

RESOURCE MANAGEMENT AND PROTECTION PROGRAM
AND THE UNDEVELOPED PORTIONS OF COLLIER
COUNTY'S COASTAL ZONE CM-97

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RESOURCE MANAGEMENT AND PROTECTION PROGRAM FOR THE UNDEVELOPED
PORTIONS OF COLLIER COUNTY'S COASTAL ZONE

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RECOMMENDATIONS AND A PROGRAM FOR RESOURCE MANAGEMENT
AND PROTECTION FOR THE UNDEVELOPED LANDS OF
COLLIER COUNTY'S COASTAL ZONE

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"Freedom in a commons brings ruin to all."

Garrett Hardin

1968

TABLE OF CONTENTS

INTRODUCTION..... 1

THE AREA..... 4

THE PROBLEM.....11

METHODOLOGY.....12

 The OWNRLIST Program.....12

 The COASTVAL Program.....15

 The OWNRZONE Program.....15

 The Vegetational Indicators Program.....16

 The LUMACT Program.....18

THE APPROACH

I. WHAT ARE THE ESTUARINE AND COASTAL VEGETATIONAL RESOURCES IN
 THE UNDEVELOPED AREAS OF COLLIER COUNTY'S COASTAL ZONE?.....22

 Vegetational Assemblages in the Undeveloped Coastal Zone.....25

 Land Resources in the Undeveloped Coastal Zone.....27

II. WHO OWNS THE LAND ON WHICH THE RESOURCES OCCUR?.....29

 Land Ownership in the Undeveloped Coastal Zone.....29

 The RFD (Restricted Future Development) Classification.....36

 Land Ownership by Coastal Zone.....41

 Water Management No. 6.....41

 Belle Meade.....43

 Camp Keasis.....44

 Fakahatchee.....46

 Turner River.....47

 Big Cypress West, Big Cypress East.....48

THE SOLUTION

III. HOW CAN THESE RESOURCES BE PROTECTED, OR PUT TO THE BEST AND
 HIGHEST USE WITHOUT SUBSTANTIALLY DEGRADING THE COASTAL ZONE
 ENVIRONMENT AND ECOSYSTEMS?.....50

 1. Land Held in Private Ownership.....50

 A) Creative Zoning.....51

 B) Tax and Developmental Relief or Modification.....51

 C) Restrictive or Environmental Zoning.....52

 D) Environmental Easements.....53

 E) Bufferzone Mandates.....53

 F) Population Cap for Collier County.....53

 G) Enforcement of Environmental Ordinances.....55

 2. Coastal Lands and Public Welfare.....55

 3. The Maintenance of Healthy Coastal Ecosystems.....58

ACKNOWLEDGEMENTS.....64

REFERENCES.....65

Table of Contents (Continued).

APPENDICES

Appendix 1.	OWNRLIST Program Example.....	60
Appendix 2.	COASTVAL Program Example.....	61
Appendix 3.	OWNRZONE Program Example.....	62
Appendix 4.	LUMACT Program Descriptors and Definitions.....	63
Appendix 5.	LUMACT Program Example.....	119

INTRODUCTION

The coastal zone in the State of Florida faces an impending crisis. In the the 15 years between 1960 and 1975 the population of Florida approximately doubled from 4.9 million to 8.5 million, increasing at a rate of nearly 24,000 people per month. Projected population by the year 2000 is nearly 15 million persons. It is anticipated that most of these will settle in defined regional centers either along the shoreline or in major populational nodes within the interior of the state. Presently, 75% of the state's population occurs in the coastal zone areas (Division of State Planning, 1976). These populational figures become more important when it is realized that 1) development in the state of Florida continues to take place with little consistent strategy of management; 2) the coastal margins of Florida are now incapable of supporting unmanaged growth; and 3) there seems to be little incentive to take a responsible position in growth management.

Portions of the coastal zone of Collier County comprise one of the few unaltered major environmentally sound areas remaining in the state. The natural resources of the county, consisting of subtropical climate, relatively untrammled beaches, nearly pristine seagrass and mangrove ecosystems, extensive salt and freshwater marshes, expansive coastal prairies, and associated cypress and pine upland forest systems, all occur within the zone and provide a wealth of natural habitats and environmentally attractive amenities. Indeed, without these resources Collier County would not exhibit the attractiveness that it does--an attractiveness which has resulted in the county becoming one of the fastest growing areas in the entire United States. The Naples Metropol-

itan area is the third fastest growing in the entire United States. U.S. Census Bureau stated that population increased 29% between 1980 and 1984 with nearly 111,000 living in the coastal area from North Naples to Marco Island.

In Collier County, according to the Community Development Division of this county there are presently over 100 planned unit developments (PUD) being considered or actively being developed through the entire area of Collier County. These developments, when realized, will cover approximately 22,000 acres and consist of nearly 84,000 single and multifamily units, as well as nearly 100 commercial units. A populational increase of 170,000 is projected which would raise the total Collier County population to over 285,000 people by the year 2,000. The effects of extensive development on the coastal zone ecosystems may be massive.

One management tool for this rapid growth has been the formulation of the county Comprehensive Plan, which established two major land-use and management categories. One was the Coastal Resources Management and Recreation Area (CRMRA) which identifies some 138 square miles of the unaltered coastal zone still held in private ownership, and noted it as an area where future developmental activities will require a detailed review to ensure compatibility with existing natural resources. The second category, Parks and Preserves, designated and mapped the undeveloped areas of the coastal zone presently under administration of Federal, State and County governmental agencies. The Natural Resources Element in the Comprehensive Plan also provides a detailed listing and functioning of the natural resources in the county, especially the coastal barrier islands, lagoons, marshes, maritime forests, and other

wetlands which are coming under increasing pressure as man's impact impinges on, alters, or eliminates these biotopes.

Although the Comprehensive Plan has identified the remaining undeveloped areas of the coastal zone, and set general goals and policies to protect these areas, its implementation has been quite general and exhibits many deficiencies. Prior to 1984 no functional water district management units, or much data related to these, existed. Estuarine resources were acknowledged but were not categorized in any meaningful manner. There were no summational data on property ownership, zoning, vegetational cover, ecosystem interlocking, or other important input relating to environmental factors and land use management. Consequently, developmental activities that were permitted on parcels of land did not necessarily take into account such aspects at the time of development. Nor was the affect of the permitted development on adjacent areas, or the future environmental consequences of such development on any contiguous areas, considered in depth.

The impact of existing development has now been well documented (see Benedict 1984, Benedict et al. 1984, Gore 1984a, b). Attention has been drawn to the potential detrimental effects future development might have on primeval areas, especially in undeveloped regions of the county. This attention fits well with the goal of the Collier County Coastal Zone Management Program which seeks the protection of the undisturbed natural resources of the county on the one hand, and the careful management of coastal development within and adjacent to these resource areas on the other. Such a policy, if adhered to, will ensure that future land-use activities will have minimal adverse impact on the existing natural resources.

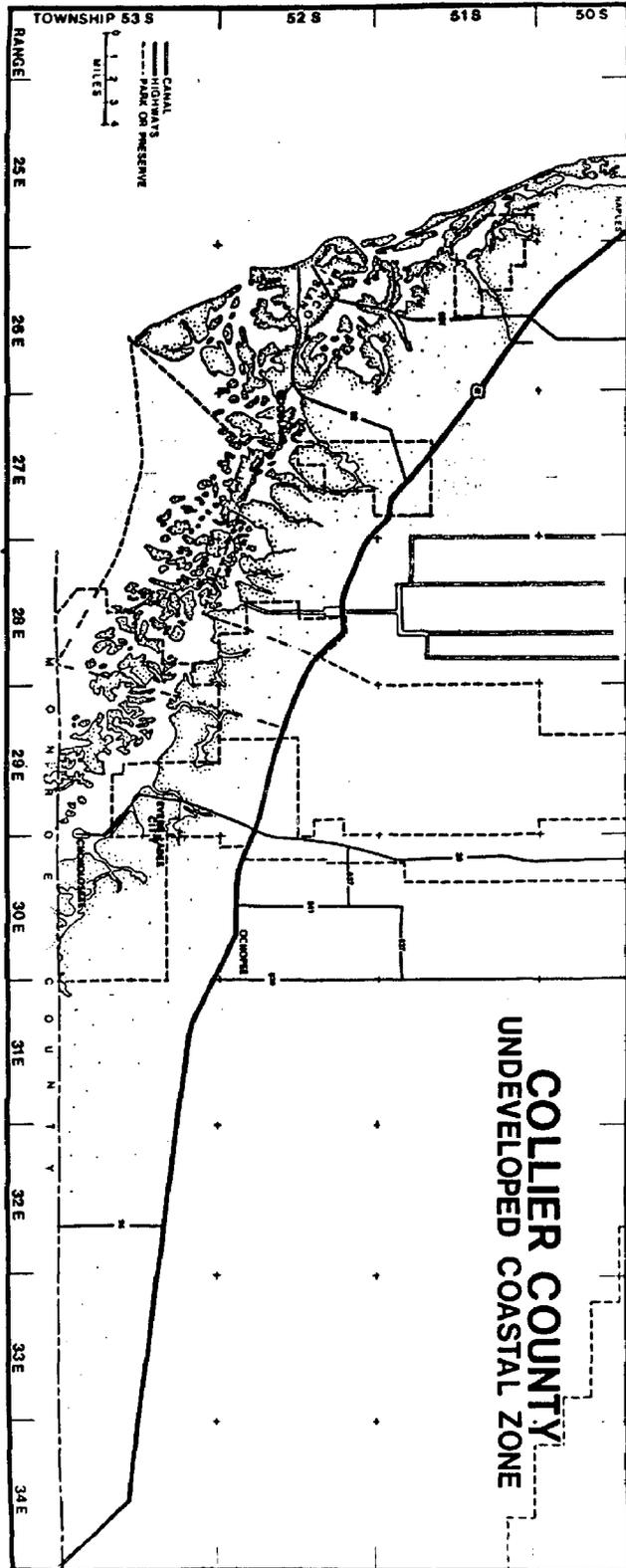
It is apparent that many, if not all, of the pristine ecosystems in Collier County are sufficiently resilient to recover from mild environmental insult. Any impact, however, produces some change and no ecosystem can remain totally unaltered. Nor can an ecosystem that has been changed ever be restored to its primeval and pristine state. Only by careful management of growth and development will these systems remain resilient and persist into the future.

THE AREA

The coastal zone of Collier County is defined here as that area of the County on the south, or Gulf of Mexico, side of US 41 (Tamiami Trail). This area comprises a relatively narrow strip of land that stretches 57 miles from the northwest terminus at the Lee County line to the southeastern terminus at the Dade-Monroe County lines. The strip varies in width from 2 miles in the north, to 12 miles in the area of Marco Island, to 8 miles wide near the southeastern county border. The coastal zone comprises 16 percent of the total land area of Collier County and is inhabited by nearly 40,000 people, or roughly 35 percent of the total county population. Nearly 30,000 additional people (approximately 30% more of the population) live eastward of US 41 within a five mile strip paralleling that highway. Thus, nearly 65% of the total county population occurs within 10 miles of the Gulf of Mexico.

The Collier County Coastal Zone contains both developed and undeveloped areas. Approximately 67 square miles (21%) of the total 328 square miles comprising the Zone are developed, with the majority of this development found in five major populational centers: Vanderbilt Beach, Park Shore, City of Naples, East Naples, and the Marco Island-Isles of Capri areas. The first three centers are located north of Gordon Pass,

FIGURE 1



the mouth of Gordon River that forms the southern terminus of the Naples headland. The fourth area is inland and southeast of the Pass, and Marco Island is to the southeast and forms the southernmost terminus of development in western Collier County.

The undeveloped coastal zone as defined for this report comprises the area south of US 41 that extends from Gordon Pass in the northeast to the Monroe County line and Everglades National Park in the south, and to the Dade County line and the Big Cypress National Preserve areas in the east (Figure 1). This region contains approximately 261 square miles of land (about 79% of the total coastal zone), most of which is uninhabited or slightly to moderately developed. Populational centers in this area include the towns of Goodland (population 332), Everglades City and Chokoloskee Island (population 514) and Ochopee (population 204). The two most important factors affecting this region are the existence of several large parks or preserves which make up about 37% of the undeveloped lands, and the fact that nearly 52% of the remainder of undeveloped lands remains in private ownership. The existence of parkland, which is non-developable, forces future development and growth into the undeveloped lands which, although inherently undevelopable, or developable only with difficulty and great expense, nevertheless remain potentially so and are held for speculation by many of these same owners.

The vast majority of undeveloped coastal land in Collier County is relatively remote and exists in its natural or nearly primeval condition. The coastal physiography of this region includes active barrier islands, tidally influenced estuarine lagoons, mainland coastal bays, and associated wetlands and maritime seasonally inundated upland areas. A number of rivers, creeks and tributaries also occur as important hydrological

features in the undeveloped zone, the most prominent being Henderson Creek and Royal Palm Creek, the Blackwater, Fakahatchee, Whitney, Wood, and East, Barron and Turner Rivers, and the Turner River and Faka Union canal systems. The latter two conduits drain upland hardwood forest and coastal prairie lands north of US 41.

Included within these land and water regions are several major vegetational biotopes, such as marine seagrass beds, extensive mangrove forests, well-developed coastal saltwater marshes, maritime upland pine and cypress forests, and wide low coastal prairies. In several delimited areas large stands of RUE (rare, endangered or unique) vegetational assemblages occur. These include a mature coastal hardwood (predominantly oak) hammock on Cannon Island, a unique Mastic-Gumbo Limbo hammock on Little Marco Island adjacent to Cannon Island, a complex and now unique high island xeric-hydric forest community on Horr's Island, and large hydric oak-maple-cabbage palm hammocks in the Camp Keasis and Fakahatchee districts. North of US 41 large pine barrens, and mixed swamp hardwood strands are found from east of SR 951 to the Turner River area.

Before alteration and development the vegetational and physiographical relationships of Collier County's coastal ecosystems extended northward to link with similar systems in Lee County, and southward to blend with the coastal ecosystems of the Everglades in Monroe County. The upland systems, in turn, reached northeastward and southeastward to unite with the coastal prairies and pine and cypress islands of Broward and Dade County and eventually also merged into the vast sawgrass and hammock-dotted plains of the Everglades (Conservation Foundation, 1968). Now, many coastal areas north of Gordon Pass have been completely al-

tered, or are presently undergoing massive destruction through developmental land clearing. The remaining coastal ecosystems are restricted to four main areas south of US 41. These are 1) the Rookery Bay-Keewaydin Island estuarine lagoonal and coastal barrier systems in Water Management District No. 6; 2) the large and relatively undisturbed seagrass-mangrove-saltmarsh systems north of Marco Island and east of SR 951, which extend to SR 92 in the Belle Meade and Camp Keasis districts; 3) the vast reticulated coastal mangrove swamps east of Marco Island comprising the western Ten Thousand Islands, plus the associated freshwater marshes occurring from SR 92 eastward to SR 29 in the Fakahatchee district; and 4) the complex reticulated mangrove swamp-salt/freshwater marsh-cypress forest-coastal prairie systems of the eastern Ten Thousand Islands area and the associated maritime margins east of SR 29, and extending to Dade and Broward Counties. The distinctness of this latter system is especially apparent in the upland regions north of US 41 along SR 84 (Alligator Alley) where a noticeable transition from sawgrass prairie to cypress dome prairie can be seen in a 5-10 mile stretch between western Broward and eastern Collier County. The importance of all these areas has been well documented previously (see Gore 1984a, Benedict et al. 1984 for bibliography).

The vegetational systems noted above all intergrade into the coastal estuarine system of Florida Bay. This region, including the Ten Thousand Islands area, has been characterized as "...a complex system of tidal creeks and mangrove swamps with islands separated by shallow tidal lagoons and natural passes. Sand beaches are infrequent in this area." (Warinner et al. 1976). This same report notes that important habitat and nursery grounds for estuarine-dependent fish and shellfish, including

commercially exploited stock, occur throughout the region. The authors list 8 concerns including Major Concerns of domestic and industrial pollution, dredging, and diversion of freshwater flows; Significant Concerns of pesticides, electric power generator impacts, pulp and textile mill wastes, and filling of marshes; and the Lesser Concern of ditching and draining of wetland areas. They point out that the Everglades/Ten Thousand Islands systems are acutely sensitive to freshwater supplies, and that severe curtailment of freshwater inflow can be expected to decrease overall amounts of mangrove and marshland habitats, affect salinities and flushing of waters through these systems, and induce additional physiological stress on the fauna and flora. At least 13 endangered species of mammals and birds are found in these estuarine systems or rely on them in some manner.

THE PROBLEM

The program embarked upon during 1984-1985 by the Collier County Natural Resources management Department is a continuation of the Coastal Zone Management Program begun in 1983 and 1984. Attention in 1985 was focused on undeveloped coastal resources and how they may best be managed. This study began by asking three important questions:

1. WHAT ARE THE ESTUARINE AND COASTAL VEGETATIONAL RESOURCES IN THE UNDEVELOPED AREAS OF COLLIER COUNTY'S COASTAL ZONE?
2. WHO OWNS THE LAND ON WHICH THESE RESOURCES OCCUR?
3. HOW CAN THESE RESOURCES BE PROTECTED, OR PUT TO THE BEST AND HIGHEST USE WITHOUT SUBSTANTIALLY DEGRADING THE COASTAL ZONE ENVIRONMENT AND ECOSYSTEMS?

Toward this end a detailed land-use review and permitting process incorporating a land-use matrix is herein proposed which delineates the natural resources of a given section of land (concentrating on vegetation, for reasons which will become clear), and which recommends developmental categories and activities within each category that are amenable to that particular land section. This process, if adopted, will ensure that future land-use activities will not, or only marginally, degrade existing natural resources, not only in the section being developed, but in adjacent sections which might also be affected by developmental activities. It is now apparent that no land-use activities should be conducted in any portion of the undeveloped coastal zone of Collier County without giving serious consideration to existing ecosystem values, functions, and limiting factors in contiguous sections as well. To ignore these factors is to put the coastal zone environment in jeopardy and ultimately to alter the entire coastal ecosystem, the prime factor

that makes Collier County such an attractive place to live.

METHODOLOGY

In order to develop a Land Use Matrix it was necessary to determine ownership and zoning of all land in the undeveloped coastal zone, and the major vegetational systems on such lands. A list of the types of activities that might take place was developed and the activities ranked on a descending scale of compatibility or desirability. This scale was then applied to each section of land within the seven major coastal zones. From this application recommendations could be made as to the type and extent of the various activities, thus forming the basis of the Land Use Matrix. A series of land use Categories and Impacts was developed with categories ranging from Compatible (benign or very low adverse impact) to Prohibited (severe or catastrophic impact). Each general activity category in this series was defined on the basis of potential ecosystem impairment using vegetational recovery as the criteria. In addition, the required agency permits, approval, guidelines or environmental impact statements was listed, as well as situations in which a performance bond¹ would be posted, with a listing of penalties for non-compliance. These data are provided in Table 1.

The OWNRLIST program

To determine the general land ownership and extent of holdings by various corporations, individuals or other legal entities within the undeveloped coastal zone a listing of all property owners within the

1 The performance bond refers to the Performance Bond Ordinance designed by the author in a previous report (Gore 1984b).

sections, townships and ranges of the zone was obtained from the Collier County Tax Assessor. Each owner was given a unique owner number, named, listed under the appropriate map reference (section, township, range) and sorted under one or more of seven coastal zone water management districts. These data were entered in an expandable r:Base program named OWNRLIST, which allows a general determination of land ownership and distribution within each district. A synopsis of these data will be discussed in more detail below (see also Fig. 5). An example of the program printout is provided in Appendix 1.

The COASTVAL Program

A second program was developed which compiled the tax valuation and assessments for land and assets of all major land owners in Collier County. The owners were listed under 14 general names in the r:Base program COASTVAL which allows a summary of land values within each section, or within each coastal zone. An example of the COASTVAL program is given in Appendix 2.

The OWNRZONE Program

A third program, ancillary to OWNRLIST, was developed which contained data on zoning, dominant vegetation, alterational aspects, and general location notes, including major physiographical features, for every section in the undeveloped coastal zone. An example of this program, termed OWNRZONE, is provided in Appendix 3. As with the other programs, OWNRZONE is expandable. This program may eventually be combined with OWNRLIST to provide a more expanded database once the assessment for all of Collier County (and not just the undeveloped coastal zone) has been completed.

Table 1. Land Use Categories and Impacts to Developmental Activities in the Collier County Coastal Zone

<u>ACTIVITY DESIGNATOR:</u>	<u>COMPATIBLE(C)</u>	<u>PROVISIONAL(P)</u>	<u>RESTRICTED(R)</u>	<u>INCOMPATIBLE(I)</u>	<u>PROHIBITED(X)</u>
Projected impact of activity:	Benign or very low adverse impact; ecosystem only slightly affected; habitat recovery probably complete or nearly so.	Very low to moderate adverse impact; ecosystem stressed in part, but resilient; habitat recovery probably incomplete.	Moderate to high adverse impact; most or entire ecosystem stressed; recovery of part or all of habitats prevented; system partially and permanently altered.	High to severe adverse impact; entire ecosystem recovery severely stressed; majority of habitats completely and permanently altered.	Severe to catastrophic adverse impact; ecosystem recovery improbable or impossible; major portion of habitats nearly or totally destroyed.
Permits:	None	Required	Required	Discouraged; Granted only in <u>extremis</u> .	Denied
DNRMGMT Notification:	Administrative approval required.	Site plan approval required.	Site plan approval required.	Site plan approval mandatory.	N/A
Guidelines:	As needed	Required	Required	Mandatory	N/A
Monitoring:	Only in exceptional cases.	May be required during one or more phases.	Required during one or more phases of development.	Mandatory during all phases of development.	N/A
BCC Variance:	None needed	None needed	May be required	Mandatory	N/A
E.I.S.:	None needed	None needed	May be required	Mandatory	N/A

Table 1. (continued)

<u>ACTIVITY DESIGNATOR:</u>	<u>COMPATIBLE (C)</u>	<u>PROVISIONAL (P)</u>	<u>RESTRICTED (R)</u>	<u>INCOMPATIBLE (I)</u>	<u>PROHIBITED (X)</u>
D.R.I.:	None needed	None needed	May be required	Probably required	N/A
Performance Bond:	None	None	May be required for one or more phases of development.	Mandatory; to cover all phases of development.	N/A
Non-Compliance:	Fine equal to 1% of total development costs.	Fine equal to 5% of total projected development costs.	Fine equal to 25% of projected total development cost or complete mitigation, whichever is greater; and/or jail sentence.	Fine equal to 50% of total development costs plus complete mitigation; mandatory jail sentence.	Fine equal to 100% of all development costs; total restoration of areas; mandatory jail sentence.
Contractors Licenses:	N/A	N/A	Possible revocation up to 5 years.	Mandatory revocation for 10 years.	Permanent revocation

CHART/
Categories and impacts

sections, townships and ranges of the zone was obtained from the Collier County Tax Assessor. Each owner was given a unique owner number, named, listed under the appropriate map reference (section, township, range) and sorted under one or more of seven coastal zone water management districts. These data were entered in an expandable r:Base program named OWNRLIST, which allows a general determination of land ownership and distribution within each district. A synopsis of these data will be discussed in more detail below (see also Fig. 5). An example of the program printout is provided in Appendix 1.

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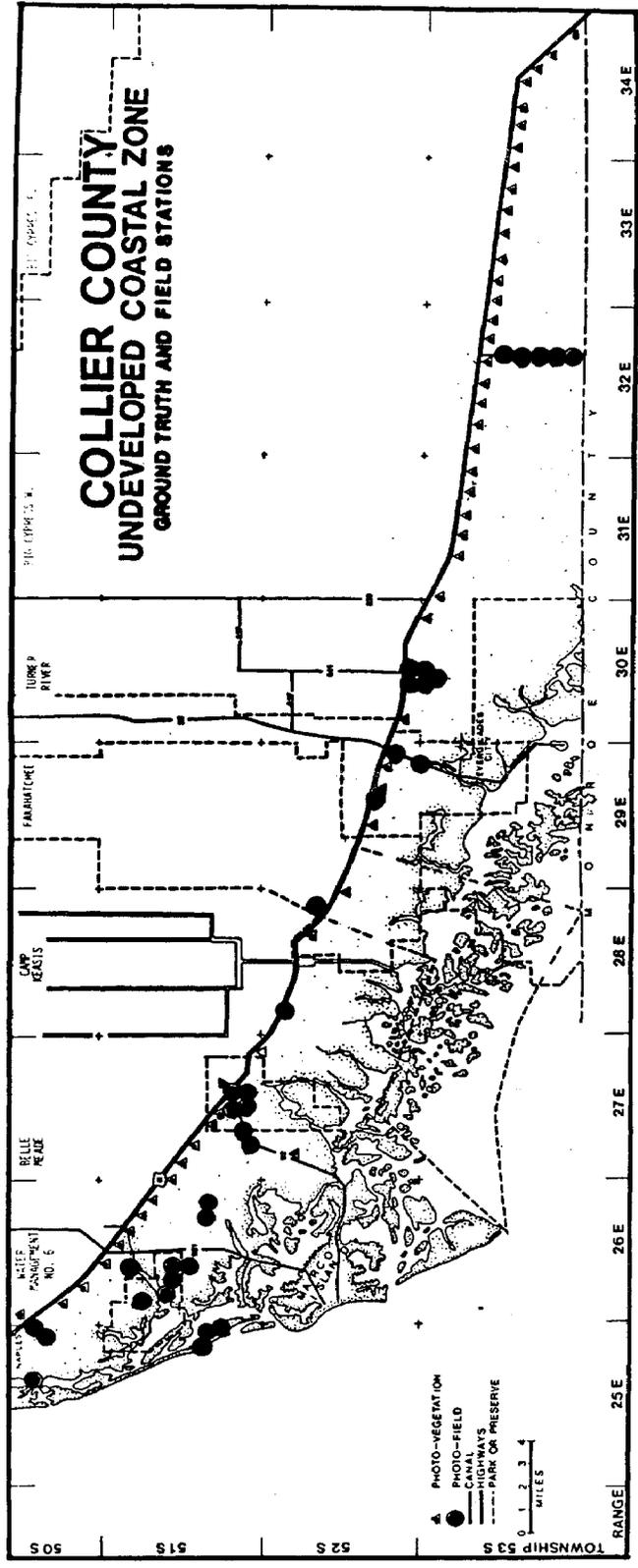
The Vegetational Indicators Program

The most important part in determining land use activities within this study is the use of vegetational assemblages as a major and more or less permanent ecological indicator. Vegetation descriptions also provide information on general characteristics of the ecosystem in an area and reflect the general environmental health. These assemblages thus allow guidelines and recommendations to be made for nearly every developmental or recreational activity in any given section.

Because much of the undeveloped coastal zone in Collier County is remote or generally inaccessible by normal land vehicles three methods were employed to determine the major vegetational assemblages in each section: 1) aerial photography using REDI (Real Estate Development Institute) photographs, usually at 1:600 or 1:1200 scale; 2) State of Florida Department of Transportation (DOT) aerial overflight transects which produces a section by section series of photo mylars at a scale of 1:200 or 1:400; 3) ground truthing and photography in selected sections where known vegetational assemblages could be identified and provide "signatures" for aerial photograph interpretation. In this phase a series of ground photographs were also made approximately every mile along the south side of US 41 from the Collier-Dade County lines westward to Rattlesnake Hammock Road (SR 864). These stations are shown in Fig. 2.

The REDI photographs allowed a major overview of entire ecosystems, including watercourses, sheetflow ways, large vegetational assemblages (such as pine-cypress forests or hardwood hydric strands), and important geomorphological features. Zoning categories and areas within each section were listed on each page facing a photograph. A major drawback

FIGURE 2



was that at the scale used many smaller vegetational features were indistinct or impossible to evaluate. In such a case the DOT photographs filled the gap, because at their scale individual trees or other vegetational units, major physiographic features, hydrological characteristics, and other important terrestrial components were usually easily discernible and interpretable. The close-up scaling, however, provided a less holistic view of the surrounding biome, and no zoning was indicated within each section.

The ground truthing of the program provided more detailed data on physiographical and hydrographical features, as well as micro-vegetational assemblages in selected areas of the coastal zone. They allow fine-tuning of features interpreted from the DOT or REDI aerial photographs.

Interpretation of the photographs produced a categorization of the predominant vegetational communities occurring in each section. Not every community was listed because this would have made the database too unwieldy. After categorization these data were combined with physiographic features and assembled as a series of worksheets from which assessments and recommendations for developmental or recreational activities could be made. Each section was assessed in this manner.

The LUMACT Program

Finally, data from OWNRLIST, OWNRZONE, and vegetational information was combined into a single working unit for each section. A series of seven major developmental categories was established for activities within the undeveloped coastal zone (Table 2). Each category contained 10 sub-categories listing general developmental, non-developmental, or recreational activities which might be applicable within a given section

Table 2. Categories for developmental activities within the Collier County undeveloped coastal zone.

NON-DEVELOPMENT (NONDEVEL)	Land should be maintained in existing state or modified only toward non-developmental activities such as park, preserves, or other restricted public usage.
RECREATION (RECUSE)	Land is suitable for one or more recreational activities and may be developed along guidelines appropriate for the particular type of recreation. Emphasis is toward non-major construction or land modification activities.
AGRICULTURE (AGRIUSE)	Land is suitable for one or more agricultural or agriculture-related activities, and may be developed under guidelines appropriate for such activity, including construction and land-clearing.
LAND MODIFICATION (LANDMOD)	Land is suitable for any developmental activities that require alteration of the surface, provided guidelines (as necessary) are adhered to. Magnitude and areal extent is dependent on particular vegetational assemblages.
WATERFLOW USES (WATERFLO)	Land is suitable for storage, construction of flowways or conduits, or otherwise acting as reservoir or flowway for particular types of water, including sewerage and wastewaters, subsurface storage or disposal, under appropriate environmental guidelines.
CONSTRUCTION (CONSTRCT)	Land is suitable for constructional activities as delineated and recommended, providing appropriate guidelines are met and environmental concerns (if any) are suitable addressed.
DREDGE & FILL (DRDG&FIL)	Land and related bottomlands suitable for dredge and fill activities which meet the criteria of all appropriate governmental permitting agencies.

The categories were then listed on a second series of computerized worksheets, one for each section in any given township and range. Each applicable activity was ranked in a Land Use Activities Matrix as being Compatible (C), Provisional (P), Restricted (R), Incompatible (I) or Prohibited (X). An example of this worksheet is provided in Appendix 4. These recommendations were combined with map references appropriate to each coastal zone, the presently established zoning, the numbered owners of property, and a general comments portion relating to any special, unique, vegetational or alterational features existing in the particular section. Once assembled the data were entered into a r:Base program named LUMACT. The LUMACT program thus allows a section by section appraisal of any pertinent activities that might be proposed within a parcel of land in any given section. It also provides recommendations for or against such activities and notes the reason why. An example of LUMACT and its explanation is provided in Appendix 5.

Once computerized, the worksheet data become quickly retrievable, or modifiable as conditions warrant (e.g. zoning changes). The LUMACT, OWNRLIST and OWNRZONE Programs thus allow the Department of Natural Resources Management to provide a more complete assessment of proposed activities in any section of the undeveloped coastal zone. The LUMACT program also allows the land owner or developer to see just how the various ecological factors aid in determining the type and magnitude of permitted activities on land in any given section. It is important to realize, however, that this method and program only provides general recommendations, based on predominating physiographical-hydrological-vegetational conditions existing at the time of aerial or ground surveys. It is expected that within any given section some or all of the

recommendations may eventually prove inapplicable at some future time owing to greatly altered conditions (e.g. hurricane damage). To forestall discrepancies of this order recourse can be made to the DOT aerial photographs where specific features come into question. On-site surveys may also be made in those cases where disagreement arises as to which recommendations may or may not apply. In such cases the developmental guidelines may require modification in order to be properly implemented.

THE APPROACH

I. WHAT ARE THE ESTUARINE AND COASTAL VEGETATIONAL RESOURCES IN THE UNDEVELOPED AREAS OF COLLIER COUNTY'S COASTAL ZONE?

The ecological resources in the Collier County undeveloped coastal zone have been considered in depth in previous reports (Gore 1984a,b; Benedict et al. 1984). As a general definition, the resources to be managed in this area are primarily those natural factors, parameters or objects which may be exploited for human usage. The Florida Comprehensive Plan Land Development Element lists 10 land resources, as follows:

1. Air
2. Uplands
3. Wetlands and submerged lands
4. Water
5. Soils
6. Agricultural lands
7. Minerals
8. Amenities
9. Beaches and dunes
10. Natural hazard areas

As might be expected, these categories are often too broad for any meaningful application of management techniques. Moreover, statements of purpose such as "Achieve the highest long-term quality of life for all Floridians consistent with sound social, economic and environmental principles through proper land development." (p. 8) in the same report are mere exercises in acrimonious vacuity if the modifiers "highest, long term, sound . . . principles, etc." are not clearly defined. It is also disarmingly easy to have similarly unclear objectives such as "Main-

tain[ing] and enhance[ing] the quality of the environment by the proper use and development of land", or "Distribute growth and development in the state in a manner consistent with support capabilities of available resources" when "proper land use and development" mean different things to a developer, an investor, a buyer, a county commissioner and a member of the planning or environmental staff. In addition, distribution of growth and development within the state, and Collier County in particular, has not been consistent with the support capabilities of the available resources, but more often has taken place in spite of the known deficiencies of such resources. For example, as repeatedly emphasized in previous reports (Gore 1984a, b) Collier County is a water-based county, dependent on, and subject to, rainwater, ground water, sheetflow, and sea water. Yet development has taken little regard of the limited nature of these resources and planning has often fallen far behind anticipated growth.

One solution to this problem, and a means of addressing the questions posed at the beginning of this section, is to focus on a single more or less inclusive resource which not only will reflect the basic state of most of the resources listed previously, but will also allow monitoring of many of these same resources either directly or indirectly by observing the status of the single inclusive resource. In this report we have focused on vegetation, because it is the one resource which is most practical to consider, which is most easily delineated, which can function as an ecological indicator of environmental health, and which can be assessed over a period of time in order to determine conditions that previously existed (resulting in its growth) as well as to determine whether any changes have or can be predicted to take place. In this

respect only the predominant vegetational assemblages occurring in the coastal zone are considered. Such assemblages are, for the most part, clearly identifiable from a distance or in aerial photographs, and are more or less characteristic of the prevailing ecological conditions within a given area. Moreover, any change over time can be ascertained, so that a general monitoring of the ecosystem is possible either by employing direct ground-truthing, or by using periodic aerial photography or surveys.

Utilized in this manner, a parcel or section of land can be aeri-ally photographed and the major or dominant assemblages determined. The general health of these assemblages can provide information on air quality, abundance of water, soil conditions, and ecosystem structure and succession. From these assessments the general state of uplands, wet-lands, submerged lands, agricultural lands and even beaches and dunes can be extrapolated. Natural hazard areas (e.g. floodplains, barrier is-lands) can be observed and assessed for management purposes using extant vegetation, or areas of secondary regrowth (as seen, for example, in barrier island dune washovers).

The one resource which does not seem amenable for assessment using vegetation is minerals, including petroleum deposits. But the adverse impacts caused by negligent extraction of these resources can be easily determined by observing vegetational change or elimination in mining and drilling locations.

Concomitant to vegetation resources are wildlife resources (classi-fied under Amenities in the Florida Comprehensive Plan). Birdlife, sport and gamefish, commercial finfish and shellfish, and native animal species co-existing within their respective vegetational biotopes will have their

populational health reflected to a large degree by the health of the surrounding ecosystem. A much-touted example of this interrelationship has been the mangrove forests upon which larval and postlarval invertebrates and fishes are dependent for their juvenile growth, and which in turn support adult populations of commercially valuable fishes and shellfish, and aesthetically valuable bird and mammal populations.

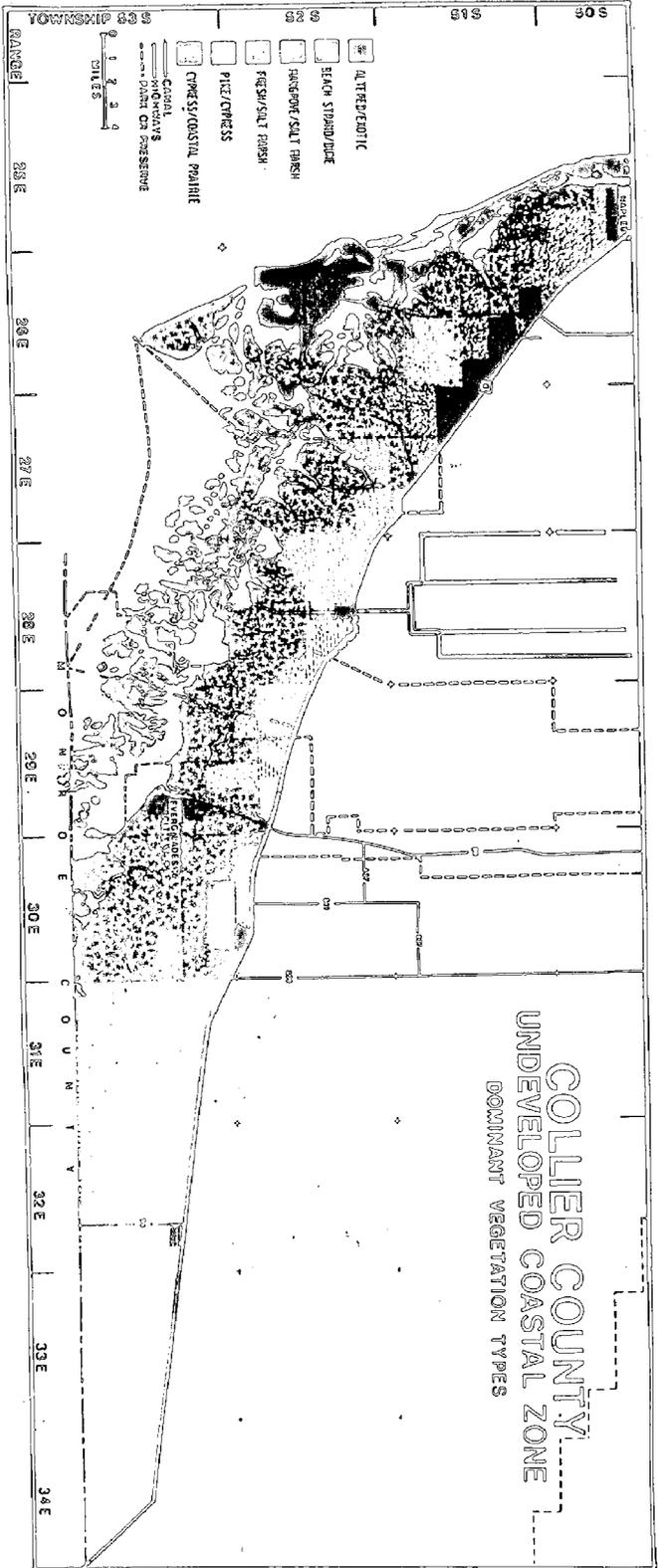
Vegetational Assemblages in the Undeveloped Coastal Zone

As seen in Figure 3 the predominant vegetational assemblages in Collier County south of US 41 extend in four relatively well-defined, more or less parallel strips. Progressing from the estuary landward (and generally northward) these are: 1) the mangrove forests and reticulated coastal swamps along the margins of a series of bays beginning with Rookery Bay and extending into the Ten Thousand Islands area; 2) the saltwater-freshwater marshlands contiguous with and generally shoreward of the marginal mangrove fringes; 3) the upland maritime pine barrens and pine-cypress forests on the higher lands above the marshes; and 4) the coastal prairie-cypress dome systems in the freshwater drainage areas to the northeast.

Interspersed within each of these major systems are numerous subsystems consisting of numerically dominant species-groupings that reflect more localized ecological conditions. Some examples are the sabal palm-halophyte islands east of Collier-Seminole State Park, the isolated hardwood hammock islands within portions of the coastal mangrove forest, and the high island xeric communities seen on Horr's Island, or in their remnant state on southeastern Marco Island.

Ecotones, or transitional vegetational assemblages also are found between one dominant community and another. Of no less importance than

FIGURE 3



the major systems just delineated, ecotones function either as plant species intergradational areas in major waterflow regions, or as species refugia for those plants which would be outcompeted, or which are excluded by resident ecological factors from growing in any abundance in the larger adjacent systems.

The predominant assemblages considered and employed in this report are given in Table 3. The program descriptor provides a summary notator for the dominant vegetation and is used in the General Comments section in the LUMACT Program (q.v.).

Land Resources in the Undeveloped Coastal Zone

In areal extent the coastal land resources with associated vegetational assemblages comprise approximately 270,000 acres. This figure is misleading in one sense because adjacent bodies of water such as coastal bays, tributary or river mouths, mangrove swamps, salt or freshwater marshes, and tidal mudflats are often alternately inundated or exposed, or may be under water for most or all of the year, depending on the tidal regime, and may thus have little dry land associated with them. Yet the overall extent of these areas is extremely important insofar as their relationship to the coastal margin is concerned. There is no need to delineate the importance of mangroves or saltmarshes because their intrinsic, real monetary, and aesthetic values are now well recognized.

Closely coupled with simple areal extent are physiographical, hydrological and ecological aspects. Lowlying, perpetually inundated mangrove swamps along coastal margins are now less attractive in a developmental sense than are high and dry (at least seasonally) pine barrens. At present, development is proceeding rapidly in many of the upland areas of the county, partly as a consequence of available and

Table

Predominant Vegetational Assemblages, Composition, and General Location Within the Undeveloped Coastal Zone of Collier County, Florida

<u>Location</u>	<u>Program Descriptor</u>	<u>Vegetation</u>	<u>Dominant species</u>
Coastal Barriers	COASTBAR	Beach Strand Dune Vegetation Coastal Hardwood Hammocks	Sea oats, railroad vine, seagrape Dune panic grass, dune sunflower, scrub oak Live oak, gumbo limbo, cabbage palm
Estuarine Lagoons	COASTLAG	Mangrove Forest Seagrass Beds Halophyte Shrubs	Red, black and white mangrove Cuban shoal grass, manatee grass, turtle grass Saltrush, goldenrod, sea oxeeye
Coastal Marshes	COASTMAR	Salt Marsh Freshwater Marsh Fresh-salt Ecotone	Cordgrass, saltgrass, black rush Cattail, flat sedge, bullrush giant reed, willow, wax myrtle
Coastal Upland	COASTUPL	Hydric Hardwoods Mixed Pine/Cypress Pine Barrens	Swamp maple, pond apple, pop ash Slash pine, bald cypress, wax myrtle Slash pine, saw palmetto, panic grass
Coastal Prairie	COASTPRA	Sawgrass Prairie Cypress Domes Pine Barrens	Sawgrass, maidencane, cabbage palm Pond cypress, pickerel weed, arrowhead Slash Pine, saw palmetto
Rare, Unique, or Endangered	RUE	Island Hardwood Hammock Xeric High Island Group Intra-mangrove Coastal Hammock	Live oak, mastic, Jamaica dogwood Cactus, saw palmetto, xeric hardwoods Myrtle, oak, silver palm, wild tamarind

relatively cheaper land, and partly as a result of the ecological pendulum which has swung so far in one direction that mangroves have now become the sacred plant of Florida. Without denying the very real value of mangroves or any wetlands, it nevertheless must remain a major consideration that to develop the uplands completely while leaving the low wetlands untouched will eventually result in the degradation of the latter, simply because of curtailment or interruption of nutrient and waterflow to these systems (see Clark, 1975). Moreover, permanent alteration of uplands places an additional burden on water resources because groundwater supplies and shallow aquifer recharging may be interdicted by concrete and asphalt. Percolation is slowed or prevented in wet years adding to local flooding; in dry years hard surface runoff also eliminates groundwater recharge.

II. WHO OWNS THE LAND ON WHICH THE RESOURCES OCCUR?

In this study 416 sections in 4 townships located in 10 ranges south of US 41 were delineated and compared. An estimated 266,240 acres in total overall area were calculated to be available either partially or completely for various types of developmental activities. Excluded from this total are approximately 16 sections on Marco Island proper which have already undergone complete development or alteration resulting in the total destruction of the previously occurring ecosystem. This acreage is not considered further in this report.

Land Ownership in the Undeveloped Coastal Zone

Land in the undeveloped coastal zone can be classified into five main owner-categories: Corporations, Large family-oriented holdings, Bank and Savings & Loans Institutions, Miscellaneous small owners controlling individually and collectively less than 25% of a section, and

Social, Church or Government Agency holdings. Individual categories within this groups reflect control to a varying degree of much or nearly all sections within some coastal zone management districts. It should be remembered, however, that ownership within any given section of a coastal zone is often patchy and only rarely are entire or nearly entire sections owned by a single corporate or individual entity. Although there may be substantial land area controlled by such entities, these may often be overshadowed by the holdings of numerous smaller entities.

Approximately 50% of the 261 square miles of undeveloped coastal zone in Collier County is under the ownership or management of federal, state or county governmental agencies whose sole mission is management and preservation of these areas for public use (Figure 4). In the undeveloped coastal zone the State of Florida presently administers Collier-Seminole State Park, Fakahatchee Strand State Preserve, and the Cape Romano-Ten Thousand Islands Aquatic Preserve. Under Federal jurisdiction are the Big Cypress National Preserve and Everglades National Park. Rookery Bay National Estuarine Sanctuary is administered in a tripartite arrangement involving land ownership by national private agencies (e.g. Audubon Society), and management by the State of Florida Department of Natural Resources, under the aegis of the National Oceanic and Atmospheric Administration (NOAA). The only County-administered park within the boundaries of the undeveloped coastal zone is Tigertail Beach Park on the northwest coast of Marco Island. The approximate total acreage and the percentage of the undeveloped coastal zone involved in these preserves is presented in Table 4.

Slightly more than 50% of the undeveloped coastal zone remains in private ownership and is presumably available for any development contin-

FIGURE 4

Table 4.

Parks and Preserves in the Undeveloped Coastal Zone of Collier County

<u>Entity</u>	<u>Approximate Total Acreage</u>	<u>Percentage of coastal zone</u>	<u>Administration</u>
Rookery Bay National Estuarine Sanctuary	9 sections 5760 acres	2	Florida Dept. Natural Resources
Collier-Seminole State Park	10 sections 6400 acres	2	Florida Dept. Natural Resources
Fakahatchee Strand State Preserve	21 sections 13440 acres	5	Florida Dept. Natural Resources
Big Cypress National Preserve	117 sections 74880 acres	29	
Everglades National Park	58 sections 37120 acres	14	U.S. Park Service
Rookery Bay Aquatic Preserve	sections* acres*	**	Florida Dept. Natural Resources
Cape Romano-Ten Thousand Islands Aquatic Preserve	56 sections* 35840 acres*	14**	Florida Dept. Natural Resources
Tigertail Beach County Park	< 1 section ca. 8 acres	< 1	Collier County Parks and Recreation Department

* Includes only sections with land indicated. Areal extent of Aquatic Preserve much greater but limited to baybottom lands.

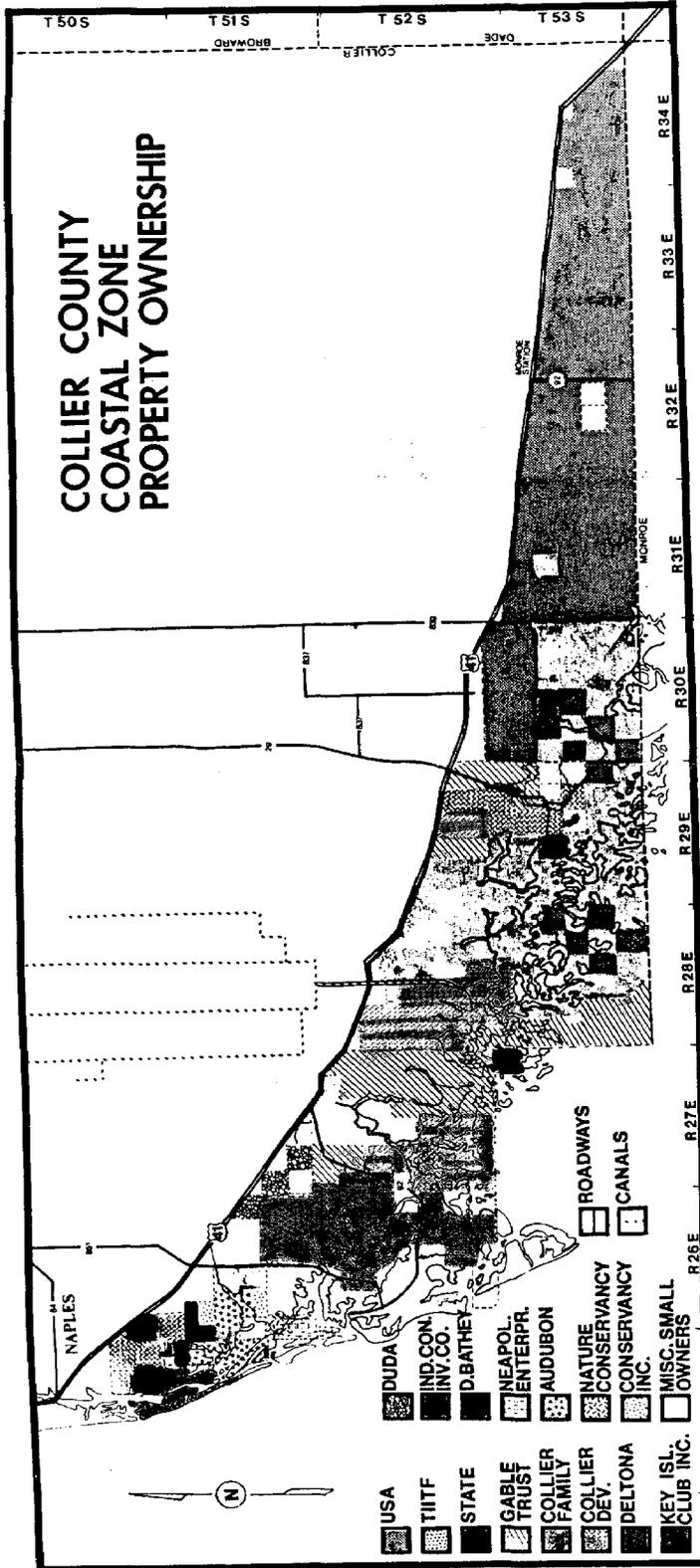
** Calculated percent based on delineated land area, including overlap with Fakahatchee Strand State Preserve and Everglades National Park boundaries.

gent on applicable zoning categories. As seen in Table 5, much of these lands is zoned A2-ST or agricultural, special treatment. Although the prime usage is expected to be for agricultural purposes, secondary usage such as single family residential is also permitted, as are projected other uses. It becomes moot whether these lands, used in their major category as farm or citrus or pasture or pulpwood lands, or in secondary categories as single family developments, would be more inimical to the environment. Many of these same properties are slated for, or are actually undergoing agricultural, residential or commercial development. This development imposes a two-fold threat to the preserved lands: 1) potential development of coastal zone lands presently held in private ownership eliminates usage of valuable upland and wetland areas needed to maintain present ecosystems; and 2) projected development of lands adjacent to or contiguous with preserved lands increases the threat of subsequent environmental degradation within the preserved areas when interlocking ecosystems are altered or destroyed.

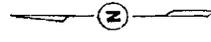
As seen in Figure 5 private ownership of land in the undeveloped coastal zone is a well-marked patchwork of residential, commercial, agricultural, and undeveloped areas. Two important points must be noted. First, nearly all the coastal land north of Gordon Pass has been completely developed. Second, major development south of Gordon Pass is centered on the Marco Island area. Both of these regions have had relatively little management of resources insofar as maintenance of ecosystem or environmental amenities. This is primarily a consequence of a now-outmoded land ethic which, in effect, restructured existing coastal margins and wetlands into putative uplands suitable for construction. It is also a consequence of ignorance deliberate on the part of county and

FIGURE 5

COLLIER COUNTY COASTAL ZONE PROPERTY OWNERSHIP



- | | | | | | |
|--|---------------------|--|-------------------------|--|----------|
| | USA | | DUDA | | ROADWAYS |
| | TITF | | IND. CON. INV. CO. | | CANALS |
| | STATE | | D. BATHEE | | |
| | GABLE TRUST | | NEAPOL. ENTERPR. | | |
| | COLLIER FAMILY DEV. | | AUDUBON | | |
| | COLLIER DEV. | | NATURE CONSERVANCY INC. | | |
| | DELTONA | | MISC. SMALL OWNERS | | |
| | KEY ISL. CLUB INC. | | | | |



T 50S T 51S T 52S T 53S
COLLIER COLLIER MOORE

NAPLES

R 25E R 26E R 27E R 28E R 29E R 30E R 31E R 32E R 33E R 34E

city governmental bodies before the concept of living within (instead of over) the environment became fashionable. Inasmuch as these two areas are either completely developed (City of Naples) or have been totally altered (Marco Island) they are not considered further.

Instead, attention has been directed toward the remaining areas in either private or public ownership. These lands, lying southeasterly from Naples and nearly due east of Marco Island have great potential. As noted by numerous authors (see Gore 1984a) most of this area can be divided into several major coastal zone or waterflow districts. Progressing from Gordon Pass to the southeast these originally included: Water Management No. 6, Belle Meade, Camp Keasis, Fakahatchee, and Turner River. With the completion of the present study the sixth district previously listed as Big Cypress has been separated into Big Cypress West and Big Cypress East, respectively, because the general waterflow patterns can often be separated south of US 41. For example, vegetational indicators show that waterflow in the Big Cypress West district trends primarily southwest, toward Everglades City and the Chokoloskee Bay area, whereas that of Big Cypress East trends predominantly southward into Monroe County and Everglades National Park.

For development purposes much of these lands could be altered, either for constructional or agricultural purposes. By the same token, nearly all of these properties could be removed from further development for preservational purposes, or at least restricted in part as to the type and extent of development allowed. Approximately 68% of these lands are zoned A1-ST, another 9% is zoned A2-ST, and another large percentage (11%) is zoned RO-ST. The predominant zoning in each coastal zone is listed in Table 5 and indicates the approximate percentage by section of

Table 5.

Predominant Zoning Classifications in Coastal Zones of Collier County, Florida

Coastal Zone Unit	Total Sections	% A1-ST	% A2-ST	% A2	% RO-ST	% RSF	% RSF-ST	% RMF	% GC	% PUD
Water Mgmt 6	42	--	50	19	16	5	--	5	--	4
Belle Meade	49	12	27	16	6	12	6	2	2	14
Camp Keasis	100	86	3	1	3	4	2	--	--	--
Fakahatchee	76	57	--	--	42	--	--	--	--	--
Turner River	48	98	--	--	2	--	--	--	--	--
Big Cypress West	60	100	--	--	--	--	--	--	--	--
Big Cypress East	41	100	--	--	--	--	--	--	--	--
Totals	416	68%	9%	4%	11%	3%	<1%	<1%	1%	2%

RHG/jw
Table 5
9/16/85

zoning classifications within each district.

The RFD (Restricted Future Development) Classification

Before considering land ownership in each of the water management districts the possibility of potential adverse environmental impacts on properties in those sections which lie adjacent to parks or preserves, or in relatively pristine regions must be addressed. The critical nature of many of these lands reemphasizes the importance of the ST (Special Treatment) classification attached to their present zoning. These areas will assume major importance in future years as the remaining undeveloped portions of the coastal zone become altered through development. They may thus be employed as a bufferzone around critical areas so as to allow hydrological and ecological factors to continue to operate. Many of these lands deserve a special additional categorical appellation, herein termed "RFD", or Restricted Future Development, so as to maintain and enhance their environmental integrity.

The RFD classification emphatically does not mean no development. It does mean that any type of developmental activity must receive increased scrutiny from the Department of Natural Resources Management, even more so than those properties designated "ST", before any approval for alteration can be given. It is apparent that the "ST" designation in the Collier County Zoning Regulations has several loopholes. This designation is no impediment to unbridled development of environmentally critical lands. The suggested "RFD" classification simply emphasizes that any developmental activities which involve major alteration or modification to land, water, or vegetation within any sections of the undeveloped coastal zone must be conducted under appropriate guidelines, determined on a case by case basis by the Department of Natural Resources

Management. An outline of these guidelines is listed in Appendix 6. The "RFD" classification is thus equivalent in part to the "Restricted" category of the Land Use Management Matrix insofar as alteration or modification is concerned, but is not necessarily subject to all the restrictions of this classification in regard to constructional or recreational activities or permitting.

The sections recommended for "RFD" classification are depicted in Figure 6. It is easily seen that the majority of these areas lie adjacent or contiguous to park or preservation areas, or extend to a distance on either side of such areas. The sections involved are restricted primarily to ensure uninterrupted, or minimally altered waterflow and ecological intergradation between the ecosystems to the north and the south of US 41. It should also be noted that the "RFD" classification is applicable primarily to privately owned land west of SR 29, an area which is of increasing critical concern owing to developmental pressures. A small area in the far eastern corner of the undeveloped coastal zone at the Dade County line is also recommended for "RFD" because there is little resource management in these sections and because the area is important as a water flowway to the south Big Cypress National Preserve and ultimately Everglades National Park. It is anticipated that additional county border protection will be required in the future for sections north of US 41 to the Hendry County line in order to ensure maintenance of environmental integrity along the Broward County borderline.

Land Ownership by Coastal Zone

A district by district assessment of land holdings and vegetational systems provides much insight on the value of undeveloped lands, as well

FIGURE 6

as allowing some predictions for land use in the future. In the assessment that follows data were assembled from Collier County tax rolls, the zoning atlas, and from DOT aerial photographs and/or ground-truthing by field surveys or area walkovers. Table 6 summarizes the land holder and tax base data.

Water Management No. 6

In the Water Management No. 6 area a total of 42 sections were considered. The assessed tax value is approximately \$758,789. Land ownership in this district is varied, with the majority of property in the hands of several corporations or environmental groups. Keewaydin Island ownership resides for the most part in Key Island Club, Incorporated. The Rookery Bay area is held by National Audubon Society, The Nature Conservancy, and The Conservancy, Incorporated. Some additional land is owned by the State of Florida Department of Natural Resources. Other important owners include Industrial Concern Investment Company, Neapolitan Enterprises, and Collier Development Company. Miscellaneous small owners of individuals parcels complete the distribution.

Water Management No. 6 is an important region for three reasons. First, Rookery Bay National Estuarine Sanctuary occupies a large portion of the district. Although delimited as an estuarine sanctuary, its ties to the surrounding ecosystems, including pine barrens and adjacent salt marshes are strong. Loss of these biotopes would undoubtedly affect habitats within the sanctuary to some, or a major degree (see e.g. The Nature Conservancy, 1968).

Second, this district contains the northernmost part of the functioning estuary and contiguous coastal ecosystems in Collier County. These lands remain critical to the health of the estuary at large, and

Table 6. Summary of Land Ownership and Tax Evaluation in the Undeveloped Coastal Zone of Collier County

Coastal Zone: WATER MGMT. 6.		Coastal Zone: BELLE MEADE		Coastal Zone: CAMP KEASIS	
Owners	\$TaxVal	Owners	\$TaxVal	Owners	\$TaxVal
1. USA	\$0.00	1. TIITF/STATE	\$0.00	1. TIITF/STATE	\$0.00
2. TIITF/STATE	\$0.00	2. DELTONA	\$79,049.83	2. COLLIER DEVELOPMENT	\$6.73
3. COLLIER DEVELOPMENT	\$123,724.29	3. COLLIER FAMILY	\$2,409.53	3. DELTONA	\$17,542.19
4. GABLE	\$6.90	4. GABLE	\$89.75	4. COLLIER FAMILY	\$4,237.29
5. D. BATHEY	\$4,522.85	5. BANKS/S&L	\$638,027.46	5. GABLE	\$3,996.50
6. KEY ISLAND CLUB. INC.	\$161,685.61	6. DUDA	\$20,456.68	6. BANKS/S&L	\$1,098.46
7. BANKS/S&L	\$7,357.59	7. IND. CON. INV. CO.	\$41.58	7. MISC. SMALL OWNERS	\$55,894.70
8. IND. CON. INV. CO.	\$2,240.69	8. NEAPOL. ENTERPR.	\$1,512.01		
9. NATURE GROUPS	\$0.00	9. MISC. SMALL OWNERS	\$658,016.67		
10. NEAPOL. ENTERPR.	\$300.38				
11. MISC. SMALL OWNERS	\$604,451.40				
Coastal Zone: FAKAHATCHEE		Coastal Zone: TURNER RIVER		Coastal Zone: BIG CYPRESS WEST	
1. USA	\$0.00	1. USA	\$0.00	1. USA	\$0.00
2. TIITF/STATE	\$0.00	2. TIITF/STATE	\$0.00	2. TIITF/STATE	\$0.00
3. COLLIER DEVELOPMENT	\$1,908.26	3. COLLIER DEVELOPMENT	\$289.61	3. COLLIER DEVELOPMENT	\$521.70
4. COLLIER FAMILY	\$489.21	4. GABLE	\$2,068.00	4. MISC. SMALL OWNERS	\$3,241.93
5. GABLE	\$1,900.00	5. MISC. SMALL OWNERS	\$19,289.87		
6. NATURE GROUPS	\$1,957.22				
7. MISC. SMALL OWNERS	\$974.26				
Coastal Zone: BIG CYPRESS EAST					
1. USA	\$0.00				
2. MISC. SMALL OWNERS	\$7,747.67				

RHG/jw
Table 6

have come under pressure in recent years to be developed as large, country-club PUD's both south and north of US 41.

Third, the last unspoiled remnants of coastal barrier islands occur within this district, and include not only Keewaydin Island (the longest barrier island) but the important RUE lands of Cannon Island and Little Marco Island, both of which are unique in Collier County, and both of which are presently held in private ownership.

It is for these reasons that nearly all of the sections surrounding Rookery Bay, and throughout the Dollar and Johnson Bay area have been recommended for RFD classification. Because much of the land is presently mangrove forest the pressure to develop will undoubtedly be shifted to the upland maritime systems which are predominantly given over to pine-cypress forests. Reference to Table 5 shows that the majority of sections in the district carry A2-ST zoning, (50%) followed by A-2 (19%) and RO-ST (16%).

Several large (>1000 acres) planned unit developments (PUD) have either been approved or are in planning stages. The Lely development would add some 10,000 new residences and approximately 20,000 people to the population along the coastal zone. In addition to general population pressures several 18 hole golf courses are planned, thus promoting a major destructive use of fragile pine-cypress maritime forest lands, as well as being a prime nutrient-pesticide-herbicide source for groundwaters and runoff into the estuary.

Belle Meade

A total of 49 sections were assessed within this district with a tax value of approximately \$1,399,569. In the Belle Meade district the Deltona Corporation is by far the largest private landholder, controlling

some 18 sections (although some parcels have been deeded to the State of Florida under conditions of a settlement/land swap agreement involving jurisdictional lands of the Department of Natural Resources and the US Army Corps of Engineers). The next largest private landholder is Duda Farms, along with some other agricultural interests. Miscellaneous small owners constitute the third ranked private group. The State of Florida controls much of the bottom lands, and the Lamar Gable Trust owns some acreage in the eastern boundary of the district along SR 92.

The Belle Meade district is a critical area because it lies at the southern terminus of a major sheetflow waterway, which drains the lands in the vicinity of Golden Gate Estates. South of US 41 these lands are predominantly pine-barren, saltmarsh and mangrove ecosystems, that comprise an important and viable series of biotopes utilized by birdlife and other estuarine fauna and flora. A series of ragged bays, oyster bars, seagrass beds and mudflats make up the lower portions of the Belle Meade system and undoubtedly enhances the maintenance of the estuarine/marine ecosystems in the region. In addition to birdlife this region is also noted for gamefishing, and is exploited commercially for stone crabs.

The major zoning in this district is A2-ST (27%), followed by A-2 (16%), PUD (14%) and RSF (12%) (Table 5). Presently, land development is occurring to the east of SR 951 by Deltona Corporation in an area fronting McIlvane Bay. To the north much of the land has been cleared and turned over to agriculture by Duda Farms. Both types of development will have serious impacts on the saltmarshes of the lower estuary as more and more land is removed from the sheetflow way. Portions of the district adjacent to Collier-Seminole State Park and above Addison Bay have been

recommended for RFD status in order to act as bufferzones, or to provide some protection for major parts of the estuary to the southeast, respectively. Critical habitat, including an RUE coastal hammock, also occur on John Stevens Creek in the vicinity of Goodland. A PUD by Deltona Corporation is underway in this area but the company has stated its intention of leaving the intra-mangrove coastal hammock property as a nature preserve.

Camp Keasis

A total of 100 sections were considered in this district with a tax value of approximately \$82,775. Nearly all of this land is in private holdings except for Collier-Seminole State Park. Three major land owners, the Gable Trust, the Collier Family, and Deltona Corporation share this district, controlling approximately 65% of the land. State of Florida ranks fourth at 28%. Miscellaneous small owners comprise a fifth group which, collectively, owns about 5% of the land.

Most of the land in private ownership is salt marsh and mangrove forest, although a large parcel of coastal hardwood hammock and associated sabal palm-halophyte island assemblages occur adjacent to and within Collier-Seminole State Park. Moreover, much of the coastal fringe, primarily lowlying mangrove islands forming the northwestern gateway to the Ten Thousand Islands, is relatively remote and mosquito-infested black and red mangrove forests. As such, it is to all extents and purposes undevelopable, although it functions as a major recreational area for local boaters and fishermen, and contributes to a stone crab fishery. Other land, however, on southeastern Marco Island is prime waterfront property which has undergone developmental conversion via dredging and filling. Planned unit developments occur along the upland margins of

Barfield Bay, a remnant area of prime coastal hammock, and adjacent to John Stevens Creek in the Goodland area. Horr's Island, a unique high island with RUE coastal hammock and xeric-high island pine assemblages lies directly in the center of the estuary and points toward Caxambas Pass and the open Gulf of Mexico. Also of great importance are Kice and Morgan Islands south of Marco Islands. Although considered coastal barriers, their areal extent and accretional tendencies suggest that they are more correctly considered incipient headlands which have not yet united with Marco Island (itself a headland in formation). Kice and Morgan Islands are nearly pristine areas, supporting a few vacation-type houses. Much of these islands is hammock, fringed by extensive beach and dune assemblages or surrounded by extensive mangrove forest.

Of additional importance in the Camp Keasis district are the lands draining the southern terminus paralleling US 41, and the large mangrove forest-saltmarsh ecosystem that lies on the western boundary of the Fakahatchee Strand State Preserve. The Cape Romano-Ten Thousand Islands Aquatic Preserve is found predominantly in the Camp Keasis district and incorporates many of the southernmost Ten Thousand Islands and much of the shallow nearshore Gulf of Mexico bottomlands in the Gullivan Bay area.

Major portions of the region have been recommended for RFD status in order to preserve these biotopes, or ensure that bufferzones exist for the valuable wildlife areas and marine/oligohaline ecosystems.

Predominant zoning is A1-ST (86%) followed by RSF (4%), A2-ST (3%) and RO-ST (3%) (Table 5).

Fakahatchee

A total of 76 sections were considered in this district. Tax value

was assessed at approximately \$5,272. Landholdings in the Fakahatchee district are in large part held in protected status, being managed under one or more agencies either by the State of Florida as the Fakahatchee Strand State Preserve, or by the Federal Government as the Everglades National Park. Nevertheless, a small but important area consisting of approximately 14 sections located in the vicinity of the US 41/SR 29 junction at Carnestown remains in private ownership. This land is controlled primarily by Collier Development Company, the Gable Trust, or the Collier Family, plus miscellaneous small owners. A southern part of the area is incorporated as Everglades City and Chokoloskee Island, again mostly in small tracts held by miscellaneous owners.

Only the uplands near US 41 would seem to have any potential for development. The lower part of the Fakahatchee coastal zone is almost completely given over to reticulated coastal mangrove swamp and salt-marshes, and innumerable small, oyster-bar built mangrove islands. The upland areas are critical because roughly 50% of these lands lie in the flowway for the eastern margin of the Fakahatchee Strand and the northwestern Everglades National Park. These lands form an important saltmarsh-freshmarsh interlock between Fakahatchee and Faka-Union Bays. They are thus extremely important as sheetflow and tributarial water-courses for the region.

It seems probable that SR 29 forms a dike of sorts within this area, directing sheetflow and tributarial flow westward into the Ten Thousand Islands and Chokoloskee Bay. This input probably does not match in importance that of the Faka-Union Canal. This canal drains freshwater from much of the Golden Gate Estates subdivision and thus produces relatively low salinities within Faka-Union Bay, in contrast to higher

and more normal salinities (28-38%)in Fakahatchee Bay.

This district is zoned primarily A2-ST (57%) and R0-ST (42%) in the preserve areas. These include the lower portion of the Fakahatchee Strand State Preserve, the Everglades National Park, and the bay and upland/salt marsh portions of the Cape Romano-Ten Thousand Islands Aquatic Preserve. Owing to the proximity of the Fakahatchee Strand State Preserve and Everglades National Park 10 sections are recommended for RFD classification because they lie directly adjacent to these preserves.

Turner River

A total of 48 sections with an assessed tax value of about \$2,364 were considered. In the Turner River district with the exception of a large parcel lying parallel to SR 29 most of the lands belong to the Federal Government, either as part of the Big Cypress National Preserve or as Everglades National Park. The State of Florida has some scattered holdings. The remainder of the area ownership is with miscellaneous small owners in the incorporated section containing Everglades City and its environs.

The land adjacent to SR 29 is either mangrove forest or saltwater or freshwater marsh. Approaching US 41 the land begins to intergrade into coastal prairie although freshwater marsh remains extensive. It is probable that the salinity of this region is determined in large part by lunar tidal ingress and storm-tide modification. Mangroves are seen north of US 41 in an area otherwise given over primarily to cattail (Typha) marsh.

Although some development has occurred, it is mostly of very low density (Carnestown, Ochopee) and of little ecological consequence at

present. Primary impact seems to be swamp buggy and airboat trails which remain for long periods of time after the makers have departed. The Turner River district is in a relatively remote part of Collier County, served by US 41, and economical, logistical, zoning, hydrological and entomological factors are all operating against future major development. Although Everglades City has now become something of a rustic resort town its expansional abilities are few owing to its geographical position between the Big Cypress National Preserve to the east, Everglades National Park to the south, and the Fakahatchee Strand State Preserve to the west. Whether the northern areas near US 41 that are still open for development will be exploited remains to be seen.

Three sections are recommended for RFD, all to the east of SR 29. The area around the Chokoloskee Causeway is also recommended as RFD as insurance against adverse impact from residential development to the Chokoloskee Bay bottomlands. The Turner River district is otherwise zoned almost entirely A1-ST (98%) or RO-ST (2%).

Big Cypress West, Big Cypress East

A total of 60 sections and 41 sections comprise the two districts, respectively. Assessed tax values are \$3,762 and \$7,747. Land in the Big Cypress area is owned primarily by the Federal Government, but with some notable private holdings (Figure 5). Development in these two districts is mostly at a very low level, consisting of isolated or small-group home-sites, limited commercial facilities, and scattered Seminole Indian villages. Hunting cabins, some of which are equivalent to small, self-contained rustic resorts, are also scattered throughout the area, but to a lesser extent than north of US 41. A small commercial hub occurs at SR 92, Monroe Station, and limited agricultural development

and land clearing has occurred. The entire area south of US 41 is nearly pristine but undergoes some stress with extensive swamp buggy and airboat usage, the trails of which are clearly visible on aerial photographs. Just what effect these seasonally periodic trail scars will have on the coastal prairie ecosystem remains to be seen.

Both districts comprise some of the most beautiful land in Collier County. Vast expanses of coastal prairie, interrupted by the green domes of cypress forests, and scattered cabbage palm hammocks on tear-drop shaped islands in the norther margins of the River of Grass, all add up to a scene of untrammled and exquisite wilderness beauty. Because it is greatly removed from urban hubs the landscape offers a peaceful serenity that has been discovered by many Collier Countians, who explore its verdant vistas on weekend escapes. Its Federal preserve status will ensure that no major residential development will occur, although agricultural, forestry and petroleum development remains possible. The region should be maintained primarily for recreational purposes, and as an important recharge and sheetflow area.

The two districts are 100% A1-ST. A group of sections south of 50 mile Bend on the Tamiami Trail just before the Dade County line is recommended for RFD because present development is unmanaged and appears to be uncontrolled. The zoning atlas indicates that both commercial and residential development could occur in this vicinity.

THE SOLUTION

III. HOW CAN THESE RESOURCES BE PROTECTED, OR PUT TO THE BEST AND HIGHEST USE WITHOUT SUBSTANTIALLY DEGRADING THE COASTAL ZONE ENVIRONMENT AND ECOSYSTEMS?

Three major considerations are salient in addressing the problem of land ownership in the undeveloped coastal zone and how these areas may best be managed. These are 1) the amount and distribution of lands held in private ownership; 2) the necessity of restricting degradational development on much of the coastal lands; and promoting its direct and indirect use for the needs and general welfare of the general public; and 3) the absolute necessity of maintaining a healthy environment on such lands regardless of their ultimate use. Although these considerations may seem to be mutually exclusive, a little reflection will show that they are not.

1. Land Held in Private Ownership

In this report several r:Base programs have been developed which allow continued input and assessment of data from these lands, so that the Department of Natural Resources Management can more properly arrive at sound environmentally compatible decisions. These programs also can show potential developers the criteria used in judging how their property is to be best managed during development. In addition, there are permitting guidelines and penalties indicated for non-compliance. The latter, if correctly, properly and expeditiously implemented should go far in enhancing an environmentally proper land-use ethic in Collier County.

There are other means available to aid in accomplishing these recommendations. One effective technique is the concept of "Creative Zoning", which includes transfer of developmental density rights (TDR).

Others include tax relief incentives; restrictive or environmental zoning (ST, RFD); environmental easements; bufferzone mandates; a population cap; and strict enforcement of environmental ordinances. Each or all may be used with lands held in private ownership.

A) Creative Zoning

This is a relatively recent term (see Blackwelder 1985). Creative zoning is defined as the application to resources of specifically tailored techniques for controlling land-use which traditional comprehensive planning and Euclidian zoning would not adequately address. This category utilizes several concepts, including clustering of development in selected portions of environmentally sensitive or critical areas, or as urban clusters; groundwater wellfield ordinances for aquifer protection; developmental restrictions for estuarine margins, floodplains, or sheet-flowway; designation of local critical areas by a zoning notator such as ST, or RFD; coastal setback or vegetational provisions; and parks and special use restrictions including area designators such as Preservation, Conservation, or Recreation. All of these concepts are addressed at length in Blackwelder (1985).

B) Tax and Developmental Relief or Modification

Of increasing usage in the State of Florida, financial "rewards" to the developer or landholder are an attractive way to ensure preservation or conservation of critical lands. One of these concepts employs tax relief whereby higher taxes paid for a number of years on properties now considered non-developable or restricted can either have the differences carried forward or applied to relieve in part tax burdens on other non-critical properties, or assessed in part toward future (lower) taxes on the same property. As an example, if a landholder or developer deeds

to a county non-developable wetland property which was taxed under a higher zoning category (e.g., RSF) and the property is subsequently rezoned RO-ST, taxes previously paid on such lands may now be pro-rated and applied to relieve in part taxes on other lands to which the landholder retains ownership.

Another concept involves the transfer of density rights from environmentally sensitive property to adjacent non-sensitive or other property held by the landowner. This often involves a "bump-up" provision where non-developable acreage densities are incorporated into a higher density on the remaining acreage, or are transferred to properties considered non-critical.

C) Restrictive or Environmental Zoning

This concept is already employed in part in Collier County with the ST or Special Treatment zoning appellation. Unfortunately, portions of the ST requirements contain serious loopholes. Even in the Big Cypress Area of Critical State Concern (ACSC) any privately held land used for agricultural or related purposes may be exempted from ACSC regulations. The largest proportion of lands having ST designation are agricultural A-1 or A-2, with only a limited number of parcels zoned RMF-ST or RSF-ST (single or multifamily residential). As noted earlier, most of these lands are environmentally critical and are located within or adjacent to major flowways or other important habitats. Thus, the addition of an RFD classification will require a more thorough and detailed examination of any developmental activity proposed for these lands, although it does not necessarily prevent carefully controlled modification. Included in this concept is the establishment of RFD corridors leading from the developable uplands to the coastal margins, and major delineated RFD sections in

a checkerboard pattern. Both will ensure continued nutrient and hydrological flow patterns from north to south through the County.

D) Environmental Easements

Another concept which is receiving increasing scrutiny is the provision of easements allowing dedication of portions of sensitive properties for public use. Control of access may reside in the County government, or be jointly held between owner and the County. This concept is especially attractive for lands which have some unique physiographic, environmental or historical feature, such as sinkholes, caves, springs, RUE vegetational assemblages, or significant Indian mounds. The owner can retain ownership, and receive tax relief on the portion dedicated to easement while still having some control over its usage, usually as specified in the deed to the County.

E) Bufferzone Mandates

This concept is an outgrowth of the basic idea behind a bufferzone, an area which acts to prevent direct impact between a developed area and a non-developed area. Land with Bufferzone Mandate would not necessarily be removed from developmental consideration, but certain portions of the land would need to be permanently restricted from any type of development potentially inimical to the land being buffered, although the overall zoning is not necessarily changed. Again, tax relief of one sort or another could also be applied toward the portion mandated as buffer zone inasmuch as it is now prohibited from future development.

F) Population Cap for Collier County

This is undoubtedly the most unappealing recommendation but one

which recognizes the absolute carrying capacity² of the environment. It is a matter of simple mathematics, already realized too late by the megalopolis along the southeastern Florida coast ("The Gold Coast"), that the land may support exponentially increasing populations, but the water table will not. Nor will governmental agencies, public utilities, school, police, and fire districts be able to maintain equality with such growth unless severe tax increases are implemented. Indeed, not even a greatly expanded tax base is the final solution, as witness the breakdown or non-usage of public transportation, utility blackouts, and populational disenfranchisement occurring in the metropolitan Dade County area at present.

Because so much land in the middle and eastern part of Collier County is in parks and preserves status already, and because it is absolutely necessary to maintain strict developmental controls on low-lying coastal areas, most development will be required to locate in the western areas, a region already heavily developed in places. Although populational growth estimates project over 200,000 people by the turn of the century, there are definite questions whether the environment as it now is being managed will tolerate such increase. In a region subject to periodic drought, seasonal storms and hurricanes, having a limited area for growth, and eventually to become part of a projected megalopolis extending to Tampa, a population cap may well be required by the year 2000 for Collier County, and probably for other southeastern coastal counties as well.

2 An ecological concept that refers to the ability of an ecosystem to sustain a finite number of individual and aggregational floral and faunal units within its boundaries without being stressed.

G) Enforcement of Environmental Ordinances

None of these recommendations will have any weight without a vigorous and rigorous enforcement of applicable ordinances. Developers should not be let off with minor wrist slaps for environmental degradations. Nor should "after the fact" permits be routinely tolerated. If Collier County is to retain any control on growth in any area, and not just the coastal zone, there must be strong and rapid enforcement of vegetational, CCCL, ST, EIS, and Performance Bond ordinances. Moreover, County Commissioners and the public must be made aware that now is the time to address and enforce, and not later. Education of landowners as to the results of unconscionable development, and government administrators and County Commissioners as to the effects of injudicious granting of variances, is mandatory.

2. Coastal Lands and Public Welfare

In a perceptive and far-reaching paper Hardin (1968) made the important point that it is mathematically impossible to maximize for two or more variables at the same time. Referring in this case to population growth he held that a purely technical solution may not be possible. His arguments can be as easily applied to Land Use Management. That is, it is impossible to obtain the maximum amount of land for preservation and at the same time allow a maximum for development. The corollary is that the maximum amount of public good may not be directly correlated either to the maximum amount of land being developed, or placed in preservation. Hardin asks: "What is good? To one person it is wilderness, to another it is ski lodges [or in southwest Florida, condominiums, RHG] for thousands. To one it is estuaries to nourish ducks for hunters to shoot; to another it is factory lands" (Hardin 1968,

p.1244). In pursuing his arguments Hardin used the analogy of the tragedy (i.e. the solemn remorseless working of things) of the commons. The commons is an English land-use concept in which land open to all is used by some people to a greater degree than by others. Hardin's example was pasture land used by herdsmen. By substituting "development" for Hardin's "herdsman" the argument goes as follows.

Given an undeveloped area, development within that area will tend toward maximal numbers. Until the carrying capacity of the land is reached this poses no problem. At that point, however, the scenario changes. Each developer will continue to try and maximize his holdings, by adding one more development to the land. This produces a positive component of +1 directly and only to the developer for each unit developed and sold. The negative component is the function of additional environmental stress on land already at its carrying capacity. But the negative effect is shared not only by this developer, but by all others, and all other members in the population. Thus, the negative component to the developer is only a fraction of -1. As each developer realizes his potential for gain in the commons of the undeveloped coastal land each tries to maximize his holdings. The result? "Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons."

How can this apply to coastal lands? Quite simply, if development is allowed to proceed untrammelled the lands will cease to become functioning parts of the coastal ecosystem. The ecosystem becomes severely strained, and with the addition of one or only a few more otherwise previously tolerable insults, collapses. The results are dramatic, extensive, and permanent. No ecosystem once perturbed ever reestablishes

itself precisely as it was before, and none ever returns to its original pristine state once altered or destroyed.

How does this affect the public welfare? Again, quite simply, if the highest and best use of undeveloped land is ultimately for the public good (and not just for the good of the developer) then the development of such lands must be carefully managed. Not in a manner so that either the public or the developer obtain maximum benefit (a mathematical impossibility as noted earlier) but in a way that both receive optimum benefit based on mutual participation. For example, a developer may wish to clear coastal maritime pine forests adjacent to the estuary to put in single and multifamily residences and a golf course. One may reasonably ask "With at least 35 golf courses, country clubs and driving ranges already in Collier County, do we need yet another?" In other words is the addition of a direct benefit to a limited number of people (golf course) worth the cost of destroying a feature of direct or indirect benefit to the majority of people (an upland maritime pine ecosystem)? Instead, cannot the development be modified to incorporate pine forest, and an alternate use for part of this land be determined? This, of course, will not seem fair to landowners many of who still hold the Judaeo-Christian philosophy that a man's land is his property to utilize as he sees fit. But the results of decades of such use and exploitation have also had an impact on fairness. What was fair during low population decades is no longer fair today.

3. The Maintenance of Healthy Coastal Ecosystem

If Collier County is to maintain its attractiveness then the amenities and features that produce this attraction must be maintained, and if possible enhanced. Development of coastal lands does not

necessarily mean that the amenities are destroyed, although examples are numerous where such is the case. Careful land-use can and does enhance many of the amenities by making them more available and by allowing them to be managed in part. Two simple examples illustrate this, both at opposite ends of a well-managed land-use scale. The first is The Wilderness Country Club, a PUD of 377 proposed multifamily units on 218 acres. Here the majority of the cypress-pine forest ecosystem has been maintained, the units carefully placed, and the golf course carefully planned and laid out. The Wilderness is a reasonably good model of how to allow inevitable develop in a sensitive area. At the opposite end of the scale is Big Cypress Country Club, a 620 acre country club in which the entire vegetational cover was scraped clean. With the exception of a few isolated cabbage palms this "planned development" lies unvegetated and baking in the sun, a monument to environmentally poor development. Moreover, being upland from the estuary this type of land alteration will probably have adverse impact via waterflow, nutrient and pesticide input, and a number of other factors that impinge directly or indirectly on the coastal ecosystem.

Throughout this report the emphasis has been on maintenance of ecosystem viability, and usage of vegetational assemblages as indicators of health. It must also be remembered that Collier County is a water-dependent, water-blessed and water-cursed county. Any land use management must take into account the presence, absence, and quality of rainfall, surface and aquifer waters. This is not only important for flood control reasons, but more importantly because the water supply within Collier County must remain essentially or potentially potable.

Loss of shallow potable drinking water may be the one factor that

may eventually prove catastrophic to Collier County. It should not be forgotten that Collier County is in a relatively precarious hydrological situation because:

1. It is on the lowest downstream side of all upland-generated waterflow;
2. Sister counties to the north are using groundwaters before they arrive in Collier County and may be returning waters of poorer quality into the aquifer;
3. Recent evidence of wet-dry cycles and periodically occurring droughts, with resultant wildfires, has shown how critical the sheetflow system is to the county;
4. Projected populational increases over the next 15 years will severely tax presently available water supplies in good wet years, whereas in dry or drought years well draw-down or exhaustion may result in disaster both at the commercial-residential as well as agricultural levels;
5. Present water policies are directed primarily toward removing standing water during heavy-rainfall years, with no consideration or provisions for storage above or below ground against years of drought;
6. Standing surface waters are no longer percolating downward to recharge shallow aquifers in the amounts that they did for millenia, but instead are shunted from canal to canal and eventually pour out into the Gulf of Mexico;
7. Loss of surface recharge increases drastically the possibility of saltwater intrusion in shallow aquifers, with further resultant loss of potable supplies;

8. Incipient sea level rise, predicted to range from a few inches to nearly a foot over the next century will exacerbate the salt intrusion problem both to humans and to the surrounding ecosystems (Titus and Barth 1984);
9. Incipient sea level rise will also drastically affect the ecology of lowlying coastal areas via inundation, or by erosion and displacement caused by longshore current systems (Titus 1984);
10. As water supplies decrease it will become increasingly expensive to find, obtain, treat and provide such water to a burgeoning coastal population, most of whom desire a lifestyle totally foreign to the prevailing environment.

There is a wealth of information and recommendations for guidelines regulating growth within the coastal zones and wetlands of the State of Florida. These include publications by the Coastal Coordinating Council (1973), the Florida Division of State Planning (1976), The Conservation Foundation (1968), in the professional press (e.g. Clark 1975; Blackwelder, 1985), and in Collier County governmental studies such as the Demographic and Economic Profile, and the Natural Resources Element and Future Land Use Element of the Comprehensive Plan. Most of the suggestions made in these reports, and those made herein will be difficult to accept for those landowners or developers who primarily see the immediate results of their actions and are profit-oriented with little thought or care for the environment now or later. It is an unfortunate fact that a great many of these developers are not native Floridans, as are an increasing number of landholders. To many of these, Southwest Florida is not and never should be a land of eroding or accreting coastal barriers,

cabbage palms, fresh and saltwater marshes, coastal mangrove swamps, mosquitoes and other insects, snakes, and all the other "non-amenities" they have perpetrated on the general public in conjunction with public relations media. Instead Southwest Florida is an ethereal mirage of sugar sand beaches, swaying coconut palms, verdant golf courses, aerial "adulthooding", land drainage, habitat destruction, and other so-called "amenities" conducive to a manufactured and manipulated subtropical paradise. Whether any of these images can be modified or erased is debatable given the opinions of a certain faction of the populace (Fig. 7). Implementation will require courage and far-thinking on the part of permitting agencies in response to those developers who are motivated solely for profit.

Recognizing that private ownership of undeveloped lands is a factor that must be contended with, it is far better to promote careful, regulated, and even restricted usage of such lands where necessary, in order to prevent continued mismanagement within the coastal zone. On the other hand, it must also be recognized by landowners that the Judaeo-Christian ethic of total exploitation of the earth's resources is now no longer tenable. Although not discouraging careful development or limited exploitation it is now necessary to emphasize that any development must take into consideration not only the potential or actual adverse impacts on the lands to be developed, but also the results of such impacts on adjacent, contiguous, or downstream areas. Furthermore, such developmental considerations are applicable not only in the present, but to an indeterminate time in the future. Only by considering the results of present day activities will Collier County be able to ensure a productive and lasting heritage for its future.

Water Restriction Decision Delayed

By DAVID FLECHSIG
Staff Writer

Regional water officials are playing a waiting game with the weather.

One said today that his office is hesitant to reintroduce mandatory water controls for Collier County this late in the dry season, but a decision must be made next week to either enforce mandatory water controls or put the county's underground water source at the mercy of Mother Nature.

The advent of the daily rains

which accompany South Florida summers would end the dilemma. But there is no rain in sight.

TILFORD CREEE, deputy executive director for the South Florida Water Management District, said today that water officials will wait one more week before deciding on imposing water-use controls to reduce consumption from the Coastal Ridge Aquifer, an underground pool of fresh water.

"I think what we will do is sit down with our people Monday or Tuesday and discuss what we can do," he said.

Tuesday next week and assess the situation," Creee said. "With the data available at that time we should be able to make a decision."

District officials admit they may have lifted mandatory water consumption controls too early last month. Restrictions on lawn sprinkling were imposed in mid-March and lifted after a week of moderate rain in late April.

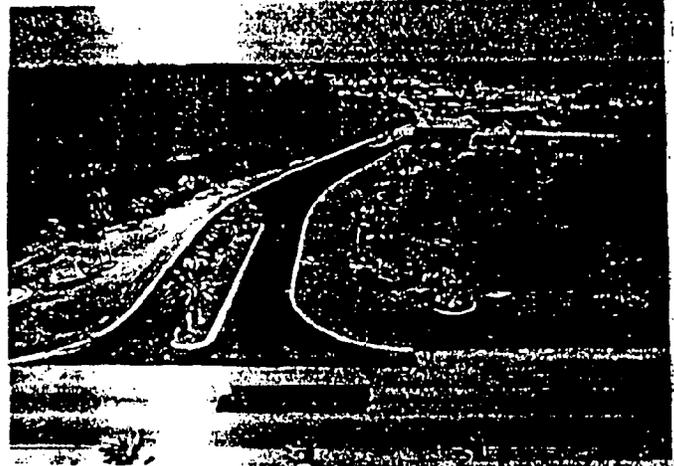
"We've been getting a good amount of rain over here on the east coast," Creee said. "The normal rainy season weather patterns have developed here but I guess it is not happening in Naples. The amount of rain Naples got and the conditions that exist (Coastal Ridge) will be what we have to determine if we're going back to mandatory controls."

CREEE SAID that residential lawns are part of the increased water use levels being recorded in Collier County. Voluntary water use restrictions currently in effect call for residents to water lawns only between the hours of 4 a.m. and 8 a.m. a maximum of three times a week. However, many are disregarding the request.

The only Collier County rain gauge with water in it this weekend, says on Marco Island. The Marco Island Fire Department recorded 0.35 inches Monday, officials said. Immokalee, Golden Gate and Naples remained without precipitation throughout the Memorial Day weekend.

Daily water use in Naples has grown from 0.3 million gallons of water during the mandatory water restrictions to highs of approximately 2.5 million gallons, Creee said. The roller-coaster effect on the aquifer is damaging to the natural filtration of underground water supplies and promotes salt-water intrusion.

From Page 1A



LELY-BAREFOOT BEACH GOT THE OK TUESDAY TO BUILD MORE HOMES. The photograph was taken looking south toward the beach-front development.

Collier Officials Allow Beach Density Increase

By JOHN LUNSFORD
Staff Writer

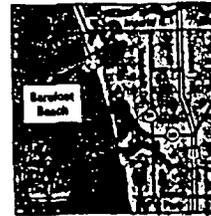
Not even the biggest kids on the environmental block Tuesday could halt changes in the Lely-Barefoot Beach development order which allows more homes to be built along the beach in north Collier County.

In the face of opposition by major regulatory and environmental forces, the County Commission voted 4-1 to allow higher density on the two-mile stretch of Gulf-front property and to permit more than double the number of residences directly on the beach. Commissioner Max Hesse cast the dissenting ballot.

Tuesday's change increases beach-front homes from 209 to 492 — the major complaint of opponents — and increases from 7.9 to 800 the number of dwelling units permitted overall.

WHILE SOME say the battle may be lost, Torvo Tammer, director of The Conservancy, says the war has just begun.

"I can't understand the motive



PROJECT LOCATION north of Naples.

of the Sierra Club/Audubon Society and Isaac Walton League, decriing ecological damage to the fragile beach area; the Coastal Area Planning Commission; recommending less density on the beach; the county planning department and local residents, complaining about plans to change the location of the public beach as well as lack of adequate fire protection.

AND PRESENT in spirit if not fact, was State Sen. Frank Marshall of Fort Myers, who is reportedly pursuing state purchase of the property, and three regulatory heavyweights—the state Department of Natural Resources, the Southwest Florida Regional Planning Council and the Florida Department of Community Affairs. The Natural Resources Department wrote the commission last week asking for time to review the new proposal while the regional planning council has informed the board that the Community Affairs Department might require that the revised development order endure (Please see BEACH, Page 2A)

tion of the commission," he said, adding that The Conservancy will carry the fight to state levels. Lined up against the application by Lely Estates Inc. were The Conservancy, insisting that beach-front development could be unsafe to future occupants; the local League of Women Voters, with similar views.

Sound of DC-3s Overhead Was Beautiful Music

Editor, Naples Daily News.

What beautiful music to hear over our house today with those three DC-3s spraying as they zoomed over our rooftops on Gordon Drive.

Some of us who were born in this beautiful state know how unpleasant it can be with swarms of "skeeters" bombarding each and every one as they stopped outside. That was before the days of aerial spraying.

Yoit Callaghan and members of FACTS are evidently newcomers to our area and will probably go back North after they can't stand it, if they get aerial spraying halted. Let's just pray they don't succeed.

James J. Antle
Naples

"I COULDN'T care less about the environmental studies," Marco Realtor Stanley Sichel said. "I'm tired to death with environmentalists. I'm for aerial spraying."

"I'm totally for spraying there's nothing wrong with it," John Greico said.

"Don't confuse me with these minority facts."

Figure 7. Selected examples of prevailing environmental philosophy in Collier County, Florida. The excerpts refer to developmental variances, vacillation in water management decisions during time of drought, and comments from pro-aerial adulticiding factions on the efficacy of Baytex applications using DC-3's. (Naples Daily News)

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9/17/85

Appendix 1

OWNRLIST Program Example. Summary assessment of individual land ownership in the undeveloped coastal zone of Collier County.

Owner	Coastzon	Maprefer	Owner1	GenlComm
32	Water Mgmt. 6	S 13 T 50 S R 25 E	3550 S. Trail	0.08 acres
33	Water Mgmt. 6	S 13 T 50 S R 25 E	Gubala, E.	-0-
34	Water Mgmt. 6	S 13 T 50 S R 25 E	Lakewood Country Pl	33.44 acres
35	Water Mgmt. 6	S 13 T 50 S R 25 E	Ryan Homes, Inc	-0-
36	Water Mgmt. 6	S 13 T 50 S R 25 E	Hubschman Assoc.	4.23 acres
37	Water Mgmt. 6	S 13 T 50 S R 25 E	Aligarta, N.	0.92 acres
38	Water Mgmt. 6	S 13 T 50 S R 25 E	Hubschman Assoc.	0.69 acres
39	Water Mgmt. 6	S 13 T 50 S R 25 E	Naples Park/K. Mart	0.92 acres in 4 parcels
40	Water Mgmt. 6	S 13 T 50 S R 25 E	Ramco/S. Naples Dev	0.69 acres
41	Water Mgmt. 6	S 13 T 50 S R 25 E	Mobile Oil Co.	1.02 acres
More output follows - press [ESC] to quit, any key to continue				
Owner	Coastzon	Maprefer	Owner1	GenlComm
42	Water Mgmt. 6	S 13 T 50 S R 25 E	Naples Associates	4.24 acres
43	Water Mgmt. 6	S 13 T 50 S R 25 E	Denny's Inc.	0.80 acres
44	Water Mgmt. 6	S 13 T 50 S R 25 E	Glades Country Clb	Glades Country Club Apartments Association Inc.
45	Water Mgmt. 6	S 13 T 50 S R 25 E	Insured Income Prop.	0.62 acres
46	Water Mgmt. 6	S 13 T 50 S R 25 E	Weinfeld, J.	-0-
47	Water Mgmt. 6	S 13 T 50 S R 25 E	Howard Trust	-0-
48	Water Mgmt. 6	S 13 T 50 S R 25 E	Carey, T.	-0-
49	Water Mgmt. 6	S 13 T 50 S R 25 E	Smith, R.	-0-
50	Water Mgmt. 6	S 13 T 50 S R 25 E	National Trust Co.	#5086
51	Water Mgmt. 6	S 13 T 50 S	National Trust Co.	#5086

Appendix 2

COASTVAL Program Example. Summary assessment of land ownership and evaluation in the undeveloped coastal zone of Collier County.

Coastal Zone: FAKAHATCHEE Mapreference: T 52, 53 S R 28, 29 E LUMAP: 179267
 Total No. Sections: 30465.0 Sum Land Assessment: \$624,135.00
 Total No. Owners: 7 Sum Total Assesment: \$755,275.00
 Summed Tax Valuation: \$7,228.95

Owners	Rank	Sects.	Acres	% Tot	\$TaxVal	\$TotAss	\$LndAss
1. USA	4	7.00	1002.7	3.00	\$0.00	27,250.00	297250.00
2. TITL/STATE	1	58.0	20624.	67.0	\$0.00	75,600.00	75,600.00
3. COLLIER DEVELOPMENT	2	11.0	4454.7	15.0	1,908.26	154725.00	154725.00
4. COLLIER FAMILY	5	3.00	933.00	3.00	\$489.21	39,150.00	39,150.00
5. GABLE	3	9.00	2983.4	10.0	1,900.00	150660.00	150660.00
6. NATURE GROUPS	6	1.00	624.90	2.00	1,957.22	151375.00	151375.00
7. MISC. SMALL OWNERS	7	3.00	41.200		\$974.26	156575.00	25,375.00

8.
9.
10.
General Comments: 52/28: 10-11, 13-15, 22-27, 35-36; 52/29: 19-21, 25-32; 53/28: 1-2, 11-15, 21-27, 35-36;

Coastal Zone: BIG CYPRESS E. Mapreference: T 53 S R 33, 34 E LUMAP: 376416
 Total No. Sections: 25261.4 Sum Land Assessment: \$1,249,558.00
 Total No. Owners: 2 Sum Total Assesment: \$1,484,633.00
 Summed Tax Valuation: \$7,747.67

Owners	Rank	Sects.	Acres	% Tot	\$TaxVal	\$TotAss	\$LndAss
1. USA	1	42.0	22815.	90.0	\$0.00	803350.00	803350.00
2. MISC. SMALL OWNERS	2	21.0	2446.5	9.00	7,747.67	681283.00	446208.00
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

General Comments: 53/33: 13-36; 53/34: 17-36

Appendix 3

OWNRZONE Program Example. Summary of vegetation, location and zoning data for individual sections in the Collier County undeveloped coastal zone.

Coastzon	Maprefer	Vegetatn	Zoning	Locnotes
Water Mgmt 6	[48] S 25 T 50 S R 25 E	Pine, Cypress,	A2-ST	Lely Canal area
Water Mgmt 6	[48] S 26 T 50 S R 25 E	Mangrove	A2-ST	Lely Canal area
Water Mgmt 6	[47] S 27 T 50 S R 25 E	Mangrove, Pine	RPD-RI-15	N Keewaydin Island
Water Mgmt 6	[47] S 28 T 50 S R 25 E	Mangrove, Australian Pine	R-3T-12	N Keewaydin Island
Water Mgmt 6	[47] S 34 T 50 S R 25 E	Mangrove, Hi Isl Cstl Ham	A2-ST	N Keewaydin Island
Water Mgmt 6	[48] S 35 T 50 S R 25 E	Mangrove, Pine, Cypress	A2-ST	Lely Canal area
Water Mgmt 6	[48] S 36 T 50 S R 25 E	Pine, Cypress, Mangrove	A2-ST	Lely Canal area
Water Mgmt 6	[104] S 1 T 51 S R 25 E	Mangrove	A2-ST	Middle Keewaydin Island
Water Mgmt 6	[104] S 2 T 51 S R 25 E	Mangrove	A2-ST	Middle Keewaydin Island
Water Mgmt 6	[104] S 3 T 51 S R 25 E	Mangrove, Cstl Hammock	Apparently A2-ST	Middle Keewaydin Island
Water Mgmt 6	[58] S 17 T 51 S R 26 E	Pine, Cypress Mangrove	A2-ST	Rookery Bay
Water Mgmt 6	[58] S 18 T 51 S R 26 E	Mangrove	RD-ST	National Estuarine Sanctuary
Water Mgmt 6	[58] S 19 T 51 S R 26 E	Mangrove	RD-ST, A2-ST	Rookery Bay National Estuarine Sanctuary
Water Mgmt 6	[58] S 20 T 51 S R 26 E	Mangrove	A2-ST	Rookery Bay National Estuarine Sanctuary
Water Mgmt 6	[58] S 21 T 51 S R 26 E	Mangrove	R5F, RD-ST	DELTONA platted parcels, no development
Water Mgmt 6	[58] S 22 T 51 S R 26 E	Pine, Cypress	R5F	DELTONA platted parcels, no development
Camp Keasis	[N/D] S 28 T 52 S R 27 E	Mangrove	A1-ST	Shell Key area
Camp Keasis	[N/D] S 29 T 52 S R 27 E	Mangrove	A1-ST	Tripod Key area; Ten Thousand Islands Aquatic Preserve
Camp Keasis	[70] S 30 T 52 S R 27 E	Mangrove	A1-ST	Coon Key Pass, E end Horr's Island
Camp Keasis	[N/D] S 31 T 52 S R 27 E	Mangrove	A1-ST	Neat Key; Ten Thousand Islands Aquatic Preserve
Camp Keasis	[N/D] S 32 T 52 S R 27 E	Mangrove	A1-ST	Coon Key area; Ten Thousand Islands Aquatic Preserve

LUMACT Program Descriptors and Definitions

<u>DESCRIPTOR</u>	<u>MEANING</u>	<u>DESCRIPTION AND DEFINITION</u>
01. WILDRNSS	WILDERNESS	Part or all of a section to be left in a natural, or as close to natural state, as possible. No developmental activity of any kind except for fencing, interpretive signs, primitive campsite clearing, em- placement of minimal facilities (pit toi- lets, small fire pads, grating, etc.); accessways unimproved.
02. NATURPRK	NATURE PARK	Part or all of a section to be developed or salvaged as interpretive natural park area. Development confined to minimal entrance or docking facilities, restrooms (septic tank or sewerline serviced), camping pads, campfire pads, grills or grating, flowing water supply, basic ve- hicular accessways, improved nature trails, bikepaths, battery powered tram- ways or autoways.
03. GREENPRK	GREEN PARK	Part or all of a section to be developed or salvaged as recreational park area. Limited development restricted to paved roadways, picnic facilities, shower and restroom facilities (septic tank or sewerline serviced), parking areas, lim- ited numbers of R/V pads and hook-ups, sporting or playground areas; flowing

water supply, moderate or extensive removal of non-native vegetation, in conjunction with transplanting or reintroduction of native species, including landscaping.

04. FORESTRY

FORESTRY

Part or all of a section potentially utilizable for forestry purposes, including maintenance of mono- or polyculture tree species for commercial use, or protected as specimen examples of local native assemblages. Development restricted to activities not affecting forestry resource values, and/or to areas not indigenous to, or impinging on or within forestry-designated portions.

05. BUFFRZON

BUFFER ZONE

Part or all of section potentially capable of forming a buffer area between partially or completely developed adjacent areas on the one side and incompletely developed, undeveloped or preserved areas on the other, or acting in such a way as to modify the influence of adverse environmental parameters in an adjoining or adjacent region or related ecosystem. Development restricted to activities preserving or enhancing the buffering capability of the portion of the section in question.

06. RESRMGMT RESOURCE
 MANAGEMENT
- Part or all of a section requiring careful management of important or influential environmental resources, either to maintain the ecological continuity of part or all of the area, or to ensure same in adjacent areas or related ecosystems. Development restricted to activities which preserve, enhance, or upgrade the resources in question.
07. ARCHAEO ARCHAEOLOGIC
 RESOURCES
- Part or all of a section has been shown to contain widespread or scientifically significant archaeological artifacts, or to have noteworthy anthropological value, as determined by a professional archaeologist or other recognized anthropological or archaeological authority or group. No developmental activity permitted until site has been thoroughly evaluated and necessary excavations or recovery completed. Development on significant archaeological sites restricted to activities which preserve or enhance archaeological or anthropological features. Developmental activity on non-significant, excavated, or recovered sites to be determined with Department of Natural Resources Management approval and guidelines, and utilizing existing zoning.

08. HISTORIC

HISTORIC
RESOURCES

Part or all of a section has been shown to contain cultural attributes of significant historical value, such as homestead, battle, treaty, pioneer or early settler sites; historical artefacts, buildings or roadways or other constructions; vegetational, biological, geomorphological or ecological features or settings; or which otherwise contains important information relating to the history, culture, or mores of the vicinity, Collier County, or regional Southwestern Florida, as determined by a recognized professional historian or historical society. No developmental activity permitted until the site, artefacts, buildings, topography or other attributes are fully assessed to determine the feasibility, necessity, and mode of preservation or recovery. Development on significant sites restricted to those activities which preserve or enhance the historic features. Development on non-significant, excavated or recovered sites to be determined by Department of Natural Resources Management, requiring approval and guidelines, and utilizing existing zoning.

09. Reserved
10. OTHERUSE OTHER NON-
 DEVELOPMENTAL
 USAGE Category reserved for part or all of a section which requires preservation, conservation, or limited development owing to attributes or features not specifically covered by other categories as listed above. Approved developmental activities are normally restricted to those causing minimal environmental disruption or ecological damage.
11. PASSVREC PASSIVE
 RECREATION Part or all of the section in its natural state is suitable for passive recreational activities such as hiking, backpacking, birding, tent-camping, photography, nature study and other non-sport recreation, via nature trails, pathways, bike paths, bridle paths, boardwalks, or similar access routes or passages. Developmental activity that normally enhances such recreation will be encouraged.
12. WATERREC WATER
 RECREATION Part or all of the section is suitable for activities on, in, or related to fresh or saltwater recreation, including non-commercial fishing by individuals or using licensed fishing guides, water-skiing, power boating, houseboating, canoeing, rafting, tubing, swimming or wading. Developmental activities that

13. BEACHREC

BEACH
RECREATION

normally enhance such recreational activities and which do not alter or significantly degrade the existing environmental quality of the areas will be encouraged. These might include construction of limited launching or docking facilities, excluding marinas, and development of lakefront, riverfront, streamfront or pondfront beaches, or maintenance of active flowways for any significant water bodies,

Part or all of the section is suitable for activities normally associated with freshwater- or saltwater-bordered beaches including swimming, sunbathing, surfboarding, windsurfing, snorkelling, SCUBA-diving, surf-fishing, sailing, picnicking or family-outing activities. Developmental activities normally restricted to those which preserve, enhance, or upgrade the recreational potential of the area. Such activities may include grading, clearing and other small scale maintenance of beaches, construction of service structures such as lifeguard stands, restroom or dressing facilities, picnic stands, firegrates or braziers, and other related facilities.

14. LANDREC

LAND
RECREATION

Part or all of a section in its natural or partially altered state is suitable for land-related or land-participatory recreation, including hunting, occupation of weekend or other short term or interval-occupied vacation-type housing, camping using individual or isolated RV or trailer vehicles not involving RV campgrounds or trailer (TTRV) parks, and land-based sporting activities such as tennis, volleyball, baseball, softball, football, or other non-professional sporting activities, and their associated courts, diamonds or playing fields. Developmental activities would include single-family vacation-type dwellings, limited construction of courts, playing fields and other sports facilities, and not to exceed a capacity of 100 persons/developed unit, nor more than 20 such units/section.

15. CAMPGRND

CAMPGROUND

Part or all of a section is suitable for the establishment of a permanent commercial or agency-operated non-domiciliary, interval-usage tent or RV campground with or without utilities hookups, pads, shower and lavatory facilities, restrooms, running freshwater supplies, concessionaire services such as laundromats, grocery

or supply stores. Development activities restricted to construction of interval usage RV or tent pads, utility poles, limited sewerage and waterlines, on-site sewage treatment plants, and other supplies and services capable of supporting no more than 100 persons, or 25 developed sites, per unit, and not more than 10 such units/section. Petroleum dispensing and storage facilities if included require mandatory Department of Natural Resources Management approval, permits and guidelines, and may be emplaced only under allowable zoning presently existing on site.

16. AEROREC

AERIAL

RECREATION

Part or all of a section is suitable for the development of a field and facilities for single or twin-engined fixed, or rotary wing, aircraft, including ultralight craft, and balloons or other lighter than air vehicles, hanggliders and sailplanes, provided that in any case passenger capacity shall not exceed 6 persons including the pilot, and such craft shall be flown primarily for pleasure and not for hire or other commercial purposes. VFR flight rules shall apply at all times. Developmental activities may consist of no

more than 2 hard, permanent or semi-permanent concrete or graded earth runways, not to exceed 2000 feet in overall length, limited tie-down or other storage facilities of a temporary nature, confined petroleum storage and dispensing depots, and such other structures and facilities to properly service or maintain the aircraft while in site and expressly for short intervals.

17. ORVREC

OFF-ROAD-
VEHICLE
RECREATION

Part or all of a section shall be left in its natural state but is suitable for the use of swamp buggies, airboats, jeeps and other 4-wheel drive vehicles, all-terrain cycles (but specifically excluding Motocross and all other racing or cross-country vehicles) and other off-road vehicles employed primarily for pleasure and not for hire, racing or other commercial usage. Developmental activities would include construction or maintenance of trails and pathways, fenced and protected areas, open picnic grounds and other places for passive recreation (PASSVREC) (q.v.). No permanent or temporary housing, garages, or structures for repairs, maintenance or any other purposes shall be established, nor shall

18. AMUSPARK

AMUSEMENT
PARK

any petroleum storage or dispensing depots be incorporated within.

Part or all of a section is suitable to the development of a theme or amusement-type of park or area, consisting of conveyances, rides, games, attractions, support services and ancillary facilities representative of a given theme, amusement concept, or a zoo or other enclosed wildlife facility or display, or other outdoor recreational activity. Developmental activity would include area land modification and preparation, employment of certain discharge activities potentially detrimental in whole or in part to the surrounding ecosystem, and construction of rides, mechanical contrivances, enclosed rinks, eating establishments, theme or other related housing and constructional activities appropriate to the facility. No permanent housing, hotels, or other domiciliary structures, whether commercial or private, shall be included, and all development will require Department of Natural Resources Management approval, permits, and mandatory guidelines and environmental monitoring services.

19. GOLFCORS GOLF COURSE Part or all of the section is suitable or will support development of a private or public golfcourse not to exceed 18 holes overall including all related facilities supporting same. Developmental activities which may involve large-scale land modification, implementation of various discharge categories, and construction of permanent structures, may prove inimical or completely destructive to the surrounding ecosystem. No such development shall occur without prior Department of Natural Resources Management approval, permits, and guidelines including mandatory monitoring of environmental impacts during all phases of construction and for a period of five years or longer thereafter.
20. OTHERREC OTHER RECREATIONAL Part or all of the Section is suitable
ACTIVITIES for employment or development of recreational activities not specifically defined or covered in the preceding list. Developmental activities in regard to such recreation may or may not be inimical to the surrounding ecosystem and would require judgement on its individual merit.
21. SHELFISH SHELLFISHING Part or all of the section is suitable for, or supports habitats that contain shellfish, specifically oysters, clams,

scallops, mussels, crabs, shrimps, fresh-water crayfish, or spiny lobsters in quantities that may be sufficient for seasonal commercial exploitation, or individual private consumption. Developmental activities should be confined to those which have no, or only moderate adverse environmental impact on the habitats and biotopes involved, or which would enhance and not result in inordinate depletion of, the shellfishery stocks either directly or indirectly.

22. NETTING

NETTING

Part or all of the section is suitable for commercial or private fishery exploitation of non-sport or non-game finfish, by the use of seine, cast, or gill nets, but excluding any type of trawl, dredge, or other dragged bottom-sweeping device. Finfish may consist of those commercially valuable species such as mullet, anchovies, sardines, various species of baitfish such as spot, pinfish, shiners, minnows, or any other non-sport or non-game marine, estuarine, or saltwater species for which a commercial or private individual market exists. Developmental activities should be confined to those which have no, or only moderate adverse

environmental impact to the habitats or biotopes involved, or which would enhance and not result in inordinate depletion of, the finfish stocks either directly or indirectly.

23. HUSBNDRY ANIMAL HUSBANDRY Part of all of the section is suitable for the commercial or private utilization of livestock such as cattle, swine, horses, or other grazing animals maintained for food, dray, sporting or recreational purposes, using pasturage, feedlots, training or racing tracks, bridle paths or trails, or for the maintenance and breeding of such animals, also to include domestic pets such as dogs, cats, and other animals normally kept as household pets, either in kennels, studfarms or in other enclosed maintenance facilities. Developmental activities would be those having moderate to severe environmental impact either as a direct result of establishing facilities or pasturage, or through the consequences of grazing, herd movement, or other activities directly resulting from physical or biological activities by the livestock being maintained.

24. HORTICUL

HORTICULTURE

Part or all of the section is suitable for the establishment and/or maintenance of horticultural facilities or grounds for the commercial production of plants, such as nurseries, garden or agricultural supply operations, tree farms (excluding forestry, pulping, mulching, or other timber operations, TIMBEROPS q.v.), ornamental or household plants, commercial flower production, and sod or lawngrass farms. Developmental activity would be those resulting in low to intermediate adverse environmental impact as a consequence of nursery or garden-oriented concerns, or activities producing moderate to severe impact on the existing ecosystem as a result of land modification or constructional activity. Activities which are not inordinately detrimental or which enhance the existing environment would be encouraged.

25. AQUACULT

AQUACULTURE

Part or all of the section is suitable for the establishment and maintenance of aquaculturing or mariculturing facilities such as finfish farms, turtle, alligator, crocodile or other aquatic reptile hatcheries, invertebrate aquatic animal rearing facilities for molluscs, crustaceans and

other non-chordate organisms, or the culturing of other living aquatic organisms including freshwater and marine algae, or other hydrophytes. Developmental activities would produce adverse environmental impacts ranging from small or negligible to moderate or severe depending on the extent of modification of the surrounding ecosystem, and the impact of nutrients, fertilizers, herbicides or pesticides into the groundwater table and the associated freshwater estuarine or marine environment.

26. PADCULT

PADDY CULTURE

Part or all of the section is suitable for the establishment and production of paddy-associated or terraced-farming crops such as rice and related water-cultured grains or produce. Developmental activities would produce moderate to severe adverse environmental impacts on the surrounding ecosystem depending on the amount of land modification, discharge and nutrient-pesticide input for the area involved. This category which involves surface-water retention ponds and nutrient and pesticide impoundment, should be reserved for lands of marginal productivity in which the extant ecosystem

has already been severely modified or destroyed, and which would have minimal environmental impact on contiguous properties.

27. ORCHARDS

ORCHARDS

Part or all of the section is suitable for the establishment and maintenance of commercially valuable or exploitable fruit, nut, seed, sap, leaf, root, or bark-producing trees. Operations would include citrus and other fruit groves for fruits, juices or oils, turpentine, resin and other commercially important sap production. Developmental activities would produce moderate to severe adverse environmental impacts depending on the amount of land modification involved, amount of ground water usage, and the requisite type of horticulture used to ensure orchard productivity. Nutrient and pesticide loading to adjacent groundwaters or estuarine or marine environments is presumed to be substantial and would require careful planning for optimum resource management and minimum environmental impact.

28. VINICULT

VINICULTURE

Part or all of the section is suitable for viniculture for the production of grapes, or other fruit-bearing vines, and for

byproducts normally associated with this activity. Developmental activities will produce moderate to severe adverse environmental impact, depending on the amount of land modification and amount of groundwater involved and the requisite types of vinicultural activities needed to ensure productivity. Nutrient and pesticide loading to adjacent groundwaters or estuarine and marine environments may be substantial and would require mandatory monitoring for optimum resource management and to lessen adverse impacts on adjacent or related ecosystems.

29. FARMING

FARMING

Part or all of the section is suitable for cultivation and production of commercial crops including vegetables, grains, groundbased fruits such as melons, or tubers and related produce. Developmental activities will produce severe to catastrophic adverse impacts on existing ecosystems as a consequence of agricultural field establishment, plowing, tilling, planting, fertilization, pesticing, and harvesting. Environmental impacts on adjacent areas will range from moderate to severe depending on the amount and extent of land

modification, and the input and/or retention of fertilizers and biocides, depletion or pollution of groundwater resources, and modification of historical water flowways. Owing to the drastic alteration of land area, and the subsequent environmental damages, this category must be given careful consideration before recommendation, and will require mandatory monitoring before and during implementation. Adequate safeguards to protect adjacent ecosystems must be ensured.

30. TIMBEROP

TIMBER OPERATIONS

Part or all of the section is suitable for timber or tree management operations, including pulpwood for paper or fermentation, cordwood, boardwood or other lumber usage, mulching and other bark and trunkwood use, and any other operation involving the selective, partial or clear-cutting of large stands of single species of trees. Developmental activities will have severe to catastrophic adverse impacts on existing and adjacent ecosystems, involving major or complete ecosystem destruction with resulting environmental consequences. This category should be employed only with extreme care

and requires mandatory monitoring during all phases of operations. Mitigation of part or all of habitat destruction may be required when environmental damage intrudes on adjacent ecosystems, groundwater supplies, existing wildlife, or other environmental parameters.

31. LANDSCAP

LANDSCAPING

Part or all of the section is suitable for landscaping or horticultural modification, including transfer, removal and replacement of contained native and non-native vegetation, and associated land modification, contouring, and related landscaping architectural activities for purposes of enhancing the ecological and/or aesthetic value of an area. Developmental effects will range from benign or moderate to severe environmental impact depending on the magnitude of land and horticultural modification employed. Activities which utilize, enhance, or encourage the propagation and maintenance of native vegetational species would be encouraged.

32. VEGREMOV

VEGETATION
REMOVAL

Part or all of a section may have naturally occurring (but not necessarily native or indigenous species) vegetation which may be removed either entirely or in part, by excavation, pruning, or other

non-chemical or non-pyrogenic means, provided that no greater than 50% of the total native vegetation growing in the section, or that portions in each subsection add up to no more than 50% of the total native vegetation overall are removed, and provided that such removal is for purposes other than landscaping. Exception may be made when it can be demonstrated that greater than 50% of the naturally occurring vegetation is composed of noxious exotic species particularly any species of Casuarina (Australian Pine), Melaleuca (Punk or Cajeput tree), or Schinus (Brazilian Pepper). Development activity will have benign to severe adverse environmental impact depending on the extent of vegetation removed and the methods employed in removal. Developmental activity which avoids or limits damage to native species and which employs mitigation using native species will be encouraged.

33. WATERWEL

FRESHWATER

WELL DRILLING

Portions within a section may be compatible for the drilling of shallow or deep-aquifer freshwater wells for commercial, private, municipal or county purposes. Developmental activities will

range from benign or no adverse environmental impact to moderate or severe impact depending on the size and depth of the well and the amount of water removed from the standing water table, as well as the amount of saline intrusion caused by well drawdown, or as a consequence of extended drought conditions or failure of the drilled aquifer to adequately or consistently recharge itself, thereby affecting both hydrological and ecological systems. Such activities should be carefully monitored and regulated, with DNR management permits and guidelines mandatory.

34. EARTHMOV

EARTH MOVEMENT

Part or all of a section may be suitable for topographical or physiographical dry land surface modification including bulldozing, excavating, ditching, swale formation, water course establishment, or other activities which emplace or remove surface and subsurface sediments and substrata, provided that such modification does not take place in conjunction with, or as a consequence of dredge and fill operations (q.v.). Developmental activity will range from moderate to severe adverse impact depending on the extent and magnitude of modification, and the methods

employed. Activities which avoid, or spare, as much as feasible of naturally occurring native habitats and biotopes will be encouraged. Activities in pristine, relatively undisturbed, or RFD or RUE areas will be strongly discouraged, or will require Department of Natural Resources Management permits and mandatory guidelines with possible mitigation involved.

35. LANDFILL

LANDFILL

Part or all of a section may be suitable for sanitary landfill purposes, provided that such fill can be shown to be non-hazardous or is not detrimental to the immediate environment, and that future breakdown of such fill, or its potential future interaction with environmental parameters will not result in noticeable or harmful degradation to the immediately surrounding ecosystems. Developmental activities will produce from moderate to severe adverse impact depending on the extent of the fill area and the type and methodology of emplacement of the fill material. DNR management permits and mandatory monitoring will be required during fill emplacement and for a period

36. STORAGE

SURFACE OR
SUBSURFACE STORAGE

of 5 years after cessation of all fill activities.

Part or all of a section may be suitable for emplacement of surface or subsurface storage containers, for petroleum, chemical, biological or other substances used in either a commercial or private capacity, and which may or may not be drawn upon for future use, or which may or may not be permanently sealed against any future use. This category does not include septic tanks or other sewerage systems (q.v.) or the use, transport or storage of any waste substance or refuse which is demonstrably toxic to any form of life or which has been, or can be shown to be, detrimental to the quality of the environment and which may properly be labelled as hazardous waste (q.v.).

Developmental activity will have benign to severe or catastrophic adverse impact, depending on the size of the storage facility, its means of emplacement, and its present and future container integrity. Developmental use in this category requires an EIS, DNR Management permits, and mandatory monitoring during use,

for initiation or continuation of commercial mining operations such as limerock, phosphate, or other mineral extracting methods, and which might employ the use of heavy machinery, explosives, or other devices for excavating or reducing the mined material. Developmental activities will range from severe to catastrophic adverse impact on the immediate environment and adjacent ecosystems, and may continue for an unknown period of time after mining operations have ceased. An EIS and DNR Management permits will be required, and guidelines and monitoring before, during, and for a period of 5 years after cessation of all activity will be mandatory. In addition, complete mitigation and restoral of the mined area is mandatory.

39. LANDCLER

LAND CLEARING

Part or all of a section may be suitable for land clearing operations which involve the partial to complete removal of all surface vegetation, grading of all topographical contours and alteration or removal of surface soils present, provided such operations are not for landscaping or horticultural purposes, but are employed in preparation of a site, for constructional, roadway, highway, agricultural or

other major site-alteration activities. Developmental activities will range from severe to catastrophic and will result in the total or nearly complete annihilation of the contained ecosystems, and produce moderate to severe affects on adjacent ecosystems. An EIS, and DNR Management permits and guidelines are required; mitigation and restoral may be required depending on present use and zoning, should a rezoning application be filed.

40. OTHERMOD

OTHER MODIFICATION

Part or all of the section is suitable for employment or utilization of land modifying activities not specifically defined or covered in the preceding list. Developmental activities may be of varying detriment to contained or adjacent ecosystems and each would require judgement on individual merits and assessment of actual or potential environmental degradation.

41. WATERFLO

WATER FLOW AREA

Part or all of the section is suitable for the construction, maintenance, enhancement, or modification of swales, channels, creekbeds, streams, rivers and sheetflow areas, or other naturally occurring watercourses or water conduit structures to maintain historical water passage, alleviate flooding, or conduct water from

one naturally occurring aquatic body to another. Developmental activity would consist of minimal grading or excavating or other topographic or physiographic modification to provide for drainage or passage and would range from moderate to severe adverse impact. Activities which utilize existing contours and historical flowways would be encouraged, as would activities which do not, or have only minimal adverse impact on large sheetflow and shallow aquifer regions.

42. SEWERAGE

SEWER OR STORM

DRAIN INSTALLATION

Part or all of the section is suitable for the emplacement of sewer, water, or storm drainage systems for the express purpose of providing water to, or conducting water away from certain areas, and conveying such water to appropriate treatment, storage, or disposal facilities. Such activities normally have low to moderate adverse environmental impact. Developmental activities would include excavation of appropriate ditches and other subsurface facilities normally associated with water or sewerage lines. Activities which cause minimal environmental damage during construction and are shown to be reasonably fail-safe to the

surrounding ecosystem after emplacement and during usage thereafter, will be encouraged.

43. AGRUNOFF

AGRICULTURAL RUNOFF

Part or all of the section may be suitable for the passage, or conducted flow, or storage of agricultural runoff, such as irrigation or fertilizer or pesticide /herbicide containing waters or fluids associated with farming, produce or grove operations, silage disposal, containment ponds or catchbasins associated with dairy, livestock or other farming operations, and refuse or waste products from pastureland, or animal husbandry activities whether private or commercial in scope. Such activities may range in adverse impact from low to severe, depending on prevailing environmental conditions. Developmental activities would include construction or excavation of appropriate facilities normally associated with agricultural operations under consideration. Activities which have a minimal or no adverse impact on the environment would be encouraged, as would construction or use of containment facilities to prevent eutrophication of adjacent or nearby naturally occurring water bodies.

44. PSTCNTRL

PEST CONTROL

Part or all of the section may be suitable for the employment of chemical or biological agents or activities required to contain, control or eliminate larvae or adults of those organisms recognized as pests or vermin, and which comprise a hazard to agricultural, horticultural, aquacultural, commercial, recreational, or residential activities or lifestyles, by virtue of their direct or indirect effects on, or by the production of disease or other trauma to, the health and general welfare of humans, livestock, pets or other native organisms whether animal or plant. Any such activities would invariably have adverse effects which may range from low to severe, depending on methods and substances employed. Developmental activity may consist of application of appropriate sprays, dusts or other materials, introduction of biological controls such as predators or disease-inducing organisms, or physical modification or other destruction of habitat with which the targeted pest or vermin is associated. Activities, agents and methodologies which have the least adverse impact to any or to

45. SOLIDWST

SOLID WASTE
PRODUCTION AND
DISPOSAL

the majority of organisms within the total ecosystem involved would be encouraged.

Part or all of the section may be suitable for the disposal or storage of solid waste materials such as concrete building materials, scrap metal, or other non-degradable and non-organic refuse, but excluding commercial waste fluids, industrial waste fluids and materials, and any material or substance which can properly be classified as hazardous waste (q.v.).

Solid Waste disposal by its very nature would have a noticeable detrimental impact on the environment, ranging from moderate to severe in extent, depending on the materials, their means of disposal and their ultimate containment. Developmental activity would consist of providing access ways to the site, excavation or other forms of emplacement of solid waste materials, and appropriate means of covering or containing the emplaced materials. Activities which have a moderate adverse effect on the environment would be encouraged.

46. COMMRWST

COMMERCIAL WASTE
PRODUCTION AND

Part or all of the section may be suitable for the transport, storage,

DISPOSAL

treatment or disposal of commercial fluid waste, including chemical or biological products which may be toxic in part or in whole, to the immediately surrounding environment, and which thus would require special containment or treatment conditions to ensure the safety of persons, wildlife, native vegetation, or other parts or all of the ecosystem. Commercial waste storage because of its nature will invariably have some detrimental effect on the environment ranging from low to severe. Developmental activities would include those associated with construction, maintenance, and storage or disposal facilities involved with waste treatment. Activities which are designed to minimize environmental degradation would be encouraged.

47. INDUSWST

INDUSTRIAL WASTE
PRODUCTION AND
DISPOSAL

Part or all of the section may be suitable for the transport, storage, treatment or disposal of industrial waste fluids or substances resulting from industrial operations or concerns, and which may be partially or totally toxic or otherwise harmful to the immediately surrounding environment, including surface and subsurface waters, and to any or all

living organisms. The degree of environmental degradation associated with industrial wastes depends on the type, toxicity, method of production, transport, treatment or disposal, storage conditions and the short and long-term cumulative effects of such substances on the ecosystem. Such effects may range from moderate to catastrophic. Developmental activities would include those associated with the construction of industrial operations producing such wastes, and their subsequent treatment thereafter. Activities which provide maximum containment, with the highest degree of fail-safe operation or security, and which are of lowest possible detrimental effect on the present and future health of the immediately surrounding ecosystem will be encouraged.

48. HAZRDWST

HAZARDOUS WASTE
 PRODUCTION AND
 DISPOSAL

Part or all of the section may be suitable for the production, storage, or treatment of certain chemical, radioactive or biological materials or substances which, owing to their extreme toxicity to humans, wildlife or to the general environment need extreme precautions and extraordinary care in handling, use,

storage and disposal. Environmentally detrimental effects may range from severe to catastrophic depending on the nature of the material and the extent and magnitude of exposure to the ecosystem, wildlife or humans. This category requires extreme care in its implementation and should not be permitted without a variance from the County Commission, and a full EIS.

49. DPINJECT

DEEP WELL INJECTION

Part or all of the section may be suitable for the storage or emplacement by deep well injection of hazardous or environmentally damaging materials or substances. Environmentally detrimental effects ranging from severe to catastrophic if such substances were stored or maintained at the surface, may continue after injection, or such effects may be mitigated to some or a great degree by utilization of the deep well method of storage. This category should be employed only after careful consideration of long-term effects of such substances to shallow and deep aquifers, complete hydrological and geological evaluation of the effects of the injected substance, as well as the determination that no viable alternative exists for their storage. Implementation

50. OTHERDIS

OTHER DISCHARGE
ACTIVITIES

of this category requires a variance from the County Commission and a complete EIS. Part or all of the section is suitable for discharge activities not specifically defined or covered in the preceding listing, and which may vary in the amount of adverse impact to the environment depending on their type, mode of employment, or actual or residual effects either immediately or cumulatively over a specific period of time.

51. PATHWAY

PATH OR UNIMPROVED
TRAIL WAYS

Part or all of a section is suitable for the construction, maintenance, or enhancement of naturally occurring or artificial footpaths, biketrails, jogging paths, nature trails or walkways, boardwalks, scenic overlooks or byways or other access routes of a non- or semi- permanent nature, and which are restricted to foot, bicycle or other non-motorized vehicular traffic, and in which the prime purpose is to minimize constructional or roadway damage to the immediate environment. Developmental activities would be restricted to limited landclearing and vegetational removal, and to those earthmoving or other activities immediately necessary for pathway construction or

maintenance. Adverse impacts would range from none to benign to low or moderate depending on the extent, size, and construction methodology of the pathway. Use of environmentally or ecologically compatible constructional materials and methodologies would be encouraged.

52. ROADWAY

ROADWAYS, AND
STREETS

Part or all of a section is suitable for the construction and maintenance of streets, roadways or other passageways established primarily for motorized vehicular traffic either private or commercial in nature, and which are meant to provide a means of access or transportability from adjacent sections to or through the section in question. Developmental activities will range from low to moderate in adverse impact, depending on the length, width, and areal extent of the roadways, their method of emplacement and maintenance, and the type of constructional materials employed. Activities that would minimize damage to the immediately surrounding environment, including mitigation of runoff, enhancement of sheet or tributarial flow within the section, avoidance of ecologically sen-

53. UTILITY

UTILITY CONSTRUCT-
ION AND EASEMENTS

sitive areas, and use of environmentally conscious engineering would be encouraged.

Part of the section is suitable for the establishment of public or private utility construction or easements, in which only a moderate amount of alteration is required for buildings, accessways, or associated structures. Developmental activity would include erection of substations, powerlines, telephone poles, high-tension towers, microwave towers, radio or television transmitting or receiving antennae or towers, and related structures. Also included are construction of water treatment and sewerage facilities, polishing ponds, catch or aeration basins and other structures associated with municipal or PUD water and wastewater treatment.

Developmental activity would range from low to moderate depending on the amount of land modification and landclearing or vegetational removal required, or to the amount of maintenance of easements associated with such activities. Development and construction which utilizes naturally occurring features would be encouraged.

54. SINGLFAM

SINGLE FAMILY

Part or all of the section is suitable

RESIDENTIAL HOUSING for the construction of single-family residential housing, including townhouses, or mobile home communities, utilizing appropriate densities to be determined by the Department of Natural Resources Management and existing zoning. Developmental activities would include any and all phases of construction and landscaping of housing, whether in estate or planned unit developments. Such activities will invariably have a moderate or severe adverse impact depending on the amount of land affected and the means used to clear it and the types of housing and their construction. Activities which are environmentally conscious, particularly those utilizing existing natural features or enhancing native ecosystems would be encouraged. Mitigation may be required in some instances, guidelines and environmental monitoring will be mandatory in developments larger than 10 acres, and an EIS may be required in any case if so deemed by the Department of Natural Resources Management.

55. MULTIFAM

MULTIFAMILY

Part or all of the section is suitable

RESIDENTIAL HOUSING for the construction of multifamily residential housing, such as townhouses,

apartment buildings, condominiums, co-operatives, and other multifamily dwelling units including hotels, motels, and other multiunit dwellings built for commercial lodging purposes. Developmental activities associated with this construction will range from moderate to catastrophic in adverse impact depending on the extent of the area modified and the magnitude of destruction that results either directly or indirectly from such modification, particularly before and during any or all phases of construction. Development in this category which emphasizes or enhances the natural environment, and includes part or most of the native vegetational ecosystem, as well as that which involves minimum alteration to topographic or physiographic parameters in the vicinity will be encouraged. Any such development will require an EIS and permits, and guidelines from the Department of Natural Resources Management.

56. COMMERCE

COMMERCIAL

CONSTRUCTION

Part or all of the section is suitable for the establishment of commercial, non-industrial, enterprises or businesses, including professional associations, restaurants and food service

establishments, medical or technical services, small proprietary ownership, and the like, but not including commercial operations requiring above or under ground storage facilities such as automobile service stations, manufacturing facilities, or other small or large industry. Developmental activities would include small or large scale land and vegetational alteration, construction of suitable structure to house the businesses, emplacement of parking facilities, roadways, and utility easements and services.

Adverse impacts will range from moderate to severe depending on the magnitude of constructional activity and the type of activity employed. Commercial construction which maintains or enhances naturally occurring vegetation, topography, or other environmental features would be encouraged.

57. HYDROCON

HYDROLOGICAL
OR HYDRODYNAMIC
CONSTRUCTION

Part or all of the section is suitable for the establishment or construction, modification or repair of structures specifically designed to retard, inhibit, or prevent waterflow or water ingress into a given area, to stabilize land subject to water-induced erosion by the employment of

seawalls, groins, bulkheads, or other stabilizing structures, or to channel or direct waterflow from one portion within the section to another by use of emplaced structures or confining canals, sluices or raceways. Included in this activity is the construction of bridges or viaducts across standing or flowing bodies of water. Developmental activity would include constructional activity using poured concrete, driving of pilings, burying of culverts, erections of lift stations weirs, or other means of ensuring continual directional waterflow, and other hydrodynamically associated construction activity, not specifically employing natural, minimally disturbed or undisturbed flowways. Adverse impacts would range from moderate to severe depending on the amount and type of construction employed and the modification of land topography and vegetational cover that resulted from such activity. This activity requires careful monitoring to ensure that any such construction will not have direct or indirect short or long-term effects on the immediate or adjacent ecosystem.

58. HIGHWAYS

HIGHWAY
CONSTRUCTION

Part of the section has been shown feasible for construction of paved, highspeed, highway or turnpike. Developmental activity would include grade construction, fill emplacement, land clearing and topographical alteration, interruption of historical continual or seasonal waterflow patterns, and concomitant affects on the adjacent ecosystem and contained wildlife. Adverse impacts will range from moderate to catastrophic over a limited area in the immediate vicinity of the highway and the associated shoulder and berm, and from low to moderate at increasing distances from the main roadway. In addition, both short and long term ecological effects will occur owing to highway presence, vehicular use, associated petroleum/petrochemical runoff, interruption or alteration of waterflow on plant ecosystems, and impact on traditional wildlife migrational or range routes, as well as having direct effects on local wildlife population owing to vehicular hazards. This activity will require careful monitoring of all development directly impinging on the ecosystems in the immediate vicinity, adherence to

guidelines, filing of a detailed EIS, and possible mitigation or monitoring of environmental subsequent to completion of highway construction.

59. MARINAS MARINA
 CONSTRUCTION

Part of the section has been shown feasible for the construction of a salt or freshwater marina or boat basin, including facilities for live-aboard as well as transient boats, yachts or other water vehicles, and storage and launching facilities for same, but specifically excluding boatyards, shipyards, or other major boat, yacht, or water vehicular repair facilities, industries, or services. Developmental activity would include dredging or excavation of tidal or subtidal lands, emplacement of pilings for dock or slips, construction of seawalls and bulkheads for stabilization of adjacent land, erection of subsidiary buildings for administrative or minor service purposes, concessions, ancillary small nautically-oriented businesses, placement of necessary utility lines and conduits for electrical, telephone and water supply, and construction of associated land vehicle parking areas and access points. Adverse impacts will range from

severe to catastrophic given the nature of marina construction, and the necessity for disturbing supratidal and subtidal lands. In addition, environmental disturbances may be expected to continue for varying periods of time after construction has been completed, or even for the lifetime of the marina, owing to continual influences produced by watercraft, waste fluids, spillage or leakage, and by disruption at least in part of naturally occurring tidal flow, currents, or cycles as a consequence of shoreline hardening, pier, wharf or dock construction, channel dredging and maintenance, and other activities impinging on the immediately surrounding marine or freshwater environment. Constructional activities will require mandatory Department of Natural Resources Management permits and guidelines, a continual monitoring during all phases and for a period of 5 years after completion of all activity, and for an additional 5 years commencing from the point of initiation of additional activity, the filing of a detailed EIS, and possible mitigation of environmentally derogatory effects.

60. OTHERCON OTHER CONSTRUCT-
 IONAL ACTIVITIES
- This activity category is reserved for constructional activities not specifically covered, defined, or delineated in the above listings, or which may require modification or special consideration owing to the type, methodology, magnitude or extent of construction, or which by their nature may have unusually severe or debilitating effects on a given ecosystem within the section.
61. MAINTNCE MAINTENANCE
 DREDGING
- Part of the section may be suitable for maintenance dredging of existing canals, channels, passes, or other maintained waterways, public or private, within recognized navigable waters. Such activity is specifically directed toward maintaining depth and/or channel configuration deemed necessary for ensuring safe passage of any watercraft which normally use the waterway under consideration, but specifically excludes such dredgings to deepen, widen or otherwise modify any channels previously existing. Developmental activity would normally include emplacement of necessary pipelines, spoil dispersal equipment, dredging machinery or vessels, and associated equipment.
- Adverse environmental impacts would range

from moderate to severe depending on the amount of dredging required, the volume of material removed or displaced, the emplacement sites and methodology employed for resultant spoil, and concomitant ecological effects resulting from increased siltation, water turbidity, benthic community disturbance sediment overturn, and related perturbational effects on subtidal, and intertidal areas, as well as biological or physiological effects resulting from emplacement of spoil on adjacent submerged or upland areas. This activity requires careful and continual monitoring before, during, and for a period of 1 year after completion, permits and guidelines from Department of Natural Resources Management and other governmental agencies, and possible mitigation of environmentally detrimental aspects resulting from the activity. Extensive maintenance, longer than 1 mile or requiring removal of greater than 20,000 cubic yards of fill require detailed EIS.

62. DTCHDIKE

DITCHING OR DIKE
CONSTRUCTION

Part or all of the section may be suitable for the employment of ditching or diking to ensure impoundment of waters in

wetlands or lagoonal areas as a means of mosquito control. Excluded from this activity category are any land alteration activities involving excavation of ditches, channels, or other water courses, or the construction of berms, grades or other topographically defined water-retention structures not specifically directed toward mosquito control or abatement activities. Developmental activities would include the employment of dragline, dredging cranes, rotary ditchers, bulldozers, backhoes, tractors, or other mechanical devices, whether land or waterborne, and associated equipment to carry or disperse material excavated. Adverse environmental impacts would range from low to severe, depending on the magnitude and areal extent of the ditching or diking, the wetland hydroperiod that may be affected, and concomitant effects on the contained or associated ecosystems and wildlife. Additional effects may encompass one or more of those already delineated in the category MAINTNCE (q.v.). This activity will only be permitted following receipt and approval of a detailed EIS, permits, and guidelines

from the Department of Natural Resources Management and other appropriate governmental agencies, and upon the establishment of a continual monitoring program directed toward determining the effect of the activity during and after its completion. Mitigation may be required including complete restoration of the ditched or diked area to its previous state if it can be shown that such activity was or will be detrimental to the surrounding ecosystems.

63. RENURISH

BEACH OR SHORE-
LINE RENOURISHMENT

Part of the section may be suitable for renourishment of beach or shoreline which has eroded or otherwise been lost specifically and only as a consequence of natural forces whether climatic, oceanographic or hydrological, operating over a period of time. Developmental activity would include emplacement of required dredging equipment and vessels, associated pipelines, and related machinery. Adverse environmental impact would range from low to moderate on supratidal onshore areas, moderate to severe on nearshore tidal/subtidal areas, and catastrophic on the borrow area offshore from which dredged renourishing material is excavated. This

category requires a mandatory monitoring program initiated 6 months before activities start, and continued during, and for a period of 3 years after such activities have ceased, to determine environmental recovery. In addition a detailed EIS, permits from DNRM and appropriate governmental agencies, and guidelines directed toward best and highest use of renourishment material onshore will be required. Mitigation of any area adversely affected during or after cessation of activity through activities of the operator, whether negligent or not, may be required and can be assessed against both the operator and owners of the property being renourished.

64. LANDSTAB

LAND STABILIZATION

Part or all of a section may be suitable for stabilization of lands with the potential for, or which actually may be undergoing, loss as a result of climatic oceanographical or hydrodynamical forces operating on them. Included in this category are emplacement of shore hardening or stabilization structures, including seawalls, bulkheads, groins, breakwaters, jetties, or other wave or current-modifying devices, the positioning or

maintenance of riprap or other land-hardening or supporting construction, or the construction of dikes, levees, or other water-exclusionary or control earthenworks. Specifically excluded is ditching or diking (DTCHDIKE) in which the primary result is for control or abatement of mosquitoes (q.v.). Developmental activity will include the emplacement or employment of suitable land or waterborne equipment and machinery for constructing or positioning shore-hardening materials, including draglines, dredges, cranes, caissons and similar constructions, and other associated equipment or devices. Adverse environmental effects will range from moderate to severe and will depend on the amount of modification previously existing in an area, the type, methodology, magnitude and areal extent affected by the activity, as well as subsequent environmental affects resulting from such activity. A detailed EIS, permits and guidelines from Department of Natural Resources Management and appropriate governmental agencies is required, as is mandatory monitoring during and after completion of any project for a period of

3 years. Mitigation may be required if it can be shown that additional environmental damages occurred as a direct or indirect result of negligence by the operator, and may also be assessed against owners of the property being stabilized.

65. NEWCANAL

NEW CANAL

CONSTRUCTION

Part of a section may be suitable for the construction and maintenance of a canal specifically designed to remove excess water from a given area in the section and conduct it to another part of the section or into adjacent sections or bodies of water. Excluded is the construction of new canals as part of any subdivision or PUD which are constructed primarily as aesthetic enhancements for same, or in which the prime purpose is not the removal of excess water. Developmental activity would include use of dragline or other dredging devices and excavating equipment, both land and waterborne. Adverse environmental impact would range from moderate to severe in the vicinity of the constructed canal, and from low to severe in adjacent areas, depending on the size of the canal, amount of water carried, and the effects of water-removal on adjacent ecosystems and associated water tables.

This category requires careful monitoring during and after construction, a pre-construction detailed EIS and biological and hydrological survey, and possible mitigation of effects caused by actual canal construction or the results of its water removal.

66. NEWLAND

NEW LAND
CONSTRUCTION

Part of the section is suitable for the establishment of new land area using dredge and fill operations to extend the margin of a land parcel into a contiguous or adjacent body of water, or to create new islands by the emplacement of dredge spoil or other fill within the confines of a body of water where no land previously existed. Specifically excluded from the category are dredge and fill operations resulting in subdivision creation (SUBDIVOP, q.v.) by finger-canal and peninsular fill areas along landward margins of aquatic areas. Developmental activities are similar to those occurring in MAINTNCE, RENURISH and LANDSTAB categories (q.v.). Adverse environmental impact would range from moderate to severe, or locally catastrophic where emplaced fill materials affect ecosystems or contained wildlife. Indirect or

long-term effects from the emplaced fill may occur through sediment or turbidity increases, leaching of biological or geochemical products, modification of current or tidal regimes, and biological or physiological changes in adjacent benthic and supratidal communities. This category requires an EIS, and mandatory monitoring for a period of 6 months prior, during, and for three years after cessation of activity. Mitigation may be required to reestablish, insofar as is possible, the ecosystems and communities extant at the time of dredging.

67. CAUSEWAY

CAUSEWAY

CONSTRUCTION

Part of a section may be suitable for the construction of a causeway capable of supporting vehicular traffic, connecting two or more dry land areas with each other across wetland, baybottom, or open water areas. Developmental activity would be similar to that delineated for LANDSTAB and NEULAND categories (q.v.). Adverse environmental effects would range from locally catastrophic, to severe or moderate depending on the distance of an area from the causeway proper. Major effects would occur in interruption of or modification of current flow patterns,

tidal regimes, and hydrological forces previously existing in the affected water body, as well as sedimentary, turbidity, and water chemistry alterations owing to causeway fill emplacement. Physiological and biological impacts would occur to varying degrees on associated benthic, intertidal and to a lesser extent supratidal communities, and may be short or long term. This category requires an EIS, a mandatory 6 month pre-construction activity monitoring program, and a follow-up program lasting 3 years in order to ascertain any detrimental effects on the benthos and related ecosystems. Department of Natural Resources Management guidelines, and permits, plus permits or approval from all appropriate governmental agencies is required. Construction which maintains or enhances existing tidal and current regimes, and which minimizes ecological damage will be strongly encouraged.

68. NEWPASS

NEW PASS OR INLET
CONSTRUCTION

Part of a section has been shown to be suitable for the opening to allow nautical ingress and egress between one body of water and another. This category specifically excludes MAINTNCE and NEWCANAL

tidal regimes, and hydrological forces previously existing in the affected water body, as well as sedimentary, turbidity, and water chemistry alterations owing to causeway fill emplacement. Physiological and biological impacts would occur to varying degrees on associated benthic, intertidal and to a lesser extent supratidal communities, and may be short or long term. This category requires an EIS, a mandatory 6 month pre-construction activity monitoring program, and a follow-up program lasting 3 years in order to ascertain any detrimental effects on the benthos and related ecosystems. Department of Natural Resources Management guidelines, and permits, plus permits or approval from all appropriate governmental agencies is required. Construction which maintains or enhances existing tidal and current regimes, and which minimizes ecological damage will be strongly encouraged.

68. NEWPASS

NEW PASS OR INLET
CONSTRUCTION

Part of a section has been shown to be suitable for the opening to allow nautical ingress and egress between one body of water and another. This category specifically excludes MAINTNCE and NEWCANAL

categories (q.v.) but developmental activities would include those associated with NEWCANAL and NEWLAND dredge and fill activities. The adverse environmental effects in this category may be substantial, ranging from moderate to catastrophic, depending as much on the means employed and areal extent of the affected section as on subsequent hydrological, physiological, and ecological changes resulting from such construction. This category should only be advocated after careful consideration, including a complete hydrological study of current and tidal patterns, wave activity if appropriate, geophysical assessments including sediment transport, sand budgets, barrier island erosional or accretional tendencies if applicable, and any other major physical parameter liable to affect the immediate land area or the connected bodies of water. Biological factors including a survey of all benthic and epibenthic communities, upstream associated ecosystems, and determination if applicable of the effects of salinity variations on the flora and fauna of the region are mandatory. In addition,

scouring and siltational tendencies should be assessed. A detailed EIS, approval and permits from all appropriate governmental agencies, adherence to Department of Natural Resources Management guidelines as appropriate for each area, and the possible classification of this activity as a DRI must all be considered and satisfied before any activity is begun.

69. SUBDIVOP

SUBDIVISION

DREDGE AND FILL

OPERATIONS

Part or all of a section may be suitable for the construction of a subdivision or PUD employing dredging and filling for canal or waterway construction, and use of obtained spoil as fill for land creation or enhancement, along the landward margins of aquatic areas, or within upland areas partially or completely unassociated with any contiguous water body. Developmental activities include those associated with NEULAND, NEWCANAL, and NEWPASS categories. Adverse environmental effects would range from moderate to catastrophic depending on the extent of the area modified, the methodology employed, and the magnitude of construction. Immediate severe to catastrophic impacts would occur on water tables and vegetational ecosystems in land-locked operations, and on benthic

ecosystems in estuarine or marine operations. Long term effects would be dependent on the resiliency of the affected biotope to recover from extensive dredge and fill operations in this category. Activities in this category require a detailed EIS, permits and guidelines, including adherence to a monitoring program established by DNRM for a period of 5 years after completion of all activity, or where mitigational damage can be demonstrated.

70. OTHERD&F

OTHER DREDGE &
FILL OPERATIONS

This category is established to cover any dredge and fill operations not defined in the above listing, or is to be used in special cases involving those so defined where it is deemed that the general categorical definition or descriptor is too broad. Activities and the resultant impacts will depend on the type, extant, and methodology employed.

BOB'S WORK
9/18/85

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