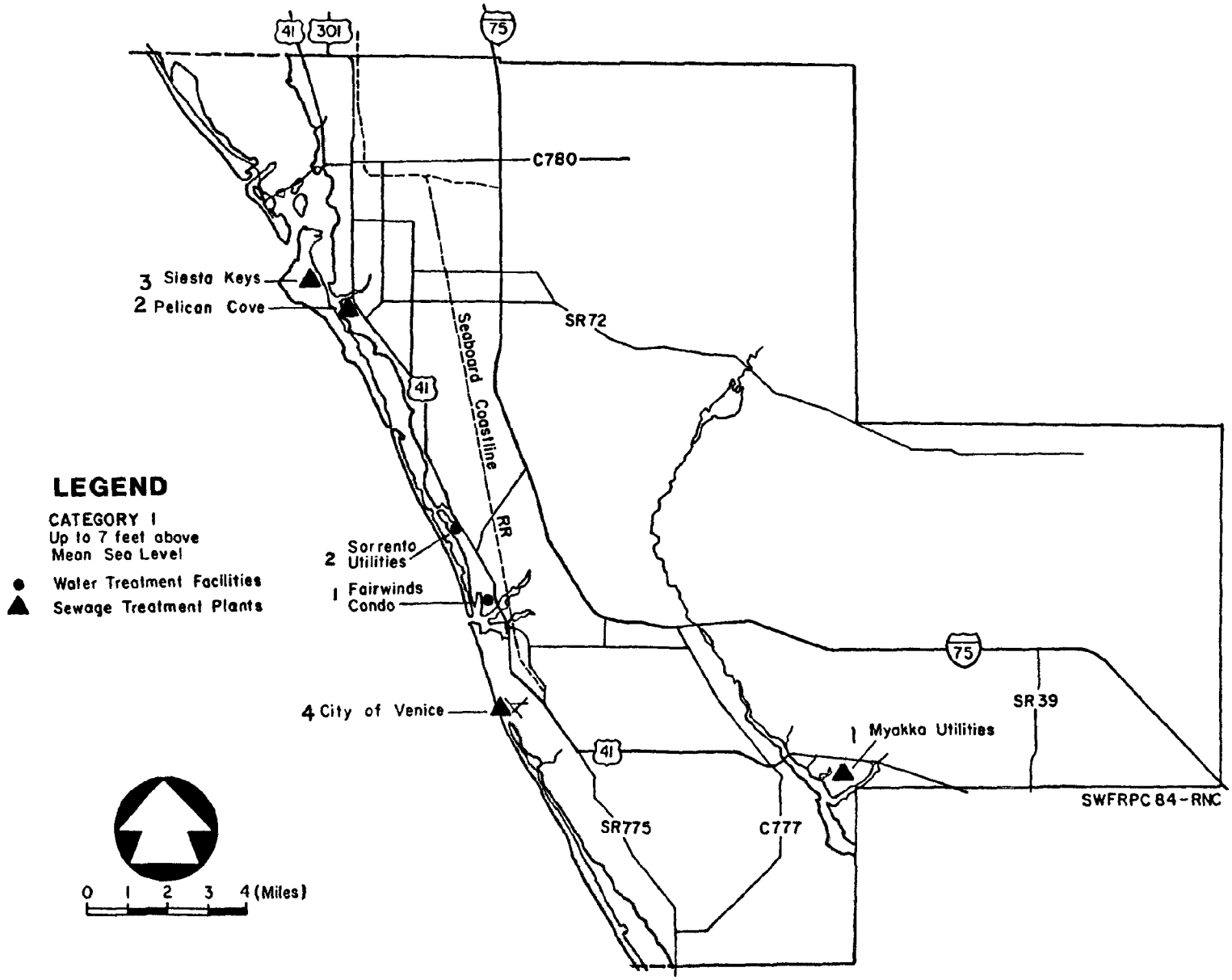
MAP 8
CHARLOTTE COUNTY
WATER AND WASTEWATER TREATMENT FACILITIES
CATEGORY 1 FLOOD ZONE



MAP 9
COLLIER COUNTY
WATER AND WASTEWATER TREATMENT FACILITIES
CATEGORY 1 FLOOD ZONE



MAP 10
LEE COUNTY
WATER AND WASTEWATER TREATMENT FACILITIES
CATEGORY 1 FLOOD ZONE



MAP 11
SARASOTA COUNTY
WATER AND WASTEWATER TREATMENT FACILITIES
CATEGORY 1 FLOOD ZONE

Preferred relocation areas would include inland areas, such as Categories (zones) 2-5 and also areas outside hurricane flood zones. Moving to some areas, especially in the furthest inland zones (where fewer people reside), may create additional problems of economy of scale.

WASTEWATER FACILITIES

The provision of wastewater facilities in the Category 1 hurricane flood areas is by a combination of small site and community facilities. The threat to these facilities and, consequently, to the public well-being differs from that to public water systems.

Small site wastewater treatment facilities are commonly adjacent to the wastewater generators. Consequently, damage to the wastewater system is likely to be accompanied by damage to the generator. In such cases, the question of relocation of the facility is tied to the relocation of the generator.

Large volume wastewater treatment plants (more than .100 mgd) are generally independent of any major supplier. The large volume systems are typically associated with providing service to a number of individual users over a large area. They may range from the 100,000 gallons per day system which provides services to 200 or more homes to the multi-million gallon per day system of a major city. These systems have as their major investment the sewage collection system. Any question of relocation depends upon the ability to continue to move the volume of sewage to the new location.

As is the case with the water system, the most likely approach to "relocation" is through replacement with a regional system. This has been occurring on a number of the region's barrier islands. The name and capacity of large sewer systems by county in the Category 1 flood zone are listed in Table 25 and shown on Maps 8 through 11.

There are 32 wastewater treatment facilities in vulnerable (Category 1) areas in the coastal counties of Southwest Florida. Nearly half are located in Lee County, followed by Charlotte and Collier Counties. Only four facilities are found in Sarasota County's most vulnerable areas. Relocation, if feasible, would be to areas outside the Category 1 flood zone.

TABLE 25

Wastewater Treatment Plants - By County
Category 1 Flood Zone

County	Map #	Facility	Capacity* (MGD)	Type** Treatment
Charlotte	1	Eagle's Nest	.125	S.S.I.
	2	Eagle's Point MHP	.250	S.R.
	3	General Development Utilities, Gulf Cove	.330	S.
	4	South Punta Gorda	1.50	S.S.I.
	5	Pelican Harbor MHP	.200	S.R.
	6	City of Punta Gorda	1.00	S.S.I.
	7	Rotonda Wastewater Treatment Plant	.250	S.P.
Collier	1	Everglades City	.100	S.P.
	2	Hitching Post MHP	.100	S.P.
	3	Marco Island Utilities	2.50	S.S.I.
	4	Marco Shores Golf & Tennis Club	.140	S.S.I.
	5	Pelican Bay	.500	S.S.I.
	6	Rookery Bay Utility	.150	S.P.
Lee	1	Bonita Bay Club	.100	S.D.
	2	City of Cape Coral	4.00	S.
	3	Cherry Estates, Inc.	.100	S.D.
	4	Estero 7000	.200	S.S.I.
	5	Fiesta Village	2.00	S.S.I.
	6	The Forest	.500	S.P.
	7	City of Fort Myers, Bowling Green	6.00	S.
	8	Fort Myers BeachSewer District	2.71	S.
	9	Gasparilla Island Water Assoc.	.275	S.S.I.
	10	Jamaica Bay	.200	S.P.P.
	11	Jamestown Beachview	1.00	S.S.I.
	12	Matlacha Sewer District	.150	S.P.
	13	Paddle Creek STP	.100	S.D.
	14	Shell Pointe Village, Palm Acres	.200	S.P.
	15	South Seas Plantation	.160	S.S.I.
Sarasota	1	Myakka Utility	.400	S.P.
	2	Pelican Cove	.240	S.P.
	3	Siesta Key Utilities	2.7	T.
	4	Venice, City	3.00	S.S.I.
	5	Fairwinds Condo	.030	S.D.

* Capacity greater than or equal to .01 mgd

** KEY: TYPE TREATMENT

S.	Secondary Treatment
S.D.	Secondary Treatment, Drainfield
S.P.	Secondary Treatment, Percolation
S.R.	Secondary Treatment, Retention
S.P.P.	Secondary Treatment, Polishing Pond
S.S.I.	Secondary Treatment, Spray Irrigation
A.D.	Secondary Treatment, Aerobic Disc
O.D.	Secondary Treatment, Overland Distribution

ELECTRICAL FACILITIES

The electrical facilities located in the Category 1 flood zone consist of substations and switching stations, as well as one major power generator. The need or capability to relocate varies in regard to the facility type. Substations as a rule must be provided relatively close to the group of power users. Consequently, relocation of these facilities is generally incompatible with existing technologies.

Switching stations are more important in regard to power company needs. However, there is only one facility in the Category 1 flood zone, which is in Carnestown (Collier County). Relocation in this case would also involve the relocation of major power lines for a substantial distance. A case can be made that it is probably more cost effective to floodproof the facility than to relocate it.

The generating plant is owned by the Florida Power and Light Corporation (FP&L) and is located on the Caloosahatchee River in Lee County. The system requires access to large volumes of water (0.5 billion gallons/day). State policy in regard to power plant location is still debatable, but preferences have been stated that power plants should be located on the coast so that saltwater, not fresh, should be the cooling medium. If that is the policy directive, there is no other site as suitable for a power plant in Southwest Florida as that currently in use. If State policy allows the use of freshwater as a cooling medium for new plants, the FP&L power plant siting study indicates there are no suitable sites for relocation in Southwest Florida. The nearest site is in DeSoto County on the Peace River.

TRANSPORTATION FACILITIES

Few transportation facilities other than roads are located in the most vulnerable (Category 1) areas in Southwest Florida. Major facilities (such as airports, etc.) are outside the vulnerable zones and thus relocation would not be necessary. Those facilities located in Category 1 zones are divided into three categories: ports, railroads, and roads. Port facilities, of necessity, must be located in the Category 1 zone. Southwest Florida has one major port facility at Boca Grande and a large number of minor port facilities, primarily marinas. The port facility at Boca Grande is owned and operated by the Florida Power and Light Company and has been noted before as an exposed location with regard to the oil storage tanks at that location. The issue of relocating these facilities, using the same system of oil delivery, has been met in counterpoint by the environmental impacts, both at and to the proposed new site, and the costs of relocation. As a result, there has been no agreement reached on relocation. The possibility of changing the delivery system and eliminating the primary need for oil storage at the port is still an option, but would involve the voluntary participation of the port operation.

Rail facilities in the Category 1 flood zone are those primarily crossing the flood zone at river crossings. Most rail related facilities are located outside of the category 1 zone. The need for relocation of these is minor.

Road facilities in the Category 1 flood zone exist to serve urban areas located in such zones, as well as providing access to the recreational opportunities associated with those areas. These are most notably beach use, boating, and fishing. The question of relocating the roads is then related to relocation of the overall urban area, as well as limitations to the availability of recreational uses.

POTENTIAL SITES FOR FUTURE DEVELOPMENT

The preceding chapter examined the necessity of, and identified areas for, the relocation of certain land uses. This chapter includes a general analysis and identification of potential sites in the Region that are suitable for the location of future hurricane-vulnerable development. "Hurricane-vulnerable development" would include all land uses (residential, commercial, etc.) that could be impacted by hurricanes, especially by hurricane flooding.

Theoretically, all development in certain geographic areas is vulnerable to hurricane impacts and thus would be considered hurricane-vulnerable development. However, it is not feasible to preclude all development from vulnerable areas; thus, the most vulnerable areas only will be excluded.

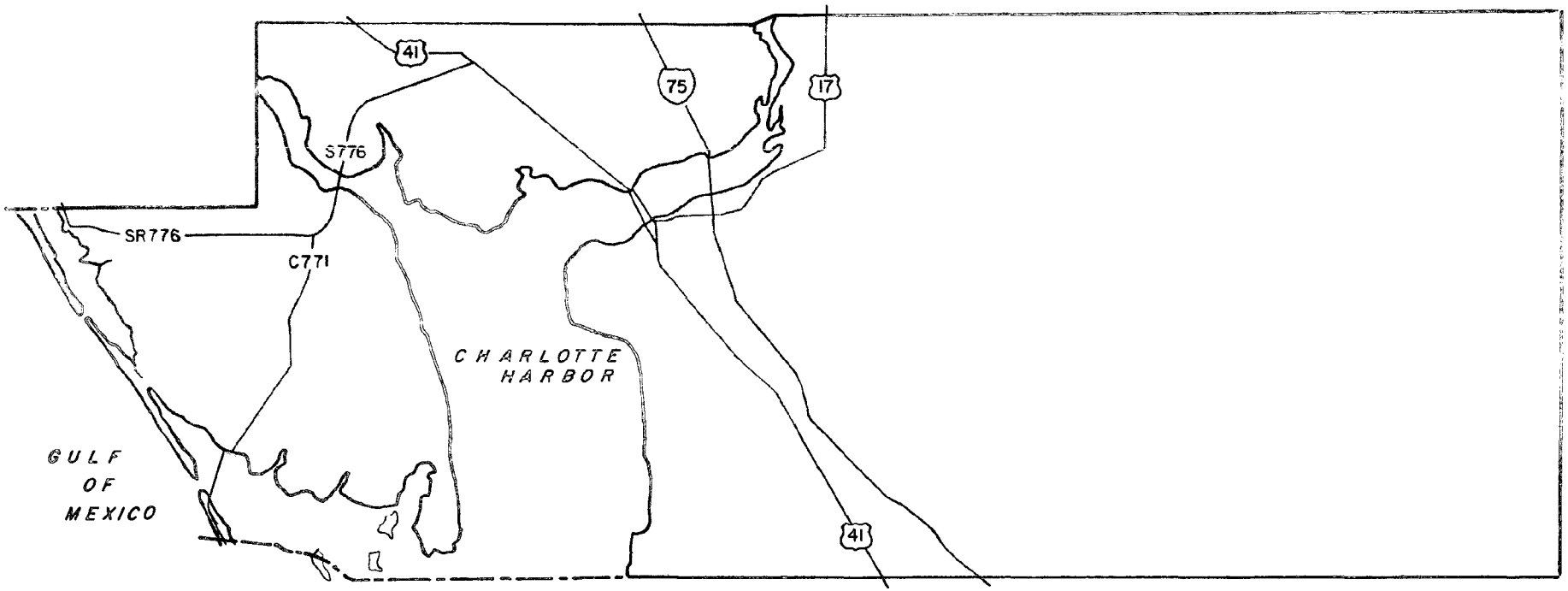
Ideally, sites suitable for the location of future development would generally be located inland, away from barrier islands, low-lying coastal areas and land adjacent to some rivers, in areas with suitable elevations to avoid hurricane flooding and also with sufficient infrastructure to support the development.

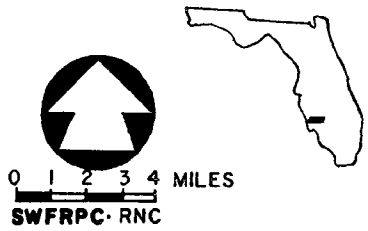
Unfortunately, many areas in Southwest Florida's coastal counties do not meet these specifications with regard to all categories of storms. However, many areas are somewhat suitable for development, especially for residential use, when the most vulnerable (Category 1) areas are excluded. Thousands of acres of land in all coastal counties in the Region were platted for development by large development companies several decades ago in what is known as "lot sales subdivisions." Substantial portions of these are located outside of the Category 1 flood zone, which is most vulnerable to flooding. These subdivisions were previously located on Map 7. The map also depicts the category 1 flood zone line.

In Collier County, the Golden Gate Estates area, located east of the City of Naples, is the most expansive lot sales area. Lots in this area are large, frequently 2-1/4 acres in size. In Lee County, Cape Coral and Lehigh Acres are the largest subdivisions. Large portions of Cape Coral are located outside the Category 1 area, while Lehigh Acres is located in the least vulnerable area in the county. In Sarasota County, Myakka Estates and the City of North Port, both located in the southern part of the county, are the biggest lot sales subdivisions. Much of this area is suitable for use for development, when considering hurricane vulnerability. In Charlotte County, much of Port Charlotte is outside of the Category 1 flood zone, as are portions of Punta Gorda Isles and Rotonda. The inland counties of Glades and Hendry are not subject to saltwater flooding impacts from hurricanes and thus would also be suitable for development in this respect. Port LaBelle, situated in both counties, is a major subdivision where future growth is planned.

It should be noted, however, that although these areas may be more suitable for development with regard to hurricane vulnerability, many of these areas lack necessary facilities and would thus require major expenditures for infrastructure, such as water and sewer systems, before development could be accommodated.

In addition to major subdivisions, each county's Comprehensive Plan to varying degrees promotes growth away from its shoreline. This is most evident in Sarasota and Collier Counties, less evident in Lee and Charlotte Counties. As is the case for the major subdivisions, infrastructure would need to be created in order to serve new development. Maps 12-15 depict the areas being identified for major growth in the coastal counties through the comprehensive planning process.



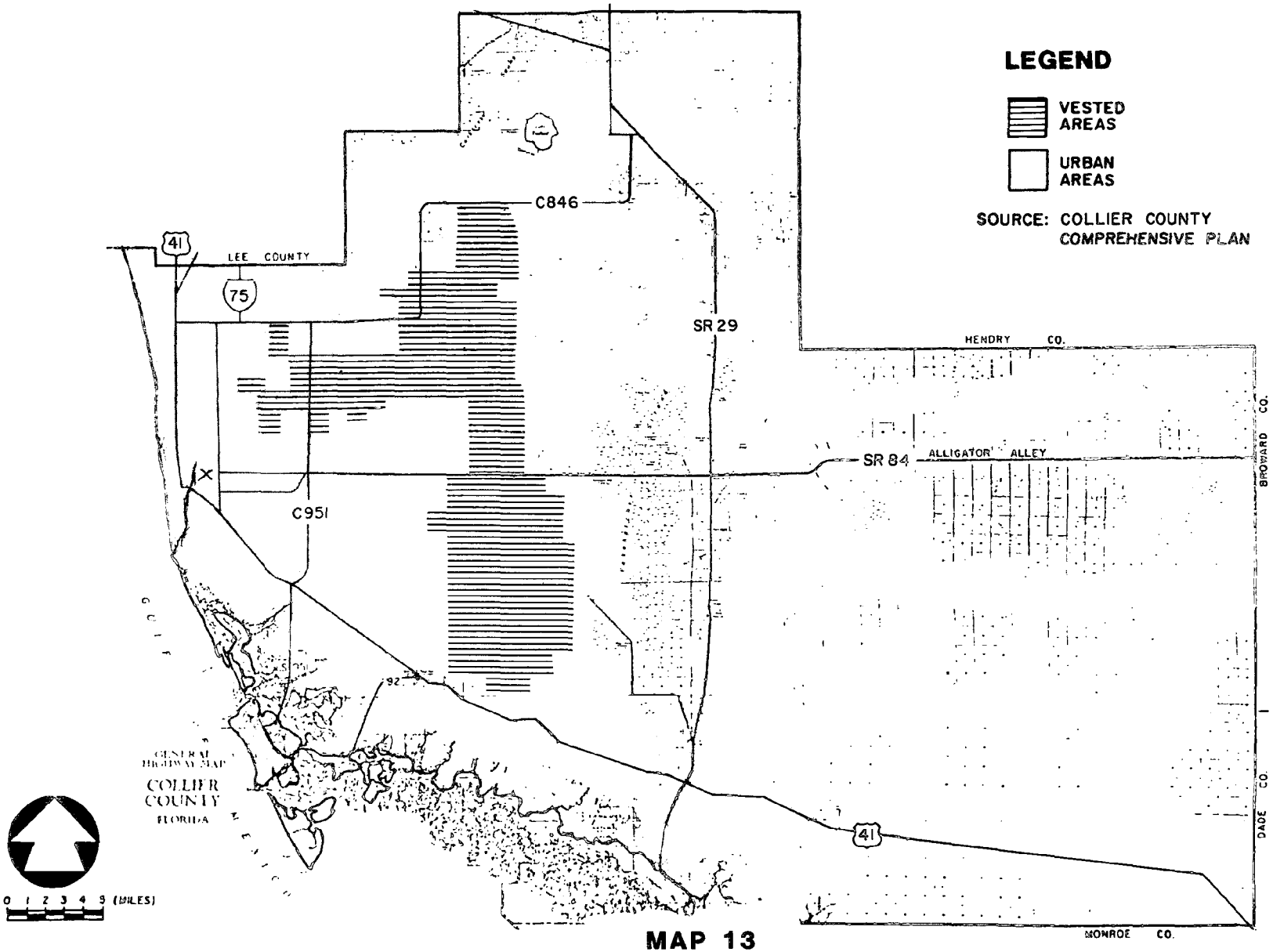


LEGEND

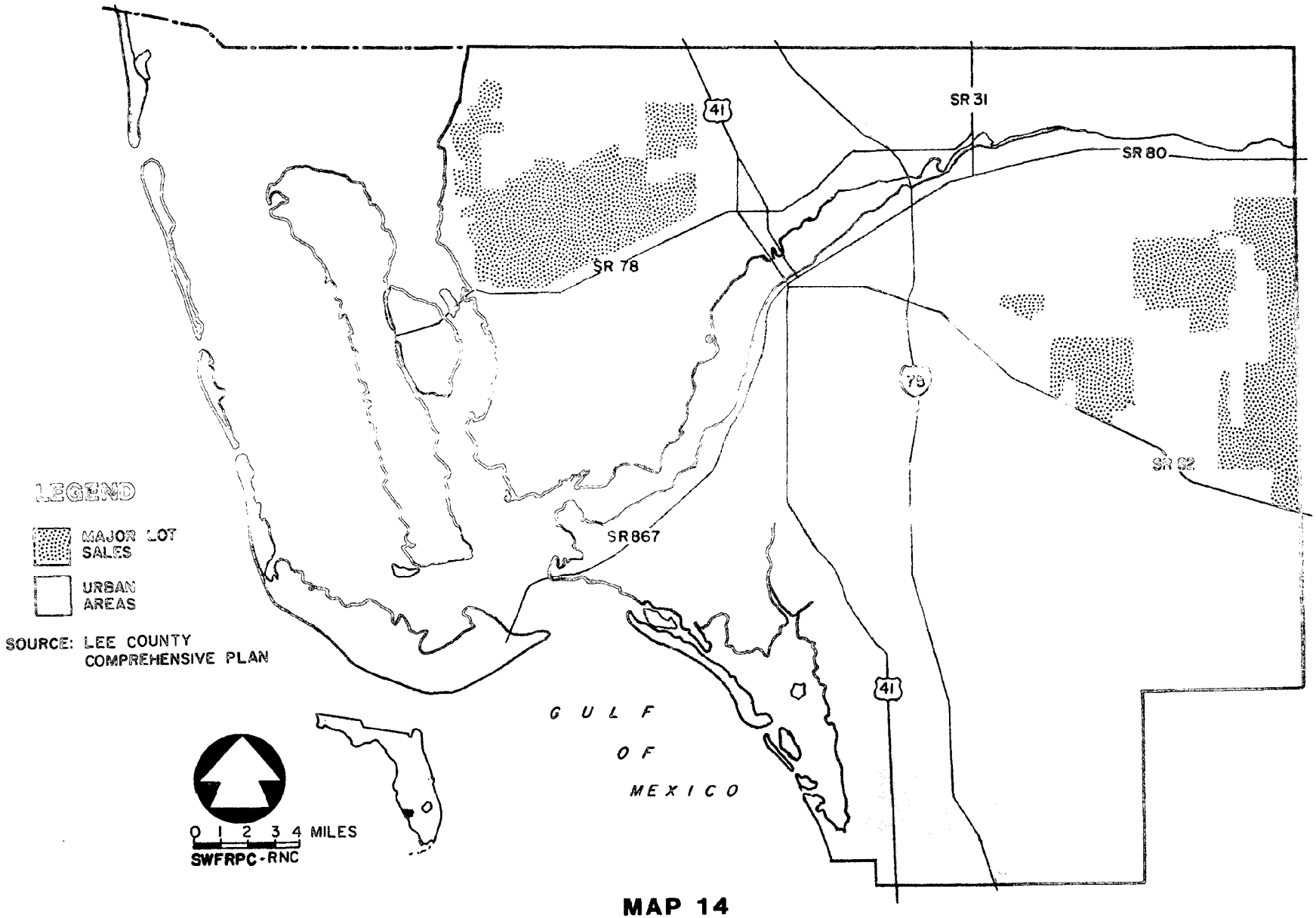
URBAN AREAS

SOURCE: CHARLOTTE CO./PUNTA GORDA COMPREHENSIVE PLAN

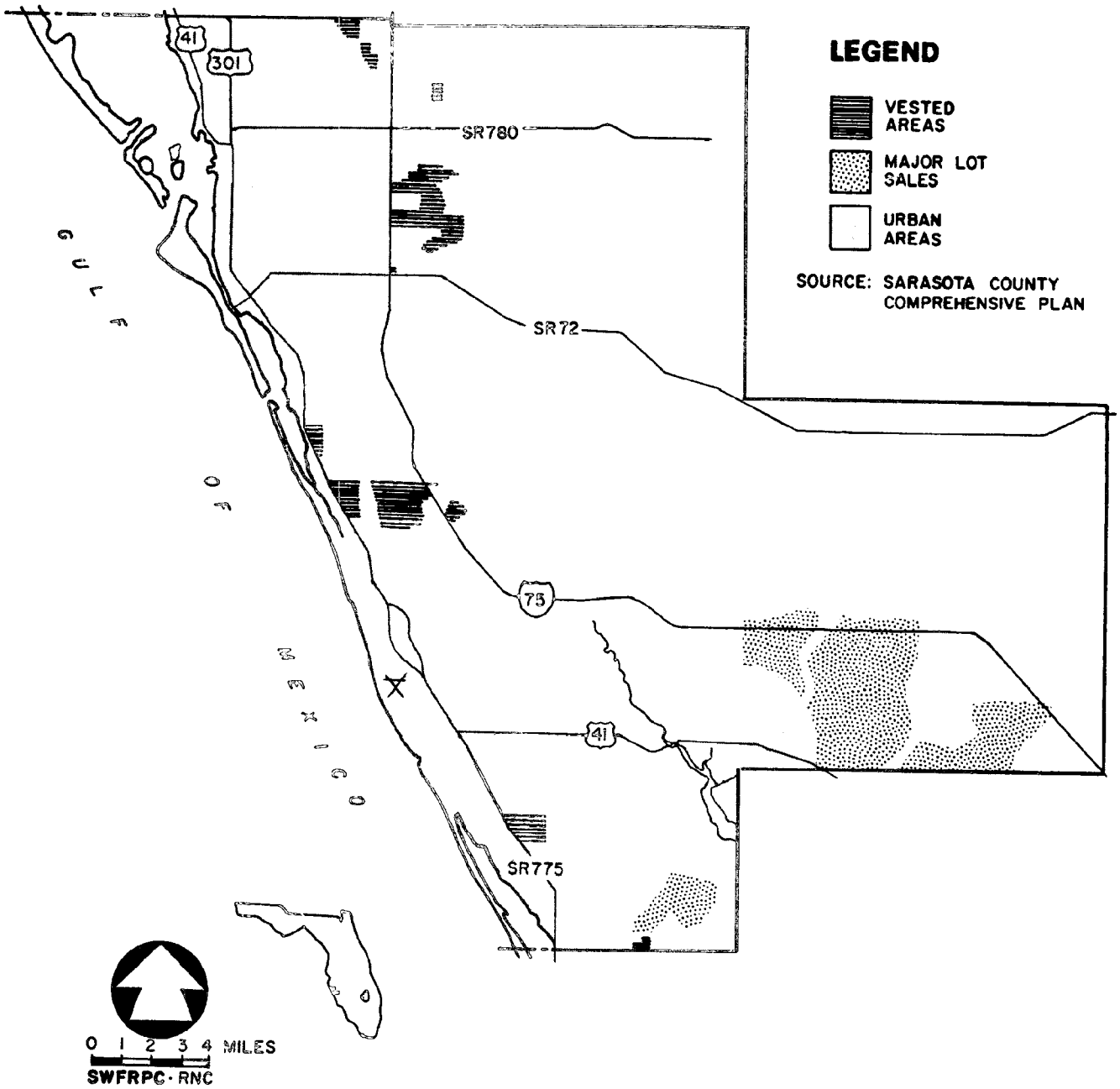
MAP 12
CHARLOTTE COUNTY
FUTURE URBAN AREA



MAP 13
COLLIER COUNTY
FUTURE URBAN AREA



MAP 14
LEE COUNTY
FUTURE URBAN AREA



MAP 15
SARASOTA COUNTY
FUTURE URBAN AREA

HIGH HAZARD SITES

In this chapter, high hazard sites are discussed and defined; in addition, possible future public acquisition areas will be identified. With regard to land use in "high hazard" areas, there is a basic perceived conflict between the duty of government to protect the health, safety, and welfare of its citizens and the rights of property owners to the use and disposition of their property. One way, perhaps the best way, to resolve this issue is for government to acquire properties deemed as having high hazards with regard to hurricane flooding, in accord with Constitutional Law. The acquisition program is perceived to be particularly necessary when the protection role of government removes most commonly agreed upon reasonable uses from land which would normally be suitable for such use.

CHARACTERISTICS OF HAZARD AREAS

There are several characteristics which, individually or collectively, give land a high hazard designation (regarding hurricanes). These are: proximity to large bodies of water; the location of the property in relation to shifting channels; and, the height of land in comparison to adjacent water bodies and tracts of land.

The proximity to large bodies of water is the most important single factor in defining high hazard areas. Most of the region's shoreline falls into this category. The National Hurricane Center has indicated that those areas within 150 feet of such shorelines will suffer the greatest damage in the event of a storm.

The location of shifting channels also contributes to the "high hazard" designation. This is a very important factor for the barrier island chain, where the channels (passes) have been known to make sudden major shifts. This is less important for inland areas in Southwest Florida due to the relatively slow flow of freshwater streams.

Low-lying lands (in relation to adjacent lands), is the last factor contributing to the "high hazard" designation. In the event of hurricane flooding, such low-lying lands will receive the first impacts of floods being deflected from other, higher, tracts. This may result in localized "surge" or seiche conditions which would not be a consideration for the overall area.

PRIORITIES

The priority of acquisition is usually a policy matter, depending upon the urgency of the situation and the perceived threat. As a general guide, the priority order for acquisition is recommended to be, first, land adjacent to channels; second, low-lying areas; and third, shoreline.

Land Adjacent to Channels

The hydrodynamics of the Region's Gulf/Bay system indicate that adequate connections between the two are necessary for movement of water. Lacking such normal connections, hurricanes are likely (as an indirect effect) to either create new passes or cause existing ones to move. The process of urbanization on barrier islands is such that development occurs along the entire length of such islands. In such cases, beach and pass stabilization projects normally follow, which result in the loss of the ability of passes to move normally. This results in an increased likelihood of damage from storms. Consequently, lands adjacent to existing channels should be acquired to assure that there is adequate room for normal pass movement.

Low-lying Areas

Most of Southwest Florida's lands are low-lying in comparison to the central and northern parts of the state. However, a portion of these lands are recognized as being even more low-lying than is common for the area. Typically, such areas serve as natural drainage systems, for example, rivers and streams, and should be managed through good floodplain management priorities. Other similar low-lying areas, however, do not serve a recognized (and managed) function and are subject to normal urban development. Without proper management (or acquisition), development in these areas becomes subject to abnormal hazards from hurricane flooding. Should such land be located on a barrier island, the low-lying area also serves as a possible path for a break in the island and the creation of a new pass or channel.

Shoreline

This is the most extensive of all high hazard areas. This extensive nature is one reason, but not the only reason, for being a last priority acquisition area. The major reason for not having a high priority is that a substantial amount of man's activities are "water dependent," requiring proximity or access to large volumes of water. Consequently, improved management practices along the shoreline would be of more benefit to the public than an acquisition program.

MAPPING

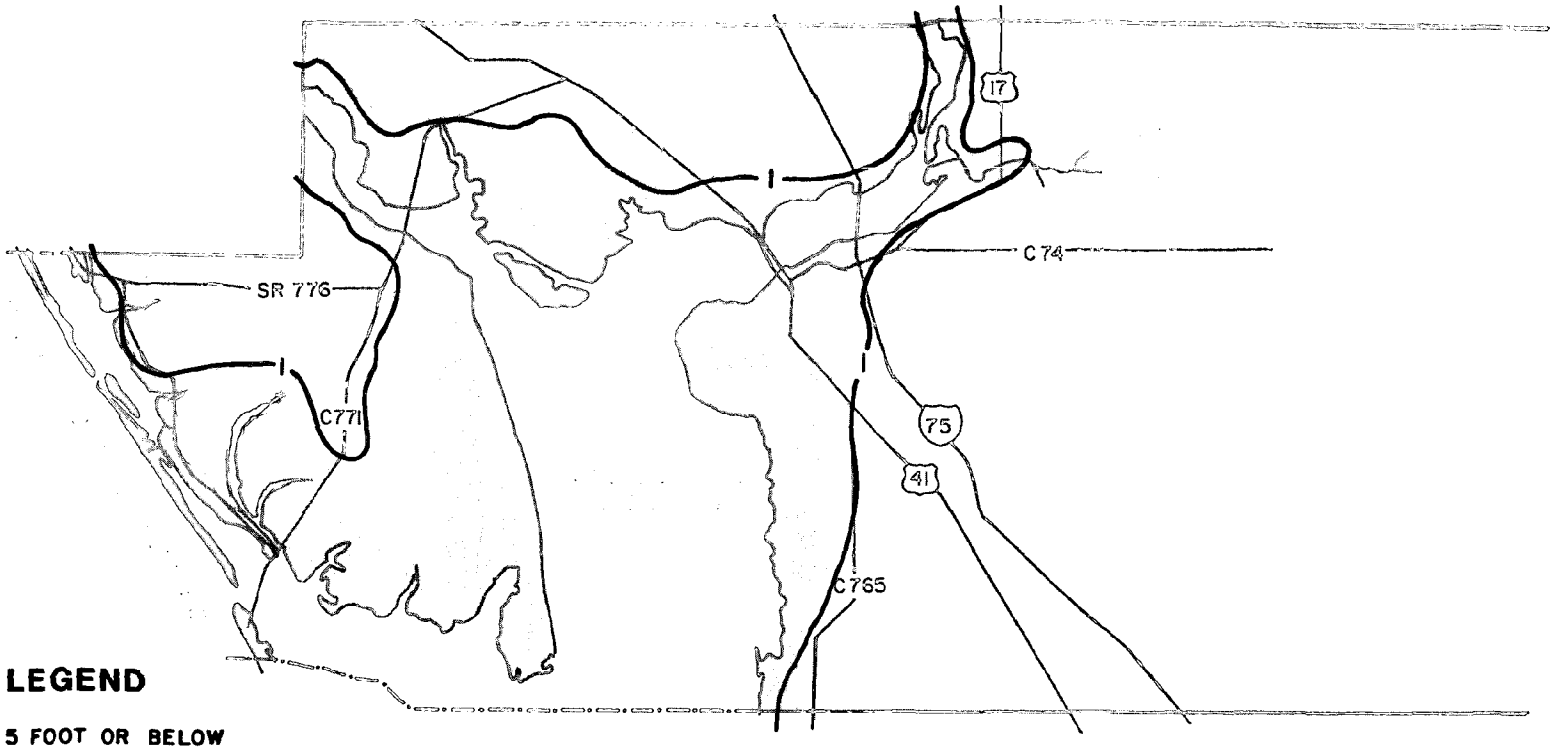
The series of maps that compose this section depict the various priorities for acquisition. The first set of maps are general county-wide maps illustrating the 5-foot height elevation and Category 1 flood zone. It also depicts identified channels and low-lying priority areas.

The second set of maps are more discrete presentations of channel/ low-lying priority areas, including which areas are already developed and/or are in public ownership. Public lands include government-owned lands, such as beaches. Other types of land ownership identified on the map include single owners (of parcels greater than five acres), and multiple owners and subdivisions. Lands with multiple owners are defined as parcels with more than one owner, such as several owners within a subdivision (including both single-family dwellings and condominiums, owned by a single person or corporation). These are identified on the maps to illustrate areas near channels or low-lying areas that have been or could be acquired. Large parcels owned by a single person or corporation, for example would generally be less difficult to acquire than subdivisions with many individual owners.

The third set of maps are county-scale maps indicating the shoreline, the extent of urbanization along the shoreline and the extent of public ownership of the shoreline. Areas along the shoreline that are not urbanized or already in public ownership would be priority areas.

In Charlotte County, much of the shoreline is already urbanized or public land, especially along the Cape Haze Peninsula. The Charlotte Harbor Management Plan has specially designated this area for resource management. In Collier County, shoreline land in the Naples area is urbanized. Some public lands exist along the shoreline (Everglades National Park). In Lee County, much of the shoreline is urbanized especially on Sanibel Island, Fort Myers Beach (Estero Island), Bonita Beach, Pine Island, and along the Caloosahatchee River. Areas of public ownership include portions of Sanibel, Little Pine Island, Cape Coral, and Black Island. Urbanization is very extensive along the shoreline of Sarasota County, with very few public ownership areas.

It should be noted that these are suggested priorities for acquisition; acquisition programs can be extrememly costly and it is improbable that all recommended areas could be acquired.



LEGEND

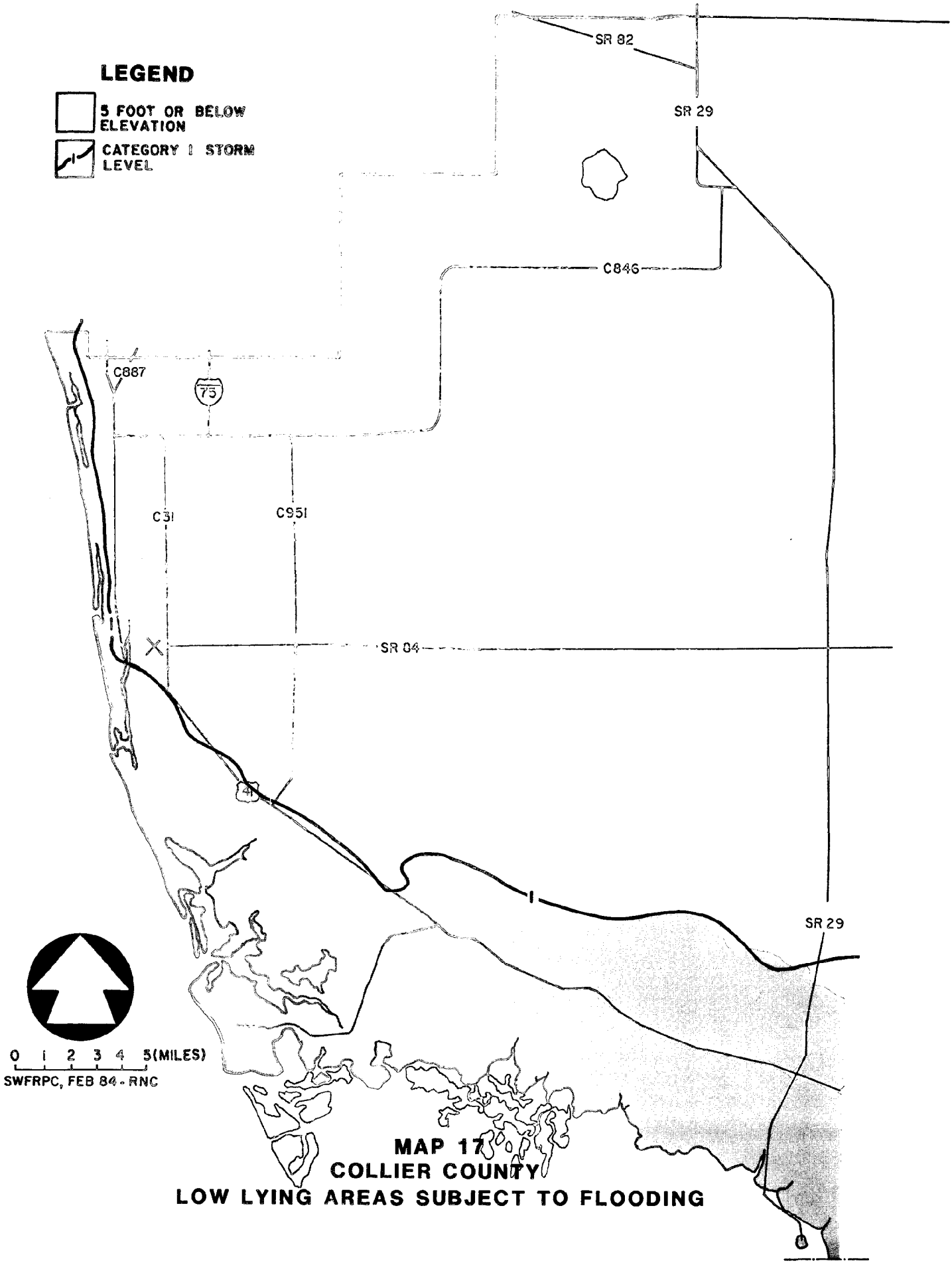
5 FOOT OR BELOW ELEVATION

CATEGORY 1 STORM LEVEL

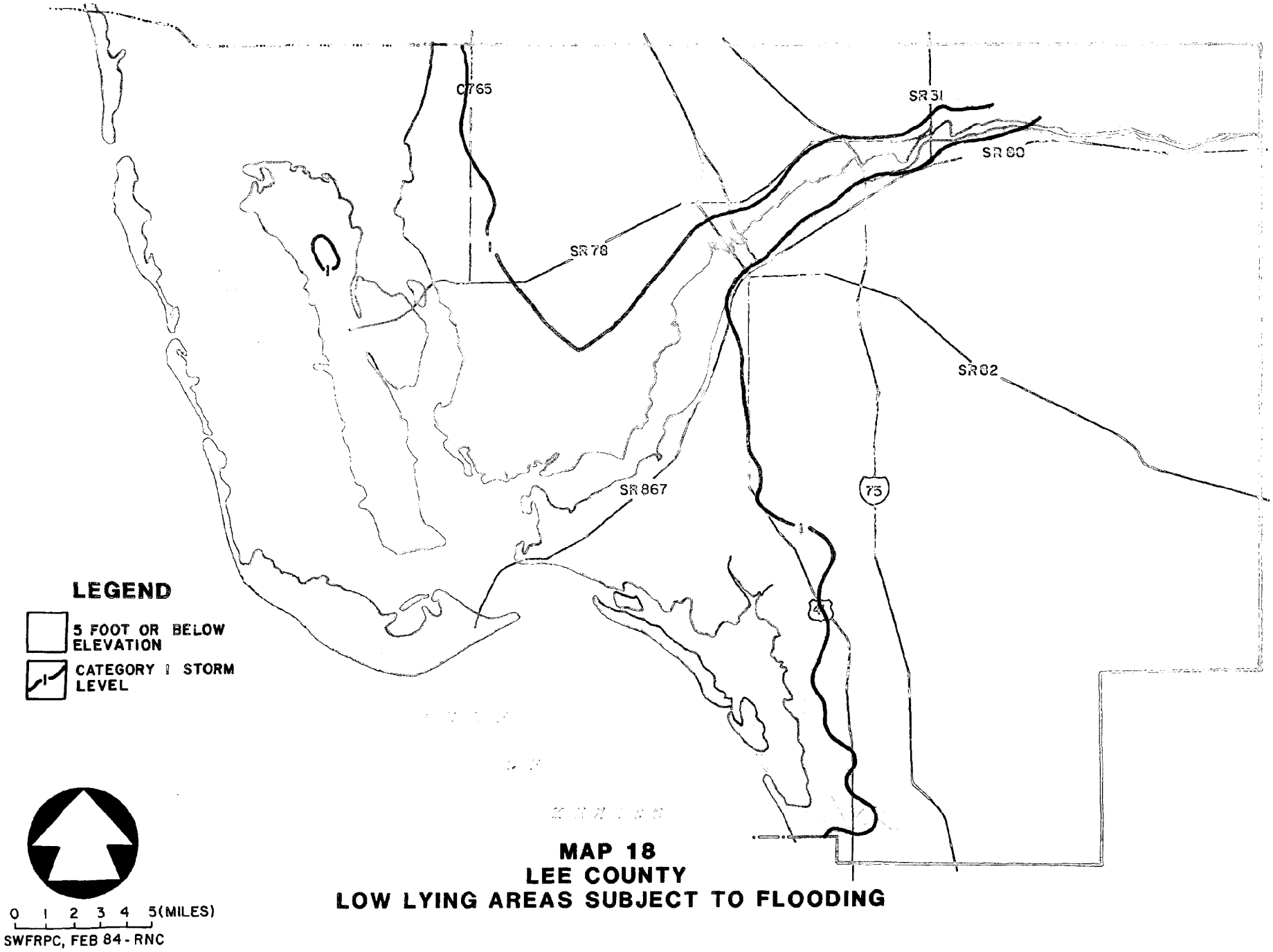
0 1 2 3 4 5(MILES)

SWFRPC, FEB 84 - RNC

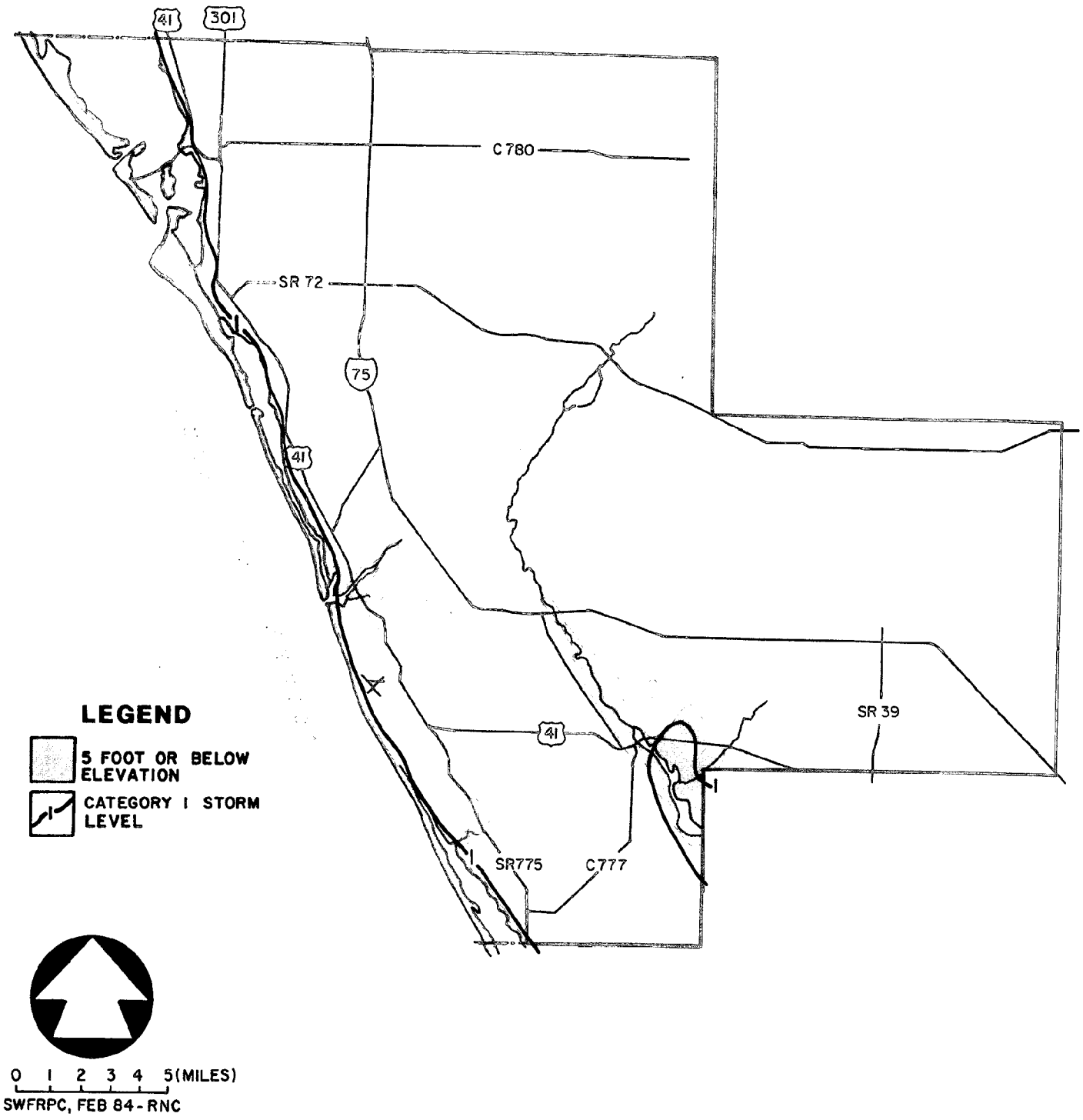
MAP 16
CHARLOTTE COUNTY
LOW LYING AREAS SUBJECT TO FLOODING



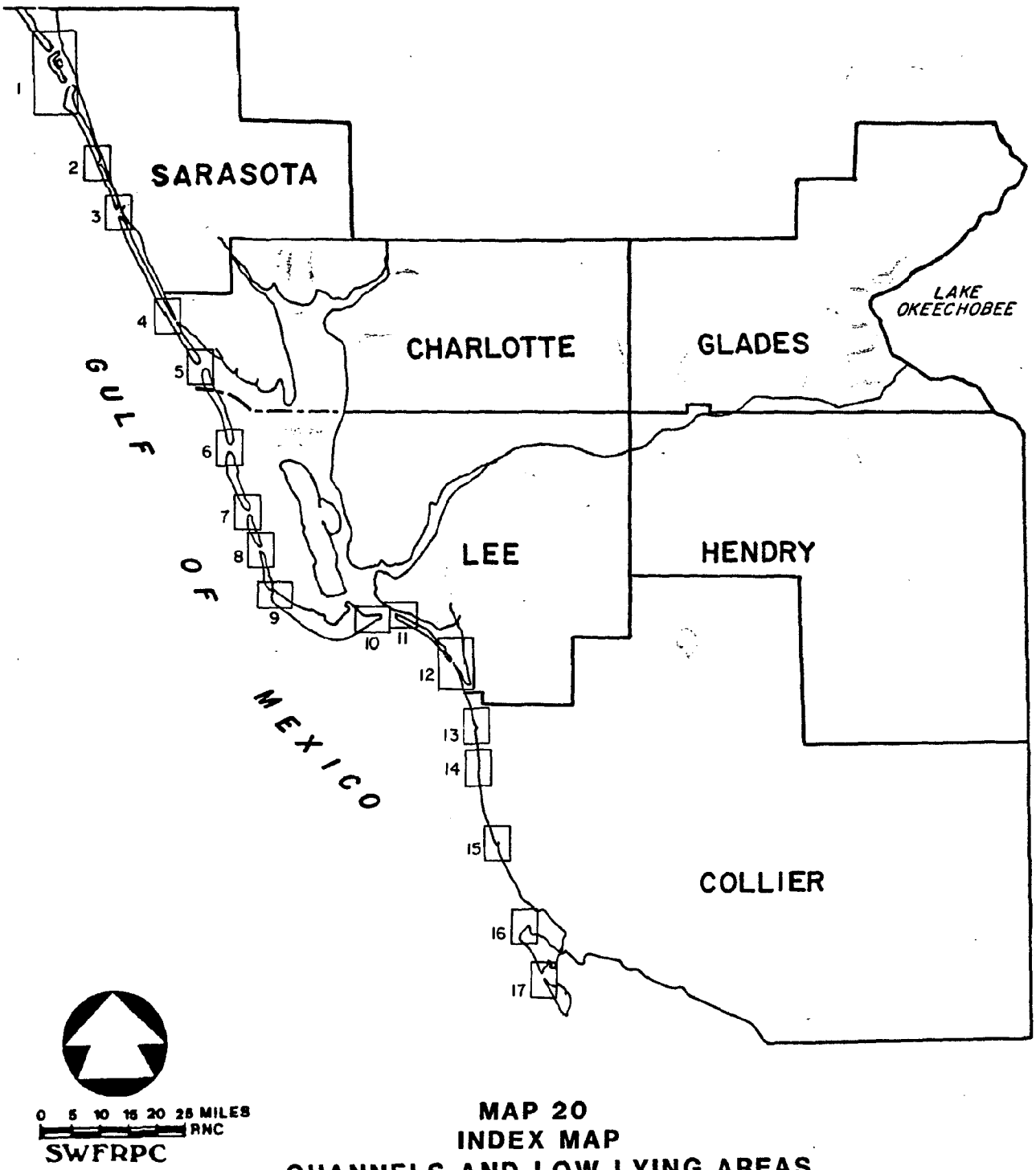
MAP 17
COLLIER COUNTY
LOW LYING AREAS SUBJECT TO FLOODING



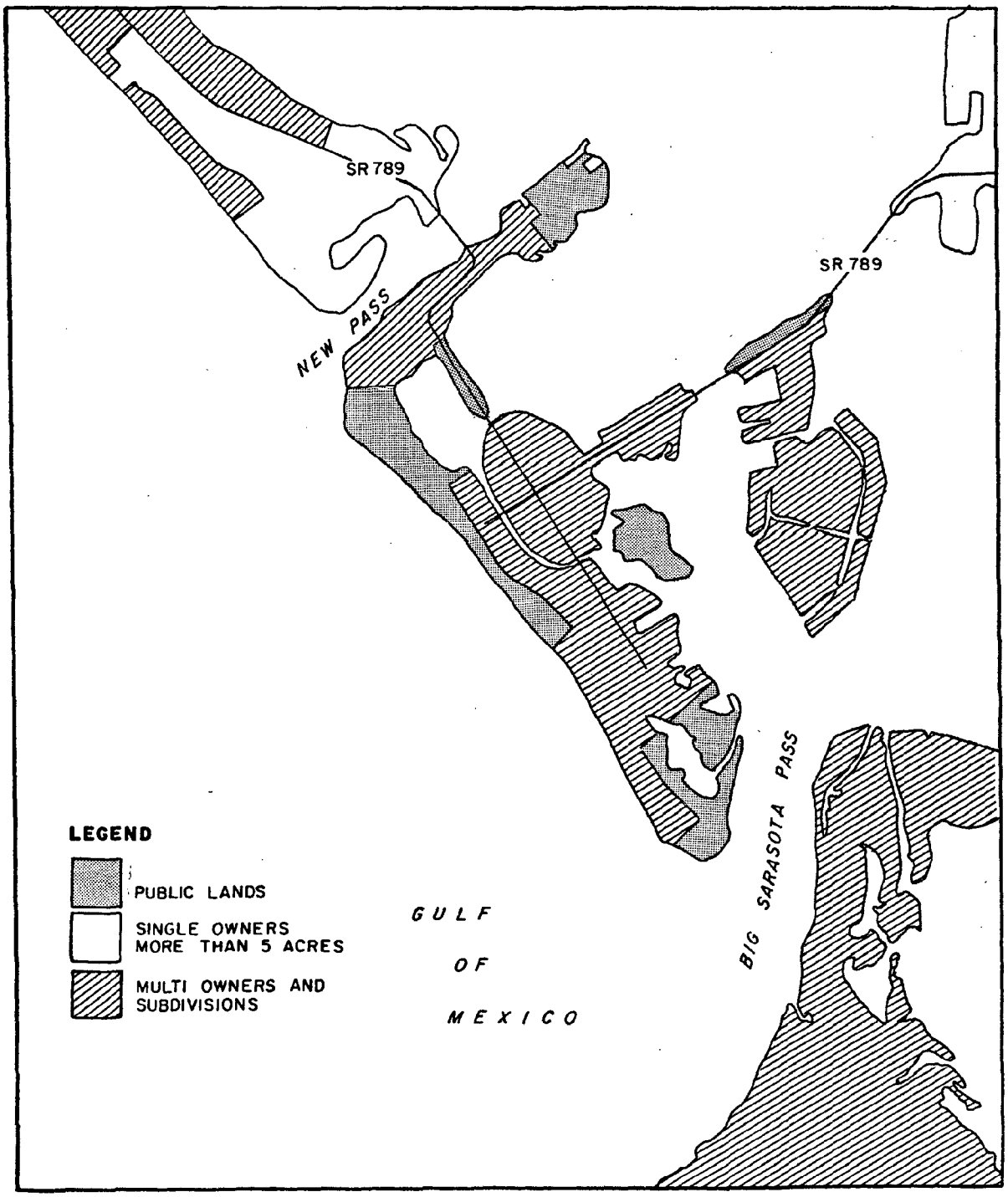
MAP 18
LEE COUNTY
LOW LYING AREAS SUBJECT TO FLOODING

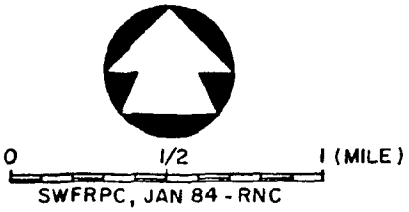


MAP 19
SARASOTA COUNTY
LOW LYING AREAS SUBJECT TO FLOODING

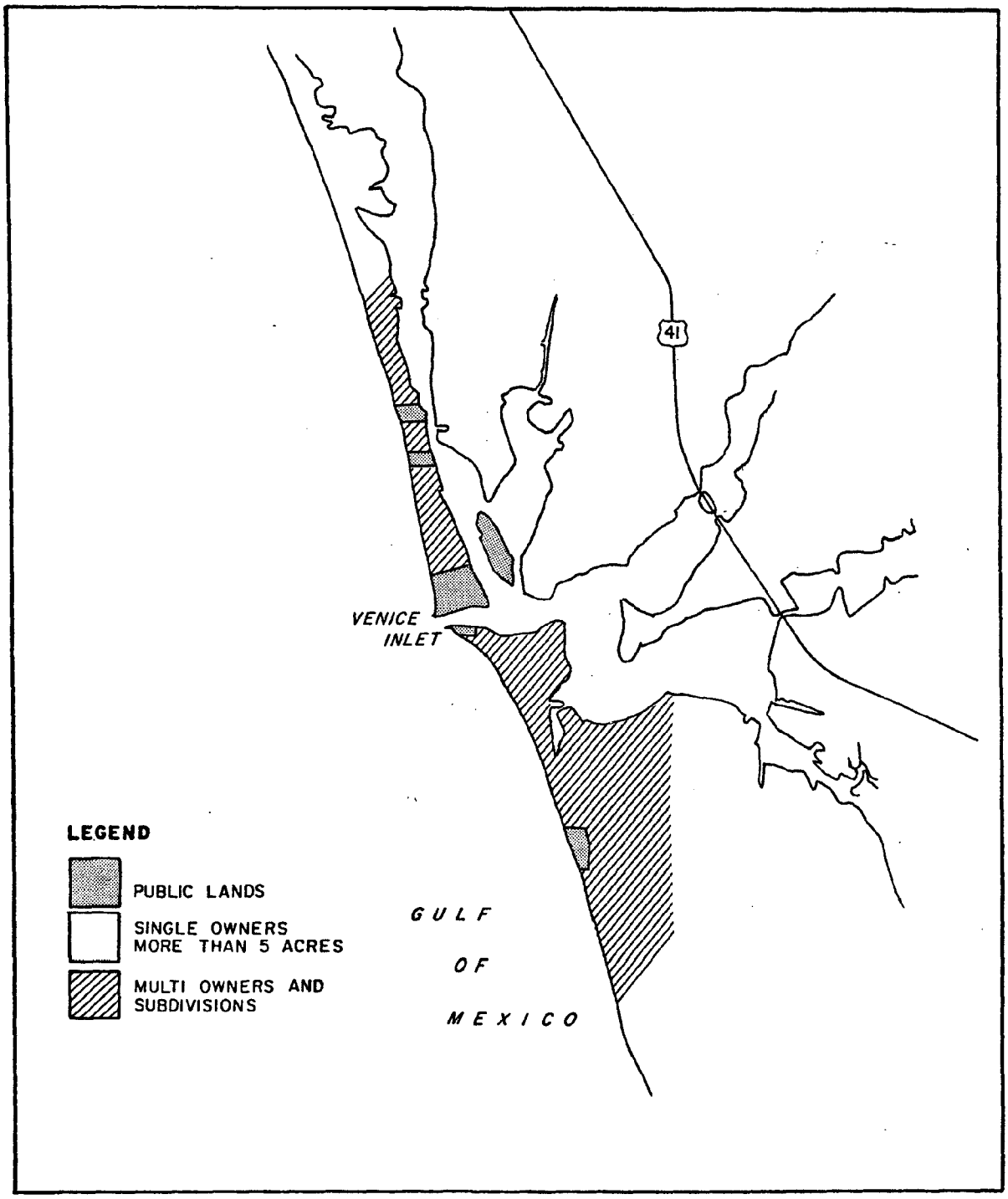


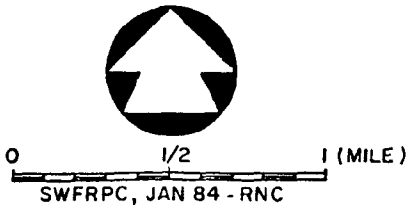
MAP 20
INDEX MAP
CHANNELS AND LOW LYING AREAS
SOUTHWEST FLORIDA



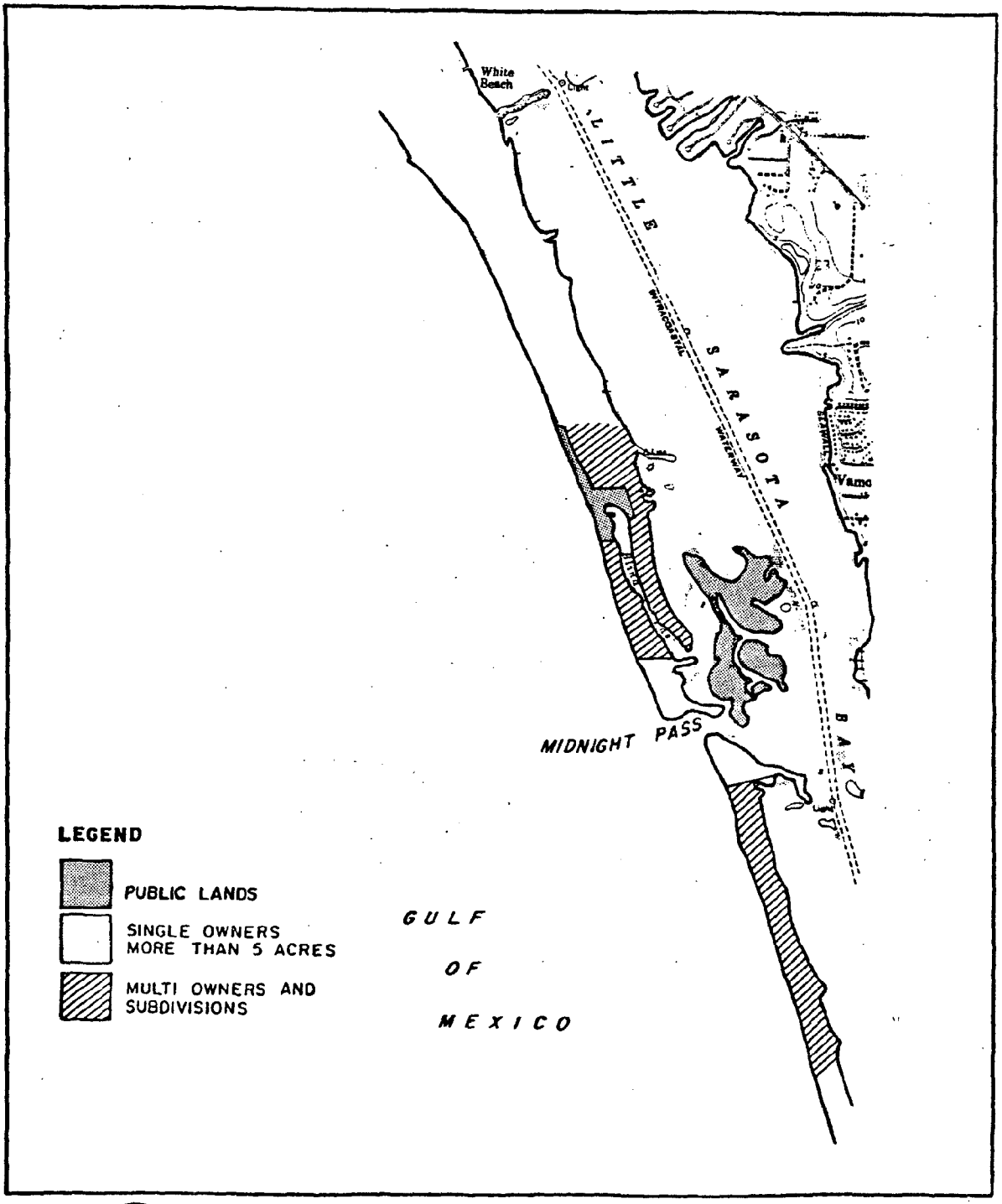


MAP 20-1
SARASOTA COUNTY
CHANNELS AND LOW LYING AREAS





MAP 20-2
SARASOTA COUNTY
CHANNELS AND LOW LYING AREAS



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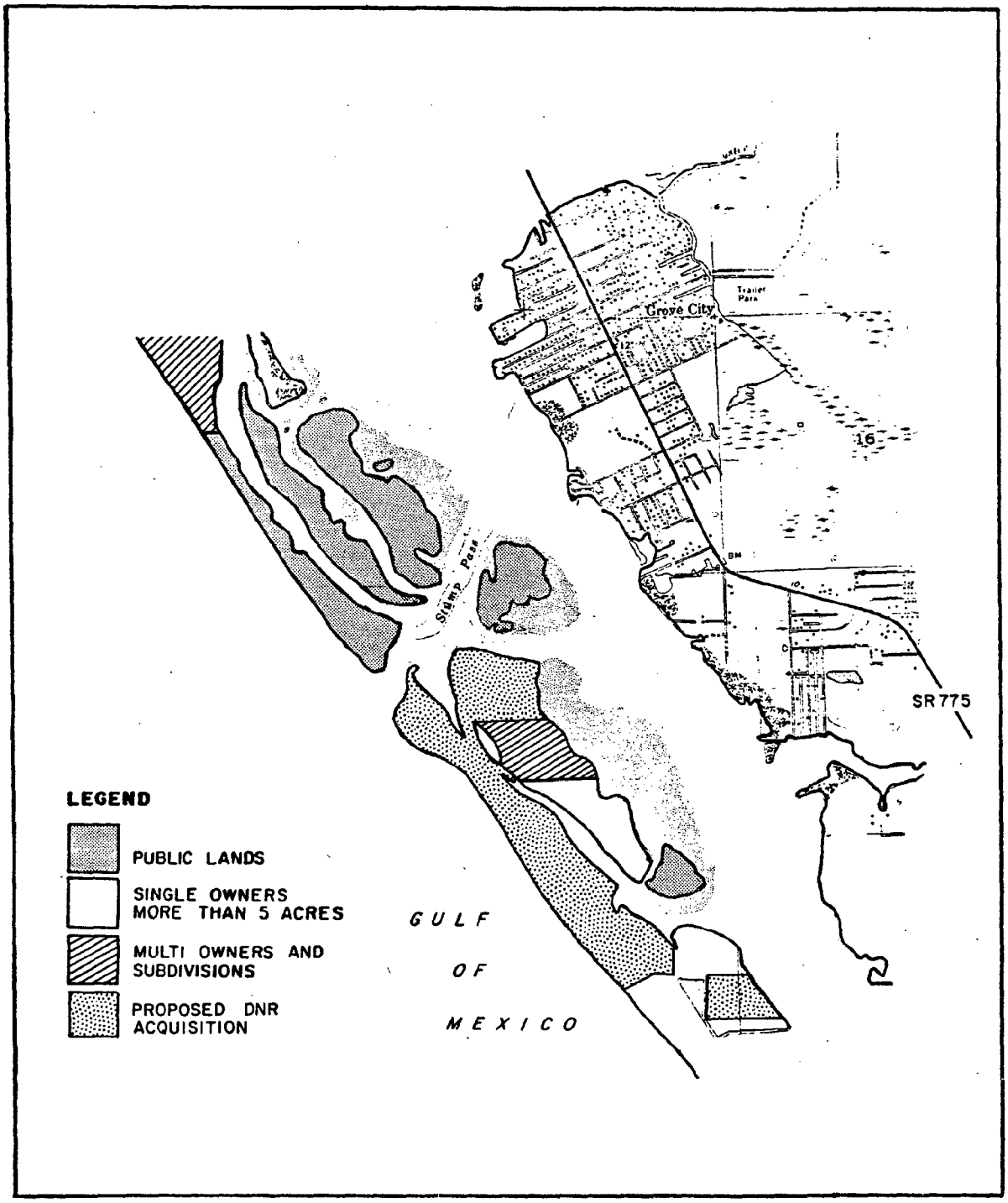
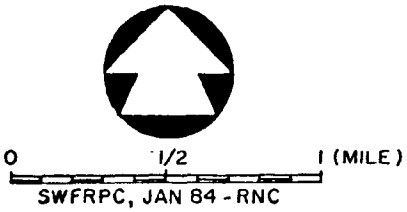
SWFRPC, JAN 84 - RNC

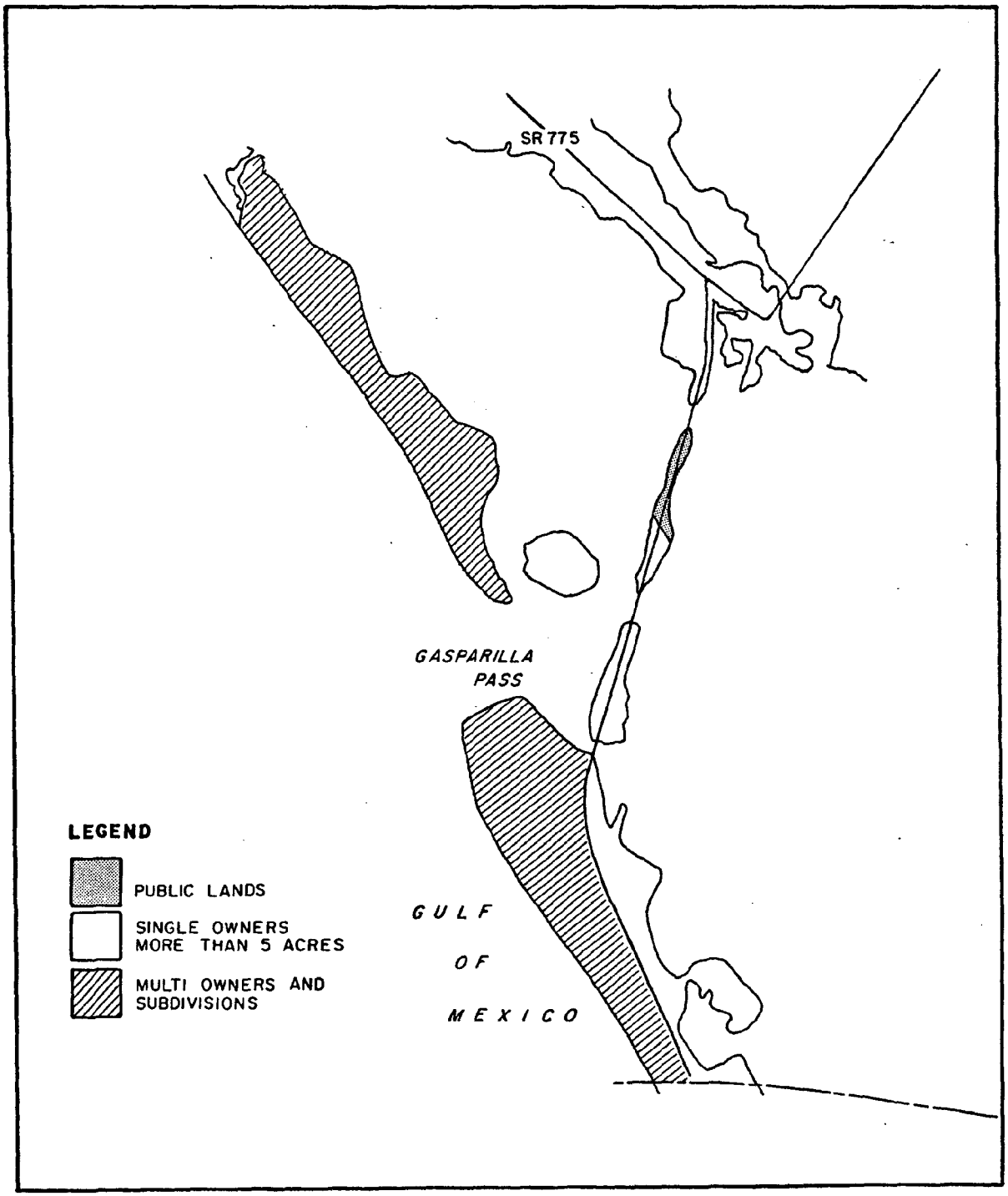
MAP 20-3
SARASOTA COUNTY
CHANNELS AND LOW LYING AREAS





SWFRPC, JAN 84 - RNC

MAP 20-4
CHARLOTTE COUNTY
CHANNELS AND LOW LYING AREAS



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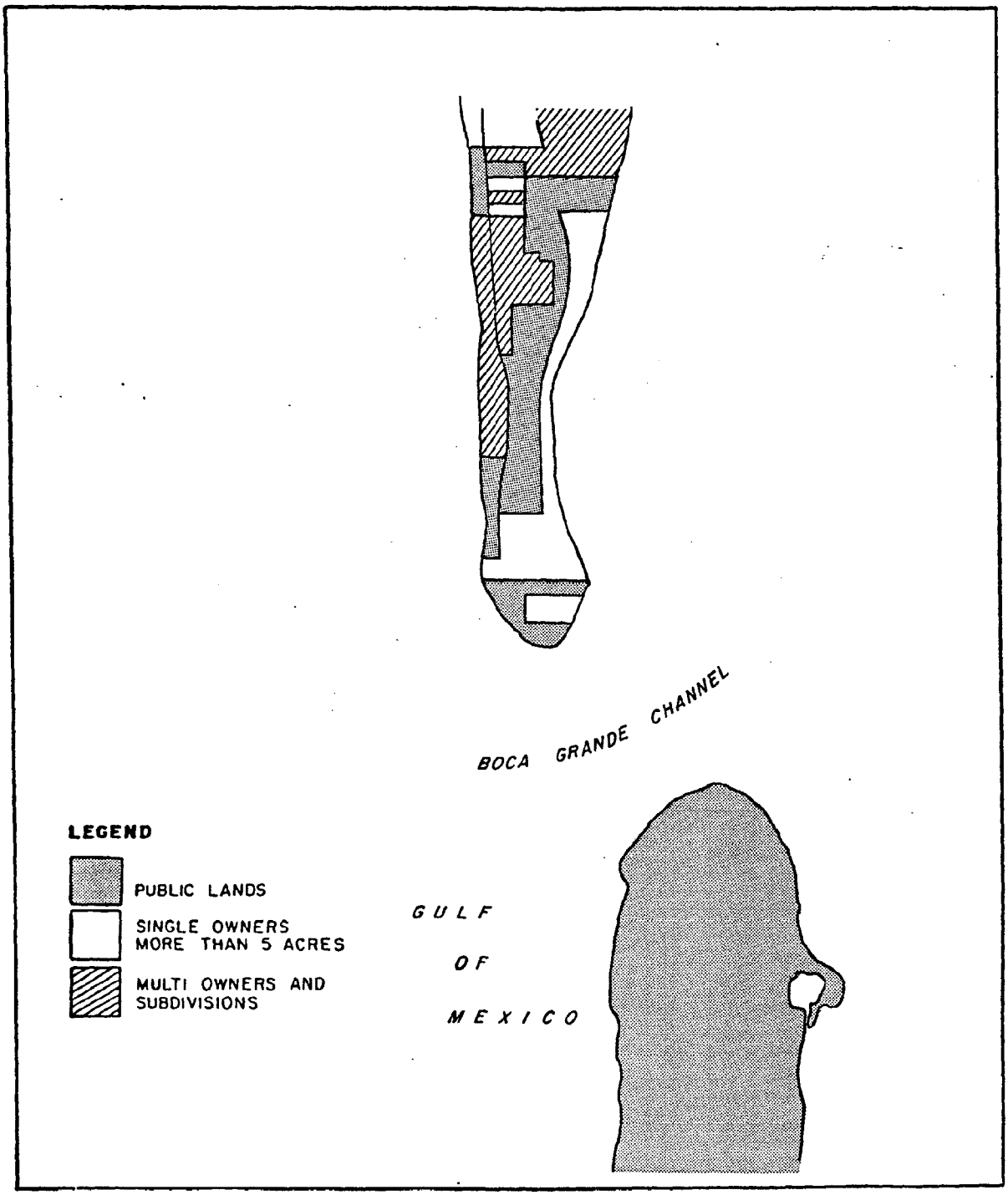
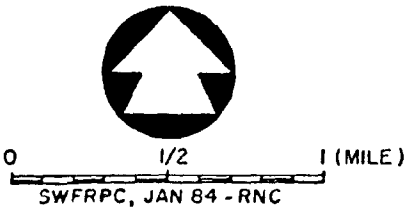
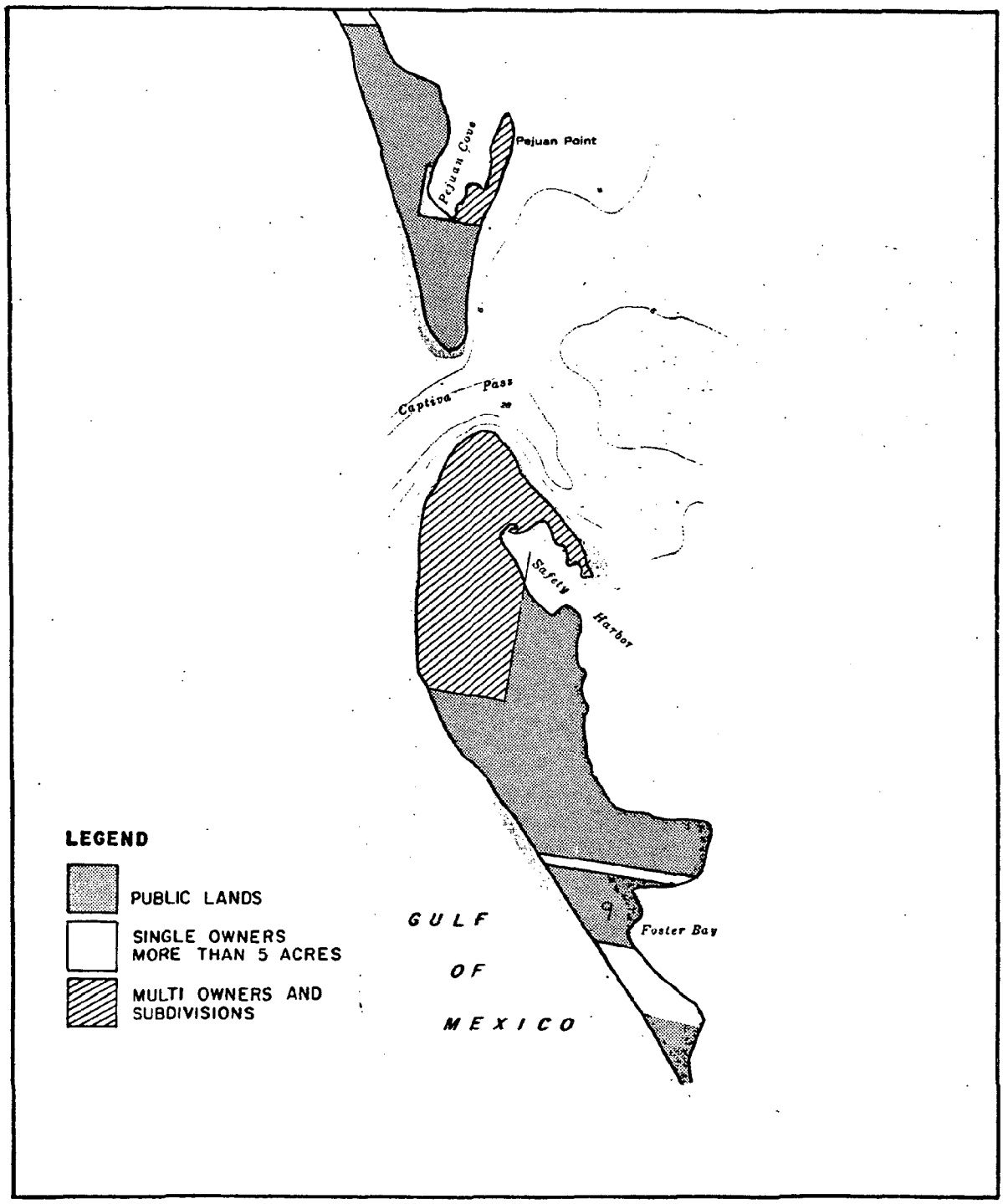
SWFRPC, JAN 84 - RNC

MAP 20-5
CHARLOTTE COUNTY
CHANNELS AND LOW LYING AREAS





MAP 20-6
LEE COUNTY
CHANNELS AND LOW LYING AREAS



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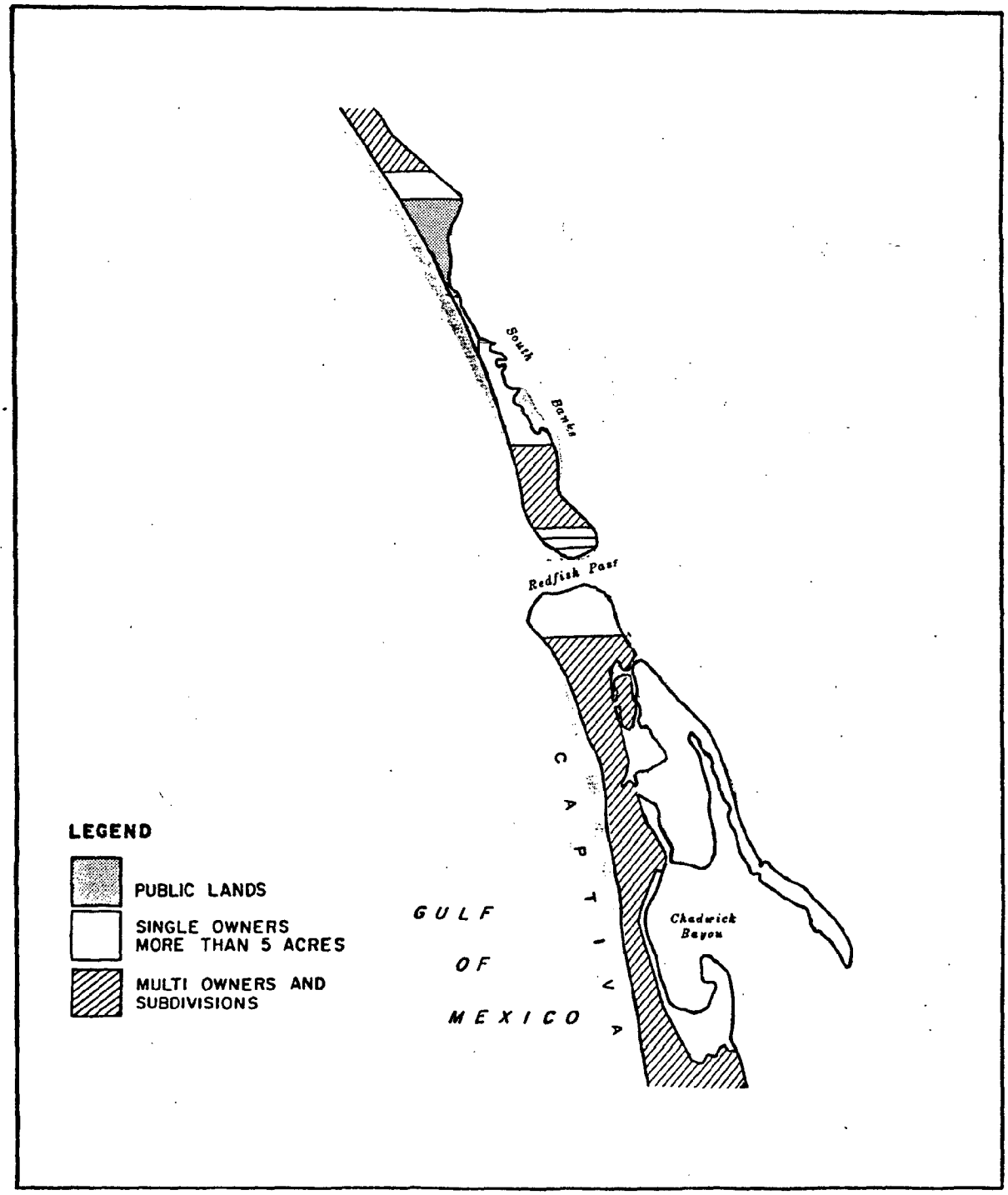
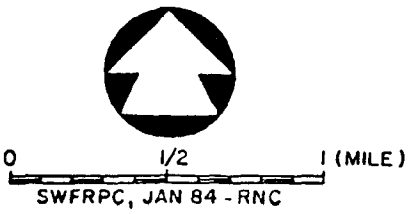
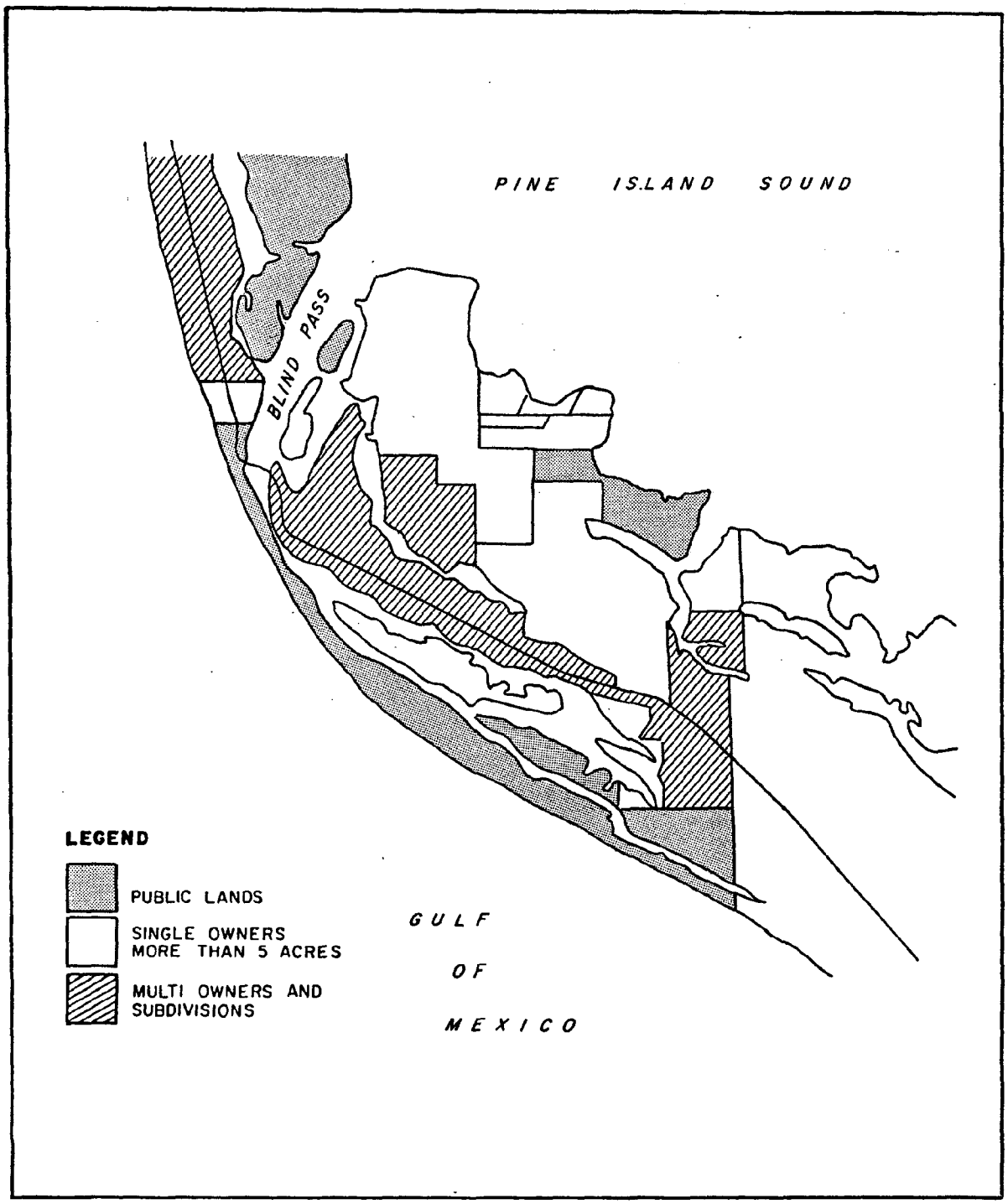
SWFRPC, JAN 84 - RNC

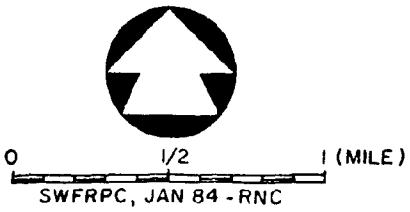
MAP 20-7
LEE COUNTY
CHANNELS AND LOW LYING AREAS



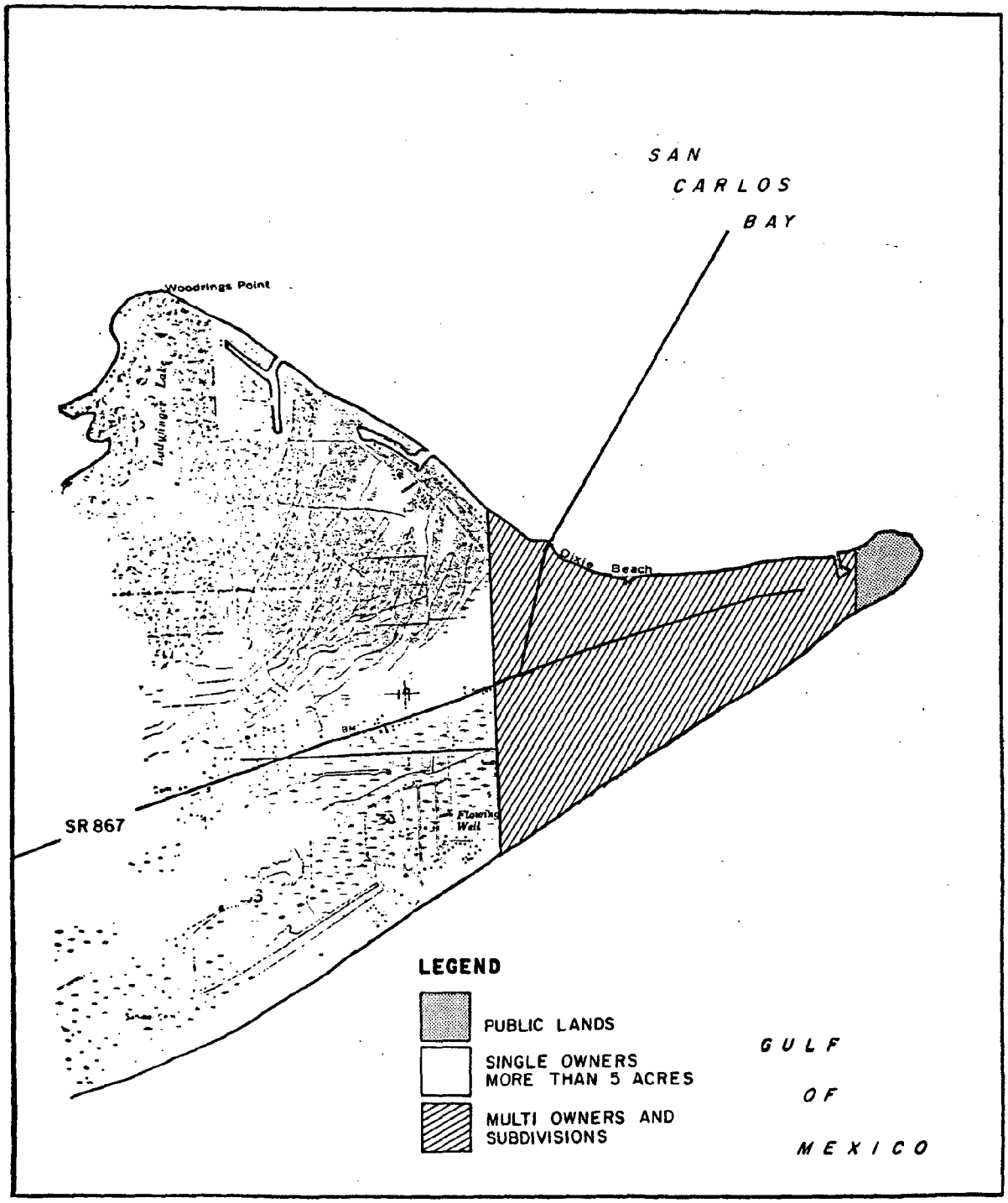


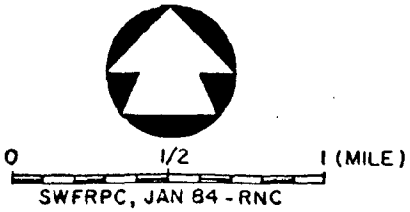
MAP 20-8
LEE COUNTY
CHANNELS AND LOW LYING AREAS



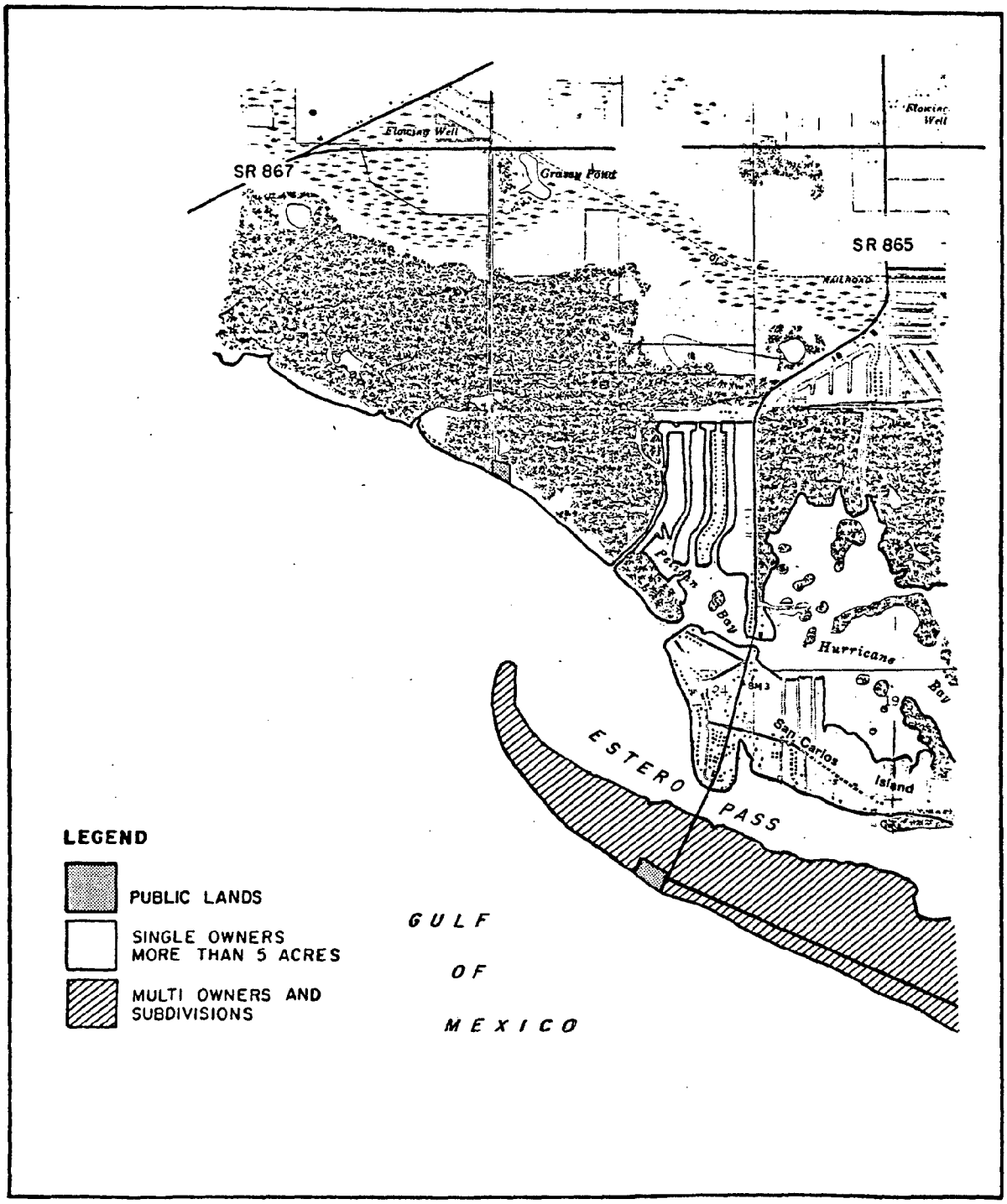


MAP 20-9
LEE COUNTY
CHANNELS AND LOW LYING AREAS





MAP 20-10
LEE COUNTY
CHANNELS AND LOW LYING AREAS



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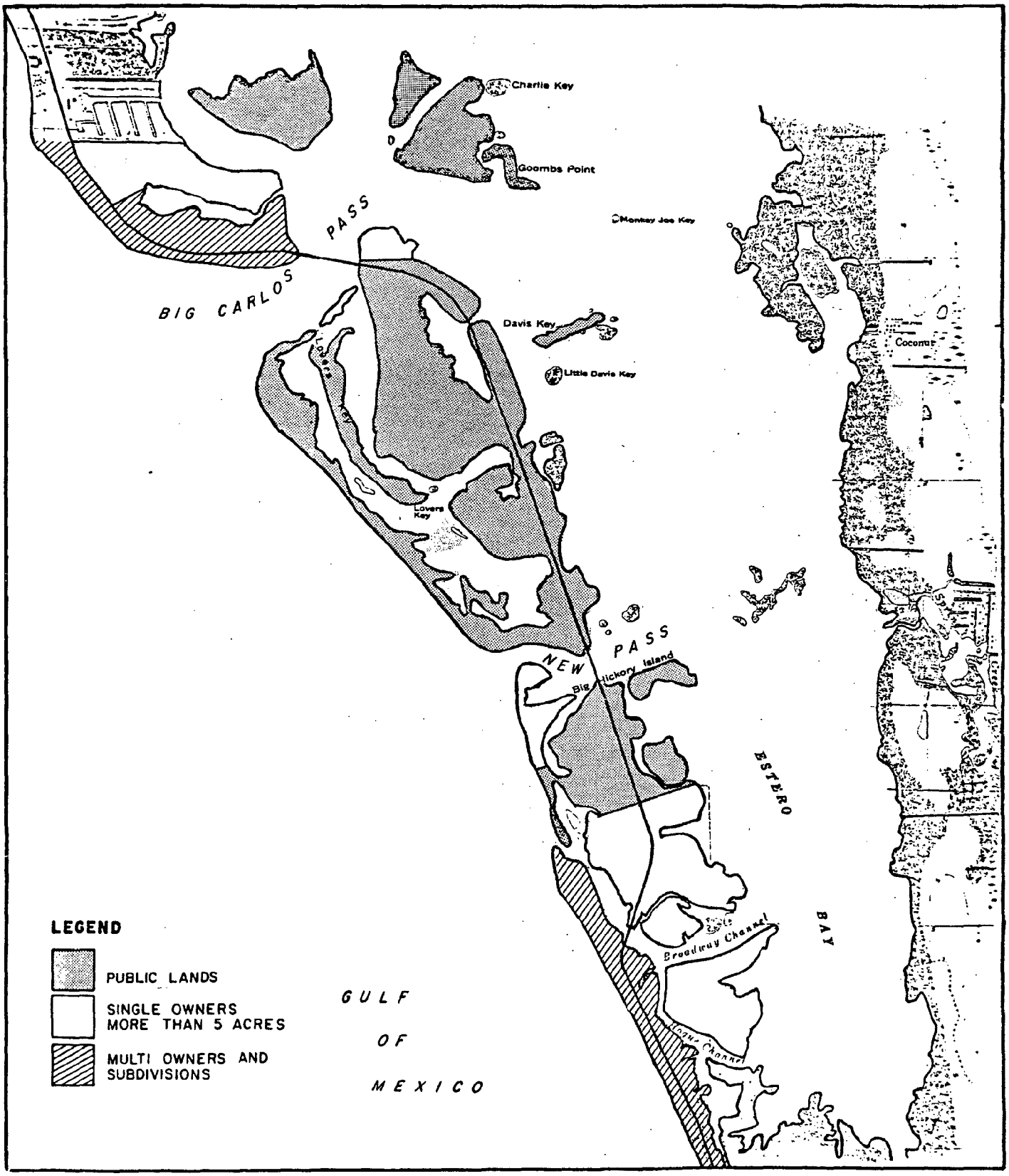
SWFRPC, JAN 84 - RNC

MAP 20-11
LEE COUNTY
CHANNELS AND LOW LYING AREAS



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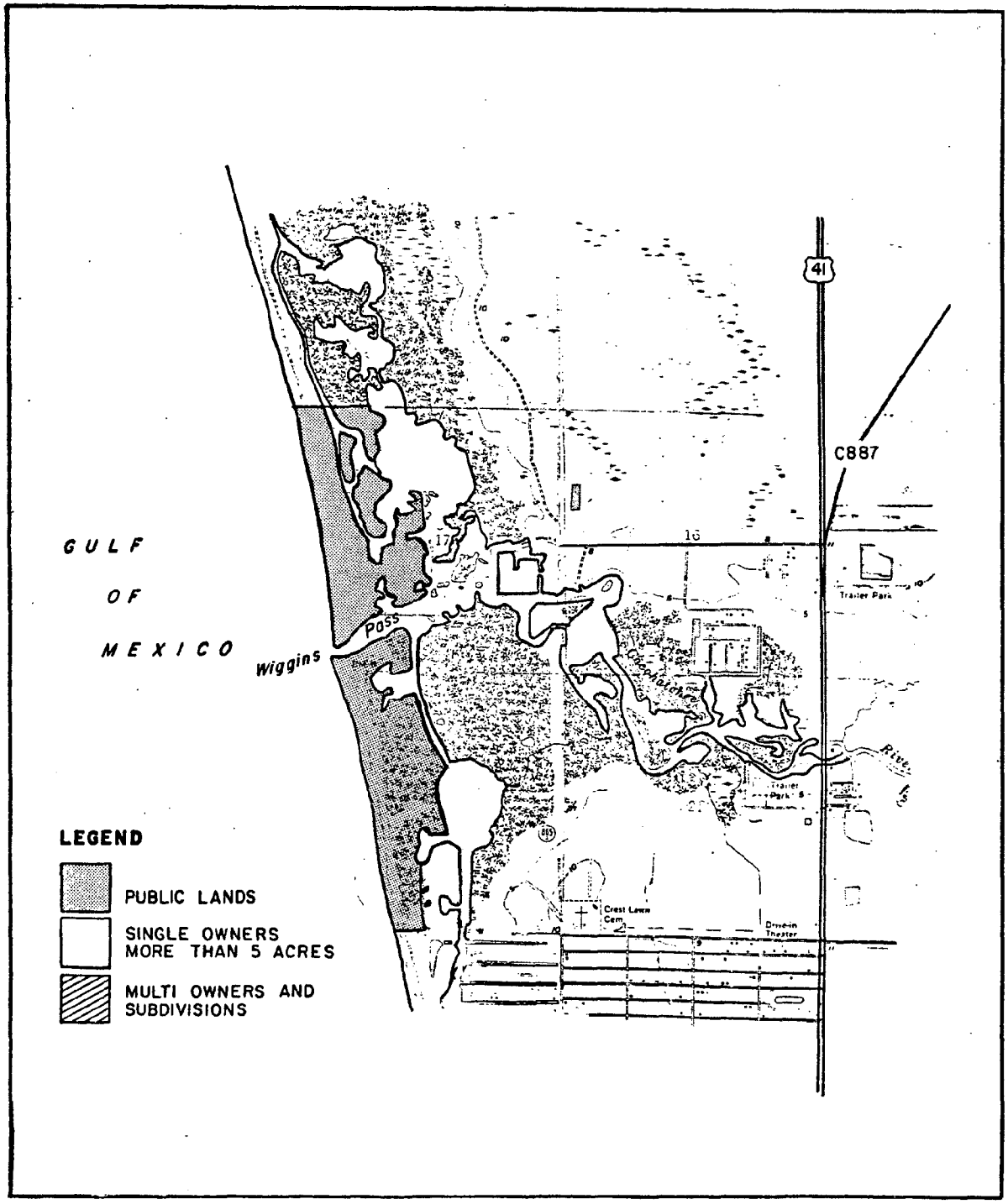
SWFRPC, JAN 84 - RNC

MAP 20-12
LEE COUNTY
CHANNELS AND
LOW LYING AREAS



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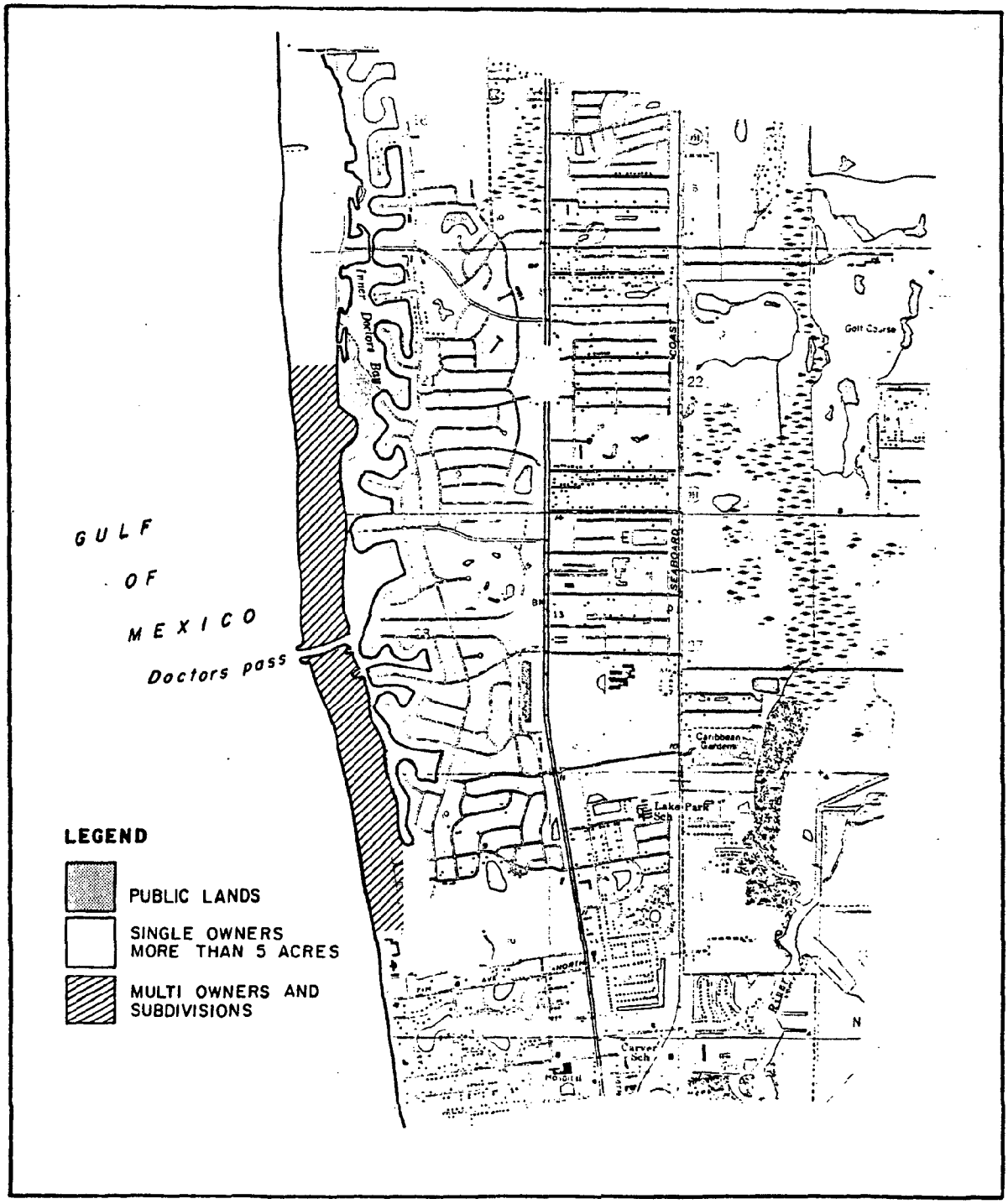
SWFRPC, JAN 84 - RNC

MAP 20-13
COLLIER COUNTY
CHANNELS AND LOW LYING AREAS



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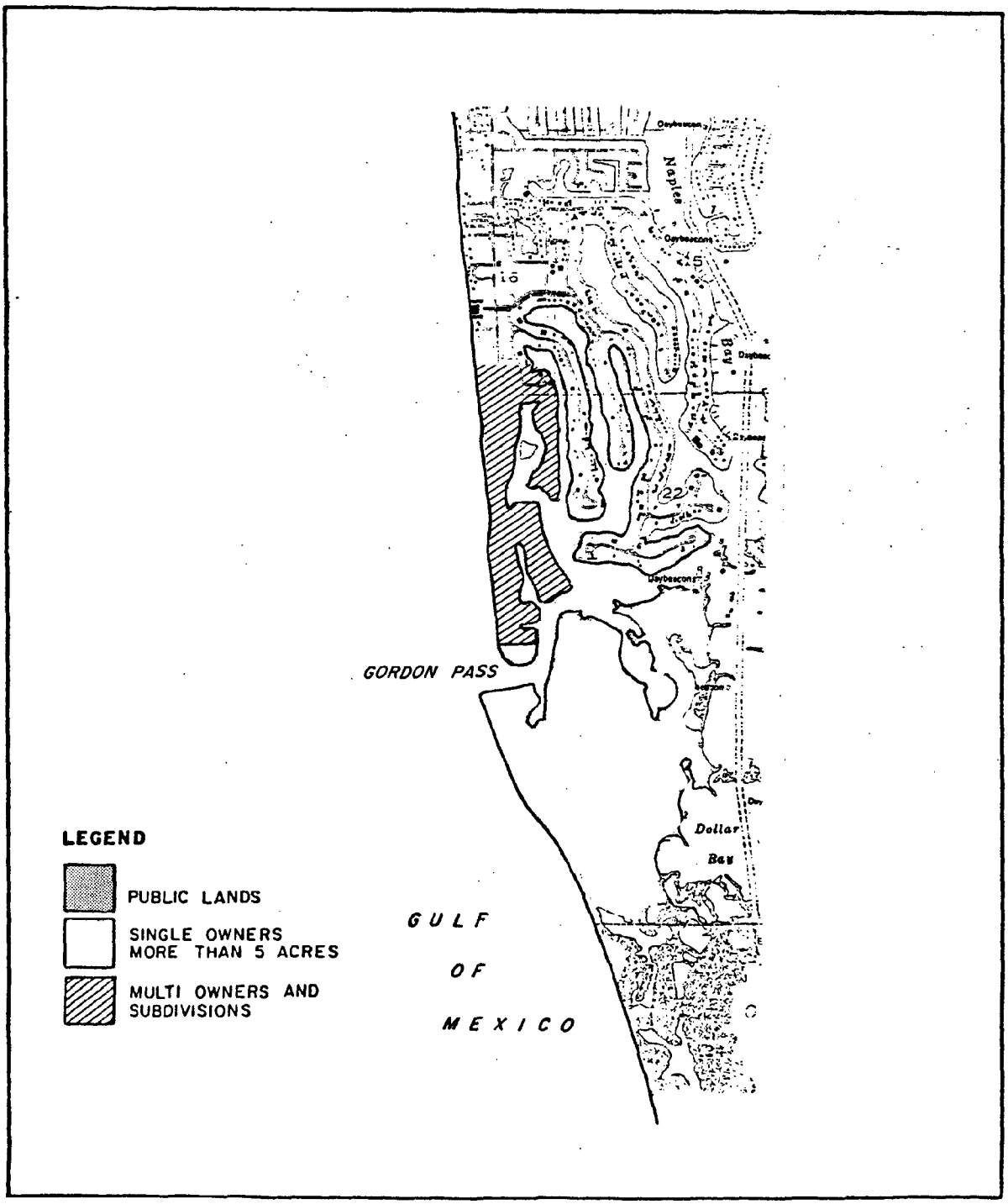
SWFRPC, JAN 84 - RNC

MAP 20-14
COLLIER COUNTY
CHANNELS AND LOW LYING AREAS



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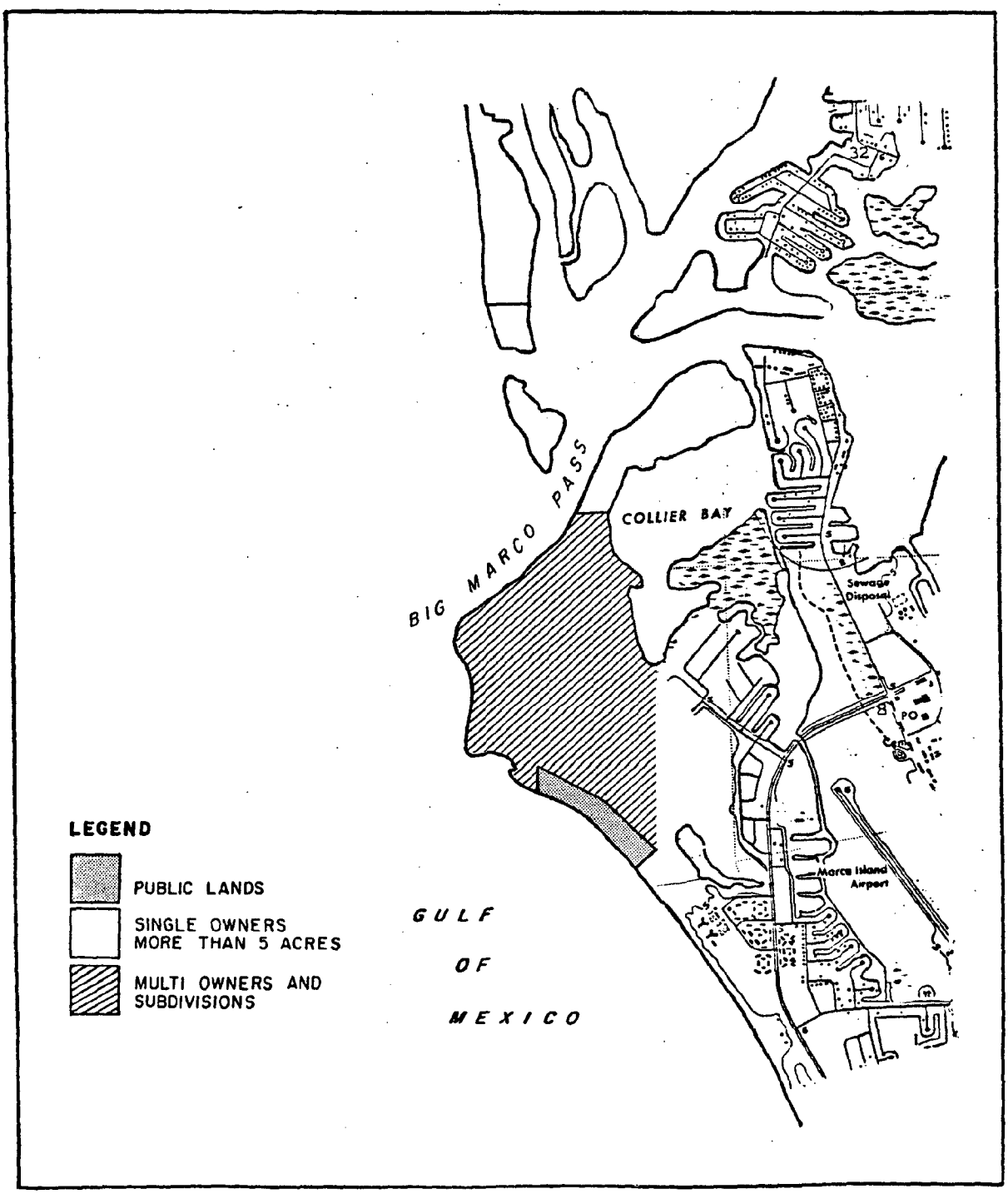
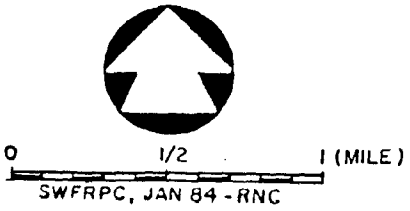
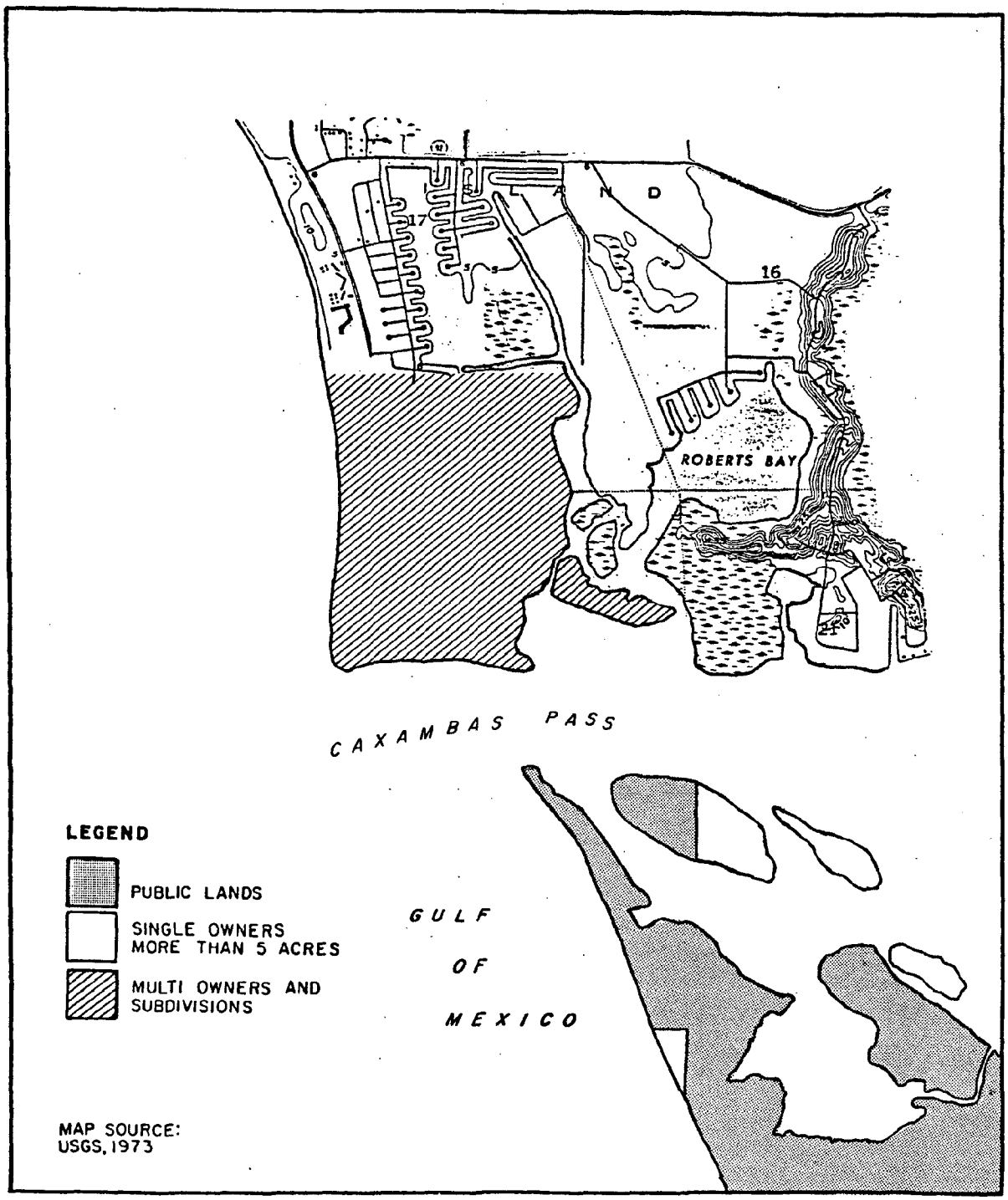
SWFRPC, JAN 84 - RNC

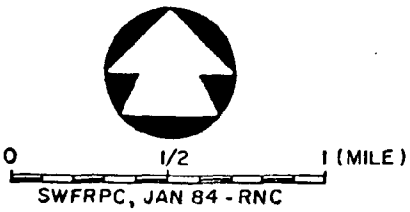
MAP 20-15
COLLIER COUNTY
CHANNELS AND LOW LYING AREAS



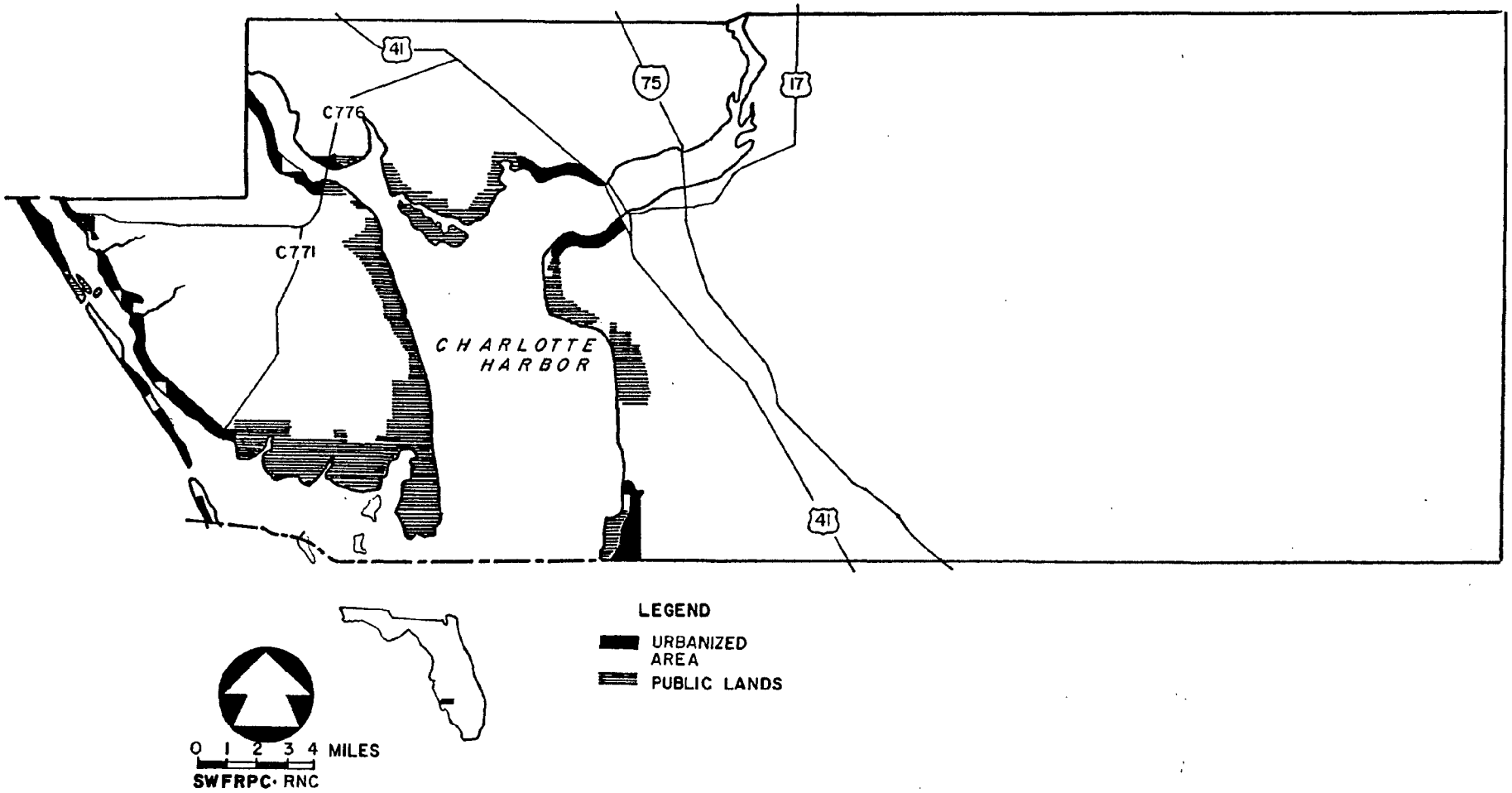


MAP 20-16
COLLIER COUNTY
CHANNELS AND LOW LYING AREAS

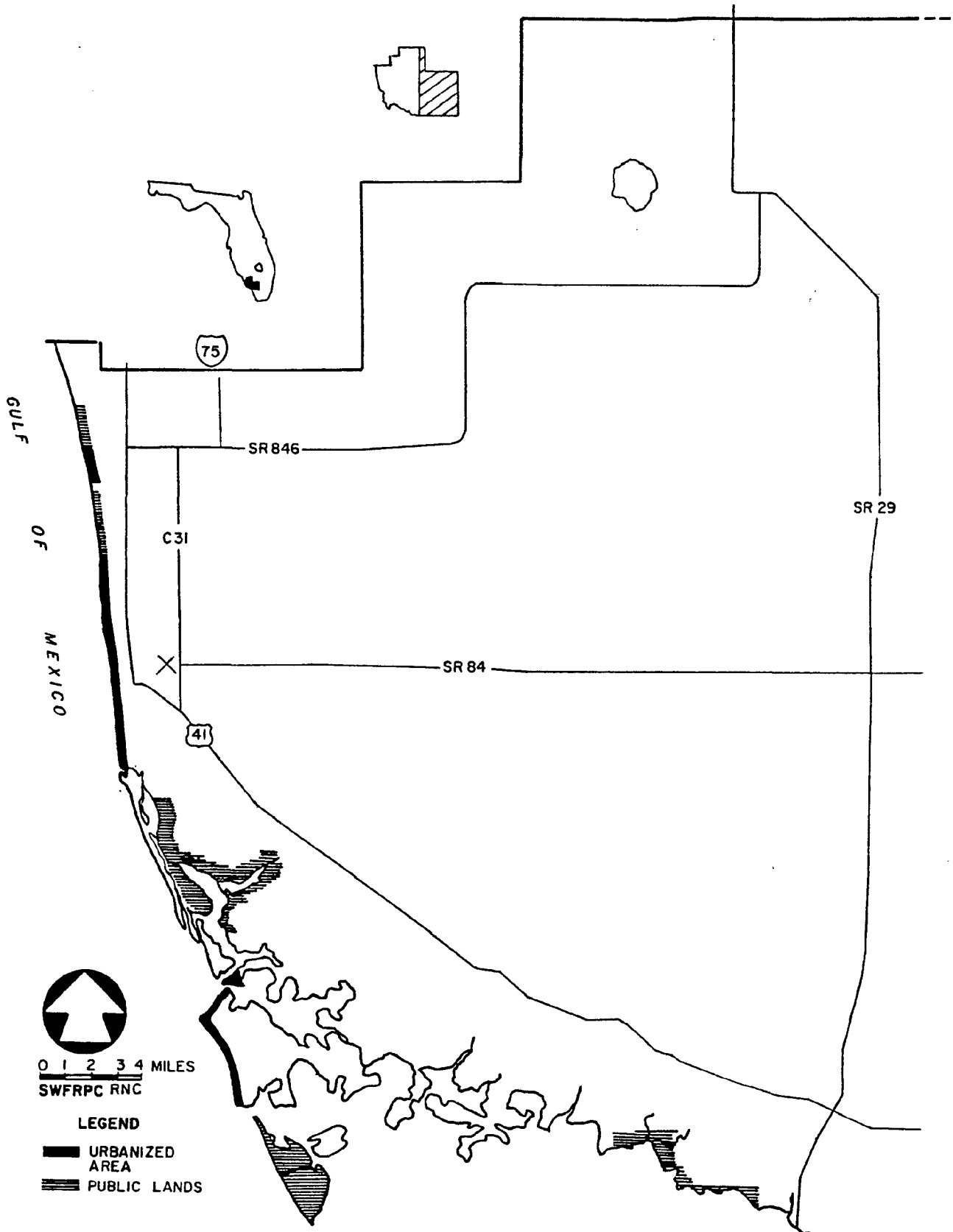




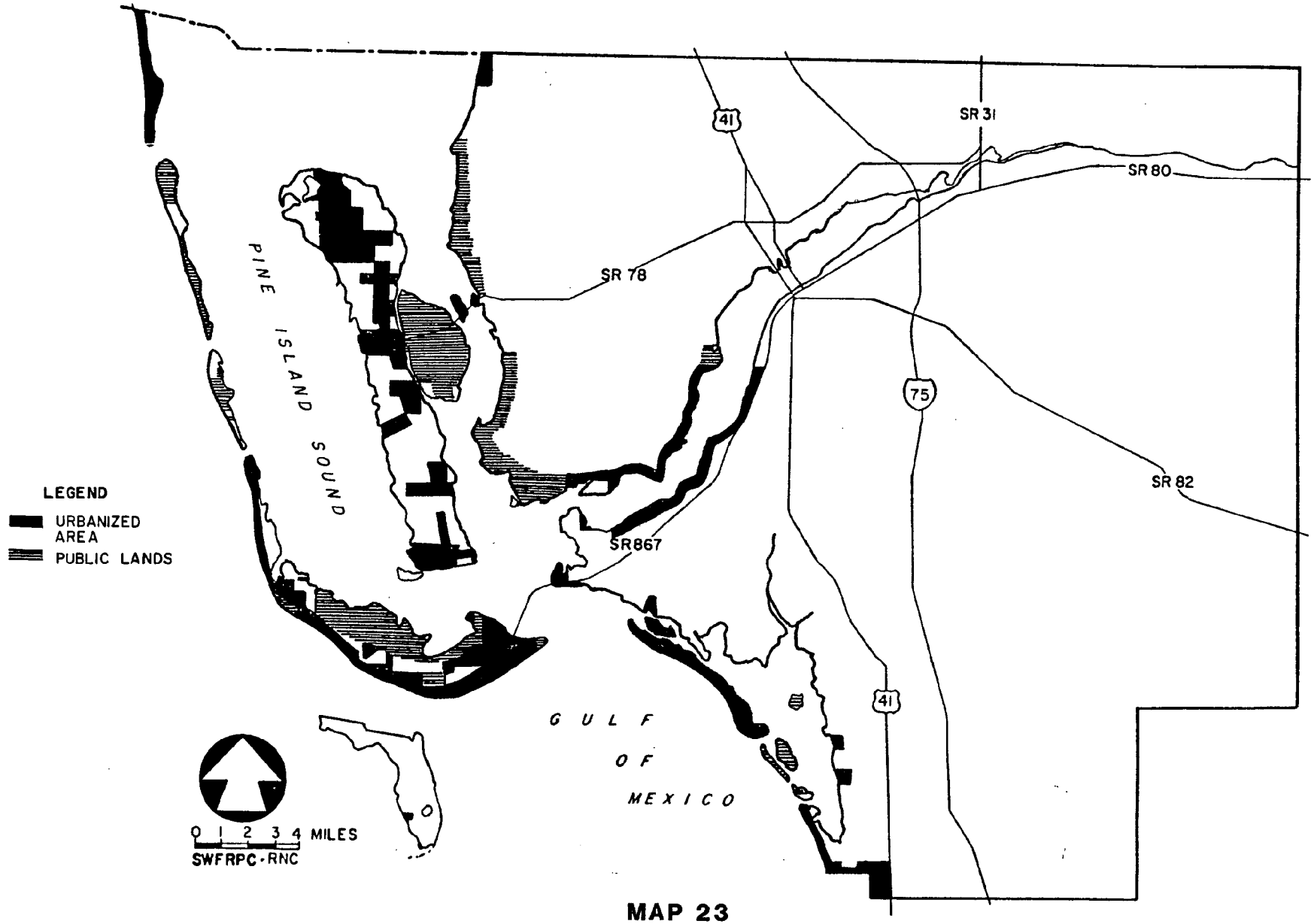
MAP 20-17
COLLIER COUNTY
CHANNELS AND LOW LYING AREAS



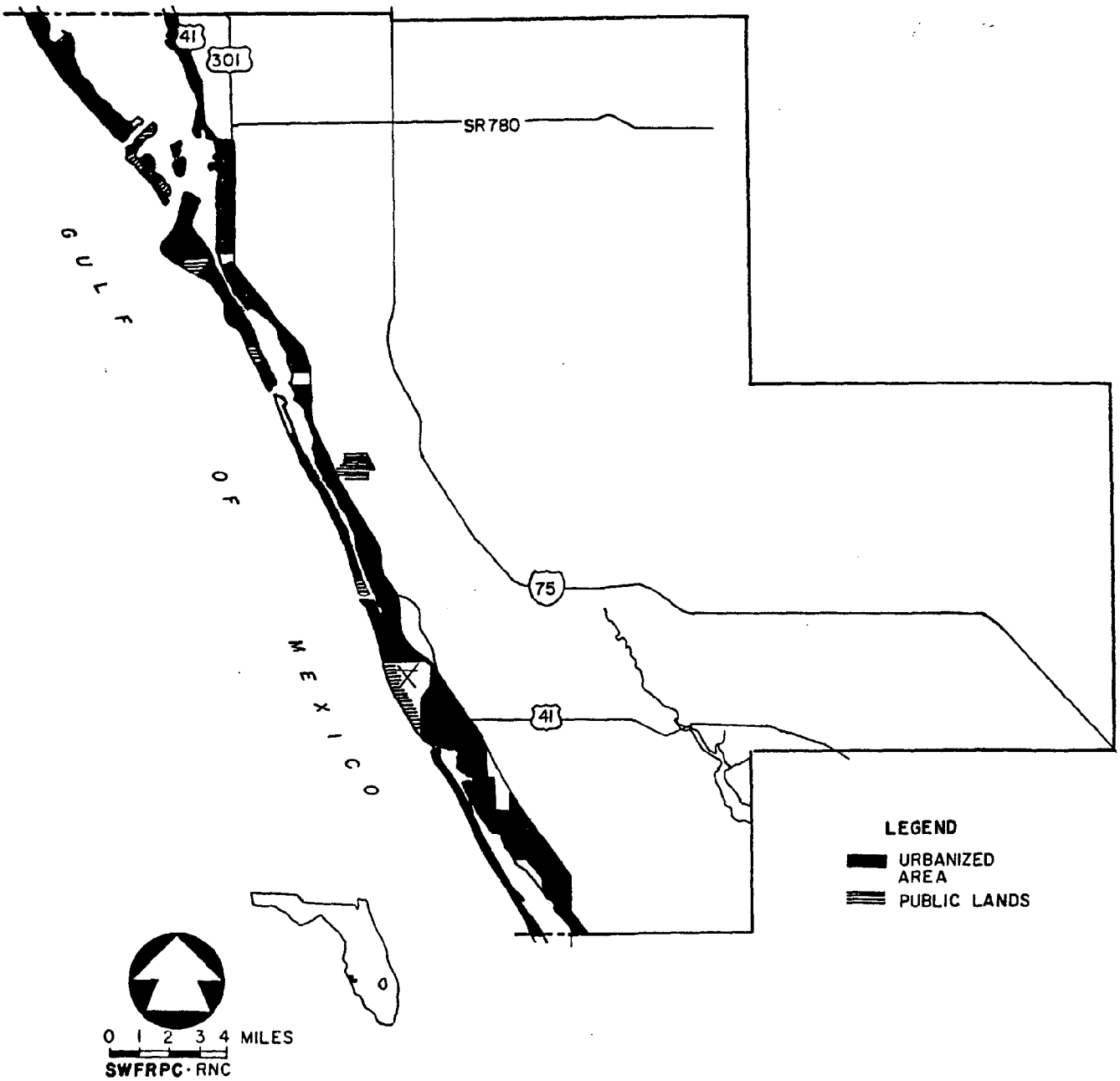
MAP 21
CHARLOTTE COUNTY
SHORELINE AREA



MAP 22
COLLIER COUNTY
SHORELINE AREA



MAP 23
LEE COUNTY
SHORELINE AREA



MAP 24
SARASOTA COUNTY
SHORELINE AREA

GROWTH MANAGEMENT TECHNIQUES

One manner in which the impacts of hurricanes can be mitigated is through the use of growth management. This chapter will define and identify applicable growth management tools or mechanisms that local government can use to promote the location and relocation of hurricane-vulnerable development. In addition, it will include a discussion of the various techniques that are currently used by the Region's local governments.

There are numerous techniques available to address the issue of growth.[1] Several mechanisms can be utilized especially with regard to natural hazards such as hurricanes. These can be divided into the following categories: building codes, subdivision regulations, zoning (these are derived from police power), land use and comprehensive planning, fiscal policy (financial incentives and disincentives, taxing policies, etc.), public acquisition (compensation programs), public improvements (public facilities location), development rights transfer, and environmental controls.

BUILDING CODES

Building codes protect the health, safety and general welfare of the public as it relates to the construction and occupancy of buildings and structures. The codes govern the design and construction practices of residential and other development.

An adequate building code which is properly administered and enforced can help mitigate potential hurricane damage. Building codes are required by the state legislature. All local governments in Southwest Florida have adopted the Standard Building Code (formerly the Southern Standard Building Code), developed by the Southern Standard Building Code Conference. Many building codes contain hurricane-proofing provisions.

It should be noted that a building code can only reduce the damage potential resulting from a hurricane, it cannot prevent it. Building codes will not prevent potential loss of life and property due to hurricanes.

SUBDIVISION REGULATIONS

Subdivision regulation is a very commonly used development control device. These regulations guide the division of large parcels of land into smaller lots for sale or development. Subdivision regulations can be an effective means for local governments to supplement hurricane hazard protection by incorporating specific measures into these regulations.

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1 Growth Management Techniques are discussed in detail in "Comparative Description of Selected Municipal Growth Guidance Systems," Vol. II, Management and Control of Growth, Urban Land Institute, 1978, pp. 283-329.

In general, subdivision regulations can reduce hurricane hazard losses by the following methods[1]:

1. prohibiting the subdivision of lands subject to hurricane hazards unless hazards are overcome;

2. requiring the designation of hurricane hazard areas on subdivision plats and the insertion of restrictions in purchase deeds to control land unsuitable for residential or other uses;

3. prohibiting encroachment in hurricane hazard areas by fill or structures;

4. requiring that a portion of each lot be filled or otherwise protected to provide a safe building site with adequate areas for sewage disposal (i.e. septic tank drainfield), if onsite facilities are used, at an elevation above flood heights, and,

5. requiring the installation of streets, sewers, water and other facilities which are hazard-proofed, elevated or otherwise protected against the hazards of a hurricane.

All local governments in the coastal areas of Southwest Florida have adopted subdivision regulations.[2]

CONVENTIONAL ZONING AND LAND USE PLANNING

A functioning community needs to provide the capability for virtually all types of development. The manner in which this development may locate is commonly accomplished through the zoning-land use planning process.

Zoning is a commonly employed development control device. It is used to regulate the use of buildings and land, the area of a lot which may be developed, the density of development, and the height and bulk of buildings or other structures.

Zoning is one of the most effective means of protecting residents and their property from hurricane flood damage. Zoning regulates the height of structures, the use of structures and land, and the size of lots and density of use. One important aspect of zoning is the ability to specifically regulate flood hazard area land uses.

Comprehensive plans are also an effective means of protecting persons and property from potential hurricane impacts by designing general land uses in specific areas. The allocation of land uses

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[1] John D. Wilson et al., Hurricane Hazard Mitigation at the Local Government Level, 1980, p. 142

[2] Everglades City uses the Collier County subdivision regulations.

going maintenance programs (shoreline protection programs) or to retire bonds which require a consistent revenue level. Such taxes would normally be applied to the owner(s) of the completed development. Special assessments and preferential taxation fall into this category.

Preferential taxation, or one form of fiscal and financial incentives, can be used to prevent development in hurricane prone areas. Fiscal and financial policies can be formulated to discourage development in high hazard coastal areas, while at the same time encouraging development to take place in less disaster-prone locations.

To accomplish this task, local governments could provide fiscal and financial incentives, including subsidies and loans to land owners who comply with land use regulation that reduces disaster risk. In addition, tax measures may be used to discourage development in areas where open spaces are needed for other beneficial, low density uses. Land left as open spaces are needed for other beneficial, low density uses. Land left as open space or for agricultural uses could be taxed favorably, to encourage the land owner to maintain his land in that state.

Negative taxation policies would be confined to various kinds of taxes on land itself, land improvements or the income earned from land developed in areas that promote population congestion in hazardous places. Positive taxation policies such as capital grants for specific types and location of buildings, or interest rate subsidies on land development and building, would be used to enhance development in more suitable areas.

It should be noted that fiscal policies do not inhibit the development of hazard areas. Such development that does occur, however, is more costly, consequently, some users will be crowded out by economic market conditions.

PUBLIC ACQUISITION

The acquisition of land to prevent the development of extreme hazard areas has been discussed previously. There are four types of acquisition which have varying degrees of use and applicability. These forms of ownership, listed in order of degree and control, and cost of acquisition from highest to lowest, are fee simple acquisition, land banking, compensable regulation, and less than fee simple acquisition.

Fee simple acquisition is defined as acquiring full title to land for public purposes such as a park, open space or school. This form is used when full use of the property by the public is required. Fee simple acquisition is the most expensive long-term form of acquisition. This technique transfers ownership from private to public hands and should be employed only when any private development on the threatened land would be in such danger that government's responsibilities can only be met through

to areas that can accommodate those uses can mitigate potential hurricane damage.

If communities incorporate disaster preparedness considerations into their overall planning and zoning process, then the threat to a great deal of future development may be avoided. The uses to be directed away from hazardous areas include moderate to high density residential development, population-related intense commercial development, most forms of industrial development, and population-related institutional uses (schools) and utility development. The uses which would be permitted or encouraged in hazard areas are the water dependent commercial and industrial development (marinas, canneries, ports), water oriented tourist development, recreation, agriculture, and estate housing.

Zoning ordinances are used by the Region's local governments, and comprehensive land use plans have been adopted for all counties and municipalities in Southwest Florida.

FISCAL POLICIES

The use of fiscal policy in hazard areas is somewhat related to the provision of public improvements but has one major difference, which is to make it more expensive to develop hazard areas, regardless of the cost of normal services. The rationale for the imposition of additional costs is that the cost of services for hazard areas is greater than normal due to several factors, including the need for shelters and for adequate traffic flow on evacuation routes.

Fiscal policy may take several forms, such as exactions, fees, and special taxes. Each type of policy may apply during different times in the life of a development.

Exactions are a form of fiscal policy, in that cash or cash equivalent dedications (land, capital facilities, etc.), are provided by a developer as a condition for approval of the proposed development. Common hazard-related exactions include dedicated road rights of way, cash for roadway improvements or off-site shelters, and the provision of on-site shelter.

Tax and fee systems are set up to generate revenues, but they also have an impact on development. Fees are a form of fiscal policy which are applied during the construction phase of an approved development. Fees (such as impact fees) are normally charged for project-specific public costs. The primary difference between exactions and fees is that the "purchaser" of the building permit is the one who pays. This may not necessarily be the developer who received initial approvals.

Special taxes are a form of fiscal policy which are applied through time, which may extend beyond the life of the development. Such taxes are perhaps most appropriate for unusual on-

total acquisition. Permitted public uses would have to be compatible with the flood hazard. Undeveloped land, or land with few structures, is most appropriate for fee acquisition since developed land will make acquisition very expensive.

Land banking is defined as public acquisition of land where urban expansion is expected, and holding it for timely and appropriate use by the public or private sector. Land banking is an approach that involves fee simple acquisition, but differs in that there are appropriate public applications for which the lands may be used by the public. The lands may also be resold to private parties for certain specified uses that are not unduly threatened by storm damage.

Compensable regulation is a technique of combining compensation with constitutionally acceptable police power regulation. Compensable regulation invloves the regulation of lands to such an extent that certain uses, which would be appropriate under other circumstances, are not allowed due to hurricane threat. When the remaining land uses are of less overall value than uses that are forbidden, public reimbursement of the land owner may be in order.

Less than fee simple acquisition is employed where less than full rights to property are required. Less than fee simple acquisition involves the outright purchase of certain rights associated with property, but not the title to the land. As example would be the purchase of the urban development rights of agricultural lands in low-lying areas, or scenic easements or other partial uses of land which would remain in private ownership.

Land acquisition helps to provide for orderly land development. Public land acquisition is costly but may have long-term benefits such as reducing potential hurricane damage.

PUBLIC IMPROVEMENTS

Growth is influenced by the location of specific public facilities and services. The location of infrastructure will have an impact on a community's development patterns. One benefit is that it can be used to direct growth away from areas prone to adverse hurricane impacts.

Public improvements include both the location of facilities to influence growth (such as roads, sewer, water and other essential support facilities), and access to existing facilities (such as the permit to tap into a sewer or water line, etc).

The uses of land which are most endangered by hurricane flooding are urban uses. These uses are dependent upon services and facilities normally provided by public agencies. Both the location of facilities and access to these facilities can be used to limit development in hazard areas by not providing services or expanding

services in such areas. To a certain extent, Governor Graham's Executive Order #81-105 is an example of public policy in this regard. However, most local governments and state government in Florida do not directly prohibit private agencies from providing services in such areas. Consequently, the approach of public improvement limitations is not of great value by itself. When used in coordination with other approaches, however, public improvement limitations have greater utility.

DEVELOPMENT RIGHTS TRANSFER

One method of reducing development in the flood zone is the Transfer of Development Rights (TDR) process. In this process, which is normally contained in the zoning ordinance, development rights are severed from one parcel of land and transferred to another. The process invloves creating a market for "rights" of development which may then be transferred from sites that flood to sites that do not flood. This market, however, can only be created when there is an effective method of "capping" total development and the "rights" being transferred have little relationship to locational factors (i.e., near the water). Very few communities in Florida have been able to establish these caps; where they can be enacted, however, TDR has unrealized capabilities.

ENVIRONMENTAL CONTROLS

These controls have emerged to protect natural processes such as flooding, stormwater runoff, ground water recharge, or to prevent development in sensitive resource areas such as flood plains, stream valleys, wetlands, and shorelands, where problems could occur with development.

Much of the area subject to a high degree of hurricane hazard also has recognized environmental values. Examples of such areas are beaches, dunes, and salt and fresh water wetlands. Strong adherances to effective environmental controls would remove the possibility of intense development in such areas.

There are other environmental areas which have less recognition and less regulatory protection. These are floodplains and drainageways for stormwater runoff. Such areas, which may be expected to be flooded by hurricanes, have only moderate developmental controls, with those being primarily performance standards. Typical examples of such performance standards include the requirement of minimum building elevations in flood zones and storage capacities in drainageways. Consequently, many environmental controls that have been enacted have limited utility in preventing hurricane flood zone development.

OTHER TECHNIQUES

Most other techniques that are in use do not prevent the development of coastal hazard areas. They do, however, either improve the disaster preparedness capabilities of development or alter the timing of development. Techniques which improve disaster preparedness capabilities include those performance standards referenced previously, such as height requirements, wind requirements, and shelter requirements. Those affecting the timing of development include annual permit limits, short term moratoria, and development/infrastructure relationships.

Southwest Florida's communities make use of some of these techniques in their preparedness programs. Other techniques referenced could also be used with greater effectiveness. Table 26 summarizes these techniques and indicates which are currently in use or may be utilized with greater effectiveness by the cities and counties of Southwest Florida.

TABLE 26

Use of Growth Management Techniques
for Disaster Preparedness in Southwest Florida

Community	Acquisition	Public Improvements	Environmental Controls	TDR	Planning & Zoning	Fiscal Policy	Other
Charlotte County	A	A	U	A	U	A	U[1]
Punta Gorda*	U	U[2]	U	-	U	A	U[1]
Collier County	A	A	U	U	U	A	A
Everglades City**	-	A	-	-	U	A	U[3]
Naples*	-	-	U	-	U	-	-
Lee County	A	A	U	A	U	U	A
Cape Coral	-	A	U	A	U	A	-
Fort Myers*	-	-	A	-	U	-	-
Sanibel**	-	U	U	-	U	U	U[3]
Sarasota County	A	A	U	U	U	U	A
Longboat Key	-	A	-	-	U	A	-
North Port	-	A	-	A	U	A	-
Sarasota City*	U	-	U	-	U	-	-
Venice*	-	-	-	-	U	A	-

*Largely built out in Category 1 Flood Zone
**Entire Community in Category 1 Flood Zone

U - used or promoted for use by the community
A - appropriate; recommended for use in community but not normally used
- - not in use

1 - Height restrictions up to 1200 feet back from shoreline
2 - Sewer moratoria, timing development
3 - Height restrictions

PROGRAMS

Several programs in existence will help implement the techniques and tools previously discussed. These include the National Flood Insurance Program, Comprehensive Land Use Plans, Development of Regional Impact (DRI) Process, Areas of Critical State Concern Program (the DRI and ACSC program both come under the Florida Environmental Land and Water Management Act of 1972), and the State Coastal Management Act. All these programs can be used to manage development in coastal areas subject to hurricane hazards.

USE OF GROWTH MANAGEMENT TECHNIQUES FOR DISASTER PREPAREDNESS IN SOUTHWEST FLORIDA

From Table 26, it is apparent that environmental controls and conventional planning policies and zoning ordinances are used extensively in the Region for disaster preparedness.[1] Also evident, is the widespread lack of use of several other appropriate measures, including control of the provision of public improvements and prudent fiscal policies to discourage development in flood prone areas. Other techniques that are in limited use are acquisition and transfer of development rights. The following discussion will briefly review those specific techniques currently employed by local governments in Southwest Florida that support disaster preparedness objectives.

Charlotte County

In Charlotte County, environmental controls and planning and zoning tools are used by the local government. In addition, acquisition, timing of public improvement, transfer of development rights, and fiscal policy would also aid disaster mitigation efforts. The tools currently used will be described below.

The County Zoning Regulations contain an "Environmentally Sensitive" (ES) district which is composed of sensitive areas which require limited development. This district is intended "to preserve and protect open spaces, park lands, wilderness areas, marshlands, watersheds and water recharge areas, scenic areas, beaches and native flora and fauna in those areas designated ES or LD (Limited Development) on the Comprehensive Plan Map." While not specifically conceived for disaster preparedness, this district furthers the objective by limiting development in coastal areas.

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[1]Although the major purpose of these controls may not be disaster preparedness, they directly or indirectly aid in disaster preparedness and mitigation goals.

Charlotte County also has an adopted "flood ordinance" which meets the requirements of the Federal Insurance Administration. This Ordinance, Section 8.7 Zoning Regulations, requires new residential construction to be built so that the lowest habitable floor is elevated to or above the applicable level of the one hundred year flood as shown on the Flood Insurance Rate Maps of the county. Similar requirements or effective floodproofing apply to non-residential construction in Areas of Special Flood Hazards. Additional restrictions apply to developments in the Coastal High Hazard Areas or velocity zones. In such areas, no mobile homes can be located outside of existing mobile home parks. In addition, manmade alteration of sand dunes and mangrove stands which would increase potential flood damage is prohibited. In Coastal High Hazard Areas, the Ordinance requires: 1.) new or replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the system and 2.) new or replacement sanitary sewer systems to be designed to minimize or eliminate infiltration of flood waters into the system and discharges from the system into flood waters.

Section 8.38.2 of the Charlotte County Zoning Regulations includes the following:

> On any lot, the closest boundary of which lies within twelve hundred (1200) feet of the water of Charlotte Harbor, the Gulf of Mexico, Lemon Bay, Gasparilla Sound, Placida Harbor, Red Fish Cove, the Myakka River or the Peace River except as to mobile homes and single family residences, the following requirements shall apply in addition to all other zoning requirements:
>
> (a) No building shall exceed thirty-five (35) feet in height...
>
> (c) ...no building shall be constructed seaward of the Coastal Construction Control Line unless a permit therefor has been issued by the State of Florida...
>
> (f) No building shall exceed two hundred (200) feet in width or length on properties abutting the shorelines of the Gulf of Mexico, Lemon Bay, Placida Harbor, Gasparilla Sounds, Charlotte Harbor, The Myakka River, the Peace River and Red Fish Cove.

The joint Punta Gorda/Charlotte County Comprehensive Plan of 1979 contains within the Coastal Zone Element numerous goals, objectives and policies to protect and preserve coastal resources and environmental quality including the following:

> "3. Objective - To assure the safety of residents of the coastal area during hurricanes.
> Policy - Produce a thorough and detailed revised evacuation plan in conjunction with federal, state, and regional agencies."

The joint Comprehensive Plan also includes the Charlotte Harbor Management Plan Element adopted June 5, 1981, in response to the State of Florida Charlotte Harbor Resource Planning and Management Committee recommendations. Objective 4 of this Element states, "Future development in floodplain areas is to occur only in a manner consistent with the function of floodplains." Objective 8 states, "The barrier islands and beaches of the Charlotte Harbor area should be managed as a whole, recognizing that any developmental activity potentially affects the processes of the entire barrier beach, barrier island, and pass system." Finally, Objective 14 of the Charlotte Harbor Plan Element states, "Coastal areas should be managed in a manner which minimizes the threat to life and property caused by tidal flooding."

Punta Gorda

In the City of Punta Gorda, acquisition, public improvements, environmental controls, and planning and zoning are utilized. The City has an Environmentally Sensitive District in its Zoning Regulations similar to that of the county. Punta Gorda also has an adopted flood ordinance with provisions similar to those of the county. The city has a Marine Park District (which is more inclusive than the county's district) which protects and preserves water areas and public or privately-owned submerged lands extending from the mean high water line or bulkhead line. The city has an ordinance, Section 9 (12) Zoning Regulations, limiting the height and bulk of waterfront buildings similar to that of the county. While the city's setback is also 1200 feet, the height limitation is forty (40) feet above grade. Punta Gorda also owns a waterfront trailer park and is seeking to restrict densities within the park area. The city has also instituted an impact fee system to fund expansion of municipal services.

Collier County

In Collier County, environmental controls, transfer of development rights and planning and zoning techniques are utilized. The Zoning Ordinance of Collier County contains a Special Treatment Overlay District (ST) with special regulations to preserve, protect, and conserve areas of environmental sensitivity including mangrove and freshwater swamps, barrier islands, coastal beaches, estuaries, cypress domes, natural drainage ways, etc. The fact that a use is permitted under the basic underlying zoning district classification confers no right to the property owner for such use unless such use is specifically approved as a condition of approval of a site alteration plan and/or site development plan by the Board of County Commissioners. Collier County also has a Transfer of Residential Development Rights Ordinance which allows an owner of land designated as "ST" to elect to transfer some or all of the residential development rights of his "ST" land to non-"ST" property, as an alternative to the development of his "ST" lands in conformity with the "ST"

regulations. The property owner of the "ST" land is "strongly encouraged" to donate the land to the county; however, if the owner chooses otherwise, the approval may be conditioned upon agreement guaranteeing that the "ST" lands will forever retained in their natural condition and will never be developed in any manner whatsoever by anyone.

Collier County is enrolled in the regular flood insurance program and has an adopted Flood Damage Prevention Ordinance based on the federal model ordinance with provisions similar to those discussed earlier.

The Collier County Comprehensive Plan contains a Safety Element and a Housing Element, both of which contain policies and recommendations for disaster preparedness. Objective 7 of the Housing Element reads, "Protect residents of Collier County from the effects of natural disasters." This objective is followed by five policies for implementation.

Everglades City

The City of Everglades is in the regular flood insurance program and has adopted a Flood Damage Prevention Ordinance based on the Federal model. The Comprehensive Plan for the City limits new construction to a height of 35 feet. The entire city is in the Category 1 Flood Zone having been dredged from mangrove swamps and filled earlier this century to an average elevation of only four feet above sea level.

Naples

The City of Naples is in the regular flood insurance program and has adopted a Flood Damage Prevention Ordinance based on the federal model. The city allows no additional mobile home parks to be developed and restricts mobile homes to the one existing park due to the vulnerability of such units to storm damage. The Conservation and Coastal Zone Management Element of the Comprehensive Plan states as Objective 6, "Reduce or prevent the loss of lives and property in flood hazard areas." This objective is supported by three policies, one of which reads, "Land use intensities in new developments shall be low in density and surface coverage within the identified flood velocity zone, or in areas below 5 feet MSL." (Policy 6-2). The city is largely built out in the Category 1 (most vulnerable) flood zone.

Lee County

Environmental and fiscal tools, and planning and zoning, are currently used by Lee County to manage growth. All other techniques previously mentioned would also be appropriate. Lee County is currently in the "emergency" flood insurance program although a flood damage prevention ordinance is being developed

and the county will soon be in the regular program. The Lee County Zoning Regulations contain a Preservation District-PD (Section 622) classification which has been applied to barrier islands and other coastal areas. This district limits permitted uses to those connected with passive recreation and wildlife preservation. The county is one of the few in the state which administers a Coastal Construction Code, which limits development for each of the barrier islands and other coastal areas under its jurisdiction. Sections 607 and 608 of the Zoning Regulations, require that each mobile home rental park and subdivision, "be provided with a permanent building for use as an emergency shelter sufficient in size to accommodate all the residents of the park or subdivision." These shelters can be used in the event of a hurricane.

The Conservation and Coastal Zone Management Element of the Lee County Comprehensive Plan contains several objectives and policies the support disaster preparedness:

Policy 6 (e) "It shall be the policy of the Board of Commissioners of Lee County to recognize that to the extent practicable, public utilities and installations should be located outside of flood prone areas...

7 (a)(6) It shall be the policy of the Board of County Commissioners of Lee County to encourage, support, or promote development designs that will recognize hazards to life and property from hurricanes, sea level rise and inlet dynamics, and which are designed and located in a manner that will not inhibit natural processes and thereby require subsequent stabilization or fortification...

7 (a)(7) It shall be the policy of the Board of County Commissioners of Lee County to encourage, support, or promote development designs that will recognize the value and need for protection of natural floodways so that they are kept as unobstructed as possible to speed the passage of flood flow."

Lee County has also incorporated the recommended Charlotte Harbor Objectives of the Charlotte Harbor Resource Planning and Management Committee within its adopted Comprehensive Plan. The Lee County Flood Emergency Evacuation Plan has been updated and incorporated within the Southwest Florida Hurricane Evacuation Plan.

Cape Coral

The City of Cape Coral is in the regular flood insurance program and has adopted a Flood Damage Prevention Ordinance. The city land use code contains both a Preservation District (in which lands are not to be developed for any residential, commercial, or industrial use) and a Conservation District (in which land uses will be restricted in intensity and location to protect wetland resources and their natural functions). Areas zoned for mobile homes are very limited. The Cape Coral Comprehensive Plan Environmental Element indicates the following two policies:

C-5. All new development shall be adequately protected from the impacts of hurricanes and other natural disasters.

C-16. The safe evacuation of residents in the event of flooding shall be a prime consideration in all future plans for improving roads.

The City of Cape Coral has also adopted a Charlotte Harbor Element for the Comprehensive Plan.

Fort Myers

The City of Fort Myers is largely built out in the Category 1 flood zone. Fort Myers is in the regular flood insurance program and has adopted a Flood Damage Prevention Ordinance following the federal model. The Comprehensive Plan: 1979 lists the following objectives in the Conservation and Coastal Zone Protection Element.

3(A)(3) Preserve the shoreline and flood plain of the river and its tributaries as natural resources serving both natural and human use functions.

3(A)(4) Preserve life and property in areas prone to severe flooding.

Sanibel

In the City of Sanibel, public improvements, environmental controls, planning and zoning, and fiscal policy are growth management tools that are utilized. The City of Sanibel which is a barrier island located entirely in the most hurricane vulnerable zone (Category 1), is in the regular flood insurance program and has adopted a Flood Damage Prevention Ordinance. The Comprehensive Lnad Use Plan (CLUP) restricts density throughout the barrier island based on ecological zones. The maximum allowed density is five units per acre in certain upland areas, with most densities much lower. The CLUP was developed to aid the City in disaster preparedness and hurricane evacuation. The CLUP contains the following sections:

Section 3.7.2 Emergency Shelter Space - All new residential structures containing more than 4 dwelling units and all new commercial structures designed primarily for uses involving public entry with greater than 3000 square feet of floor area requiring a development permit, including but not limited to banks, office buildings, shop complexes and halls and theaters shall be designed and constructed insofar as determined to be practical by the City so that hallways, lobbies, lounges, and utility areas can be used as emergency shelter during hurricanes.

Section 3.7.3 Emergency Water - Each emergency area which is required under Section 3.7.2 shall have tanks or other storage facilities for 500 gallons of emergency potable water.

The CLUP also established Environmental Performance Standards (Part 3.9) which have the effect of furthering disaster preparedness objectives. The CLUP only allows mobile homes in the two small existing mobile home parks due to their risk of hurricane damage. The city is currently discussing the adoption of a "build-back" ordinance which would attempt to bring into conformance with the CLUP, those nonconforming uses that might be heavily damaged or destroyed following a severe storm. The city has an adopted "Rate of Growth Ordinance" which paces the island's residential growth at approximately 180 units per year. The recommendations of the Charlotte Harbor Resource Management Committee have been incorporated as an element of the CLUP. Finally, Sanibel has recently adopted a Comprehensive Hurricane Evacuation Plan for the island and this plan has been coordinated with the Southwest Florida Regional Hurricane Evacuation Plan.

Sarasota County

Sarasota County uses environmental controls, planning and zoning, and fiscal policy to manage growth. The county is in the regular flood insurance program and has adopted a comprehensive Flood Damage Prevention Ordinance which also prohibits the placement of mobile homes, except in existing mobile home parks and mobile home subdivisions, within the coastal velocity zones on the adopted Flood Insurance Rate Maps. The Sarasota County Zoning Regulations include the Open Use Conservation (OUC) district intended, "to preserve and protect open spaces, park lands (where not otherwise zoned for Government use), wilderness areas, marsh lands, watersheds and water recharge areas, scenic areas, and beaches--to protect life and property in areas subject to flooding and to conserve fish and wildlife." Maximum residential density in such districts is one (1) unit per twenty-five acres and is permitted only when the building is for the residence of the owner, operator, or permanent employee of an agricultural or conservation activity.

The Sarasota County Comprehensive Plan APOXSEE reinforces the strong existing environmental controls with the following environmental programs.

> Program 13. Adopt a shoreline protection ordinance establishing a requirement for vegetation buffers for all new construction and which prohibits additional artificial shoreline stabilization and channelization of the main stream.
>
> Program 14. Continue enforcement of County Ordinance NO. 79-03 prohibiting construction seaward of the State Coastal Construction Control Line.

The APOXSEE Drainage Element seeks to discourage development in flood prone areas and increase maintenance of existing and proposed drainage ways. Program 8 of the Future Land Use Element discourages development on the barrier islands:

Program 8. "The intensity of future development on the barrier islands of Sarasota County shall not exceed that allowed by existing zoning. Parcels already developed at densities less than that permitted by the existing zoning should be downzoned to the zone district most closely corresponding to the existing development on the parcel taking into consideration existing plats. Parcels which are undeveloped and zoned for Commercial General (CG) uses are to be downzoned to a less intensive zoning district category."

Downzoning of the unincorporated barrier islands was completed in 1982.

APOXSEE also incorporates the recommendations of the Charlotte Harbor Resource Management Committee. Sarasota County is included in the Southwest Florida Hurricane Evacuation Plan. The "Sarasota County Public Facilities Financing Ordinance" will use impact fees to pay for certain road and park/open space improvements within the county.

Longboat Key

The town of Longboat Key is a barrier island which is located entirely in the Category 1 (most vulnerable) hurricane zone. The town is in the regular flood insurance program and has adopted a Flood Damage Prevention Ordinance. The Traffic Circulation Element of the Comprehensive Plan contains the following objective:

> "To provide for Public Health and Safety in a Hurricane."

In addition, the City has its own Hurricane Evacuation Plan.

North Port

The City of North Port is in the regular flood insurance program and has adopted a Flood Damage Prevention Ordinance.

City of Sarasota

The City of Sarasota which is largely built out in the Category 1 flood zone, is in the regular flood insurance program and has adopted Flood Plain Management Regulations. The Comprehensive City Plan contains a Charlotte Harbor Management Plan Element incorporating the recommendations of the Charlotte Harbor Resource Management Committee. The Coastal Zone Protection Element of the Comprehensive Plan contains numerous policies in support of disaster preparedness including the following:

> Objective C: To protect beaches and sand dunes for their value as recreational resources and protection against storm waves.
>
> Objective D: To preserve flood plains, drainage ways, and other natural areas having beneficial hydrological characteristics and protect development from floods.

The City of Sarasota has made extensive purchases of gulffront land for parks and open space, including City Island, large portions of Lido Key, and the bayfront marina. Lido Key, with long stretches of publicly-owned natural shoreline and unobstructex beaches, will promote long-term stability and provide protection from storm damage.

Venice

The City of Venice, also largely built out in the most hurricane vulnerable zone, is in the regular flood insurance program and has adopted a comprehensive Flood Damage Prevention Ordinance. The Zoning Regulations contain the Open Use Conservation (OUC) District intended, "to preserve and protect open spaces, park lands, wilderness areas, marsh lands, water sheds and water recharge areas, scenic areas, and beaches...to protect life and property in areas subject to flooding and to conserve fish and wildlife." This district is similar to a classification in the Sarasota County regulations and permits a maximum residential density of one (1) unit per acre.

The Comprehensive Plan adopted by Venice includes in its Drainage Element the following goal:

> "It is the goal of the City of Venice to protect its residents and their properties from flooding, and to do so in a manner which will not incur negative environmental impacts."

The Comprehensive Plan contains numerous policies to further disaster preparedness. The plan also includes a Charlotte Harbor Element.

CONCLUSION

All the techniques previously discussed are useful and important in mitigating the effects of a hurricane; however, these techniques will be most effective if used in combination and in coordination with each other.

In summary, virtually all tools are appropriate for use by county government, due to the vast undeveloped tracts of land both in and outside the hazard areas which provide flexibility in land use. In contrast, the island communities have few usable tools other than planning and zoning which provide effective development caps. For these communities, however, it is important to relate development to certain public improvements that are necessary for evacuating and sheltering a threatened population. Several of the remaining communities are largely built out; consequently, mitigation of the existing threat is the most important aspect of disaster preparedness. Those few cities with large amounts of developable land have greater flexibility in future efforts; however, existing subdivided but undeveloped lands reduce the effectiveness of the normal zoning and planning tools that are in use.

POLICIES

The purpose of this chapter is to develop regionwide hurricane hazard mitigation policies to guide future development in identified vulnerable areas. This includes policies governing the location and relocation of residential, commercial, industrial and public facilities land uses, based upon the damage susceptibility of each use in relation to the respective storm scenarios and the probability of occurrence of each scenario.

The Southwest Florida Regional Planning Council's adopted goals, objectives, and policies addressing disaster preparedness are stated below. These policies were recently revised and expanded, incorporating results of the Council's Hurricane Evacuation Plan and Hurricane Loss Study into their formulation.

SWFRPC ADOPTED HAZARD MITIGATION POLICIES

29I-2.07 Disaster Preparedness. PROTECT PRESENT AND FUTURE POPULATIONS FROM NATURAL AND NON-NATURAL DISASTERS.

(1) Objective: Ensure that new development is adequately protected from the forces of natural disasters.

POLICIES:

(a) Encourage development in identified flood hazard areas from occurring in a manner which would jeopardize the health, safety, and welfare of the residents.

(b) Encourage all residential construction in identified flood-prone areas to have ground floor elevations above the level subject to flooding as identified by the statistical 100-year storm.

(c) Encourage support service facilities which are located within flood-prone areas to have ground floor elevations above the level subject to flooding as identified by the statistical 100-year storm.

(d) Encourage local governments to prepare detailed plans and procedures for the evacuation of all new development within flood hazard areas in the event of hurricane-type high water conditions.

(e) Encourage local governments to require mobile home developments to have storm evacuation centers on-site with sufficient structural characteristics, warning systems, and evacuation procedures for the resident population in the event of tornado-like high wind conditions.

(f) Encourage local government participation in the Federal Flood Insurance Program.

(g) Encourage local governments to incorporate consideration of the impact of new development on emergency evacuation routes into the formulation of their comprehensive plans and into their zoning decisions.

(h) Encourage local governments to incorporate pertinent requirements of structural wind resistance as stated in South Florida building codes.

(i) Encourage local governments to consider the additional disaster preparedness requirements of new developments whose future residents might have limited mobility and/or demand recreational specialized attention.

(2) Objective: Ensure that disaster preparedness plans including procedures for both natural and non-natural disasters are adequate for present and future populations.

POLICIES:

(a) Encourage coordination between local governments in their Disaster Preparedness Plans.

(b) Encourage coordination between the needs of local Disaster Preparedness Plans and other relevant government planning efforts, notably transportation, capital improvement plans, land use plans, and zoning ordinances.

(c) Encourage local governments to include the requirement of an Emergency Operating Center (EOC) in their Disaster Preparedness Plans.

(d) Encourage local governments designated as Risk Areas and Host Areas for nuclear civil protection planning to participate in the statewide Nuclear Civil Protection Planning Program.

(e) Encourage dissemination of public information on how to evacuate, who needs to evacuate, and what services are available for the population in the event of a disaster.

(f) Encourage the completion of oil spill prevention and containment systems and related plans for prevention, control and clean-up of harmful, flammable or other dangerous substances before actual exploration, development or production operations begin.

Since it is inevitable that development will continue in the future, (growth has been especially rapid in coastal areas and similar hurricane-vulnerable locations), and potential losses from hurricanes can be astronomical (as illustrated in the SWFRPC Hurricane Loss Study) it is important to develop policies to prevent or mitigate losses. These policies can either discourage development in hazard areas, or encourage hurricane resistant building practices in hurricane hazard areas.

The previous policies and the following recommended policies are to be used as a guide, by local governments. They can be implemented through local land planning techniques such as codes and ordinances, and can be incorporated into Peacetime Emergency Plans of local government disaster preparedness agencies, as well as local government Comprehensive Plans.

RECOMMENDED HURRICANE MITIGATION POLICIES

*Encourage and assist local governments in developing post-disaster reconstruction and redevelopment plans

*Discourage development on undeveloped barrier islands

*Discourage post-hurricane rebuilding in vulnerable areas that utilizes pre-hurricane building practices

*Discourage the development of public facilities in the most hurricane-vulnerable areas (category 1) except when necessary for the public health, safety and welfare and to provide service for existing residents

*Encourage the acquisition of hurricane-vulnerable land, including channels, low-lying areas and shoreline by both state and local governments

*Encourage local governments to reexamine existing building codes and modify or adopt more stringent codes with relation to hurricane hazards

*Encourage local governments to include in subdivision regulations that deeds in the most hurricane-vulnerable areas (Category 1), be accompanied by a disclosure statement describing the property and its potential hurricane hazards

*Encourage the location of residential development outside the most hurricane vulnerable (Category 1) areas

*Encourage the public acquisition of property in areas that have been completely destroyed as the result of a hurricane, to prevent a similar reoccurrence

*Encourage post-hurricane reconstruction and redevelopment outside those areas most vulnerable to hurricane impacts

*Encourage in vulnerable areas only those types of land uses that are compatible with hurricane hazard areas

*Discourage post-hurricane redevelopment and rebuilding of facilities which will serve to encourage growth in hazardous areas, except for necessary services for existing developments

*Encourage local governments to identify potential disaster field offices and disaster assistance centers and to designate them in their Peacetime Emergency Plans

*Encourage the location of temporary housing, disaster field office and disaster assistance centers outside the most vulnerable (Category 1) areas

The Southwest Florida Regional Planning Council encourages mitigation through various ways, including its review of Developments of Regional Impact, Intergovernmental Coordination and Review Process (formerly A-95), and review of Local Government Comprehensive Plans. The following recommendations are included in DRI's:

*Minimum first floor living elevation equal to flooding level of worst case category 3 storm

*Shelter space at a ratio of 20 square feet per person

*On-site refuge at a ratio of 20 square feet per person, at a minimum elevation equal to or above the flooding level of the worst case category 3 storm, from the beginning of project habitation

*Provisions in deeds and covenants for temporary on-site shelter in certain applicable areas; refuge space in interior hallways of upper story structures; or similarly protected areas with protected openings leading directly to the exterior

*On-site shelter standards
- Shelters constructed to withstand winds of 140 mph, and certified by professional engineer, licensed and registered by the State of Florida

- Shelters equipped with emergency power and potable water supplies

- Shelter construction with minimum glass, glass to be protected by shutters and boards

- Adequate ventilation, sanitary facilities, first-aid equipment

- Shelters shall be elevated to a minimum height equal to or above worst case category 3 flooding level

*Establishment of a homeowners association to provide residents with pertinent hurricane-related information

*Payment for fair-share of necessary transportation improvements due to use of roadways as evacuation routes.

*Cash donation for county shelters if on-site shelters are not provided

*Provision of a disclosure statement to all prospective property purchasers indicating the vulnerability of the proposed project to hurricanes, and stating the amount of flooding (in feet) that could occur in category 3 storms.

*Requirement in deeds that allows persons in ground floor units to use units in second story or above as refuge.

*A practical plan for hurricane evacuation implemented prior to occupancy of the first unit.

These recommendations, along with the previous recommended policies, if properly implemented, will help to mitigate potential losses and may also prevent hurricane damage.

CONCLUSION

Hurricanes can have substantial impacts upon both property and human lives. Although loss of life due to hurricanes has decreased over the years, damage to property has increased significantly. As population growth continues and development becomes more concentrated in coastal areas, the potential exists for great damage from hurricanes.

The first portion of this report described the various types of disaster assistance and available programs. Since potential damage from hurricanes, as quantified in the Southwest Florida Regional Planning Council Hurricane Loss Study 1982, could amount to billions of dollars, post-disaster needs would also be significant in the Region. Billions of dollars in assistance would be required for businesses, individuals and local government ($1.9 billion in Category 3 storms) to mitigate losses to residential property, government-owned facilities and businesses.

The significant amount of potential destruction and resultant needs for monetary assistance as the result of hurricanes, illustrate the need for mitigative techniques. Although it is not possible to prevent hurricanes, potential damage and loss of life can be minimized or eliminated through the utilization of appropriate planning.

The second part of the plan developed policies and recommended techniques that are appropriate for use in the Region to lessen adverse hurricane impacts. These include land use planning and management, zoning, timing and provision of public facilities, land acquisition, environmental controls and fiscal policies. Mitigating losses by utilizing these suggested techniques and methods will reduce the need for outside assistance in the event of a natural disaster such as a hurricane. It should be noted, however, that it is dependent upon local governments to implement those policies to prevent or mitigate hurricane impacts.

Recommendations for future studies include a cost/benefit study of mitigation techniques, further study of vertical evacuation as a mitigative tool, and analysis of structural modifications to reduce hurricane damage as well as their associated costs. In addition, hurricane loss studies and damage estimates should be periodically updated, utilizing the most current data available, to maintain their usefulness.

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APPENDIX A
COORDINATING AGENCIES

APPENDIX A

DISASTER PREPAREDNESS ADVISORY COMMITTEE MEMBERSHIP

Mr. Harold Berentsen
Community Assistance Consultant
Division of Disaster Preparedness
Post Office Box 1038
Jupiter, FL 33458

Mr. Terry Dillon, Director
Lee County Disaster Preparedness Agency
Post Office Box 6926
Fort Myers, FL 33911-6926

Mr. Sebastian J. D'Alli, Director
Sarasota County Civil Defense
101 S. Washington Boulevard
County Courthouse
Sarasota, FL 33577

Mr. John P. Derr, Coordinator
Charlotte County Disaster Preparedness
County Courthouse
118 W. Olympia Avenue
Punta Gorda, FL 33950

Mr. Neil Dorrill, Director
Collier County Public Safety
Collier Co. Govt. Center
3301 Tamiami Trail, East
Naples, FL 33942

Mr. Gerry Harris
Glades County Civil Defense
Post Office Box 235
Moore Haven, FL 33471

Ms. Judi Kennington, Coordinator
Hendry County Civil Defense
County Courthouse
Post Office Box 356
LaBelle, FL 33935

OTHERS WHO HAVE ATTENDED MEETINGS

Mr. William Wagner, Director
Collier County Civil Defense
3301 Tamiami Trail, East
Naples, FL 33942

Mr. David Saniter
Lee County Disaster Preparedness Agency
Ortiz Avenue
Fort Myers, FL 33905

Mr. Estell Edwards
Lee County Disaster Preparedness Agency
Ortiz Avenue
Fort Myers, FL 33905

Ms. Colleen Heilig
Lee County Area Red Cross
2306 First Street
Fort Myers, FL 33901

Mr. Roland Cornish
Charlotte County Red Cross
801 Aaron Street, Northwest
Port Charlotte, FL 33952

Mr. Robert Barnhart
Sarasota County Red Cross
307 South Orange Avenue
Sarasota, FL 33577

Mr. Court Babcock
Sarasota County Red Cross
307 South Orange Avenue
Sarasota, FL 33577

APPENDIX B
THE SAFFIR/SIMPSON HURRICANE SCALE

APPENDIX B

THE SAFFIR/SIMPSON HURRICANE SCALE

The Saffir/Simpson Hurricane Scale is used by the National Weather Service to give public safety officials a continuing assessment of the potential for wind and storm surge damage from a hurricane in progress. Scale numbers are made available to public safety officials when a hurricane is within 72 hours of landfall. Scale assessments are revised regularly as new observations are made, and public safety organizations are kept informed of new estimates of the hurricane's disaster potential.

Scale numbers range from 1 to 5. Scale No. 1 begins with hurricanes in which the maximum sustained winds are at least 74 mph, or which will produce a storm surge 4 to 5 feet above normal water level, while Scale No. 5 applies to those in which the maximum sustained winds are 155 mph or more, which have the potential of producing a storm surge more than 18 feet above normal.

The scale was developed by Herbert Saffir, Dade County, Florida consulting engineer, and Dr. Robert H. Simpson, former National Hurricane Center director, and projects scale assessment categories as follows:

Category No. 1 - Winds of 74 to 95 mph. Damage primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage to other structures. Some damage to poorly constructed signs. Storm surge 4 to 5 feet above normal. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.

Category No. 2 - Winds of 96 to 110 mph. Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing materials of buildings; some window and door damage. No major damage to buildings. Storm surge 6 to 8 feet above normal. Coastal roads and low-lying escape routes inland cut by rising water two to four hours before arrival of hurricane center. Considerable damage to piers. Marinas flooded. Small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying island areas required.

Category No. 3 - Winds of 111 to 130 mph. Foliage torn from trees; large trees blown down. Practically all poorly constructed signs blown down. Some damage to roofing materials of buildings; some window and door damage. Some structural damage to small buildings. Mobile homes destroyed. Storm surge 9 to 12 feet above normal. Serious flooding at coast and many smaller structures near coast destroyed; large structures near coast damaged by battering waves and floating debris. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Flat terrain 5 feet or less above sea level flooded inland 8 miles or more. Evacuation of low-lying residences within several blocks of shoreline possibly required.

Category No. 4 - Winds of 131 to 155 mph. Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows, and doors. Complete failure of roofs on many small residences. Complete destruction of mobile homes. Storm surge 13 to 18 feet above normal. Flat terrain 10 feet or less above sea level flooded inland as far as six miles. Major damage to lower floors to structures near shore due to flooding and battering by waves and floating debris. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Major erosion of beaches. Massive evacuation of all residences within 500 yards of shore possibly required, and of single-story residences on low ground within two miles of shore.

Category No. 5 - Winds greater than 155 mph. Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down. Complete failure of roofs on many residences and industrial buildings. Extensive shattering of glass in windows and doors. Some complete building failures. Small buildings over-turned or blown away. Complete destruction of mobile homes. Storm surge greater than 18 feet above normal. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Massive evacuation of residential areas on low ground within five to ten miles of shore possibly required.

Dr. Neil Frank, present National Hurricane Center director, has adapted atmospheric pressure ranges to the Saffir/Simpson Scale. These pressure ranges, along with a numerical break-down of wind and storm surge ranges are:

SCALE NUMBER	CENTRAL PRESSURES MILLIBARS	CENTRAL PRESSURES INCHES	WINDS (MPH)	SURGE (FT.)	DAMAGE
1	980	28.94	74-95	4-5	Minimal
2	965-979	28.5 -28.91	96-110	6-8	Moderate
3	945-964	27.91-28.47	111-130	9-12	Extensive
4	920-944	27.17-27.88	131-155	13-18	Extreme
5	920	27.17	155+	18+	Catastrophic

APPENDIX C
HOUSING UNITS BY COUNTY AND TYPE

TABLE C-1

CHARLOTTE COUNTY
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
1	Barrier Islands	554	124	50	132	702	0	15	1,577
1	Cape Haze	1,223	433	15	221	1,046	20	99	3,057
1	Port Charlotte	2,329	42	0	0	0	0	0	2,371
1	Charlotte Harbor	1,291	489	0	123	397	26	151	2,477
1	South County	357	426	0	22	0	0	0	805
1	East Punta Gorda	501	738	0	3	138	10	26	1,416
1	Punta Gorda	3,525	1,277	121	228	859	34	312	6,356
	TOTAL Category 1	9,780	3,529	186	729	3,142	90	603	18,059
2	Cape Haze	2,481	993	299	0	26	4	35	3,838
2	Port Charlotte	5,769	806	79	412	373	0	103	7,542
2	Peace River	210	223	0	0	0	0	0	433
2	Punta Gorda	168	68	0	0	0	0	8	244
2	East Punta Gorda	146	118	0	9	0	0	8	281
	TOTAL Category 2	8,774	2,208	378	421	399	4	154	12,338
3	Cape Haze	739	0	0	72	40	0	122	973
3	Port Charlotte	6,044	0	0	141	544	84	87	6,900

TABLE C-1

CHARLOTTE COUNTY (Cont'd.)
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
3	Punta Gorda	325	565	103	0	0	0	48	1,041
3	East Punta Gorda (Shell Creek)	280	146	76	0	0	0	0	502
	TOTAL Category 3	7,388	711	179	213	584	84	257	9,416
4	East County	151	1,326	112	0	0	0	0	1,589
5	East County	0	0	0	0	0	0	0	0
	Outside hurricane zones	107	93	0	0	0	0	0	200
	TOTAL County	26,200	7,867	855	1,363	4,125	178	1,014	41,602

TABLE C-2

COLLIER COUNTY
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
1	Barefoot Beach	6	0	0	0	0	0	0	6
1	Vanderbilt Beach	285	0	0	4	895	8	353	1,545
1	Gulf Shore	3,040	20	60	58	3,616	6	477	7,277
1	Aqua Lane Shores/Port Royal	1,084	0	0	217	1,024	0	44	2,369
1	South Naples/Rookery Bay	1,247	1,578	801	519	694	10	43	4,892
1	Marco Island/ Goodland	2,580	136	24	162	5,886	40	990	9,818
1	Henderson Creek	97	509	123	3	0	0	210	942
1	Everglades/Chokoloskee	210	223	169	39	1,229	0	80	1,950
	TOTAL Category 1	8,549	2,466	1,177	1,002	13,344	64	2,197	28,799
2	Naples Park	2,015	0	0	33	43	40	37	2,168
2	Moorings Bay	1,818	173	34	554	1,868	13	589	5,049
2	Bonita Shores	421	612	295	40	87	18	10	1,483
2	Lake Forest	862	121	95	0	702	7	0	1,787
2	Naples Manor	331	0	0	0	650	16	0	997
2	South Golden Gate	547	301	55	0	0	0	0	903
	TOTAL Category 2	5,994	1,207	479	627	3,350	94	636	12,387

TABLE C-2

COLLIER COUNTY (Cont'd.)
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
3	Pine Ridge	425	9	0	0	40	20	0	494
3	Pelican Bay	24	0	0	0	168	0	0	192
3	North Naples/East Naples	5,620	1,483	546	90	4,313	306	784	13,142
3	Big Cypress	594	40	43	0	0	0	0	677
3	North Golden Gate	1,390	97	133	4	164	0	0	1,788
	TOTAL Category 3	8,053	1,629	722	94	4,685	326	784	16,293
4	Corkscrew	275	130	155	0	0	0	0	560
5	Immokalee	1,003	1,235	1,337	889	0	24	38	4,526
	Outside hurricane zones	81	27	18	0	0	0	0	126
	TOTAL County	23,955	6,694	3,888	2,612	21,379	508	3,655	62,691

Table C-3

Glades County

Housing Units

Zone	Single-Family	Mobile Home/ Travel Trailer	Apartment	Condominium	Hotel/ Motel	Total
Moore Haven	504	479	61	0	86	1,130
Ortona	189	293	0	0	0	482
Fisheating Creek	100	135	0	0	0	235
Lakeport/Buckhead Ridge	1,093	1,082	0	0	35	2,210
TOTAL	1,886	1,989	61	0	121	4,057

Table C-4

Hendry County

Housing Units

Zone	Single-Family	Mobile Home/ Travel Trailer	Apartment	Condominium	Hotel/ Motel	Total
LaBelle/Felda	2,309	1,140	0	0	123	3,572
Clewiston/Flaghole	2,443	1,047	308	0	197	3,995
Big Cypress Reservation	247	83	0	0	0	330
Devil's Garden Wildlife Area	356	129	0	0	0	485
TOTAL	5,355	2,399	308	0	320	8,382

TABLE C-5

LEE COUNTY
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
1	Gasparilla	382	10	0	194	26	0	156	768
1	Islands	43	6	0	0	0	46	13	108
1	Sanibel/Captiva	2,195	89	99	162	3,917	68	1,542	8,072
1	Fort Myers Beach	2,078	598	499	360	3,839	0	1,954	9,328
1	Bonita Beach	202	40	12	33	1,237	12	137	1,673
1	Pine Island/Matlacha	1,893	1,805	577	10	120	38	43	4,486
1	Northwest Cape Coral	102	0	0	0	123	0	43	268
1	Southwest Cape Coral	549	23	0	0	150	28	0	750
1	Southeast Cape Coral	5,644	0	0	388	2,350	84	351	8,817
1	Southwest N. Ft. Myers Riverfront	530	226	0	50	414	38	319	1,577
1	N. Ft. Myers Riverfront	737	1,229	0	61	60	48	91	2,226
1	Southeast N. Ft. Myers Riverfront	787	530	147	5	0	12	0	1,481
1	Iona	2,122	1,610	394	50	2,326	92	56	6,650
1	McGregor	1,861	7	0	900	362	8	742	3,880
1	East Ft. Myers Riverfront	1,810	629	215	350	242	50	60	3,356
1	Estuaries	268	1,122	2,010	0	332	148	20	3,900
1	Gladiolus	684	951	50	86	862	36	0	2,669

TABLE C-5

LEE COUNTY (Cont'd.)
HOUSING UNITS

Storm Category		Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
1	San Carlos Estero West	642	1,673	1,070	80	228	10	10	3,713
1	Bonita	968	830	110	20	76	308	33	2,345
	TOTAL Category 1	23,497	11,378	5,183	2,749	16,664	1,026	5,570	66,067
2	South Cape Coral	4,360	0	0	194	1,212	46	0	5,812
2	Upper Cape Coral	24	2	0	0	0	2	0	28
2	Central Cape Coral	637	1	0	0	300	48	0	986
2	Central Cape Coral/Del Prado	787	2,985	0	429	230	308	0	4,739
2	Southwest N. Ft. Myers	920	171	0	50	50	46	120	1,357
2	N. Ft. Myers	851	4,661	410	111	56	60	119	6,268
2	Winkler	1,646	0	0	0	1,318	290	0	3,254
2	South Ft. Myers	2,363	809	0	0	2,548	1,242	264	7,226
2	Tice	1,631	517	29	411	0	200	42	2,830
2	Downtown North	240	0	0	300	0	0	0	540
2	Riverdale	1,598	92	0	30	46	142	0	1,908
	TOTAL Category 2	15,057	9,238	439	1,525	5,760	2,384	545	39,948
3	North Cape Coral	289	266	114	0	166	68	0	903
3	Northwest N. Ft. Myers	34	523	0	0	0	2	0	559

TABLE C-5

LEE COUNTY (Cont'd.)
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
3	N. Ft. Myers (North	39	1,373	0	0	0	0	36	1,448
3	Northeast N. Ft. Myers	557	644	0	0	0	8	10	1,219
3	Alva	316	192	0	0	0	0	0	508
3	Southeast Ft. Myers/ Ortiz	2,902	411	53	922	0	376	0	4,664
3	Southwest Alva	318	32	0	0	0	8	0	358
3	Downtown South	817	14	0	827	0	0	239	1,897
3	Buckingham	273	32	0	3	0	4	8	320
3	Cleveland	3,042	183	0	300	1,561	8	167	5,261
3	Colonial Daniels	327	66	0	0	0	0	0	393
3	San Carlos/Estero East	1,375	79	754	35	0	130	0	2,373
3	Bonita East	2,139	1,843	814	74	100	564	61	5,595
	TOTAL Category 3	12,428	5,658	1,735	2,161	1,827	1,168	521	25,498
4	East County	902	438	544	9	0	28	4	1,925
5	Lehigh	3,305	39	0	297	837	414	133	5,025
	Outside hurricane Zones	53	16	0	0	0	0	0	69
	TOTAL County	55,242	26,767	7,901	6,741	25,088	5,020	6,773	132,764

TABLE C-6

SARASOTA COUNTY
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
1	Barrier Islands	4,898	552	77	1,677	13,154	0	1,564	21,922
1	Indian Beach Bayfront	333	0	0	0	0	0	0	333
1	Whittaker Bayfront	65	0	0	0	47	0	9	121
1	Downtown Sarasota Bayfront	20	0	0	197	654	0	452	1,323
1	Hudson Bayou Bayfront	197	0	0	0	0	0	0	197
1	Roberts Bayfront	211	0	0	0	0	0	0	211
1	Phillippi Creek Bayfront	539	165	41	78	378	52	13	1,266
1	Little Sarasota Bayfront	407	0	0	0	565	0	0	972
1	Osprey Bayfront	221	0	0	0	238	0	0	459
1	Nokomis Laurel Bayfront	1,051	0	0	44	0	48		1,143
1	Venice Waterfront	474	0	0	0	1,164	0	44	1,682
1	Warm Springs Riverfront	194	0	5	58	0	146	0	403
1	Myakka River	14	1,450	46	0	0	16	40	1,566
1	East Englewood	48	0	0	0	0	0	0	48
1	Englewood Bayfront	733	91	10	24	0	0	0	858
1	Venice Airport Waterfront	158	0	0	0	195	8	0	361
1	Buchan Waterfront	70	0	0	0	0	0	0	70
	TOTAL Category 1	9,633	2,258	179	2,078	16,395	270	2,122	32,935

TABLE C-6

SARASOTA COUNTY (Cont'd.)
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
2	Indian Beach	303	0	0	16	0	0	14	333
2	Whittaker Bayou	271	0	0	40	0	0	81	392
2	Downtown Sarasota	82	0	0	657	732	0	47	1,518
2	Hudson Bayou	326	0	0	0	47	0	0	373
2	Roberts Bayou	265	0	0	58	14	0	0	337
2	Phillippi Creek	515	172	114	18	110	108	29	1,066
2	Little Sarasota Bayfront	428	113	0	8	244	0	0	793
2	Osprey	422	186	44	4	0	0	126	782
2	West Nokomis Laurel	616	129	0	32	173	10	0	960
2	Downtown Venice	257	0	0	54	549	0	0	860
2	Warm Springs	139	0	0	3	0	0	0	142
2	North Port	650	871	0	0	0	56	46	1,623
2	Myakka River	567	70	17	0	0	0	0	654
2	East Englewood	113	0	0	0	0	0	0	113
2	North Englewood	845	170	27	26	74	8	22	1,172
2	Venice Airport Waterfront	345	0	0	168	506	0	112	1,131
2	Buchan	1,499	0	0	13	0	0	0	1,512
	TOTAL Category 2	7,643	1,711	202	1,097	2,449	182	477	13,761

TABLE C-6

SARASOTA COUNTY (Cont'd.)
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
3	Indian Beach	567	0	0	35	66	32	420	1,120
3	East Whittaker Bayou	290	10	0	62	0	0	160	522
3	Downtown Sarasota	229	123	0	380	39	30	47	848
3	Hudson Bayou	177	0	0	0	0	0	0	177
3	Roberts Bayou	435	0	0	18	64	0	28	545
3	Phillippi Creek	918	129	102	48	483	96	14	1,790
3	Little Sarasota	458	256	189	49	188	9	22	1,171
3	East Osprey	87	82	1	0	90	0	0	260
3	East Nokomis Laurel	1,581	1,041	430	59	0	6	44	3,161
3	East Venice	67	264	0	92	1,258	0	264	1,945
3	North Warm Springs	984	59	43	38	0	0	0	1,124
3	South Warm Springs	0	2	76	0	0	0	0	78
3	North Port	670	0	0	0	0	0	0	670
3	East Buchan	472	466	639	0	412	16	0	2,005
3	North Englewood	1,781	594	43	6	222	56	7	2,709
3	Southeast Venice	744	430	0	330	206	0	124	1,834
3	West Buchan	1,782	0	0	0	66	0	20	1,868
	TOTAL Category 3	11,242	3,456	1,523	1,117	3,094	245	1,150	21,827

TABLE C-6

SARASOTA COUNTY (Cont'd.)
HOUSING UNITS

Storm Category	Zone	Single-Family	Mobile Home	Travel-Trailer	Apartment	Condominium	Duplex	Hotel/Motel	Total
4	East County	13,936	5,673	780	1,006	3,573	416	410	25,794
5	East County	6,572	555	112	1,436	1,106	590	0	10,371
	Outside hurricane zones	17,182	4,985	1,368	1,150	6,314	895	0	31,894
	TOTAL County	66,208	18,638	4,164	7,884	32,931	2,598	4,159	137,582

APPENDIX D
HOUSING UNITS BY TYPE AND VULNERABILITY ZONE

HOUSING UNITS BY TYPE AND VULNERABILITY ZONE*

County	Vulnerability Zone	Single-Family	Mobile Home	Apt.	Condo-minium	Duplex	Total
Charlotte	1	9,780	3,529	729	3,142	90	17,270
	2	8,774	2,208	421	399	4	11,806
	3	7,388	711	213	584	84	8,980
	4	151	1,326	0	0	0	1,477
	5	0	0	0	0	0	0
	Outside 1-5	107	93	0	0	0	200
	Total	26,200	7,867	1,363	4,125	178	39,733
Collier	1	8,549	2,466	1,002	13,344	64	25,425
	2	5,994	1,207	627	3,350	94	11,272
	3	8,053	1,629	94	4,685	326	14,787
	4	275	130	0	0	0	405
	5	1,003	1,235	889	0	24	3,151
	Outside 1-5	81	27	0	0	0	108
	Total	23,955	6,694	2,612	21,379	508	55,148
Glades	Total	1,886	1,989	61	0	---	3,936
Hendry	Total	5,355	2,399	308	0	---	8,062
Lee	1	23,497	11,378	2,749	16,664	1,026	55,314
	2	15,057	9,238	1,525	5,760	2,384	33,964
	3	12,428	5,658	2,161	1,827	1,168	23,242
	4	902	438	9	0	28	1,377
	5	3,305	39	297	837	414	4,892
	Outside 1-5	53	16	0	0	0	69
	Total	55,242	26,767	6,741	25,088	5,020	118,858
Sarasota	1	9,633	2,258	2,078	16,395	270	30,634
	2	7,643	1,711	1,097	2,449	182	13,082
	3	11,242	3,456	1,117	3,094	245	19,154
	4	13,936	5,673	1,006	3,573	416	24,604
	5	6,572	555	1,436	1,106	590	10,259
	Outside 1-5	17,182	4,985	1,150	6,314	895	30,526
	Total	66,208	18,638	7,884	32,931	2,598	128,259

* Excluding travel trailers and hotel/motel units.

APPENDIX E
HOUSING UNITS DAMAGED BEYOND HABITABILITY

HOUSING UNITS DAMAGED BEYOND HABITABILITY, BY COUNTY
SOUTHWEST FLORIDA

Storm Category	Charlotte	Collier	Glades	Hendry	Lee	Sarasota
Category 1						
Mobile Home[1]	3,529	2,466	--	--	11,378	2,258
Duplex(surge)	0	14	--	--	126	0
s.f.(surge)	554	5,063	--	--	4,900	4,898
m.f.(surge)	834	7,085	--	--	9,768	14,831
TOTAL	4,917	14,628	--	--	26,172	21,987
Category 2						
Category 1 total	4,917	14,628	--	--	26,172	21,987
mobile home[2]	2,208	1,207	--	--	9,238	1,711
TOTAL	7,125	15,835	--	--	35,410	23,698
Category 3						
1 + 2 total	7,125	15,835	--	--	35,410	23,698
mobile home[3]	711	1,629	--	--	5,658	3,456
TOTAL	7,836	17,464	--	--	41,068	27,154
Category 4						
1 - 3 total	7,836	17,464	--	--	41,068	27,154
mobile home[4]	1,326	130	--	--	438	5,673
TOTAL	9,162	17,594	--	--	41,506	32,827
Category 5						
1 - 4 total	9,162	17,594	--	--	41,506	32,827
mobile home[5]	0	1,235	--	--	39	555
TOTAL	9,162	18,829	--	--	41,545	33,382

[1] Category 1
[2] Category 2
[3] Category 3
[4] Category 4
[5] Category 5

APPENDIX F
ADJUSTMENTS FOR
DAMAGED VACANT SEASONAL AND RENTAL UNITS

ADJUSTMENTS FOR DAMAGED VACANT SEASONAL AND RENTAL UNITS

County	Storm Category	Total Units[1]	% Vacant Seasonal[2]	Vacant Seasonal Units[3]	% Damaged[4]	Damaged Seasonal Units[5]	Habitable Seasonal Units[6]	% Vacant Rental[7]	Vacant Rental Units[8]	% Damaged[9]	Damaged Rental Units[10]	Habitable Rental Units[11]
Charlotte	1	17,270	16.4	6,516	12.4	807	5,709	2.6	1,033	12.4	128	905
	2	29,076	16.4	6,516	17.9	1,168	5,348	2.6	1,033	17.9	185	848
	3	38,056	16.4	6,516	19.7	1,286	5,230	2.6	1,033	19.7	204	829
	4	39,533	16.4	6,516	23.1	1,504	5,012	2.6	1,033	23.1	238	795
	5	39,533	16.4	6,516	23.1	1,504	5,012	2.6	1,033	23.1	238	795
County Total		39,733										
Collier	1	25,425	22.4	12,353	26.5	3,275	9,078	3.7	2,040	26.5	541	1,499
	2	36,697	22.4	12,353	28.7	3,551	8,802	3.7	2,040	28.7	587	1,453
	3	51,484	22.4	12,353	31.7	3,909	8,444	3.7	2,040	31.7	646	1,394
	4	51,889	22.4	12,353	31.9	3,940	8,413	3.7	2,040	31.9	651	1,389
	5	55,040	22.4	12,353	34.1	4,217	8,136	3.7	2,040	34.1	696	1,344
County Total		55,148										
Glades	4,5	3,936	1.3	51	50.0	26	25	1.6	63	50.0	32	31
Hendry	4,5	8,062	3.9	314	30.0	94	220	2.3	185	30.0	56	129
Lee	1	55,314	13.6	16,165	22.0	3,558	12,607	5.4	6,418	22.0	1,413	5,005
	2	89,278	13.6	16,165	30.0	4,820	11,345	5.4	6,418	30.0	1,914	4,504
	3	112,520	13.6	16,165	34.5	5,586	10,579	5.4	6,418	34.5	2,218	4,200
	4	113,897	13.6	16,165	34.9	5,638	10,527	5.4	6,418	34.9	2,239	4,179
	5	118,789	13.6	16,165	35.0	5,654	10,511	5.4	6,418	35.0	2,245	4,173
County Total		118,858										
Sarasota	1	30,634	11.8	15,135	17.1	2,596	12,539	4.4	5,643	17.1	968	4,675
	2	43,716	11.8	15,135	18.5	2,796	12,339	4.4	5,643	18.5	1,043	4,600
	3	62,870	11.8	15,135	21.2	3,205	11,930	4.4	5,643	21.2	1,195	4,448
	4	87,474	11.8	15,135	25.6	3,871	11,264	4.4	5,643	25.6	1,433	4,200
	5	97,733	11.8	15,135	26.0	3,944	11,191	4.4	5,643	26.0	1,471	4,172
County Total		128,259										

[1] Excluding travel trailer and hotel/motel units; totals are cumulative for storm categories
[2] Source: 1980 Census
[3] Total units X vacancy rate for seasonal units (1 X 2)
[4] Calculated by dividing # units damaged beyond habitability by total units for county
[5] Vacant seasonal X % damaged (3 X 4)
[6] Vacant seasonal - damaged seasonal (3 - 5)
[7] Source: 1980 Census
[8] Total units X % Vacant Rental
[9] Total units damaged ÷ total units
[10] Vacant rental units X % damaged (8 X 9)
[11] Vacant rental units - damaged rental units (8 - 10)

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