

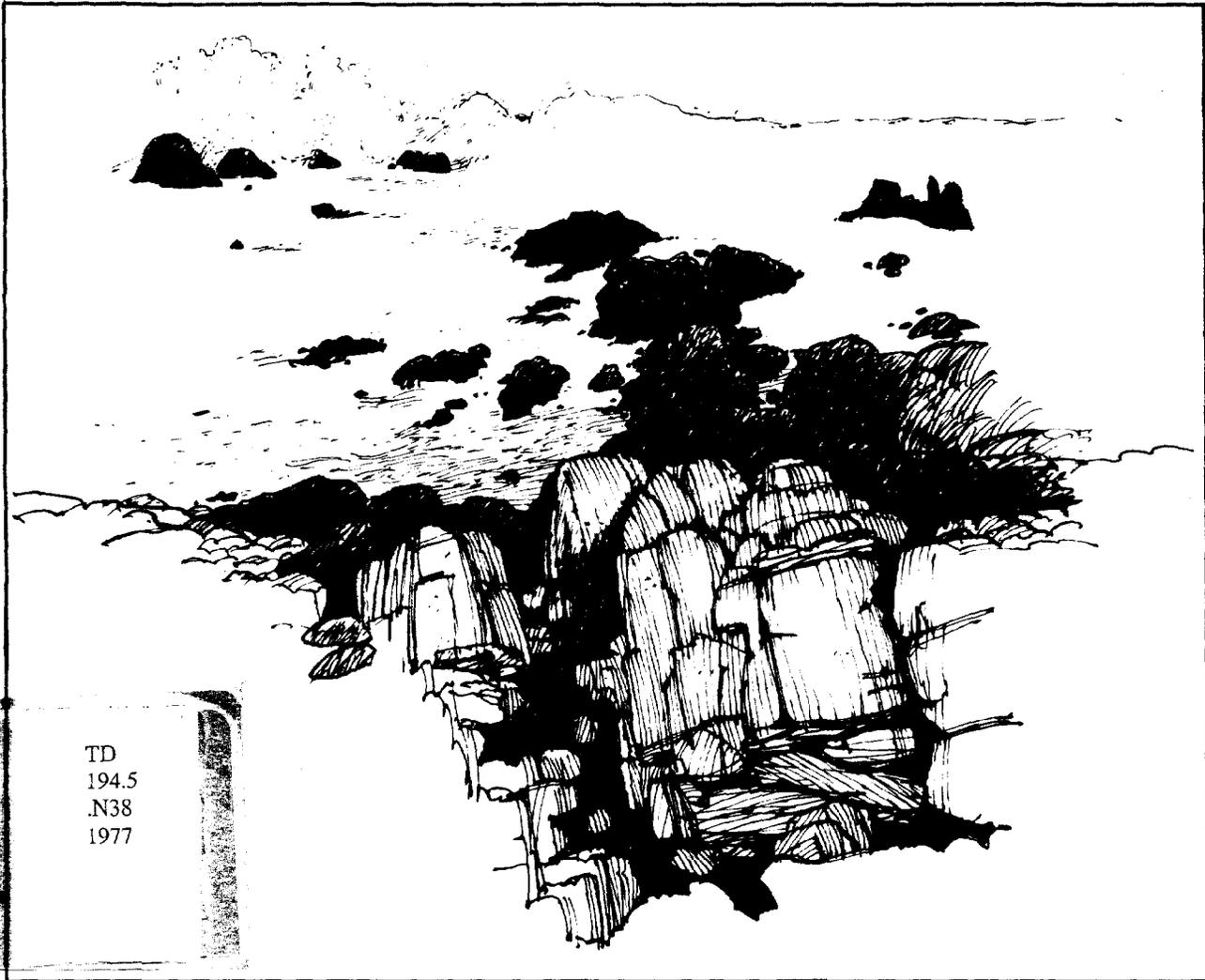
Puerto Rico Coastal Management Program and Draft Environmental Impact Statement



**COASTAL ZONE
INFORMATION CENTER**

**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Coastal Zone Management**

Volume 1



Office of Coastal Zone Management

TD
194.5
.N38
1977

TD 1985 N38 1977

11820 C.2

COASTAL ZONE
INFORMATION CENTER

UNITED STATES
DEPARTMENT OF COMMERCE

DRAFT
ENVIRONMENTAL IMPACT
STATEMENT

PROPOSED
COASTAL MANAGEMENT PROGRAM
FOR
THE COMMONWEALTH OF PUERTO RICO

Prepared by:

Office of Coastal Zone Management
National Oceanic and
Atmospheric Administration
Department of Commerce
3300 Whitehaven Street, N.W.
Washington, D.C. 20235

and

Department of Natural Resources
Post Office Box 5887
Puerta de Tierra, Puerto Rico 00906

U.S. N.O.A.A. / O.C.Z.M.

COASTAL ZONE
INFORMATION CENTER

NOTE TO READERS

The National Environmental Policy Act of 1969 mandates that an environmental impact statement be prepared as part of the review and approval process of major actions by Federal agencies. The action contemplated is approval of the Puerto Rico Coastal Management Program under Section 306 of the Federal Coastal Zone Management Act of 1972, as amended. An immediate effect of approval is the qualification of the Commonwealth of Puerto Rico for Federal matching funds for use in administering the Program. In addition, the Coastal Zone Management Act stipulates that Federal activities affecting the coastal zone shall be, to the maximum extent practicable, consistent with an approved management program.

For purposes of reviewing this proposed action:

- Part I Introduction - prepared by the Federal Office of Coastal Zone Management (OCZM)
- Part II Puerto Rico Coastal Management Program - prepared by the Commonwealth; relied upon by the Federal OCZM as the statement of the proposed action for the purposes of NEPA
- Part III Environmental Impacts - prepared by the Federal OCZM with the assistance of the Commonwealth
- Part IV Appendices - prepared by the Commonwealth

The key concerns are:

- whether the Puerto Rico Program is consistent with the objectives and policies of the national legislation,
- whether the Commonwealth's management authorities are adequate to implement the Program,
- whether the award of Federal funds under Section 306 of the Federal Act will help Puerto Rico to meet those objectives, and
- whether there will be a net environmental gain as a result of Program approval and implementation.

The Office of Coastal Zone Management believes the answers to these key questions are affirmative. The Office wants the widest possible circulation of this document to all interested agencies and parties in order to receive the fullest expression of opinion on these questions.

To those people whose time is limited in reviewing this Environmental Impact Statement, the following is recommended reading:

Executive Summary (Part I, Section D)

Problems and Responses (Part II, Chapter 3)

The Coastal Management Program (Part II, Chapter 4)

This Program is of major significance, not only to Puerto Rico, but to the Nation. Further, the Puerto Rico coast represents a concentration of natural, historic, and economic attributes that is of national importance. The Federal Office of Coastal Zone Management thanks those participating in the review of the Puerto Rico Program and this Environmental Impact Statement.

Summary

Draft Environmental Impact Statement Final Environmental Impact Statement

Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coastal Zone Management. For additional information about this proposed action or this statement, please contact:

Office of Coastal Zone Management
National Oceanic and Atmospheric Administration
Attention: Ms. Ann Berger
3300 Whitehaven Street, N.W.
Washington, D.C. 20235
Phone: 202/254-7546

1. Proposed Federal approval of the Puerto Rico Coastal Management Program
 Administrative Legislative

2. It is proposed that the Secretary of Commerce approve the Coastal Management Program application of Puerto Rico pursuant to P.L. 92-583. Approval would permit implementation of the proposed program, allowing program administration grants to be awarded to the Commonwealth and require that Federal actions be consistent with the program.

3. Approval and implementation of the program will restrict or prohibit certain land and water uses in parts of the Puerto Rico coast, while promoting and encouraging development and use activities in other parts. This may affect property values, property tax revenues, and resource extraction. The program will provide an improved decision-making process for determining coastal land and water uses and the siting of facilities of national interest and will lead to increased long-term protection of and benefit from the Commonwealth's coastal resources.

4. Federal Alternatives considered:
 1. If the new policies and criteria established in the program were not enforceable or sufficient.
 2. If the Commonwealth lacks the ability to continue to consider the national interest.

5. List of all Federal, Commonwealth and local agencies and other parties from which comments have been requested:

Federal Agency Distribution

Advisory Council on Historic Preservation	Department of Justice
Department of Defense	Department of Labor
Department of the Navy	Department of Transportation
U.S. Army Corps of Engineers	Economic Development Administration
U.S. Air Force	Environmental Protection Agency
Department of Agriculture	Federal Energy Regulatory Commission
Department of Commerce	General Services Administration
Department of Energy	Marine Mammal Commission
Department of Health, Education and Welfare	National Oceanic and Atmospheric Administration
Department of Housing and Urban Development	U.S. Coast Guard
Department of the Interior	

National Interest Group Distribution

A.M.E.R.I.C.A.N.	Earth Metabolic Design Laboratories, Inc.
AFL-CIO	Edison Electric Institute
American Association of Port Authorities	El Paso Natural Gas Company
American Bar Association	Environmental Defense Fund, Inc.
American Bureau of Shipping	Environmental Law Institute
American Farm Bureau Federation	Environmental Policy Center
American Fisheries Society	EXXON Company, U.S.A.
American Forest Institute	Friends of the Earth
American Gas Association	Getty Oil Company
American Hotel and Motor Association	Great Lakes Basin Commission
American Industrial Development Council	Great Lakes Tomorrow
American Institute of Architects	Gulf Energy and Minerals, U.S.
American Institute of Merchant Shipping	Gulf Oil Company
American Institute of Planners	Gulf Oil Corporation
American Littoral Society	Gulf Refining Company
American Mining Congress	Gulf South Atlantic Fisheries Development
American Oceanic Organization	Foundation
American Petroleum Institute	Independent Petroleum Association of America
American Shore & Beach Preservation Assn.	Industrial Union of Marine and Shipbuilding
American Soc. of Civil Engineers	Workers of America
American Soc. of Landscape Architects, Inc.	Institute for the Human Environment
American Soc. of Planning Officials	Institute for Marine Studies
American Water Resources Association	Interstate Natural Gas Association of America
American Waterways Operators	Izaak Walton League
AMOCO	Lake Michigan Federation
Ashland Oil, Inc.	League of Conservation Voters
Associated General Contractors of America	League of Women Voters Education Fund
Association of Oil Pipe Lines	Marathon Oil Company
Atlantic Richfield Company	Marine Technology Society
Atlantic States Marine Fisheries Comm.	Massachusetts Petroleum Council
Atomic Industrial Forum	Mobil Exploration & Producing, Inc.
Barrier Islands Coalition	Mobil Oil Corporation
Center for Law and Social Policy	Murphy Oil Company
Center for Natural Areas	Nat'l. Assoc. of Conservation Districts
Center for Urban Affairs	Nat'l. Assoc. of Counties
Chamber of Commerce of the U.S.	Nat'l. Assoc. of Dredging Contractors
Chevron, USA, Inc.	Nat'l. Assoc. of Electric Companies
Cities Service Company	Nat'l. Assoc. of Engine and Boat Manufacturers
Coastal States Organization	Nat'l. Assoc. of Home Builders
Conservation Foundation	Nat'l. Assoc. of Realtors
Continental Oil Company	Nat'l. Assoc. of Regional Councils
Council of State Planning Agencies	Nat'l. Assoc. of State Boating Law Administrators
The Cousteau Society	National Audubon Society

National Boating Federation
 National Cannera Association
 National Coalition for
 Marine Conservation
 National Commission on Marine Policy
 National Conference of State Legislatures
 National Environmental Development Assn.
 National Farmers Union
 National Federation of Fisherman
 National Fisheries Institute
 National Forest Products Association
 National Governors Association
 National League of Cities
 National Ocean Industries Association
 National Parks & Conservation Association
 National Petroleum Council
 National Petroleum Refiners Association
 National Realty Commission
 National Recreation and Park Association
 National Research Council
 National Science Foundation
 National Science Teachers Association
 National Shrimp Congress
 National Society of Prof. Engineers
 National Wildlife Federation
 National Waterways Conference
 Natural Resources Defense Council
 The Nature Conservancy
 Nautilus Press
 New England River Basin Commission

North Atlantic Ports Association
 Outboard Marine Corporation
 Resources for the Future
 Rice University Center for Community Design and
 Development
 Shell Oil Company
 Shellfish Institute of North America
 Shipbuilders Council of America
 Sierra Club
 Skelly Oil Company
 Society of Industrial Realtors
 Society of Real Estate Appraisers
 Soil Conservation Society of America
 Southern California Gas Company
 Sport Fishing Institute
 Standard Oil Company of California
 Standard Oil Company of Ohio
 Sun Company, Inc.
 Tenneco Oil Company
 Texaco, Inc.
 United Brotherhood of Carpenters and Joiners of
 America
 U.S. Power Squadrons
 U.S. Conference of Mayors
 Water Pollution Control Federation
 Water Transport Association
 Western Oil and Gas Association
 Wildlife Management Institute
 The Wildlife Society
 World Dredging Association

Commonwealth Distribution

225 interested citizens
 50 Representantes
 27 Senadores
 54 Alcaldes (Mayors), etc.
 10 Newspaper Editors and Radio Stations
 11 Fortaleza (Governor) and Comisionado
 Residente
 Departamento Agricultura
 Junta de Calidad Ambiental
 Autoridad Desarrollo y Conservacion.
 Culebra
 Administracion de Fomento Economico
 Cia de Fomento Industrial de P. R.
 Cia de Fomento Recreativo
 Cia de Fomento Turismo
 Autoridad Fuentes Fluviales
 Departamento de Justicia
 Mision Industrial de P.R.
 Autoridad de las Navieras
 Administracion de Parques y Recreos
 Publicos
 Junta de Planificacion
 Autoridad de los Puertos
 Administracion de Reglamentos
 y Permisos
 Departamento de Salud
 Servicios Legales de P.R. Inc.
 Administracion de Terrenos
 Departamento Transportacion y Obras
 Publicas
 Departamento de la Viviendo
 Aecion Comunal de P.R.
 Banco Gubernamental Fomento
 Fondo Seguro del Estado
 Compania de Turismo
 Instituto Cultural
 Junta Apelaciones

Negaciado Planes de Uso de Terrenos
 Servicios Legales
 Asociacion de Pescadores de Arroyo
 Asociacion de Pescadores de Catano
 Asociacion de Pescadores de Vteques
 Cangrejos Yatch Club
 Comite Defensa Calidad Ambiental
 Guayanilla
 Coop de Pesca Comercial Torrecillas
 Club Nautico Rojo
 Club Nautico Rincon
 Club Nautico de San Juan
 Club Nautico de Vega Baja
 Fideicomiso de Conservacion
 Fondo de Mejoramiento
 Guayamma Fishing Club
 Liga de Mujeres Votantes
 Villa Pesquera de Arroyo
 Ninos Eseuchas de America
 Soc. Historio Natural
 Asociacion Pescadores de Culebra
 Asociacion Agencias Publicitarias
 Asociacion Hotelera de P.R.
 Fundaciri Arquelogica, Antropologica
 e Historica de P.R.
 Energia Verde
 Coop Pesquera de Pinones, de Loiza,
 de Catano
 Clubes Exchange
 Club Nautico de Arecibo
 Club de Leones de San Jaun
 Club Leones Sabana Llana
 Club Leones Rio Piedras
 Club Leones Huto Rey
 Club Leones Catano
 Conite Pro Mejor Arribiente
 Asociacion Pescadores Aquadella

Asociacion Industriales de Puerto Rico
Colegio de Abogados de Puerto Rico
Colegio de Ingenieros, Arquitectos y Agronomos
Asociacion Agricultores de P.R.
Asociacion de Constructores de Hogares de P.R.
Asociacion Contratistas Generales
Federacion de Maestros de P.R.
Soc. Puestorriquena de Planificacion
Universidad Interamericana
Colegio Regional de Aquadilla - UPR

Colegio Universitario de Humacao - UPR
Recinto de Mayaguez - UPR
Facultad de Artes y Ciencias Mayaguez, UPR
Centro Investigaciones Energeticas y Ambientales
Universidad Catolica, Ponce
Rutgers University
Texas A&M University
Universidad de Puerto Rico
Universidad de San Paulo, Brazil

6. This Draft Environmental Impact Statement was transmitted to the Environmental Protection Agency, and the Notice of Availability to the public was published in the Federal Register on

NOTE TO REVIEWERS: The Appendices will not be reprinted in the Final EIS unless they are changed as a result of this review.

The Final EIS will be sent to all parties who comment on the Draft and any people who request it.

TABLE OF CONTENTS

	<u>Page</u>
SUMMARY	
PART I INTRODUCTION - Prepared by the Federal Office of Coastal Zone Management	
A. The Federal Coastal Zone Management Program	1
B. National Environmental Policy Act of 1969 Requirements	2
C. OCZM Requirements for Section 306 Program Approval Related to the Puerto Rico Coastal Management Program	3
D. Puerto Rico Coastal Management Program - Executive Summary	4
 PART II THE PUERTO RICO COASTAL MANAGEMENT PROGRAM - Prepared by the Commonwealth	
Statement of the Secretary	11
Introduction	13
Chapter 1 The Coast of Puerto Rico: An Overview	15
Physical and Economic Context	15
Natural Systems	15
Evolution of Occupancy Patterns	16
Industrialization	17
Agriculture	18
Urbanism and Consumerism	18
The Changing Economic Structure	19
Policy Formulation for Coastal Management	20
Description of Coastal Features	21
North Coast: Rio Grande de Arecibo to Boca de Cangrejos	22
Northeast Coast: Boca de Cangrejos to Rio Demajagua	22
Southeast Coast: Rio Demajagua to Rio Grande de Patillas	23
South Coast: Rio Grande de Patillas to Rio Tallaboa	24
Southwest Coast: Rio Tallaboa to Punta Guaniquilla	24
West Coast: Punta Guaniquilla to Rio Culebrinas	26
Northwest Coast: Rio Culebrinas to Rio Grande de Arecibo	26
The Offshore Islands: including Culebra, Vieques, Mona, and others	27
 Chapter 2 Coastal Management for Puerto Rico: Overall Objectives and Policies	29
General Objectives	31
Urban Development	33
Industrial Development	37
Agricultural Development	39
Floodable Areas	41
Infrastructure	42
Natural Areas	43
 Chapter 3 Coastal Management for Puerto Rico: Problems and Responses	45
Coastal Hazards	45
Flooding (including Hurricane Flooding)	45
Geologic Hazards	51
Coastal Erosion	53
Coastal Resources	54
Reefs	54
Mangrove Wetlands	58
Dunes	67
Beaches	70
Assuring the Public's Legal Right to Use the Beaches Themselves	71
Public Access to the Coast	73
Removing Squatters from the Coast	81
Protecting Beaches Against the Shadows and Visual Domination of High-Rise Buildings	83
Protecting and Enlarging Public Beach Holdings	86
Providing Services and Facilities for Beach Users	87
Wildlife	90
Coastal Waters	94
Reducing Pollution from Municipal and Industrial Waste Discharges	95
Reducing Damage from Oil Spills	98

Minimizing Erosion and Sedimentation	100
Minimizing Environmental Damage from Dredging, Diking and Filling	103
Coastal Forests	106
Cultural and Historic Sites	109
Coastal Development	112
Coastal-Dependent Industry	112
Sand for Construction	116
Mineral Development	120
Energy	122
Recreation	128
Transportation	132
Commercial Fishing	134
Conclusion	138
Footnotes to Chapter 3	142
Chapter 4 The Coastal Management Program: Principal Elements	147
Summary	147
Guiding Development on Public and Private Property	148
Ongoing Activities: Four Commonwealth Agencies Responsible for Guiding Development	151
Improving Coastal Development Guidance	163
Refining Policies and Regulations that Guide Development	163
Procedural and Organizational Change: The Coastal Management Unit	169
Active Management of Coastal Resources	171
Ongoing Activities: The Department of Natural Resources and Other Agencies	171
Improving Resource Management in Coastal Areas	173
Building Up Field Services and Facilities	173
Organization Changes: The Coastal Management Unit and the Ranger Corps	175
Establishing a System of Natural Reserves	176
Clarifying and Extending Public Property Rights in Coastal Resources	177
Promoting Coastal Development	179
Research	180
Policy Research	180
Economic Feasibility Studies	180
Resource and Hazard Inventories	180
 PART III ENVIRONMENTAL IMPACTS - Prepared by Federal Office of Coastal Zone Management	
A. Description of the Environment Affected	183
B. Relationship of the Proposed Action to Land Use Plans, Policies and Controls for the Area	183
C. Probable Impacts of the Proposed Action on the Environment	184
Impacts Directly Resulting from Federal Approval	184
Impacts Resulting from Commonwealth Government Implementation	184
D. Probable Adverse Environmental Effects which Cannot Be Avoided	187
E. Relationship Between Local, Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity	188
F. Irreversible or Irretrievable Commitments of Resources That Would Be Involved in the Proposed Action Should It Be Implemented	188
G. Alternatives to the Proposed Action	189
Federal Alternatives	190
H. Consultation and Coordination with Others	194
 PART IV APPENDICES	
A. Commonwealth and Federal Agencies Affecting the Coast	
Commonwealth Agencies	
Federal Agencies	
B. The Puerto Rico Program and the Coastal Zone Management Act	
C. Descriptions of Special Planning Areas (APC's) and Natural Reserves (APR's)	
D. Commonwealth and Federal Agency Consultation	Volume II
E. Public Participation	Volume II

LIST OF MAPS

<u>Map</u>	<u>Following Page</u>
1 Puerto Rico and the Caribbean Basin	16
2 Puerto Rico and Adjacent Waters	16
3 Generalized Land Use with Marine and Coastal Features	16
4 Urban Settlement Patterns	16
5 Growth of Metropolitan San Juan	18
6 Floodable Areas	46
7 Areas of Severe Erosion Conditions	54
8 Known Coral Reef Communities	56
9 Mangrove Distribution and Life Zones	62
10 Original Sand Dune Formations	68
11 Recreational Beaches	70
12 Beach Access in Fajardo Area	76
13 Critical Areas for Endangered Wildlife	90
14 Water Quality Classifications	98
15 Planned Sewerage Systems	98
16 State Forests	106
17 Guanica State Forest	108
18 Cultural and Historic Sites	110
19 Major Coastal Industrial Sites: Existing and Potential	112
20 Major Transportation Facilities	132
21 Commercial Fishing Facilities	134
22 Islandwide Land Use Policies-Illustrative Map	152
23 Zoned and Non-zoned Districts in the Coastal Zone	154
24 Marine Sanctuaries as Proposed by <u>Puerto Rico and the Sea</u>	176
25 Coastal Zone Seaward Boundaries	B-4
26 Other Coastal Resources	B-4
27 Excluded Federal Lands	B-6
28 Municipal Boundaries	B-8
29 Areas of Particular Concern and Areas for Preservation and Restoration	B-8
30-37 Coastal Zone Boundary, and Natural and Man-Made Features, by Sector (in back cover)	
30 Northeast Sector	
31 Southeast Sector	
32 South Sector	
32A South Sector - Ponce	
33 Southwest Sector	
34 West Sector	
35 Northwest Sector	
36 North Sector	
36A North Sector - San Juan	
37 Offshore Islands	
37A Offshore Islands	

PART ONE: INTRODUCTION

INTRODUCTION

A. The Federal Coastal Zone Management Program

In response to the intense pressures upon, and because of the importance of the coastal zone of the United States, Congress passed the Coastal Zone Management Act (CZMA) (P.L.92-583) which was signed into law on October 27, 1972. The Act authorizes a Federal grant-in-aid program to be administered by the Secretary of Commerce, who in turn delegated this responsibility to the National Oceanic and Atmospheric Administration's (NOAA) Office of Coastal Zone Management (OCZM).

The Coastal Zone Management Act of 1972 was substantially amended on July 26, 1976, (P.L. 94-370). The CZMA affirms a national interest in the effective protection and development of the coastal zone, by providing assistance and encouragement to coastal states to develop and implement rational programs for managing their coastal zones. The CZMA opens by stating "(t)here is a national interest in the effective management, beneficial use, protection, and development of the coastal zone" (Section 302(a)). The statement of Congressional findings goes on to describe how competition for the utilization of coastal resources, brought on by the increased demands of population growth and economic expansion, has led to the degradation of the coastal environment, including the "loss of living marine resources, wildlife, nutrient-rich areas, permanent and adverse changes to ecological systems, decreasing open space for public use, and shoreline erosion." The CZMA states "(t)he key to more effective protection and use of land and water resources of the coastal zone is to encourage states to exercise their full authority over the land and waters in the coastal zone by assisting the states ...in developing land and water use programs...for dealing with (coastal) land and water use decisions of more than local significance." (Section 302(h)).

While local governments and Federal agencies are required to cooperate and participate in the development of management programs, the State level of government is given the central role and responsibility for this process. Financial assistance grants are authorized by the CZMA to provide states with the means of achieving these objectives and policies. Under Section 305, thirty coastal states which border on the Atlantic or Pacific Oceans, Gulf of Mexico, and the Great Lakes, and four U.S. territories are eligible to receive grants from NOAA for 80 percent of the costs of developing coastal management programs. Broad guidelines defining the procedures by which states can qualify to receive development grants under Section 305 of the CZMA, and the policies for development of a state management program were published on April 27, 1977 (15 CFR920).

B. National Environmental Policy Act of 1969 Requirements

On January 1, 1970, the President signed into law the National Environmental Policy Act (NEPA), which requires each Federal agency to prepare a statement of environmental impact in advance of each major action that may significantly affect the quality of the human environment. An environmental impact statement (EIS) must assess potential environmental impacts of a proposed action in order to disclose environmental consequences of such action.

To comply with NEPA's requirement of preparing an EIS, OCZM has combined the state's coastal management program (which is the proposed action) with a discussion of the environmental impacts. The CZMA is based upon the premise that the environmental aspects of the coastal management program should receive significant consideration in the development of state programs. Therefore, as you read this EIS you should be aware that the state coastal management program is the core document included in its entirety supplemented by the requirements of NEPA, Section 102(2)(c).

For reviewers more familiar with the NEPA requirements for content of an EIS, below is an index of where you will find this information:

Description of the proposed action.....	Part Two
Description of the environment affected.....	Page 183
Relationship of the proposed action to land use plans, policies, and controls for the affected areas.....	Page 183
Probable impact of the proposed action on the environment.....	Page 184
Relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity...	Page 184
Irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented.....	Page 184
An indication of what other interests and considerations of Federal policy are thought to offset the adverse environ- mental effects of the proposed action.....	Appendix D

C. Relationship of OCZM Requirements for Program Approval (Section 306) to the
Puerto Rico Coastal Management Program Submission

OCZM Requirements	Puerto Rico Coastal Management Program
15 CFR Part 923, Section:	
.4(b) Problems, Issues, and Objectives:	Chapters 1, 2, and 3
.5 Environmental Impact Assessment:	Part 3
.11 Boundaries:	Appendix B, Maps 25, 27, 30-37
.12 Uses Subject to Management:	Appendix B
.13 Areas of Particular Concern:	Chapters 3 and 4, Appendices B and C
.14 Guidelines on Priority of Uses:	Chapter 3, Appendix B
.15 National Interest in the Siting of Facilities:	Chapter 3, Appendix B
.16 Area Designation for Preservation and Restoration:	Chapters 3 and 4, Appendices B and C
.17 Local Regulations and Uses of Regional Benefit:	Appendix B
.18 Shorefront Access Planning:	Chapter 3 (Not completed)
.19 Energy Facility Planning:	Chapter 3 (Not completed)
.20 Shoreline Erosion:	Chapter 3 (Not completed)
.31 Means of Exerting Control over Land and Water Uses:	Chapter 4, Appendix B
.32 Organizational Structure:	Chapter 4, Appendix B
.33 Designation of Single Agency:	Governor's Cover Letter
.34 Authorities to Administer Land and Water Use, Control Development and Resolve Conflicts:	Chapter 4, Appendix B
.35 Authorities for Property Acquisition:	Appendix B
.36 Techniques for Control of Land and Water Uses:	Chapter 4, Appendix B
.41 Full Participation of Relevant Bodies in Adoption of Management Program:	Appendices B, D, and E
.42 Consultation and Coordination:	Appendix B
.51 Public Hearings:	Appendices B and E
.52 Gubernatorial Review and Approval:	Governor's Cover Letter, Appendix B
.53 Segmentation:	Appendix B
.54 Applicability of Air and Water Pollution Control Requirements:	Chapter 3, Appendix B

D. THE PUERTO RICO COASTAL MANAGEMENT PROGRAM -- EXECUTIVE SUMMARY

The Federal Coastal Zone Management Program and Puerto Rico

The purpose of the Federal Coastal Zone Management Act of 1972 (the CZMA) is "(t)o establish a national policy and develop a national program for the management, beneficial use, protection, and development of the land and water resources of the Nation's coastal zones." Basic to the Coastal Zone Management Program is "an identification of the issues and problems that confront or will confront a state's coastal zone and, relatedly, an articulation of specific goals, objectives, policies, standards, guidelines and/or regulations to address these issues."

The Federal Act provides three principal kinds of benefits to Puerto Rico:

First, it provides planning funds for use by the Commonwealth in preparing a management program for its coast. Puerto Rico's Coastal Zone Management Project, sponsored jointly by the Department of Natural Resources and the Puerto Rico Planning Board, has had the benefit of Federal funds in preparing a draft Coastal Management Program and in reviewing its contents with public agencies and private citizens. Federal funds -- sometimes called "305 funds" because they are authorized by section 305 of the CZMA -- have covered up to 80 percent of the costs of the project.

Second, the Federal Act will provide management funds for use by the Commonwealth in implementing its coastal management program. These funds, which became available after Federal approval of the management program, are authorized by section 306 as well as other sections of the Federal Act. It is expected that these funds might come to some \$1,000,000 a year for Puerto Rico.

Third, the Federal Act contains Federal consistency provisions requiring many Federal actions to be consistent with Puerto Rico's approved management program.

The second and third of these benefits -- management funds and the applicability of consistency provisions -- will become available only after Puerto Rico's management program has been adopted by the Planning Board, approved by the Governor, and approved by the Federal Office of Coastal Zone Management, which is part of the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce. A number of complicated requirements must be satisfied to obtain Federal approval; these are discussed in Appendix B of the program document.

The Puerto Rican Context for Coastal Management

The Puerto Rico Coastal Management Program is intended to respond to the needs of the Commonwealth as well as those of the nation. Particular effort has been made to relate the program to the following special circumstances of Puerto Rico:

1. Natural Environment. One principal concern of the program, in keeping with the national policy set forth in the CZMA, is to protect this rich and distinctive environment against disruption.
2. Economic Plight. Another principal concern of the program is economic development of the Island, where the per capita income level is 35 percent below that of the poorest state and where, according to official estimates, unemployment currently hovers around 20 percent.
3. Land Use Policies. The existence of official Islandwide Land Use Policies adopted by the Puerto Rico Planning Board and approved by the Governor, establish a policy basis for coastal management as well as for land use in the interior of Puerto Rico. (These policies are set forth in Chapter 2 and quoted where relevant in the remainder of the program document.) In a few cases, where these existing policies are insufficiently detailed to guide coastal management, this program document includes additional policies.
4. Development Controls. There are development controls, established by the Commonwealth, rather than by local governments, that are applicable to all of Puerto Rico, including the coastal zone. The situation in Puerto Rico is thus unlike that in most states, where development controls are traditionally a local responsibility and where effective coastal management requires new control programs at the state level. Rather, Puerto Rico needs refinement of existing islandwide controls to place new emphasis on the management of coastal resources. The program provides that new emphasis and integrates it into the existing control process both to assure effectiveness and to minimize delay and red tape.
5. Coastal Resources. There is a serious, unmet need for active management of coastal resources. Although Puerto Rico has abundant controls, it has lacked the funds necessary to provide rangers, custodians, environmental educators, researchers, and supporting facilities necessary for active management of coastal resources. Accordingly, the program places special emphasis on providing affirmative management services such as these.
6. Institutional Structure. There is a well-established institutional structure to administer policies, controls, and other public measures necessary to manage the coasts as well as the interior of the island. The Commonwealth's new emphasis on coastal management requires some modification of this established structure, and that modification is included in the program.

To assure effectiveness, however, responsibility for coastal management is closely linked to responsibility for resource management throughout the Commonwealth.

Boundaries of the Coastal Zone

Generally, the coastal zone extends inward 1,000 meters from the shoreline of Puerto Rico -- and in some places somewhat farther inland where necessary to include an important coastal natural system. In addition, the coastal zone includes all the offshore islands and all waters within the 3-mile limit. The exact boundaries of the coastal zone are explained in Appendix B and shown on Maps 30-37.

The Program Document

This document, describing Puerto Rico's coastal management program, is now in its third review draft: the "Federal Review Draft." The Program (Part II of this document) has four chapters:

Chapter 1 provides an overview of Puerto Rico's coastal resources. It describes the physical and economic contexts for coastal management as well as some fundamental problems and objectives to which coastal management must be related.

Chapter 2 sets forth the formal policy base for coastal management in Puerto Rico: The statement of Land Use Objectives and Public Policies adopted by the Puerto Rico Planning Board and approved by the Governor a few months ago. (These policies govern the interior of the island as well as the coastal zone.)

Chapter 3, the longest in the document, examines Puerto Rico's coastal problems:

Coastal hazards: flooding (including hurricane flooding), geologic hazards, and coastal erosion.

Coastal resources: reefs, mangrove wetlands, dunes, beaches, wildlife, coastal waters, coastal forests, and cultural and historic sites.

Coastal development: coastal-dependent industry, sand for construction, mineral development, energy, recreation, transportation, and commercial fishing.

In discussing each of these subjects, the chapter (1) describes the problem, (2) identifies any established policies for dealing with it, and (3) examines what is already being done by Commonwealth or Federal agencies to deal with the problem. Finally, the chapter identifies needs for future action; actions responsive to these needs are included in the management program, which is described in Chapter 4.

Chapter 4 describes the coastal management program itself, with emphasis on implementation measures. Because of its importance, this chapter is described in greater length below.

In addition, the program document contains five appendices (Part IV of the document). Appendix A describes the Commonwealth and Federal agencies whose activities affect the coast of Puerto Rico. Appendix B relates the Puerto Rico Coastal Management Program to Federal requirements. Appendix C describes in detail the Special Planning Areas designated by the Program as well as proposed Natural Reserves. Appendix D describes the extensive process of consultation with Commonwealth and Federal agencies during preparation of the program document. Appendix E describes public participation during program development.

The Coastal Management Program

The coastal management program, described in Chapter 4 of the program document, contains four broad elements, of which the first two are emphasized:

A. GUIDING DEVELOPMENT ON PUBLIC AND PRIVATE PROPERTY

Guiding development on public and private property is the first program element (page 148).

Puerto Rico already has a process for guiding development in the coastal zone, conducted principally by four agencies: the Puerto Rico Planning Board, the Regulations and Permits Administration, the Environmental Quality Board, and the Department of Natural Resources. Numerous linkages connect these agencies and their activities (page 151)

Critical to an understanding of the established process is recognition of (1) the comprehensive powers of the Planning Board and the responsibility of the Board to reconcile numerous conflicting public objectives in exercising those powers; (2) the special responsibility of the Department of Natural Resources (DNR) for coastal and other natural resources. In effect, the Department serves as advocate and proponent of a natural resource perspective (much as the Economic Development Administration proposes development measures, for example, or the Department of Transportation and Public Works proposes transportation measures), and the Board makes the final decisions that reconcile those proposals with other needs. In keeping with this division of responsibility, DNR is designated as the lead agency for coastal management in Puerto Rico, and the Planning Board retains responsibility for overall policymaking and for principal development controls.

Several innovations are to be undertaken as part of the coastal management program:

First, new policies. Four new policies, each responding to a need identified in Chapter 3, are established by the program document and will become official when adopted by the Planning Board and approved by the Governor. These policies deal with mangrove wetland protection (page 58), beach access (pages 73 and 75), and coastal-dependent development (page 112). In addition, new criteria on diking, filling, dredging, and deposit of dredged sediments are incorporated in the Puerto Rico Coastal Management Program (page 103).

Second, refinements of regulations and criteria. Refinements of regulations and criteria, each of which responds to a need identified in Chapter 3, are to be undertaken as part of the management program. These relate to runoff and erosion control (page 100), community facilities along the shoreline (page 87), access dedication requirements (page 73), and floodable areas (page 45).

Third, Special Planning Areas and Natural Reserves. The program document designates all mangrove wetlands and seven additional areas as Special Planning Areas, defined as important coastal resource areas subject to serious present or potential use conflicts and therefore requiring detailed planning (page 176). Within these areas, additional review of development will be conducted, and these areas will receive priority in the allocation of scarce public funds for planning, regulations, enforcement, and the provision of appropriate public facilities.

The program also proposes future establishment of several Natural Reserves, which would be preserved in substantially their present condition (page 176).

Fourth, procedural and organizational changes will be made to assure effective implementation of the policies and controls. A Coastal Management Unit, administratively located in the Office of the Secretary of Natural Resources, has several key responsibilities for guiding coastal development (page 175):

- For preparing detailed policies and plans for Special Planning Areas and Natural Reserves;
- For proposing designation of additional areas; and
- For participating in the review of coastal development proposals.

The Coastal Management Unit will also be responsible for formulating work plans and programs for coastal management, for establishing priorities for carrying out the work program, and for monitoring progress in carrying it out.

B. ACTIVE MANAGEMENT OF COASTAL RESOURCES

Active management of coastal resources is the second broad element of the coastal program (page). Many established management activities are the responsibility of the DNR. Several innovations are to be undertaken as part of the coastal management program:

First, building up field services and facilities (page 173). These activities include training and enlarging field staffs, providing them with equipment, instructing children and adults about natural systems of the coast, planning for field services, and establishing concentrated management areas.

Second, organizational changes will be made to assure effectiveness of field services (page 175). The Coastal Management Unit will have responsibility for preparing detailed plans for field services and facilities as well as for coastal overview, monitoring, and grant administration. Another organizational change is the creation of the new Ranger Corps.

Third, establishing a system of natural reserves (page 176). The program includes preparation of legislation for such a system, ultimately to include marine, estuarine, and terrestrial areas.

Fourth, clarifying and extending public property rights in coastal resources (page 177). This includes buying additional coastal property rights, as well as statutory clarification of existing rights. In addition, one of the new policies established by the Program is the intention to assure public rights of access to surplus Federal beaches.

Fifth, other measures to protect coastal resources (page 138). These include the adoption of additional regulations governing coral extraction, sand extraction, squatter communities, and archeological site protection. Also to be undertaken as part of the Program is an updating of the oil spill contingency plan.

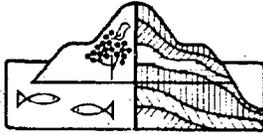
C. PROMOTING COASTAL DEVELOPMENT

Although several coastal development needs are identified (Chapter 3), few of them have proven appropriate for responsive action as part of the coastal management program itself. The most important response to be undertaken as part of the program is the conducting of feasibility studies of alternative sources of sand for construction (page 180).

D. RESEARCH

The final element of the program is research (page 180). This includes policy research (on coastal erosion hazards, beach access, and geologic hazards); economic feasibility studies (on alternative sand sources); resource and hazard inventories (mapping of coastal high-hazard areas, completing inventory of coral reefs, detailed resource inventories of Special Planning Areas and Natural Reserves, and field laboratory activities in the Guanica Forest.

PART TWO: THE PUERTO RICO COASTAL MANAGEMENT PROGRAM



**DEPARTMENT
OF NATURAL
RESOURCES**

STATEMENT OF THE SECRETARY

The Coastal Zone Management Project has been in progress in Puerto Rico for three years. In March 1977, the Culebra Segment of the Puerto Rico Coastal Zone Management Program was approved by the Federal Office of Coastal Zone Management and in April that office awarded Puerto Rico funds to begin implementing the Program in Culebra.

This Federal Review Draft, the third of a series of review drafts of the Puerto Rico Coastal Management Program, is combined with a draft environmental impact statement. This draft represents the current status of project work for all of Puerto Rico and is intended to present the recommended policies and responses of the Program for review.

In early July 1977, a First Review Draft was distributed to Federal and Commonwealth agencies, mayors of coastal municipalities, and citizen groups. Responses to many of the comments received from these organizations were incorporated into a Public Hearing Draft, although changes responding to remaining comments were deferred until this draft.

In December 1977, a Public Hearing Draft in English and Spanish was distributed to the organizations listed above. Public Hearings on this Draft were held in late January 1978. Responses to the comments received from the above organizations or presented at the public hearings have been incorporated into this draft.

The final Puerto Rico Coastal Management Program is expected to be approved in the summer of 1978.

I invite and encourage you to comment on this Federal Review Draft. If you have any questions about the Program, or wish to obtain more information please contact:

Mr. Gabriel del Toro
Assistant Secretary for Planning
Department of Natural Resources
Box 5887
Puerta de Tierra Station
San Juan, Puerto Rico 00906
(809) 724-8774

I look forward to a cooperative effort in the further development of Puerto Rico's Coastal Management Program.

Sincerely,

Fred V. Soltero Harrington
Secretary

✓

DRAFT OF GOVERNOR'S TRANSMITTAL LETTER

Mr. Robert W. Knecht
Associate Administrator
Coastal Zone Management
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Washington, D.C. 20235

Dear Mr. Knecht:

I am pleased to transmit the Puerto Rico Coastal Management Program and to provide the documentation needed to fulfill the requirements of subsections 306(c)(4), (5), (6) and (7) of the U.S. Coastal Zone Management Act of 1972, as amended:

1. I have reviewed the Puerto Rico Coastal Management Program and approve it as Commonwealth policy.
2. The Department of Natural Resources is the single designated agency to receive and administer grants for implementing the coastal zone management program, and further the Department of Natural Resources is hereby designated as the lead agency for the implementation of the coastal zone management program.
3. I attest to the fact that the Commonwealth has the authorities necessary to implement the management program.
4. I attest to the fact that the Commonwealth is organized to implement the management program.

Sincerely,

Carlos Romero Barcelo
Governor

INTRODUCTION

INTRODUCTION

On this small and mountainous Island, four-fifths of all the level land lies in the coastal plain. This limited land area must accommodate most of Puerto Rico's future development. Diverse demands upon this land and its bordering waters inevitably create conflicts. Resolving these conflicts, to produce the optimum use of coastal lands and waters, is the challenge of coastal management.

In 1972, a group of citizens, coming together to form the Committee on Puerto Rico and the Sea, responded to this challenge. Their report, Puerto Rico and the Sea, identified critical coastal problems and recommended steps toward their solution.

In 1974, the Department of Natural Resources (DNR) and the Planning Board also responded to the challenge -- by establishing a joint program to prepare a management plan for the coast. The cost of this program has been substantially supported by grants from the U.S. Department of Commerce. The grants have been administered through the Office of Coastal Zone Management pursuant to the Federal Coastal Zone Management Act of 1972.*

Chapter 1 of this document provides an overview of Puerto Rico's coastal resources and suggests some overall problems and objectives to which coastal management must be related.

In 1975, while the coastal management program was being prepared, the Planning Board prepared a statement of Land Use Objectives and Public Policies. That statement is the first element of the Islandwide Land Use Plan mandated by the Board's 1975 Organic Act. After extensive review by Commonwealth agency heads and the general public, followed by final staff revision, the Objectives and Policies were formally adopted on June 8, 1977, and approved by the Governor on June 22, 1977. Those objectives and public policies which establish an islandwide policy context for the Coastal Management Program, are set forth in Chapter 2.

Chapter 3 considers Puerto Rico's coastal problems: coastal hazards, coastal resources, coastal development needs. Findings describe the nature and extent of each problem discussed. Any established policies for dealing with the problem are then noted, followed by an examination of what is being done -- and what needs to be done -- to respond to the problem.

Chapter 4 combines the needs described in Chapter 3 into a Coastal Management Program, adding procedural and institutional changes necessary to assure that those needs are satisfied.

*Pursuant to this Act, Puerto Rico has defined its coastal zone. The boundaries of the coastal zone are specified in Appendix B and are shown on Maps 30 to 37.

Appendix A describes Commonwealth and Federal agencies whose activities affect the coast of Puerto Rico.

Appendix B relates the Puerto Rico Coastal Management Program to requirements of the Federal Coastal Zone Management Act² of 1972, as amended.

Appendix C describes the Special Planning Areas designated in Chapter 4 as well as proposed Natural Reserves.

Appendix D describes consultation with Commonwealth and Federal agencies during preparation of the Program.

Appendix E describes public participation during Program development.

CHAPTER 1

THE COAST OF PUERTO RICO:
AN OVERVIEW

CHAPTER 1

THE COAST OF PUERTO RICO: AN OVERVIEW

PHYSICAL AND ECONOMIC CONTEXT

Lying between the Atlantic Ocean and the Caribbean Sea, Puerto Rico is the easternmost island of the Greater Antilles (see Map 1). It is about 100 miles long and 35 miles wide, with a total land area of 3,421 square miles. Its population, which in 1970 was 2.7 million, is estimated to be 3.2 million today, with a resulting density of about 935 persons per square mile.

Never connected by a land bridge to a continental land area, the Island was created about 100 million years ago as a result of volcanic action. About half of Puerto Rico's surface consists of mountains and hills with slopes of 45 degrees or more.

The coastal lowlands resulted from successive inclinations of the volcanic mass, the erosion of its mountains, the deposition of alluvium at the mouths of rivers and its redistribution by ocean waves and currents, the formation of coral reefs, and sea level variations during the course of geologic time. The relatively level coastal lands now comprise about 700,000 cuerdas*, one-third of the land area of Puerto Rico, and about 80 percent of all level land on the Island.

The mountainous topography of the Island and the pattern of prevailing northeasterly winds account for the distribution of rainfall, which is most heavily concentrated over the Sierra de Luquillo in the east and over the mountains of the west. Coastal plains receiving the heaviest precipitation are in the west, the southeast, and along the north coast. The coastal plains bordering the south coast are largely arid. Most of the largest rivers flow toward the Island's north coast.

Vegetation distribution is also influenced by rainfall patterns. The vegetation of the north and west coasts is classified as subtropical moist forest (e.g., the Dorado forest), while the south and southwest coasts have subtropical dry forest vegetation (e.g., the Guanica dry forest).

NATURAL SYSTEMS

In addition to meteorological factors, the shape of Puerto Rico and the location of adjacent islands (see Map 2) influence the type and location of natural systems found along the coast (see Map 3). Protection of the shore given by offshore islands in the southwest and, north of Cabo Rojo, by the Island of Puerto Rico itself, makes coral reef growth possible. Where the shore is unprotected and directly exposed to the sea -- along much of the northern coast, for example -- few coral reef communities are found.

*One cuerda equals .97 acre.

Along the protected south coast, there is profuse mangrove growth at the sea's edge. But on the north coast, with less protection from the sea, mangroves are found along the edges of river mouths and behind sand dunes bordering salt water lagoons.

The insular shelf is believed to possess yet unexplored mineral deposits as well as submarine sand deposits. The shallow tropical waters above the insular shelf often harbor coral reef formations with abundant fish life.

Landward, the coastal plain has widely varying features including rocky cliffs, sand dunes, beaches, karst hills and sinkholes, fresh and salt water lagoons, coastal forests, mangrove swamps and marshes, salt flats, and flood plains. The area where land and sea meet is characterized by highly productive biological systems, the result of nutrient concentration caused by tidal action, alluvial silt, and shallow waters. Delicate balancing of many of these elements in near-shore waters fosters the concentration of biological organisms, such as dinoflagellates, among others, resulting in the phenomenon of bioluminescent lagoons.

EVOLUTION OF OCCUPANCY PATTERNS

Archeological evidence indicates that the first inhabitants of the Island arrived during the first century A.D. By the time of the Spanish conquest in the fifteenth century, the Island of Borinquen was inhabited by the Arawaks, a people native to northern South America, who had migrated several centuries earlier. At that time, between 60,000 and 100,000 people lived on the Island (see Map 4). Fifty villages, some of which housed as many as 3,000 to 4,000 inhabitants, were distributed throughout the Island but were principally located along the coastal plains and on the level land of the interior valleys of Caguas and Utuado. A rudimentary tropical agriculture -- devoted principally to the cultivation of yucca, the staple crop of the Arawaks -- occupied between 52,000 and 100,000 cuerdas.

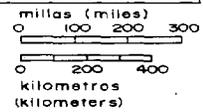
Disease and forced social change resulting from Spanish colonization at the turn of the sixteenth century greatly reduced the Arawak population, and this decline was not compensated for by European migration. By the middle of the eighteenth century, the Island had only 45,000 inhabitants, about half the population prior to Spanish rule.

Puerto Rico's population practically doubled between 1765 and 1775, as a result of a European population explosion and the relaxation of strict Spanish immigration laws. Immigration received an additional stimulus from reforms in 1815 which permitted entry of non-Spanish immigrants. In



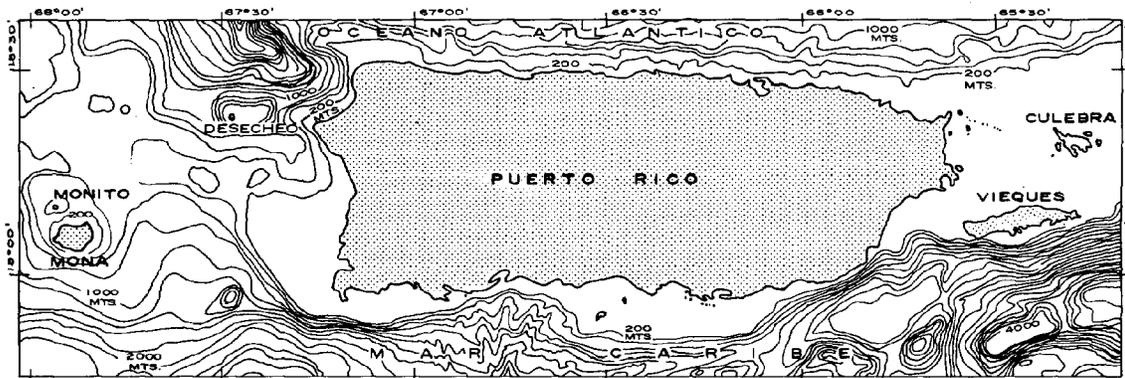
FUENTE DE INFORMACION / SOURCE :

THE SAN JUAN CITY EDGES PROJECT;
TECHNICAL REPORT, PUERTO RICO
PLANNING BOARD, P.69.



PUERTO RICO Y LA CUENCA DEL CARIBE 1

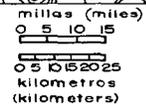
PUERTO RICO AND THE CARIBBEAN BASIN



FUENTE DE INFORMACION / SOURCE :

PUERTO RICO AND ADJACENT WATERS, U.S. DEPT.
OF COMMERCE, NATIONAL OCEANIC & ATMOSPHERIC
ADMINISTRATION, NATIONAL OCEANIC SURVEY, 1929.

MTS. - METERS BELOW SEA LEVEL



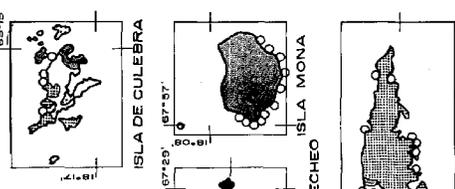
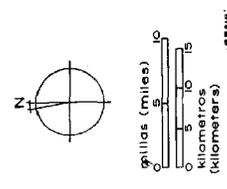
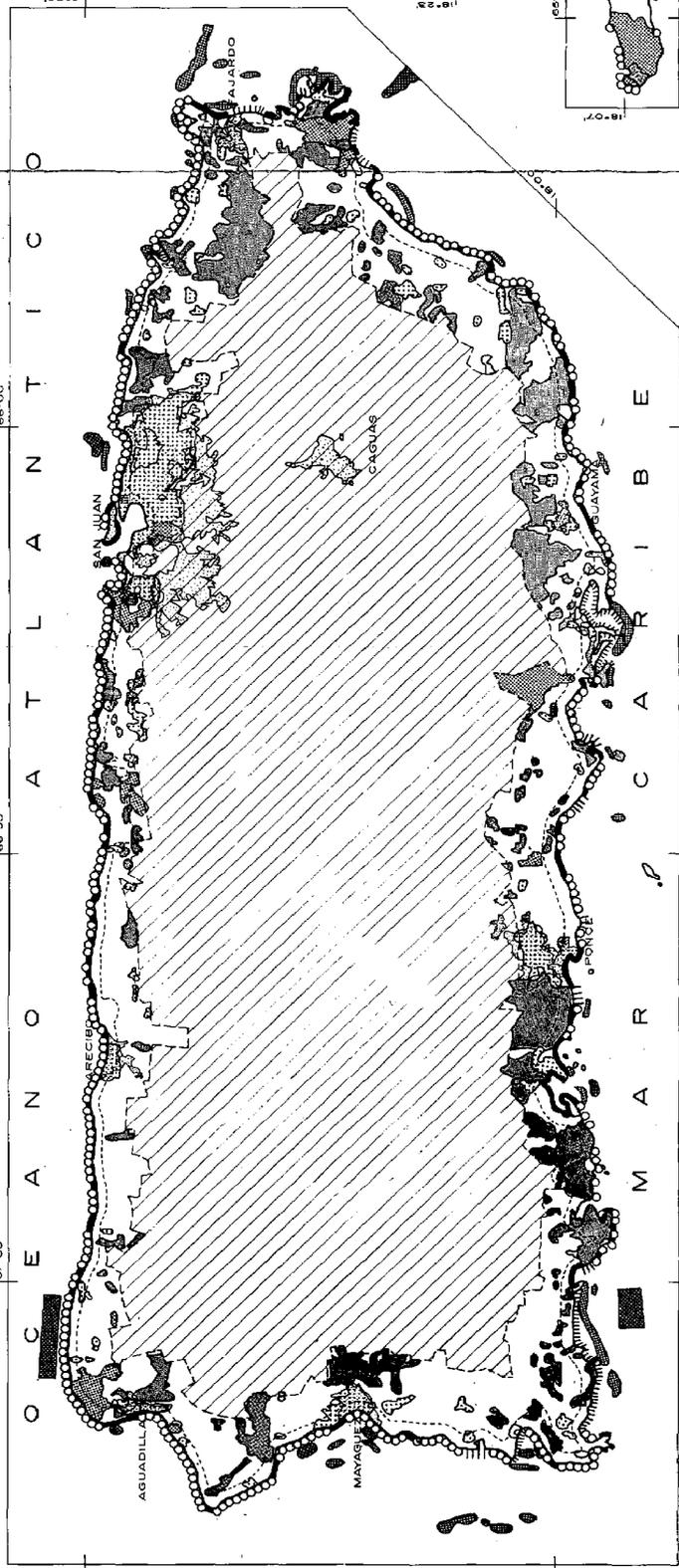
PUERTO RICO Y SUS AGUAS ADYACENTES 2

PUERTO RICO AND ADJACENT WATERS

- TERRENOS FEDERALES PRINCIPALES
- USO DOMINANTE DE TERRENOS
- AREAS URBANAS - INDUSTRIALES
- AREAS NATURALES LAGUNAS DE AGUA FRESCA Y SALADA, MANGLARES, CIENAGAS
- CARACTERISTICAS COSTANERAS
 - ROCOSA
 - MANGLE
 - PLAYA ARENOSA
 - AREAS AGRICOLAS
 - CARACTERISTICAS MARINAS
 - ARRECIFES DE CORAL
- DEPOSITOS DE ARENA SUBMARINOS
- MAIN FEDERAL LANDS
- DOMINANT LAND USE
- URBAN INDUSTRIAL AREAS
- NATURAL AREAS FRESH AND SALT WATER LAGOONS, MANGROVES, SWAMPS
- COASTAL FEATURES
 - ROCKY
 - MANGROVE
 - SANDY BEACH
 - AGRICULTURAL AREAS
 - MARINE FEATURES
 - CORAL REEFS
 - SUBMARINE SAND DEPOSITS

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY

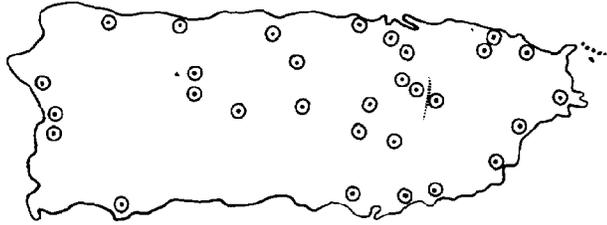
Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



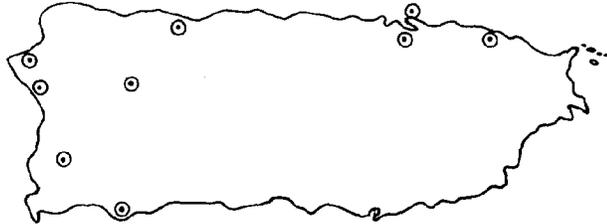
ISLA DE PUERTO RICO
 PUENTE DE INFORMACION/SOURCE:
 MORENO, SURVEY OF MARINE AND COASTAL
 RESOURCES, MAYAGUEZ, P.R., DEPARTMENT OF
 MARINE SCIENCE, 1974.

USO DOMINANTE DE TERRENOS-CARACTERISTICAS MARINAS Y COSTANERAS
 GENERALIZED LAND USE - MARINE AND COASTAL FEATURES

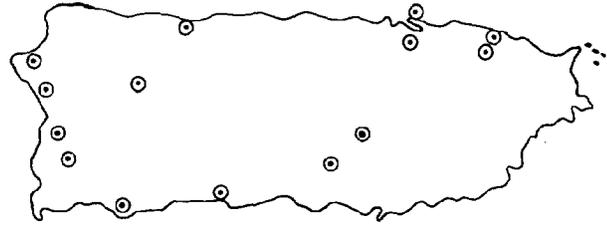
PRE-COLOMBINO
PRE - COLUMBIAN



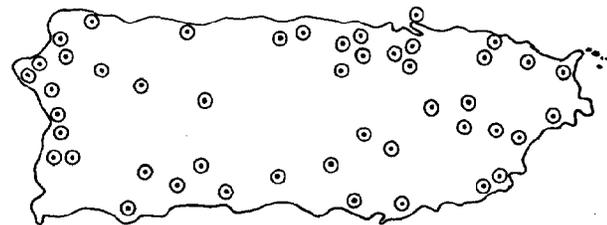
1600



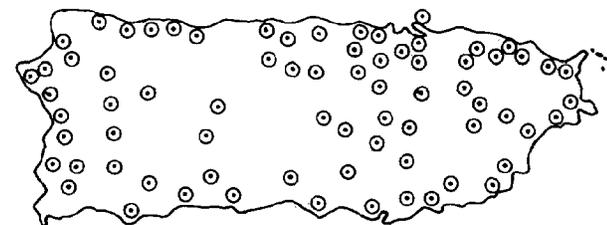
1700



1800



1900



FUENTE DE INFORMACION / SOURCE:

HISTORIC SETTLEMENT PATTERNS.

PATRON DE ASENTAMIENTOS URBANOS

URBAN SETTLEMENT PATTERNS

4

62 years, from 1765 to 1827, the Island's population multiplied eight-fold. Thus began a long-term rise in population which has continued to the present.

Land demand has increased with population growth. The coastal lowlands were progressively transformed from virgin forests to farm lands for the cultivation of rice, cotton, tobacco, coconut palms, and sugar cane. To meet the needs of a rising population, food imports increased; before the end of the nineteenth century, the population had grown beyond its capacity to feed itself. To balance the rising costs of imported food, exports had to be increased.

Sugar cane's high productivity rate, the adequacy of insular farmlands for its cultivation, and the rapidly expanding United States market, made sugar cane an important cash crop upon which the local economy increasingly came to depend. The change in sovereignty following the Spanish-American War prompted major investments of U.S. capital which, in combination with technological development, gave a major stimulus to expansion of the sugar industry after 1898. More land, mainly in the flat coastal plains, was converted to sugar cane cultivation, and the sugar industry soon became the economy's driving force. As a result, coastal forests were progressively eliminated, and food crop cultivation was displaced toward the mountains to accommodate extensive sugar cane plantations. Eventually such staples as rice and cotton disappeared altogether. By the mid-twentieth century, Puerto Rico's economy largely depended on a single crop -- sugar cane.

Puerto Rico remained an agrarian society until the mid-1940's. However, the post-World-War II era gave rise to new directions -- directions that transformed the society and placed heavy demands on Puerto Rico's limited land and natural resource base.

INDUSTRIALIZATION

Puerto Rico's experience with modern industrial development began with an emphasis on attracting labor-intensive, light industry. By the late 1960's, however, rising wage rates in Puerto Rico, coupled with competition from low-wage countries, reduced Puerto Rico's ability to attract labor-intensive industry.

Technological advances in maritime transportation achieved during World War II, as well as a U.S. petroleum import policy favorable to Puerto Rico, made possible the establishment of heavy industries based on bulk importation of foreign crude oil. As a result, in the latter part of the 1950's and in the beginning of the 1960's, a new phase of the Island's industrialization process began with the establishment of a heavy chemical industry. Since then, Puerto Rico has become a major producer of petroleum derivatives.

Physical determinants affected the pattern of industrial location. Protected waters and the availability of several naturally deep harbors helped to attract the petroleum refining and petrochemical industries to the south coast. On the north coast, extensive artesian aquifers yielding great quantities of good water were a prime attraction for the major pharmaceutical complex that has made the Island a major exporter of pharmaceutical products.

AGRICULTURE

Despite structural changes in the economy, land use in Puerto Rico is still overwhelmingly agricultural (1,835 square miles out of a total areas of 3,421 square miles). Only about half of the agricultural land is commercially productive farmland, and an even smaller amount -- roughly half a million cuerdas -- is flat, fertile, and in sufficiently large holdings for mechanized agriculture. The mechanizable agricultural lands are mainly located in the coastal plain. Principal products are sugar cane, meat and poultry, dairy products, and fruits. Although agriculture represents a low-wage sector, it accounts for a significant amount -- 14 percent -- of total Island employment.

Income generated from agriculture exerts a significantly higher multiplier effect on the general economy than any other major sector, including manufacturing. Moreover, although the Island's capacity to feed its population has long since disappeared, substituting locally grown for imported foodstuffs can contribute to a more positive trade balance.

URBANISM AND CONSUMERISM

Puerto Rico's metropolitan areas have grown dramatically during this century, particularly in response to Operation Bootstrap, the successful industrial development program initiated by the Commonwealth government in the mid-1940's. The San Juan Metropolitan Area, for example, as Map 5 shows, grew from 7,162 cuerdas in 1920 to 12,145 in 1940, 34,256 in 1960, and 51,074 in 1970. By the 1960's, construction had become a major industry, dependent on a supply of buildable, flat land, most of which consisted of alluvial lowlands and coastal plains.

Puerto Rico's three largest urbanized areas are port cities -- San Juan, Ponce, and Mayaguez.* The level coastal plains surrounding these developing urban centers are subject to continuing pressures to accommodate a society that is increasingly urban and increasingly affluent.

*The fourth largest urbanized area, Caguas, is located in the interior of the Island.



FUENTE DE INFORMACION / SOURCE

GROWTH OF METROPOLITAN SAN JUAN
 ESTADO LIBRE ASOCIADO DE PUERTO RICO.
 OFICINA DEL GOVERNADOR JUNTA DE
 PLANIFICACION, SANTURCE, P.R.

SAN JUAN METROPOLITANO
 METROPOLITAN SAN JUAN

In the course of a single generation, Puerto Rico has evolved from a predominantly agricultural economy to a semi-industrial economy. The Gross National Product has increased almost 10 times over its 1950 level and has more than doubled in the last 10 years. Personal income has also risen dramatically: from \$343 per capita in 1950, to \$1,705 in 1970, and \$2,314 in 1975. Personal consumption expenditures have also increased explosively. Puerto Rico's consumer expenditures now exceed its Net National Product. This rising consumption level has been reflected, among other ways, in increased demand for second homes and tourist condominiums, accompanied by growing public interest in water-related recreation. From 1964 to 1967, for example, the number of pleasure boats rose from 1,000 to 4,000, increasing the need for marinas and related boating facilities. In response to the growing market for second homes and tourist-recreation development, new construction has extended into rural coastal areas. This trend has stirred concern because of the adverse environmental impact such activity can have on natural areas, as well as because of a desire to prevent the building of a "wall" of condominiums along the sea.

THE CHANGING ECONOMIC STRUCTURE

The structural changes in the economy of Puerto Rico are illustrated by the shift in importance of several sectors that contribute to the Gross National Product. Table 1 shows this shift. Unemployment dropped from 13 percent in 1950 to a record low of 10.2 percent in 1969. Since then, however, unemployment has risen sharply to a record high of 21 percent in 1976.

TABLE 1

CONTRIBUTION OF SELECTED ECONOMIC SECTORS TO GROSS NATIONAL PRODUCT (GNP) AND EMPLOYMENT

	<u>Percent of GNP</u> <u>Selected Sectors</u>		<u>Percent of Employment</u> <u>Selected Sectors</u>	
	<u>1950</u>	<u>1975</u>	<u>1950</u>	<u>1975</u>
Agriculture	17.5	3.6	35.6	6.6
Manufacturing	15.9	29.9	9.2	18.7
Services (including tourism)	5.9	11.8	12.2	16.2
Local government	9.9	18.7	7.5	20.4
Transfer payments (Federal expenditures other than purchasing goods and services)	4.1	14.3	---	---

Source: Planning Board, Bureau of Economic Planning, Economic Report to the Governor - 1976, Tables 4 and 25.

With the decline in agriculture, Puerto Rico relies heavily on imported intermediate goods and foodstuffs. This dependency is demonstrated by changes, during the last 25 years, in the commercial balance of payments. In 1950, Puerto Rico exported \$244.1 million of goods, but imported \$350.3 million, yielding a deficit of \$106.2 million. By 1970 this deficit had increased to \$766 million. During the next 5 years, the deficit more than doubled -- reaching \$1.812 billion in 1975. Preventing an even more serious imbalance are transfer payments by the Federal government. These increased from \$73 million in 1950, to \$315 million in 1970, and then reached \$1.55 billion in 1975.

POLICY FORMULATION FOR COASTAL MANAGEMENT

Just as the Puerto Rico Coastal Management Program must be adapted to the physical characteristics of Puerto Rico's shoreline, so must it adapt to the social and economic realities that have consistently shaped Commonwealth policies and programs. What are some of these realities?

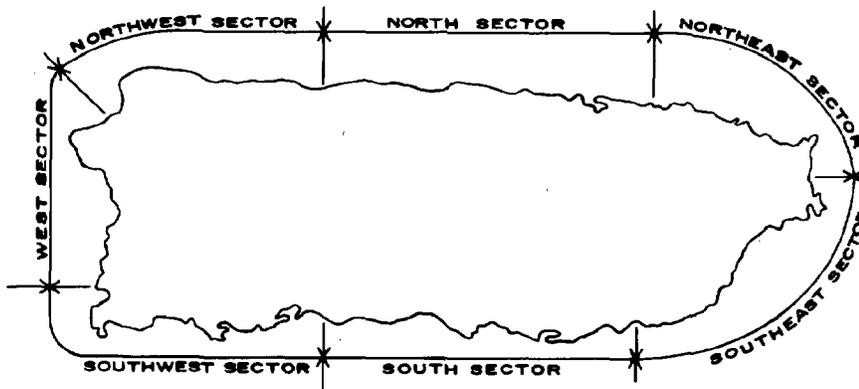
- Poverty: Despite unprecedented economic growth and structural transformation from an agricultural to an urban-industrial society, Puerto Rico's per capita income remains substantially below that of the poorest mainland state.
- Unemployment: Even during the best of times, according to Planning Board figures, the unemployment rate in Puerto Rico has fluctuated between 10 and 13 percent. Currently, unemployment is officially estimated at about 20 percent of the Island's labor force and in some municipios it is substantially higher.
- Rising consumer costs: Energy, food, and transportation are among the major components of sharply rising consumer costs. Because Puerto Rico is almost entirely dependent on imported oil to fuel its industries, power plants, and automobiles, recent increases in oil prices have played havoc with an economy long accustomed to low-cost energy. Because Puerto Rico imports about 80 percent of its food, principally from mainland markets, it is vulnerable to food price increases elsewhere. Successive increases in transportation costs have added to the price of food as well as other imported products.
- Stringencies in government: The effects of the recession on the Puerto Rican economy forced severe restrictions in government spending. For several years, capital construction has been severely curtailed. To raise badly needed revenues in a period of declining economic growth, a 5 percent surcharge was imposed on personal income taxes, a 5 percent tax was imposed on most imports, and the salaries of government workers were frozen for 2 years.

For decades, Puerto Rico has responded to unemployment and poverty by vigorously fostering economic development. No governmental program has had higher priority. Given the economic downturn of the last few years, development objectives continue to be paramount in the formulation of governmental programs. Natural resource conservation, although a subject of growing concern, lacks equivalent popular support.

Given a staggering unemployment rate, a per capita income level 35 percent below that of the poorest mainland state, and a public treasury caught between increasing demands for expenditures and declining revenues, Puerto Rico alone could hardly afford to allocate sufficient funds for the management of its magnificent shorefront resources. The Federal Coastal Zone Management Program, which makes Federal grants available to cover 80 percent of approved Commonwealth expenditures for such purposes, thus presents Puerto Rico with an important opportunity.

DESCRIPTION OF COASTAL FEATURES

On the basis of topographical, ecological and socio-economic characteristics, Puerto Rico's coastal perimeter can be divided into eight coastal sectors -- north, northeast, southeast, south, southwest, west, northwest, and offshore islands. These are shown below and in more detail on Maps 30-37. Each of these sectors possesses singular opportunities for development, and each has an array of fragile natural areas requiring conservation and protection. Two sectors, however, stand out as particularly rich in natural systems and developmental opportunities -- the southwest and the northeast.



NORTH COAST: Rio Grande de Arecibo (Arecibo) to Boca de Cangrejos (Carolina)

The San Juan Metropolitan Area (SJMA), in the eastern part of the north coast sector, is the largest of the Island's urban areas and a major port. The SJMA had a population of 943,400 in 1975*.

Topography in the north coast sector is practically level with extensive karst hillocks toward the interior. The fertility of these level lands has favored the intensive cultivation of sugar cane (32 tons to the acre) and pineapple (15.5 tons to the acre).

Two major non-mangrove wetlands along the north coast, Cano Tiburones and Laguan Tortuguero, are susceptible to tidal flooding and are populated principally by freshwater biological communities. Laguna Tortuguero, an important natural area, is the only natural freshwater lagoon in the Island. It possesses a wide variety of plant species (600), of which 35 are endemic and unique to the lagoon. Faunal diversity is also remarkable. In recent studies by the Department of Natural Resources, 18 moluscan genera, 21 species of fish, and 39 species of birds were identified. Because of its biological diversity and recreational potential, Laguna Tortuguero is one of a number of areas requiring special management attention to insure that its values are preserved and protected.

With its exposure to heavy wave action, the north coast is highly susceptible to natural erosion, a condition aggravated in several locations by man-made activities. Wave action on the coastline has resulted in the creation of numerous tombolos and lunate bays. However, most of the north coast beaches consist of thin deposits of sand covering a rocky lower foreshore. During the winter storm period, these sands may move offshore temporarily as part of the natural erosion cycle.

The north coast sector contains the rivers with the greatest volume of flow on the Island and the largest system of subterranean aquifers. This system of aquifers has attracted a major concentration of pharmaceutical and chemical plants to the area. Geologic formations off the north coast, from San Juan to Manati, have encouraged interest in petroleum exploration, and discussions of possible exploration have recently been held between private firms and the government.

NORTHEAST COAST: Boca de Cangrejos (Carolina) to Rio Demajagua (Ceiba)

This coastal sector includes the Island's most extensive mangroves (approximately 4,850 acres), and various salt water lagoons (approximately 941 acres). Together with the mangroves that

*SJMA refers to the San Juan Standard Metropolitan Statistical Area. The population figure includes six municipios -- Catano, Guaynabo, San Juan, Carolina, Bayamon, and Trujillo Alto. Source: Demographic Unit, Puerto Rico Planning Board.

surround them, these lagoons are nursery areas for sport and commercial fish. The wide insular shelf toward the east favors the proliferation of coral reefs that culminate in a chain of small islands (La Cordillera) ending in Culebra and Culebrita.

Coral and rock reefs protect these coasts, causing tranquil waters and creating conditions favorable to the formation of abundant sandy beaches that border 78 percent (45.8 kilometers) of the coastline. The extensive insular shelf, and the presence of reefs and mangroves, support an abundant marine life, making this portion of the coast very attractive for aquatic recreational activity.

Topography is predominantly level from Boca de Cangrejos to Punta Percha in Luquillo. East of Punta Percha, extensions of the Sierra de Luquillo come down to the coastline creating hills and valleys.

The rain forest of El Yunque and the chain of small islands known as La Cordillera augment the attraction of this area for tourism. This potential has generated enormous pressure for the construction of tourist complexes and summer residences on the coast.

The growth of the nearby San Juan metropolitan area is, nevertheless, the factor that continues to generate the largest demand for level land in this area. High population density and concentration of economic activities could have major adverse effects on the integrity and quality of the ecological systems of the northeast.

SOUTHEAST COAST: Rio Demajagua (Ceiba) to Rio Grande de Patillas (Patillas)

The southeastern coastline is an alternation of rocky headlands, partly shaped by marine erosion, and valleys of alluvial material that, as a result of wave action and marine deposition, form broad beach plains. North of Punta Lima the coastline consists of mangroves, rocky headlands, and a few small beach plains and pocket beaches. This end of the Island is bordered by an insular shelf, with abundant coral and marine organisms, that extends eastward to the neighboring Virgin Islands.

Average annual rainfall is high, with a range of 55 to 80 inches. Rivers and streams are abundant and meander through narrow V-shaped valleys. The most dramatic example of these is the Maunabo Valley situated between the Cuchilla de Panduras and the Sierra de Guadarraya, which reaches to the water's edge. These two formations and their forested landscapes harbor an important wildlife

habitat. Cultivation of sugar cane is the predominant land use; extensive irrigation canals are common.

Roosevelt Roads, the largest military base in Puerto Rico (25 percent of all military holdings on the Island) is located along this coastal stretch. At Yabucoa, a large man-made harbor serves the Sun Oil Company refinery and related industries.

SOUTH COAST: Rio Grande De Patillas (Patillas) to Rio Tallaboa (Penuelas)

The arid south coast sector is a low lying alluvial plain except for a short stretch between Tallaboa and Punta Cuchara where the mountains extend to a coastline shaped by wave erosion and fringing reefs. The rest of the coastline is either beach plain or mangrove.

Ponce, located in the western part of this sector, is the second largest metropolitan area -- and second largest port city -- on the Island (San Juan is the largest). The urbanized portion of the Ponce Metropolitan Area accounted for a population of 128,233 in 1970.

To reduce chronic unemployment, the Puerto Rico Economic Development Administration has proposed the establishment of heavy industries in the area, especially oil and pharmaceutical related industries. However, the water needed to serve such industrial development would have to be imported. Preliminary studies have been made to divert the waters of the Rio Manati by means of a reservoir yielding 228,000 acre-feet per year to the south coast region.

SOUTHWEST COAST: Rio Tallaboa (Penuelas) to Punta Guaniquilla (Cabo Rojo)

Topography is generally hilly with the exception of level areas near Tallaboa, Guayanilla, Guanica, Pole Ojea, and Boqueron. Precipitation is low -- 35 inches annually -- which gives rise to the xerophytic (desert-type) vegetation that abounds along the coast. The absence of alluvium and the relatively wide extension of the insular shelf along the southwest coast have permitted the proliferation of coral reefs and bioluminescent waters -- natural systems sustaining a food chain that contributes to the southwest's fisheries resources, which are abundant compared to those of the rest of the Island.

The dry forest of Guanica (9,582 acres); the mangrove swamps of La Parguera, Boqueron, and Pitahaya (1,681 acres); the reefs of Margarita and Turromote; the beaches of Cana Gorda, Bahia de la Ballena, El Combate, Caleta Salina, Punta Ventana, and Boqueron; the bird reserves of the Cabo Rojo National Wildlife Refuge and the Commonwealth's Boqueron Bird Refuge (970 acres) are examples of the natural wealth of the southwestern coast.

The level interior lands of the southwest include fertile agricultural areas appropriate for mechanized agriculture. To maximize this agricultural potential, among the richest in Puerto Rico, the Lajas irrigation system has been established, to compensate for the scarcity of rainfall.

A relatively low population density -- 342 persons per square mile in 1970 -- has helped preserve the rich biological systems of the southwest. It is projected that by the year 2000, population will have increased to 72,000 inhabitants -- 400 per square mile. Residential land demand in the southwest will continue to be relatively small. On the other hand, the scenic attractions of the sector have generated a specialized demand for land for condo-hotels, summer and weekend residences, and other tourist activities. Since these tourist-related activities are generally located on the very border of the littoral, they could threaten biological systems of the region.

The maritime conditions produced by the protection given by offshore islands and in some instances, by the Island of Puerto Rico itself, and the presence of natural ports in the southwest offer opportunities for the establishment of heavy industries that require port facilities, such as petrochemical complexes. Today, for example, a petro-chemical complex in Tallaboa occupies 1,649 acres, and additional heavy industrial sites have been proposed from time to time. Because of the unique biological systems of the southwest and the opportunities that they represent for recreation and tourism, proposals for industrial development create important land- and water-use conflicts. It is consequently important to provide for balanced land-use patterns whenever possible.

The recreational potential that this area offers is probably the greatest on the Island. The bioluminescent bay of La Parguera, the Dry Forest of Guanica, and the 16 kilometers of sandy beaches are outstanding features.

Approximately 10 kilometers (66 percent) of these beaches are not accessible to the public at present. Examples include the beaches of Bahía de la Ballena and El Combate. In some cases, access is difficult because of the terrain and because of remoteness from principal highways. In other cases, the beaches can be reached only by private roads closed by property owners.

In summary, scarcity of water limits the potential for urban development in the southwest. Other characteristics, however, offer important opportunities for tourism and recreation, and, with irrigation, for agriculture. The morphology of the coast and the navigability of its waters likewise favor the development of industrial port complexes.

WEST COAST: Punta Guaniquilla (Cabo Rojo) to Rio Culebrinas (Aguada)

The west coast, like the southeast, is characterized by valleys defined by mountain chains that come down to the coastline. This stretch of the coast receives the largest amount of rainfall -- from 65 to 90 inches annually. The abundance of water makes the principal valleys of the area -- Anasco, Culebrinas and Guanajibo -- of great agricultural value.

In the southern portion of this sector, beach plains predominate. However, north of Punta Guanajibo, there is a variety of coastal characteristics: rocky shorelines, mangrove stands, and fringing reefs.

Mayaguez, located midway between Punta Guaniquilla and Rio Culebrinas, is the Island's third largest urbanized area -- and the third largest port city -- (after San Juan and Ponce).

Anasco, north of Mayaguez, is potentially an area of great agricultural importance because of highly productive soils. The Planning Board has proposed the area for agricultural uses. In addition, it is potentially an excellent site for a port and for heavy industry. The site has a good approach to the sea and favorable upland features. Development north of Anasco would be limited by topographical conditions, but there is ample land to the south.

Nickel deposits with an estimated gross value of \$1.65 billion are located in barrio Guanajibo, south of Mayaguez. Mining activities could affect some 1,850 cuerdas over a 25-year period.

NORTHWEST COAST: Rio Culebrinas (Aguada) to Rio Grande de Arecibo (Arecibo)

This sector -- the tableland of the northwest -- is characterized by a hilly interior and rocky cliffs along the coast. These cliffs, some as much as 300 feet high, are a tourist attraction because of their dramatic scenic beauty. Nevertheless, since the coastline is exposed to direct wave action of the sea, the potential for aquatic recreation is limited. The sand dunes on the coastline are an important resource, and submarine sand deposits off the coast of Isabela are important potential resources.

The limestone bluffs of the northwest coast have been shaped by wave erosion. Along much of the coast, the bluffs extend several hundred meters or more back from the shoreline, with beach plain between the bluffs and the water. In the Jobos Beach area in Isabela, an extensive system of sand dunes exists. These pose a major coastal issue because of extensive mining which threatens the resource. East of Isabela, beaches are generally narrow, consisting of thin layers of sand over a

rocky shoreline. Despite numerous rocky headlands that separate these beaches, adjacent sand dunes supply most of the beach sands by landward erosion and littoral migration.

Borinquen Airport, the former Ramey Air Force Base now being leased by the Commonwealth, has the longest runway in the Caribbean. In addition, it has extensive aviation infrastructure, more than 1,000 housing units, and recreational facilities, including an 18-hole golf course, pools, and beaches. These facilities suggest the potential for commercial passenger and air cargo services, tourism, and related industries. Major steps towards the realization of this potential are currently being taken.

THE OFFSHORE ISLANDS: including Culebra*, Vieques**, Mona, and others

The principal offshore islands of Puerto Rico are Vieques (33,970 cuerdas), Culebra (7,180 cuerdas), and Mona (13,900 cuerdas). The topography of the first two is similar, characterized by small hills. Rainfall on these islands is light. Vegetation is the same as that of the semi-arid south coast of Puerto Rico. Portions of the coasts are bordered by mangroves, and some of the bays are bioluminescent. The clarity of coastal waters contributes to the presence of coral reefs in the near-shore waters. These waters also provide favorable conditions for marine life and recreational boating.

Economic activity on Vieques and Culebra is limited. The small population is supported by subsistence agriculture and fishing, limited industry and tourism, and civilian employment generated by the Marine Corps base on Vieques.

Mona is predominantly a limestone tableland surrounded by cliffs interrupted sporadically by bands of beach. Low rainfall and the extreme porosity of its soils result in a vegetation typified by dry coastal forest. The island is uninhabited; its flora and fauna include a large number of endemic species. The principal value of this island is as a natural reserve.

The other small islands, the majority of coral origin, are uninhabited and reflect natural conditions similar to the islands previously described. The many fringing islands of the south coast of Puerto Rico are also very important in numerous coastal processes.

*Culebra is discussed in The Culebra Segment of the Puerto Rico Coastal Zone Management Program.
**Vieques is described in Appendix C, Description of Special Planning Areas and Natural Reserves.

Conclusions and Needs

The development of this mountainous Island is concentrated in the coastal plain. Timber stands which formerly covered most of the coast were almost entirely removed to make way for agriculture.

Since the 1940's, the socio-economic structure of the Island has been transformed. A largely agricultural and rural society has moved far toward industrialization and urbanization. This transformation has placed enormous pressures on coastal land and water resources, giving rise to conflicts, which have continued up to the present.

Some past development has irreversibly limited options that once existed for agriculture, for recreation and tourism, and for retaining wildlife habitats and nursery areas for propagation of marine life. To minimize future conflicts in coastal land and water use, the finite supply of resources must be carefully evaluated. Development must be based on carefully conceived plans that emphasize the accommodation of multiple uses. And some areas must be singled out for preservation in their natural state.

Population projects indicate that urban pressures upon coastal resources will grow significantly. Competition among alternative uses will accordingly intensify. The dynamic nature of coastal processes adds to the importance -- and the difficulty -- of reaching sound use decisions. Coastal ecosystems are such that an apparently isolated action may affect an extensive area. The extraction of sand from a river mouth, for example, may aggravate the erosion of several kilometers of beach. Pollutants from a single factory may affect coastal agriculture over an extensive area. The challenge of coastal management is to achieve development in harmony with the coastal environment. An integrated planning process that identifies the interaction among demands and resources is essential to meet this challenge successfully.

CHAPTER 2

COASTAL MANAGEMENT FOR PUERTO RICO: OVERALL OBJECTIVES AND POLICIES

CHAPTER 2

COASTAL MANAGEMENT FOR PUERTO RICO: OVERALL OBJECTIVES AND POLICIES

To resolve conflicting demands on its limited resources, Puerto Rico long ago established programs of planning and resource management. Those programs apply throughout the Commonwealth -- to the central mountains and valleys as well as to the coastal plains and waters.

Federal financial aid for a Coastal Management Program will permit Puerto Rico to give new emphasis and attention to coastal needs and resources. Planning and control measures can be refined; management capabilities can be strengthened. All of this represents an important opportunity, for nowhere in Puerto Rico are the resources richer than on the coast, and nowhere are conflicting demands upon resources more intense and more difficult to resolve.

Yet the Coastal Management Program must remain an integral part of programs established to serve the Commonwealth as a whole. The coast itself does not exist in isolation; its resources cannot be used most wisely, and the demands placed upon them cannot be satisfied, by looking to the coast alone. The Management Program, even while focusing on the coast, must maintain awareness of the larger whole.

To this end, the objectives and policies and program elements of the Coastal Management Program all relate as closely as possible to objectives and policies and programs established for the Island as a whole. This chapter sets forth the objectives and policies established by the Objectives and Policies elements of the Islandwide Land Use Plan, adopted by the Puerto Rico Planning Board on June 8, 1977, and approved by the Governor on June 22, 1977. This establishes a generalized policy framework for management of many of Puerto Rico's resources in all parts of the Commonwealth, including the coastal zone.

As an element of Puerto Rico's Islandwide Land Use Plan, the overall objectives and policies guide both public and private development. The legal effect of the Land Use Plan is explained in Chapter 4.

The Islandwide Lands Use Plan establishes four general objectives, which also serve as general objectives for coastal management.

To achieve the overall objectives, the Islandwide Land Use Plan establishes general policy in six subject areas: Urban development, industrial development, agricultural development, floodable areas, infrastructure, and natural areas. These policies form the base upon which many of the more detailed policies and program elements of the Coastal Management Program are built. Because of their importance, the general objectives and policies established by the Land Use Plan are set forth here in full:*

*The remainder of this chapter is an official English translation of the Objectives and Policies of the Land Use Plan, as adopted by the Puerto Rico Planning Board on June 8, 1977, and approved by the Governor on June 22, 1977. As explained in Chapter 4, all development must be consistent with adopted land use policies.

GENERAL OBJECTIVES

1.00. TO PROMOTE OUR DEVELOPMENT BY JUDICIOUSLY UTILIZING AND AT THE APPROPRIATE MOMENT ALL THE POTENTIAL OF LAND AND NATURAL, ENVIRONMENTAL AND CULTURAL RESOURCES.

IT IS RECOGNIZED THAT THESE REPRESENT AN IRREPLACEABLE VARIETY AND RICHNESS OF ALTERNATIVES FOR OUR DEVELOPMENT AND IT IS ESTABLISHED THAT THE BEST USE OF THIS POTENTIAL AND OPTIONS FOR ITS DEVELOPMENT IS THAT WHICH:

SERVES THE COMMON INTEREST OF ALL PUERTO RICANS AND NOT THAT OF ONE OR SEVERAL SECTORS IN PARTICULAR.

YIELDS FROM THE INHERENT CHARACTERISTICS OF THE RESOURCE THE BEST POSSIBLE CONTRIBUTION FOR OUR DEVELOPMENT, CAUSING AT THE SAME TIME THE LEAST ADVERSE IMPACT ON OTHER RESOURCES, AND ASSURES THE FUTURE AVAILABILITY OF RESOURCES WHICH REPRESENT A UNIQUE OPPORTUNITY TO PROVIDE FOR THE COUNTRY'S FUTURE NEEDS.

2.00. TO PROMOTE A REASONABLE AND JUST DISTRIBUTION OF THE BENEFITS OF DEVELOPMENT IN AND BETWEEN THE URBANIZED AREAS AND THE OTHER GEOGRAPHIC SECTORS OF THE COUNTRY, ACCORDING TO THEIR NEEDS.

3.00. TO CREATE AND MAINTAIN THE CONDITIONS UNDER WHICH MAN AND NATURE MAY COEXIST IN PRODUCTIVE HARMONY, SO THAT PUERTO RICO MAY ACHIEVE THE GREATEST ENJOYMENT FROM THE BENEFICIAL USE OF THE ENVIRONMENT WITH ITS LEAST POSSIBLE DEGRADATION COMPATIBLE WITH THE FOLLOWING:

- The fulfillment of each generation's responsibility to act as custodians of the environment for the benefit of future generations.
- The guarantee of the existence of accessible, safe, healthy and aesthetically pleasing landscapes, for the enhancement of our culture, spiritual values, and for their enjoyment by all.
- The preservation of the cultural and natural aspects of our heritage and the maintenance of an environment which could offer selection alternatives to the individual.
- The improvement of the quality of renewable resources and the proper use of non-renewable resources.

4.00. TO PLAN, ON A BASIS OF BROAD AND EFFECTIVE PARTICIPACION OF ALL SECTORS OF THE POPULATION, DIRECTED TOWARDS:

- The greatest citizen participation and support in the process of diagnosing our problems, investigating their causes, establishing our common objectives, identifying alternatives, and coordinating the implementation and evaluation of plans;
- Establishing an effective process of communication between the government and the citizenry;
- Implementation principally by means of positive incentives rather than restrictive forms of control;
- Maximum productivity of governmental and private expenditures and investments;
- Comprehensive development directed towards the needs and desires of all Puerto Ricans, transcending the goal of a mere economic growth.

A. URBAN DEVELOPMENT

OBJECTIVE

TO DEVELOP DENSE, COMPACT AND ATTRACTIVE COMMUNITIES, TOWNS AND CITIES WHICH WOULD PERMIT THE INTENSIVE USE OF LAND, MINIMIZATION OF THE ADVERSE IMPACT ON LAND BEYOND THE URBAN LIMITS, ACHIEVEMENT OF GREATER EFFICIENCY IN THE INSTALLATION AND OPERATION OF PUBLIC FACILITIES AND SERVICES AND THE RAPID AND SAFE MOVEMENT OF THE POPULATION BY MAKING FEASIBLE THE DEVELOPMENT OF MASS AND PRIVATE TRANSPORTATION MEANS AND A BETTER QUALITY OF URBAN LIFE.

PUBLIC POLICIES

1.00. TO ORGANIZE AND COORDINATE THE PHYSICAL GROWTH OF URBAN AREAS.

1.01. To designate in advance, by means of zoning regulations, those lands where it is feasible, desirable and convenient, to direct urban growth, applying the following criteria:

- Provide enough and adequate land to meet the anticipated needs of the urban population as predicted or projected.
- Select as first priority for urban purposes, lands with the following characteristics: lands in built-up areas which are susceptible to redevelopment and for increasing their densities; pockets of vacant lands (which are not or would not be designated for passive or active recreation) in the built-up areas; lands adjacent to these areas not having a high agricultural productivity (except those indicated in policy 8.01) or floodable (except those indicated in policy 11.00) and where electrical and water systems, storm and sanitary sewers, as well as schools, health and recreation centers, and transportation, commercial, and other services are available or can be improved, operated and maintained at reasonable costs.
- Not utilize for urban uses, lands where important natural resources are located; which may be environmentally critical or where existing pollution represents a health risk to people in that sector, and discourage the use of steep slopes.
- In coastal towns, promote growth perpendicular to the coast and discourage lateral expansion along the primary roads having direct access to the coast.
- Use the programming and the construction of infrastructure as an instrument to promote growth in designated areas.

1.02. To restrict and control sprawl and development of isolated urban centers, using the following criteria:

- To require, as a primary rule, that development projects and land uses, proposed to meet the needs of the present and projected urban population are carried out in those lands identified by urban zoning, after the limits to this zoning have been designated according to the criteria specified by policy 1.01.
- To permit the development outside the limits of urban zoning only of those projects intended to take care of the needs of the population residing in those areas, and, as exceptions projects of an urban character (by virtue of their use, density, size, and facilities and services they require), which fulfill the following conditions:
 - Small projects which do not impair the policy of organizing and coordinating urban growth.
 - Can be integrated into existing nuclei of built-up areas.
 - Do not require substantial public investments (state or municipal) to carry out, operate and maintain public services and facilities; on the contrary their development would constitute the more efficient use of existing services.
 - Do not use lands of high agricultural productivity, lands which are being operated at present for agricultural purposes, floodable areas, steep slopes, where important natural resources which are considered best suited for other uses exist or lands which are environmentally critical.

2.00. TO INTENSIFY THE USE OF LAND IN URBAN AREAS

2.01. To stimulate the development of urban residential areas at higher densities, according to the following criteria:

- To promote higher densities in residential areas, using when possible, medium density types of housing to achieve a more intensive use of the land than that which may be obtained in single-family detached housing or lots, without necessarily involving in the construction of high use-elevator type buildings.

- To promote the construction of high density housing in urban centers.
- To implement the necessary and appropriate measures so that urban dwellers prefer medium and high density housing projects to those of low density.
- Harmonize the proposed density with the conditions in the surrounding areas and with the conditions of the land.
- To avoid the construction of housing in densities that are not compatible with the existing infrastructure or that which may be provided.

2.02. To intensify the use of lands which are or are intended for commercial and service purposes, both public and private, adhering to the following criteria:

- Revitalize, where feasible and convenient, the traditional town centers so that they will continue to be important places and dynamic centers by rezoning these areas to commercial districts, providing parking facilities, improving access roads, protecting areas or buildings of historical and/or aesthetic value, and locating in these sectors governmental offices which provide services.
- Stimulate the formation of new urban centers, where traditional centers are insufficient or inadequate, even after the revitalization process.
- Maintain adequate relationships among regional, sub-regional, community, and neighborhood centers, and between commercial areas in large and small municipalities.

2.03. To promote the establishment of urban industrial parks for light industry which are labor-intensive as related to the land-area

3.00. TO IMPROVE THE DESIGN OF COMMUNITIES, TOWN AND CITIES AND THEIR VARIOUS COMPONENTS, SUCH AS TRADITIONAL URBAN CORES, OTHER COMMERCIAL AND INSTITUTIONAL CENTERS AND RESIDENTIAL NEIGHBORHOODS, IN ORDER TO ACHIEVE A BETTER QUALITY OF LIFE IN URBAN AREAS SO THAT THEY MAY BECOME ATTRACTIVE PLACES IN WHICH TO LIVE AND WORK.

3.01. To encourage proximity and accessibility between places of work, residences, public facilities and services, and commercial and recreational facilities.

3.02. To encourage integration into urban design of natural, historic or aesthetic attractions (such as landscapes, shorefronts or other bodies of water, places of historic or cultural values, and areas or structures of aesthetic or architectural significance).

3.03. To provide those facilities and services needed by urban dwellers, both as individual or as a group, making emphasis on the development of pleasant and efficient neighborhoods and communities.

B. INDUSTRIAL DEVELOPMENT

OBJECTIVE

TO DEVELOP 60% INDUSTRIES IN STRATEGIC LOCATIONS SO THAT INTENSIVE USE IS MADE OF THOSE LANDS WHICH, BY THEIR LOCATION, CHARACTERISTICS OR THE SERVICES THEY ARE PROVIDED WITH, ARE BEST SUITED TO SUCH USE, AND IN HARMONY WITH THE FOLLOWING THREE GENERAL OBJECTIVES: TO ACHIEVE THE FULL AND WISE USE OF THE LAND POTENTIAL AND ITS NATURAL RESOURCES; TO ACHIEVE A DISTRIBUTION OF THE BENEFITS OF DEVELOPMENT AMONG THE DIFFERENT MUNICIPALITIES AND GEOGRAPHIC SECTORS OF THE COUNTRY; AND TO CREATE AND MAINTAIN THE CONDITIONS UNDER WHICH MAN AND NATURE MAY EXIST IN PRODUCTIVE HARMONY.

PUBLIC POLICIES

4.00. TO CONCENTRATE INDUSTRIES ON LAND MOST APPROPRIATE FOR THIS USE AND TO PROMOTE AT THE SAME TIME THE MOST INTENSIVE POSSIBLE USE OF SUCH LANDS.

4.01. To place those light industries which do not have adverse effects on the environment and which require a minimal infrastructure in industrial parks located within the limits of urban zoning.

4.02. To avoid the establishment of industries which pollute, except those where their exclusion would seriously affect the economic development of the country.

4.03. In those exceptional cases where it is essential to establish industries which pollute (as defined by the Environmental Quality Board), these will be located in preselected sites, with adequate provisions made to minimize their adverse impact on the environment.

4.04. To locate light industries which require a greater infrastructure, heavy and moderately heavy industries, and those termed atypical industries, in land adapted to such uses in accordance with the following criteria:

- To place priority on the use of those lands, which are served by highways or primary roads, where sources of electrical energy, water supply, and sanitary treatment facilities are present and which are close to ports, airports, and are centrally located in relation to sources of manpower.
- Not to use for these industrial uses high productivity agricultural land (with the exception of those indicated in policy 8.01), floodable areas (except those mentioned in policy 11.00), where important natural resources are to be found, or which are environmentally critical.
- To concentrate these industries in industrial parks of a regional character, previously designating lands which fulfill the above characteristics, avoiding as much as possible the dispersion of industries in individual locations, separated from one another, excepting those atypical industrial projects which might require particular special locations.

4.05. To discourage the use of lands selected for industrial uses in accordance with the criteria enumerated in policies 4.01, 4.02, and 4.03, for other activities which could significantly reduce the extension of lands available for industries and in those cases when the location is appropriate, according to the criteria, for atypical industries and/or for major emitters of atmospheric pollution, to exclude also, other types of industries except those which necessarily have to be located near them.

5.00. TO DECENTRALIZE INDUSTRIAL DEVELOPMENT, PROVIDING AS FAR AS POSSIBLE, A LIGHT-INDUSTRY INDUSTRIAL PARK IN EACH MUNICIPALITY; REGIONAL PARKS IN THE DIFFERENT SECTORS OF THE COUNTRY; AND PERMITTING IN RURAL AREAS, SMALL-SCALE INDUSTRIES WHICH ARE RELATED TO THEIR SOCIO-ECONOMIC DEVELOPMENT OF THE COUNTRYSIDE.

C. AGRICULTURAL DEVELOPMENT

OBJECTIVE

TO DEVELOP AGRICULTURAL ACTIVITIES IN ALL THOSE LANDS SUITED FOR THIS PURPOSE, IN ORDER TO ACHIEVE THE GREATEST POSSIBLE SELF-SUFFICIENCY IN FOOD PRODUCTION AND AT THE SAME TIME MAXIMIZE THE USE OF OUR LANDS TO PROMOTE THE COUNTRY'S DEVELOPMENT, SPECIALLY THE RURAL AREAS.

PUBLIC POLICIES

- 6.00. TO ENCOURAGE AGRICULTURE AS A PRINCIPAL ACTIVITY IN THE USE OF AVAILABLE LANDS WHICH HAVE POTENTIAL FOR SUCH USE, PROMOTING THOSE PROGRAMS AND MEASURES NECESSARY TO MAKE THIS ACTIVITY FEASIBLE.
- 7.00. TO PROVIDE THE NECESSARY INFRASTRUCTURE IN ORDER TO STIMULATE AND PROMOTE THE CULTIVATION OF LAND WITH AGRICULTURAL POTENTIAL NOT BEING FULLY UTILIZED DUE TO THE LACK OF SUCH SERVICES AS IRRIGATION, ACCESS ROADS, MARKETING SYSTEMS, AND OTHERS.
- 8.00. TO RETAIN, AS MUCH AS POSSIBLE, IN AGRICULTURAL USE, THOSE AGRICULTURAL LANDS SUITED TO THE PRODUCTION OF CROPS AND ANIMAL PRODUCTS, PROTECTING THEM FROM THOSE PRACTICES AND ACTIVITIES WHICH UNNECESSARILY DIMINISH THE POTENTIAL FOR THE DEVELOPMENT OF AGRICULTURE.
- 8.01. To emphasize the preservation of the most productive lands for agricultural purposes, in accordance with the following criteria:
 - To use as a basis, the soils study of Puerto Rico conducted by the Federal Soil Conservation Service, and to designate as highly productive all lands whose soils are included in categories 1 to 4 of said study.
 - To assign these highly productive lands to agricultural uses and promote the development of these lands for such uses.
 - To assign these lands to other uses only when it is clearly demonstrated that there is no other land alternative for the location of a non-agricultural activity which is urgently needed and has a very high priority for the country's development.
- 8.02. To arrest the indiscriminate subdivision of agricultural lands into small lots or farms in order to preserve farms in units of adequate size for an economically feasible agricultural operation, using the following criteria:
 - Determine the desirability of the proposed land subdivision, evaluating and giving a great deal of consideration to the proposed land uses of the resulting parcels of land.
 - Promote the integration of new subdivisions into existing residential nuclei, in order to discourage the creation of new population centers which may increase the cost of public services.

- Encourage that resulting parcels of land, intended for non-agricultural use, be as small as possible, depending on the use proposed and conditions such as topography and soil type, and be consistent with available facilities and uses.
- When subdividing land for non-agricultural uses; utilize to the maximum those lands which, when removed from agricultural use, have the least impact over the level of production of a farm.
- Discourage as a general rule, the loss by means of subdivision of a farm which would constitute a feasible agricultural production unit.

8.03. To encourage complementary activities to agricultural uses avoiding situations where the establishment of such activities on a farm would adversely affect the use of the farm as a feasible agricultural unit; promoting the establishment of such activities in less useful lands within these farms, in order to minimize the effect in its agricultural production level.

9.00. TO ENCOURAGE THE ADOPTION OF MEASURES AND PROGRAMS LEADING TO SOIL PRESERVATION IN ORDER TO AVOID EROSION PROTECT LAND PRODUCTIVITY AND MINIMIZE THE ADVERSE IMPACT ON THE QUALITY OF OUR WATER SUPPLIES AND DETERIORATION OF OTHER NATURAL RESOURCES AS A CONSEQUENCE OF THE AGRICULTURAL ACTIVITY.

D. FLOODABLE AREAS

OBJECTIVE

TO REDUCE TO A MINIMUM THE DANGER OF LOSS OF LIFE AND PHYSICAL DAMAGE IN THE COUNTRY, AS A RESULT OF FLOODING AND THE ACTION OF WAVE SURGE--AT THE SAME TIME IDENTIFY AND PROMOTE THOSE LAND USES AND ACTIVITIES COMPATIBLE WITH THESE CONDITIONS.

PUBLIC POLICIES

10.00. TO PROTECT THE POPULATION ACTUALLY RESIDING IN FLOODABLE AREAS OR IN AREAS AFFECTED BY THE ACTION OF WAVE SURGE.

10.01. To construct engineering works which will, at a reasonable cost, prevent property damage and risks to the lives of the citizenry actually affected, giving priority to these works above any other flood control measures.

10.02. Where necessary, to take the appropriate measures to relocate these persons.

11.00. TO PROHIBIT LAND DEVELOPMENT AND CONSTRUCTION OF STRUCTURES FOR URBAN EXPANSION AND OTHER ACTIVITIES WHICH ARE EXPRESSLY EXCLUDED BY CURRENT REGULATION IN AREAS AFFECTED BY FLOODS AND WAVE SURGE, EXCEPT WHEN FLOOD CONTROL WORKS OR PROTECTION AGAINST WAVE SURGE ALREADY EXIST, ARE UNDER CONSTRUCTION, OR CAN BE PROVIDED AT A REASONABLE COST, TO PROTECT THE PROPERTY AND GUARANTEE THE SAFETY OF ALL THE PEOPLE AFFECTED IN THOSE LANDS WHICH ARE NOT AGRICULTURAL PRODUCTIVE, DO NOT HAVE IMPORTANT NATURAL RESOURCES, AND ARE NOT ENVIRONMENTALLY CRITICAL.

12.00. TO STIMULATE AGRICULTURAL DEVELOPMENT IN FLOODABLE AREAS WHICH HAVE SUCH POTENTIAL.

13.00. TO CONSTRUCT FLOOD CONTROL WORKS WITH AN AGRICULTURAL APPROACH IN AREAS WHERE IT IS APPROPRIATE, AND WHICH WILL RESULT IN AN INCREASE IN AGRICULTURAL PRODUCTION.

E. INFRASTRUCTURE

OBJECTIVE

TO USE THE PROGRAMMING AND CONSTRUCTION OF INFRASTRUCTURE AS A TOOL, WHICH, TOGETHER WITH LAND USE PLANNING, MAY SERVE TO DIRECT AND PROMOTE THE COMPREHENSIVE DEVELOPMENT OF THE COUNTRY.

PUBLIC POLICIES

- 14.00. TO ASSURE OPTIMUM COORDINATION AMONG THE PUBLIC AGENCIES RESPONSIBLE FOR PROVIDING INFRASTRUCTURE SO THAT IT MAY BE AVAILABLE IN THE MOST ADEQUATE PLACE AND TIME IN ORDER TO ACHIEVE THE FULL AND JUDICIOUS UTILIZATION OF LAND IN URBAN AND RURAL AREAS.
- 15.00. TO ASSURE THE INTENSIVE USE OF INFRASTRUCTURE IN URBAN AND RURAL AREAS AND DIRECT THE FUTURE DEVELOPMENT OF LANDS TO SITES WHERE THE NECESSARY INFRASTRUCTURE IS ALREADY AVAILABLE, BUT IS NOT BEING USED TO FULL CAPACITY, WITHOUT ADVERSELY AFFECTING OTHER LAND USE OBJECTIVES AND POLICIES.
- 16.00. TO IDENTIFY AND RESERVE LANDS FOR THE LOCATION OF INFRASTRUCTURE PROJECTS WHICH, BY VIRTUE OF THEIR SIZE AND COMPLEXITY: POSSIBLE ADVERSE IMPACT ON THE ENVIRONMENT; OR SPECIAL REQUIREMENT (i.e., PORTS, AIRPORTS, ENERGY PLANTS, WATER SUPPLY FACILITIES OR REGIONAL SANITARY TREATMENT PLANTS), NEED VERY PARTICULAR OR SCARCE SITES, FOLLOWING THESE CRITERIA:
- Use for infrastructure projects which are major air pollution emitters (as defined by the Environmental Quality Board) or which could have some other significant adverse environmental effects, such as odors or noises, only those places where adverse environmental impact would be minimal due to the area's natural conditions, and where the uses of adjacent lands are not, nor could be, those which might be adversely affected by the infrastructure.
 - Not to use, insofar as possible, lands of major agricultural productivity (with the exception indicated in policy 8.01); floodable areas (except that mentioned in policy 11.00), lands where important natural resources are found, or which are environmentally critical.

F. NATURAL AREAS

OBJECTIVE

TO MAINTAIN AND PROTECT OUR ENVIRONMENT, PROMOTING THE CONSERVATION, PRESERVATION, AND THE WISE USE OF OUR NATURAL ENVIRONMENTAL AND CULTURAL RESOURCES, AND RECOGNIZING THAT THESE REPRESENT A VARIETY AND A WEALTH OF OPTIONS FOR OUR DEVELOPMENT AND AN OPPORTUNITY FOR PROMOTING THE DEVELOPMENT OF ALL GEOGRAPHIC SECTORS, SINCE THESE RESOURCES ARE DISTRIBUTED THROUGHOUT THE ISLAND.

PUBLIC POLICIES

17.00. TO MANAGE AND JUDICIOUSLY USE, NATURAL, ENVIRONMENTAL AND CULTURAL RESOURCES.

17.01. To identify the location and potential of our natural resources and their susceptibility to damage or exhaustion, completing the inventory of natural, environmental, and cultural resources already begun.

17.02. To promote the appropriate use of the resources identified in this inventory, in a manner consistent with the conservation of renewable resources, and at the appropriate time in the case of those which are subject to depletion.

17.03. To promote full knowledge on the part of the citizenry about the existence of these resources in Puerto Rico and to encourage a continuing awareness of their importance for our comprehensive development.

17.04. To avoid unnecessary loss of options for future use of these resources resulting from the establishment of new activities or from the authorization of new subdivisions, considering among others the following criteria:

- Avoid excessively increasing the cost of the eventual exploitation of mineral resources as a result of authorizing activities or land subdivisions in these lands where there are mineral deposits.
- Prevent adverse effects on the eventual use of water resources as a result of authorizing activities and land subdivisions in those areas where it is presumed that the construction of new water reservoirs is feasible.
- Avoid the construction of structures in beach areas and discourage those activities or land subdivisions in neighboring areas which would impede /or prevent free physical access to these areas, the free appreciation of panoramic views, and the free access to the sun and its enjoyment by the citizenry.

18.00. TO PROTECT NATURAL, ENVIRONMENTAL, AND CULTURAL RESOURCES FROM DESTRUCTION OR IRREPARABLE DAMAGE CAUSED BY MISUSE OR BY FAILING TO CONSIDER THE ADVERSE IMPACT OF ACTIVITIES UPON THEM.

18.01. To reduce the adverse impact of pollution on resources, by identifying and controlling the causes and sources of such pollution.

- 18.02. To control those activities and land subdivisions which may adversely affect water quality, particularly in areas of aquifer recharge and in watersheds adjacent to lakes and reservoirs including, among others, --activities such as the woods clearings, elimination of the vegetation layer, soil movement causing erosion, the excessive use of pavement resulting in increased runoff, and the indiscriminate use of fertilizers and pesticides causing water quality to deteriorate.
- 18.03. To avoid activities and land subdivision which could cause the deterioration or destruction of those natural systems essential for preserving the environment, such as mangroves, forests, reefs, dunes, ecological systems, and habitats of endangered species.
- 18.04. To avoid the destruction, mutilation, deterioration or demolition of important cultural resources such as archaeological deposits, historic sites, and/or buildings and others which have been so declared by the Institute of Puerto Rican Culture.

CHAPTER 3

COASTAL MANAGEMENT FOR PUERTO RICO:
PROBLEMS AND RESPONSES

CHAPTER 3

COASTAL MANAGEMENT FOR PUERTO RICO: PROBLEMS AND RESPONSES

This chapter examines principal coastal problems of Puerto Rico. The problems fall into three main categories: Coastal Hazards, Coastal Resources, and Coastal Development. The discussion of each problem begins with findings: What the problem is and why it is important.

Applicable policy statements are then set forth -- most often quoted from the Objectives and Policies element of the Planning Board's Islandwide Land Use Plan, but sometimes with additions from statutes, regulations, or other official documents. In a few cases, new policy is proposed or established.

Responses to each problem are then examined. Established programs of the Commonwealth and Federal agencies are briefly described; the Coastal Management Program relies on the continuation of these ongoing programs. Where programs need to be modified, or wholly new measures taken, the needed modifications or measures are then identified.

A summary table at the end of this chapter lists coastal problems together with new responses to them, included in the Puerto Rico Coastal Management Program.

COASTAL HAZARDS

FLOODING (INCLUDING HURRICANE FLOODING)

FINDINGS

Flood hazards affect large parts of the coastal plain. Floods recurrently devastate both urban and rural areas of Puerto Rico, affecting the interior of the Island as well as the coasts. The floods in September 1975, to cite a recent example, cost \$60 million and took some 20 lives.^{1*} From 1960 to 1970, more than 150 persons died in floods.²

Of the 300,000 cuerdas estimated to be subject to flooding in Puerto Rico,³ some 200,000 (67 percent) are in the coastal plain. Almost 40 percent of the urban area of the Island is floodable.⁴ Floodable areas are shown on Map 6.

During recent decades, as residential and industrial development have expanded outward from core cities into floodable areas in the coastal plains, the potential for property damage from flooding has greatly increased. The value of assets in flood-prone areas has increased enormously. Moreover, the effects of urbanization (e.g., the increased rate

*See footnotes at end of Chapter 3.

of stormwater runoff when natural vegetation is replaced by pavement) have increased the areas subject to flooding, with the result that some properties that were never extensively flooded now suffer severe damage. Truly great floods, such as those associated with hurricanes San Ciriaco in 1899 and San Felipe in 1928, would cause incalculable damage today.

Flooding probably cannot be eliminated. It seems unlikely that flooding can be eliminated entirely. Streamflow here is unusually variable because of steep slopes, narrow mountain valleys, and torrential rainfall. On some of Puerto Rico's rivers, peak flows per square mile of drainage area are among the highest in the world. Accounts of flooding during hurricanes go back as early as the 16th century, before much of the Island's original forest cover was removed.

Flooding and flood damage can nevertheless be reduced by continuing and expanding inter-related governmental programs. Governmental action of several kinds can reduce the amount of flooding and flood damage:

- Flood control measures can be taken, including the construction of flood control works.
- Other measures -- such as reforestation of upland watersheds and the adoption of regulations to bar excessive grading and paving -- can help reduce the rate of stormwater runoff.
- People who live in floodable areas can be assisted and trained in evacuation and other emergency measures.
- Policies and regulations can guide urban expansion toward areas that are not floodable.
- Regulations can prohibit new structures in floodable areas or require them to be flood-protected.

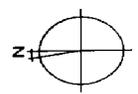
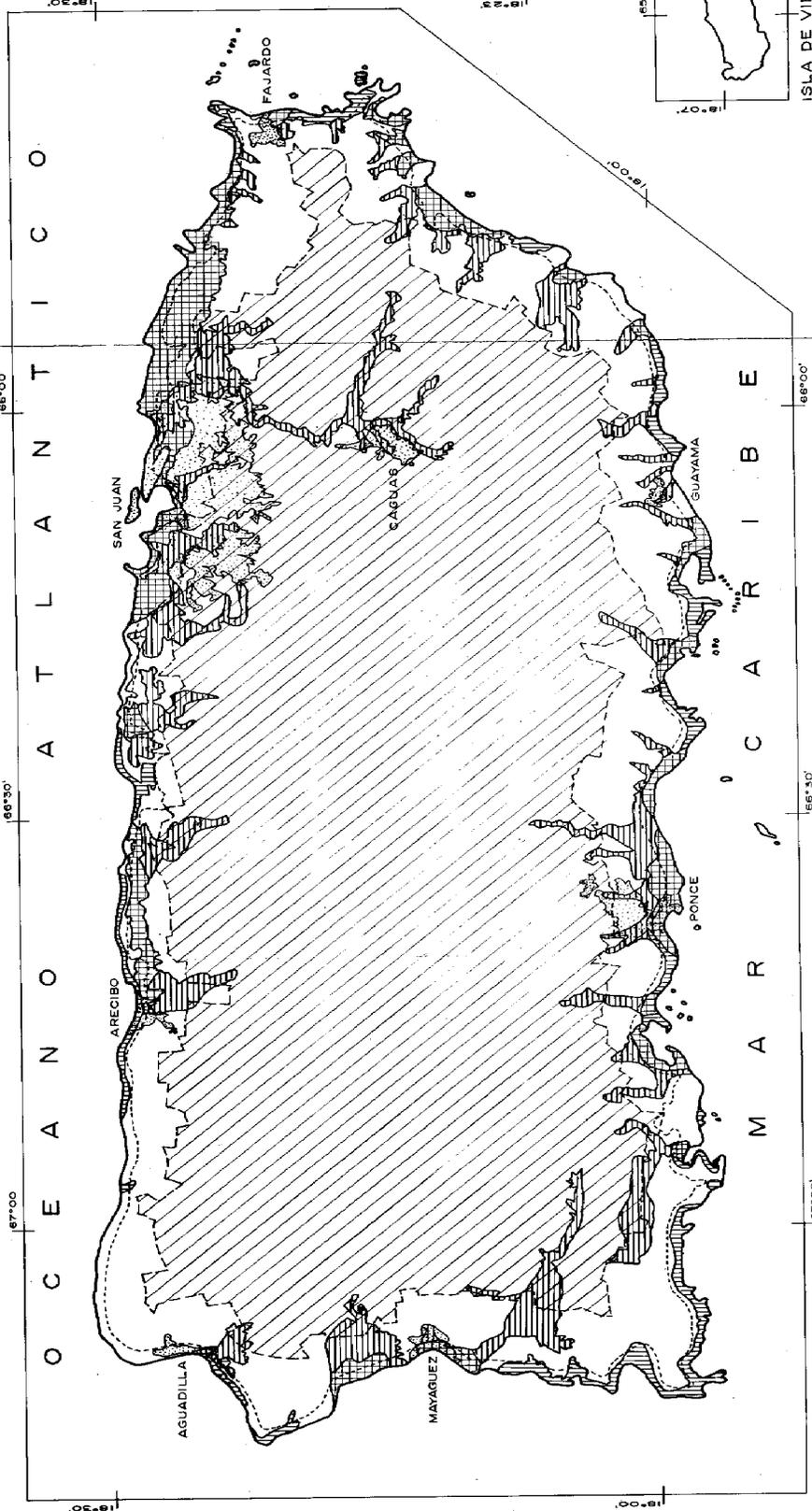
POLICY

The Objectives and Policies element of the Planning Board's Islandwide Land Use Plan, quoted in Chapter 2, establishes policy concerning flood losses. To protect people who now live in floodable areas, or in areas affected by wave surge, the policy statement calls for construction of flood control works to avoid property damage and loss of life, and, where necessary, relocation. (See Policy 10.00 quoted in Chapter 2.) For future development, the policy

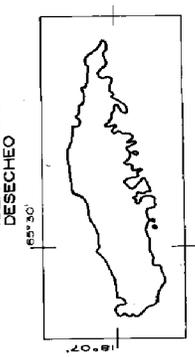
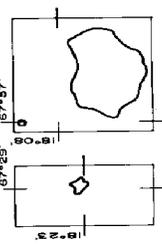
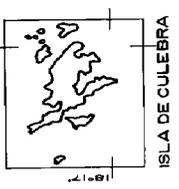
TERRENOS INUNDABLES POR RIOS  **RIVER FLOODING**
TERRENOS INUNDABLES POR MAREJADAS  **OCEAN SURGE FLOODING**

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered
 by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY



millas (miles) 0 5 10
 Kilometros (kilometers) 0 5 10 15



ISLA DE VIEQUES

6

**TERRENOS INUNDABLES
FLOODABLE AREAS**

ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:
 DEPARTMENT OF THE INTERIOR, GEOLOGIC INVESTIGATION
 NATIONAL CENTER FOR GEOMATIC SCIENCE AND TECHNOLOGY
 WASHINGTON, D.C. 20548
 THIS MAP HAS BEEN COMPILED FROM SEVERAL
 SOURCES AND IS TO BE DISTINGUISHED FROM FEDERAL INSURANCE
 ADMINISTRATION FLOOD HAZARD MAPS THAT HAVE NOT BEEN ISSUED.

statement would "...prohibit land development and construction for urban expansion and other activities which are expressly excluded by current regulations in areas affected by flooding and wave surge." (See Policy 11,00)

Policy governing grading and paving, which can reduce natural stormwater retention capacity and thus increase flooding, is included in the section on Coastal Waters.

IMPLEMENTING THE POLICY

A. Flood prevention

Two Commonwealth agencies share responsibility for flood prevention. The Department of Natural Resources (DNR) handles the planning aspects of the program, including the maintenance of coordination with the Planning Board. The Department of Transportation and Public Works (DTPW) is responsible for designing, building, and maintaining flood control works. These responsibilities of DNR and DTPW are exercised pursuant to a 1975 interagency agreement.

Four flood control works are currently under construction in the Commonwealth: Channelization of the lower part of Rio Hondo, Bayamon; channelization of Quebrada Mendoza, Cabo Rojo; channelization of Rio Humacao, Humacao; and channelization of Rios Portugues and Bucana, Ponce.

The U.S. Army Corps of Engineers is participating in one current flood control project under construction in Puerto Rico: The Portugues-Bucana project authorized by the Federal Flood Control Act of 1970. This joint Corps-Commonwealth project will provide two multipurpose dams about 3 miles above Ponce, will enlarge stretches of both Rio Portugues and Rio Bucana, and will provide a diversion canal to connect the two rivers.

The Corps has conducted studies of several other possible flood control projects, but no others have so far been authorized by Congress.

The U.S. Soil Conservation Service (SCS), in cooperation with the Commonwealth's Department of Natural Resources, has an ongoing flood control program which includes land treatment, reforestation, and structural flood control measures for small watersheds.

In the Anasco Watershed, SCS is conducting a three-phase program on building drainage channels, dams, and desilting basin to capture excess sediment. An earlier, similar program in the Guayanes watershed, in the municipality of Yabucoa, is now being revised and updated. A similar project has been authorized in the Bajura Valley, part of the Guanajibo River Watershed, in the municipality of Mayaguez.

In Utuado and Yauco, the SCS is conducting a program, under the Emergency Program, to improve and clean drainage areas blocked or damaged by heavy rains.

SCS also sponsors a Resource Conservation and Development Program to provide technical and financial help to local groups in conserving and developing natural resources. Funds for the program have been allocated from the Small Watershed Program.

Although flood control projects in Puerto Rico are limited by scarcity of funds, the need for additional projects is great -- even just to protect areas already urbanized. Future construction of additional works is therefore essential. Nevertheless, projects must be carefully designed and executed to minimize environmental damage and to mitigate the loss of flood-caused benefits (e.g., distribution of nutrients). The Environmental Impact Statement process, established by Commonwealth as well as Federal law, is the principal device used to provide environmental protection.

B. Protecting people who live in flood-hazard areas

Hurricane and flood warnings are provided in Puerto Rico by the National Weather Service, a division of NOAA. Evacuation and other services during flood emergencies are the responsibility of the Commonwealth's Office of Civil Defense.

The development of a disaster preparedness program by the Commonwealth's Office of Civil Defense, based in part on the ongoing analysis of flood hazard areas by the Federal Insurance Administration (FIA), and flood prevention methods by the U.S. Army Corps of Engineers, provides an important illustration of interrelated government programs. The disaster preparedness program, funded by a grant from the Federal Disaster Assistance Administration, was completed recently.

Need: Public education program. An intensive public education program is needed to instruct residents of coastal flood hazard areas about evacuation and other safety measures during flood emergencies.

Many current residents of flood hazard areas have never experienced a major hurricane and education is needed to fill the gaps in their experiences. Mapping of coastal high hazard areas, as recommended later in this section, can be an important contribution to the information basis needed for such a program. Dissemination of information about flood hazards is also essential to assure awareness and understanding by those affected.

C. Preventing inappropriate development in flood-hazard areas

The Planning Board's Floodable Areas Regulation (Planning Regulation No. 13) became effective in 1972. The regulation, intended to bar inappropriate development in flood plains, has been less than fully effective, mainly for want of detailed maps showing the areas subject to flooding.

In addition to protection provided by Regulation No. 13, some protection against flood-hazards is provided by the development control process described in Chapter 4. Plans for major projects are reviewed by the Planning Board, which circulates the most important ones to other agencies, including DNR. DNR recommends necessary flood protection measures to the Board. The Board, acting pursuant to its policies and recommendations, can then require the developer to take appropriate flood control measures.

Current efforts to improve development controls for floodable areas are associated with the flood insurance program described below.

D. Insuring owners of property in flood-hazard areas

The National Flood Insurance Program, established by the (U.S.) National Flood Insurance Act of 1968 and expanded in the Flood Disaster Protection Act of 1973, is designed to provide flood insurance at rates made affordable through a Federal subsidy. The FIA part of the Federal Department of Housing and Urban Development, administers the program.

At present, Puerto Rico is eligible for the sale of flood insurance under the first, or "emergency" phase of the Flood Insurance Program. In December 1976, there were some 9,000 policies in force with values over \$100 million.

After FIA publishes a detailed Flood Insurance Study, and Puerto Rico adopts additional legislation or regulations based on information provided by this study, Puerto Rico will be converted to the regular phase of the program, with full actuarial rates.

Flood-hazard mapping is under way in several parts of the Island as part of the Flood Insurance Study. The mapping is being performed, under contract with FIA, by the U.S. Army Corps of Engineers and the U.S. Geological Survey. Valle Hermosa and part of Rio Anasco have been completed. Rio Guayanilla, Rio Grande de Loiza, Rio Cibuco, Rio Grande de Arecibo, Rio Yauco, and Rio La Plata are under study. The Corps is also doing flood mapping in the Ponce area for the Department of Natural Resources.

A preliminary version of the Flood Insurance Rate Map has been issued for Puerto Rico by FIA. The map shows detailed flood zones, however, for only one small part of the Island: The Rio Espiritu Santo Watershed in the municipality of Rio Grande. For the rest of the Island, the map shows only the outer boundaries of the floodable areas, based on historic flooding and previous studies. The map will be amended as detailed analyses of river basins currently under study are completed. The Flood Insurance Rate Maps for specific areas will become effective upon completion of the review, appeals, and conversion periods established by HUD's regulations.

Once the Rate Maps become effective, thereby increasing the amounts of flood insurance coverage available on affected properties, new construction and substantial improvement of all buildings in the 100-year flood plain will be required to be elevated to the level of the 100-year flood. Construction and fill will be prohibited in the flood-way. In coastal high hazard areas, construction standards will be specified for new buildings; also, alteration of mangrove wetlands and dunes will be prohibited in accordance with FIA regulation.

Need: Refinement of regulation. In addition to mapping, some revision of the text of Regulation No. 13 is needed. The FIA has found the regulation adequate for the emergency phase of its Program and has stated that it "meets most of our Regular Program requirements." Considerable refinement of the text should nevertheless be undertaken to clarify ambiguities, simplify administration, and adapt the regulation so that it responds effectively to the detailed information becoming available from Flood Insurance Rate Maps.

Specifically, the Regulation must be revised to include additional districts, to cover mud slides and flood-related erosion, as well as mobile homes in flood-prone areas. Initial steps by the Planning Board to revise the regulations include the establishment of a work committee and a complete review of the effort to date.

E. Research (high priority)

Need: Rate maps for coastal hazard areas. Early preparation of Flood Insurance Rate Maps for coastal high hazard areas presents a special opportunity to protect life, property, and natural systems (dunes and mangrove wetlands). Although FIA is currently sponsoring extensive flood mapping in Puerto Rico, it is uncertain when mapping of coastal high hazard areas will be completed.

Expediting the mapping of coastal high hazard areas -- as an element of the Coastal Management Program, if necessary -- is essential to strengthen available protection against Puerto Rico's most serious coastal hazard -- flooding.

GEOLOGIC HAZARDS

FINDINGS

The Caribbean is a seismically active area. A belt of earthquakes along the sought margin with South America extends up through the Lesser Antilles to the Puerto Rico Trench and then west through Hispanola into the Cayman Trough.

There are four seismically active zones around Puerto Rico. These are: Mona Canyon, Puerto Rico Trench, Anegada Trough, and Muertos Trough (see Figure 1). Recorded earthquakes in the first two areas are:

<u>Year</u>		<u>Seismic Scale</u>
1915	Puerto Rico Trench	7.00
1917	Mona Canyon	7.00
1918	Mona Canyon	7.50
1943	Mona Canyon	7.75 (near junction with Puerto Rico Trench)

There have been low and high magnitude shallow events near the Island (see Figure 2).

Three earthquakes during recorded history have resulted in major damage to the Island.

These are:

- May 2, 1787, intensities of 7-8 with damage to all of the Island except the south coast;
- November 18, 1867, an earthquake in the Virgin Islands with intensity of 9, and intensities of 7-8 in eastern Puerto Rico with tsunami of 3-5 feet wave height and damage to eastern Puerto Rico; and
- October 11, 1918, earthquake in Mona Passage with intensity of 7.5 and damage to northwest Puerto Rico, accompanied by tsunami with 3-5 feet wave height.

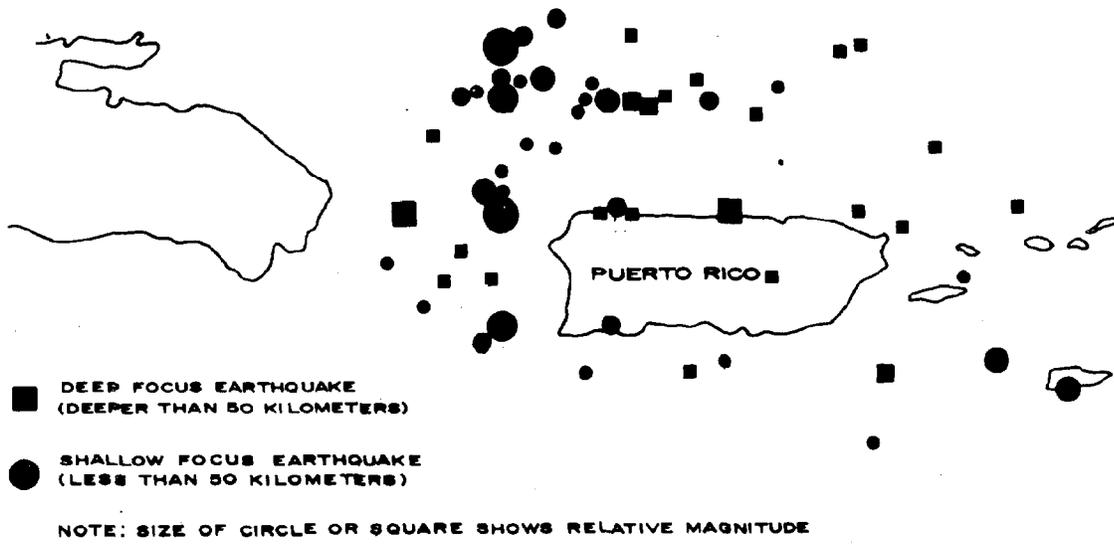
Although very small earthquakes occur frequently in Puerto Rico, no earthquakes producing major damage have occurred onshore in recent years. There are many local events with intensities less than 4.0 that produce little or no damage, although the tremors can be felt. On December 8, 1975, an earthquake in Arecibo with the intensity of 7.0 produced only minor damage. The tectonics of plate movement account for Puerto Rico's seismic activity except for a few low-magnitude shallow events on the Island itself. These have a random pattern and no earthquakes are associated with the major fault patterns on the Island. Geological investigation show that there has been no movement on the Great Southern Puerto Rico Fault or the Great Northern Puerto Rico Fault for millions of years.

Earthquake hazards have had only minor influence on development on the Island. A site proposed for a nuclear power plant, at Aguirre, was found unsuitable because of geological hazard. Also, the Planning Board's building regulation contains earthquake-safety requirements applicable to high rise buildings.

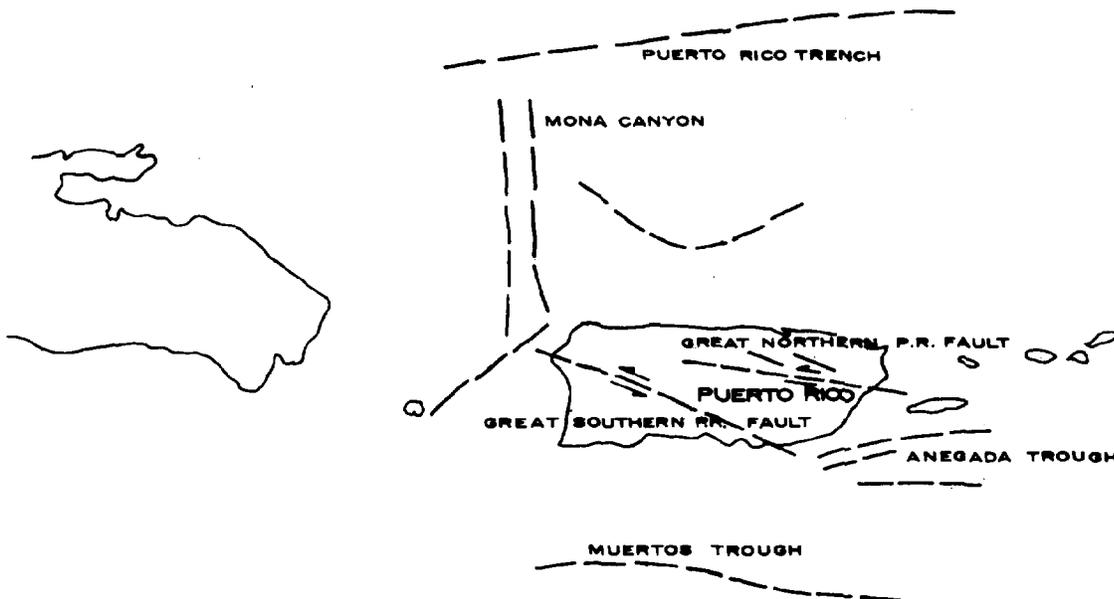
The collapse of sinkholes in areas of karst topography is another, relatively minor, potential hazard of geologic origin. In the absence of adequate foundation studies, highways and urban development in karst areas are sometimes built where there is danger of collapse. This has not been a serious problem in Puerto Rico, partly because of the relatively sparse population of the karst areas.

RESPONDING TO THE FINDINGS

The U.S. Geological Survey maintains a seismologic station at Cayey which has been part of a worldwide monitoring network since 1903.



EARTHQUAKE EPICENTERS 1962-1973



FAULT SYSTEMS AND TECTONIC ZONES

For the last 3 years, USGS has also maintained an Islandwide network consisting of 15 stations in Puerto Rico and adjacent islands. The network was established with funds provided by the Puerto Rico Water Resources Authority to provide information needed for the siting of nuclear power plants. The data furnished by the network are used to define the location of faults more precisely. This Islandwide network will be discontinued because of lack of funds.

Need: Additional research is needed to determine the extent of geological hazards and the need for precautionary responses. Early attention should be given to preparation of maps, based on soil and rock types, showing extent of earthquake hazards. There is also need for evaluation of potential damage and loss of life if a major earthquake should occur.

COASTAL EROSION

FINDINGS

Coastal erosion is occurring in many parts of Puerto Rico. Map 7 shows some sites identified as having severe erosion. Erosion is destroying not only land but buildings. In the San Jose urbanization in Mayaguez, the advancing sea is destroying oceanfront homes. Near Jobos Bay, erosion has destroyed a school. Although these situations exemplify the physical and economic damage caused by erosion, no Islandwide quantitative estimates are available.

Coastal erosion may be attributed to both natural and man-made causes. Natural erosion causes include: Ocean waves, ocean currents, and boring organisms. Little can be done to offset natural causes of erosion.

Human activities which contribute to coastal erosion are varied, and in many cases, more controllable. For example, the construction of a new structure (such as the causeway between Punta Tocones and Isla de Cabras) can block the natural transfer of sand from one area to another. Extraction of sand from river mouths, dunes, and beaches also contributes to depletion of beach systems. Construction activities aggravate the erosion process in many areas, both at the shoreline itself (e.g., by removing mangroves) and by increasing sedimentation of protecting reefs.

Several kinds of measures can be taken in response to coastal erosion. Possible measures include: (1) protecting natural features, such as mangroves and reefs, that can retard erosion; (2) controlling activities, such as sand extraction, that can accelerate erosion; (3) nourishing beaches; (4) constructing jetties, groins, seawalls, and revetments; and, (5) directing development away from erosion hazard areas.

Although some measures of these kinds are already established in Puerto Rico, and others are established by this Management Program, more information is needed about the causes and seriousness of coastal erosion in Puerto Rico and about the costs and benefits of responding to it. Coastal erosion studies of a few areas already exist. The U.S. Army Corps of Engineers has conducted several such studies -- El Tuque Beach (in process), Numoz Rivera Park, and Punta Salinas Arecibo -- and has developed a plan for beach erosion control and shore protection along 0.9 mile of beach at the Condado and Ocean Park sections of San Juan, subsequently authorized by Congress in 1962. Also, an inventory of areas with severe erosion problems has been conducted as part of the Coastal Management Program.

Need: Comprehensive study of coastal erosion. Although a planning process to assess the effects of shoreline erosion and evaluate mitigation and control measures is now being developed (in accordance with Section 305(b)(9) of the CZMA), there remains need for a comprehensive study of the causes and damages caused by coastal erosion, and of the costs and benefits of possible public responses. Such a study should include investigation of the erosion consequences of sand extraction at river mouths. It should also investigate beach nourishment opportunities (if any) from redepositing dredge spoils into the sea in the direction of littoral drift; possible adverse impacts of such redeposit on coral formations and seagrass beds must be considered in this investigation.

COASTAL RESOURCES

REEFS

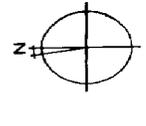
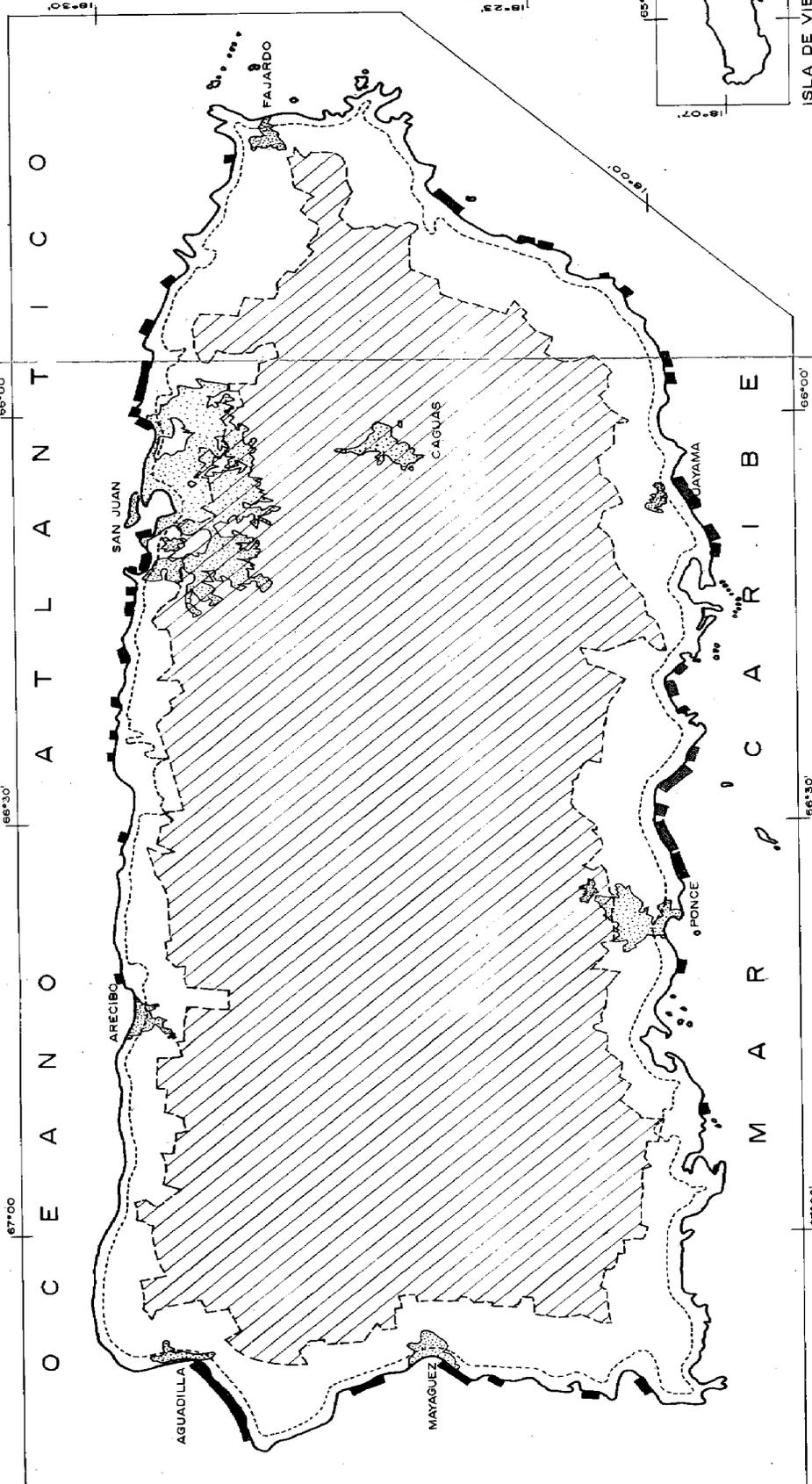
FINDINGS

Reefs -- both coral reefs and rock reefs -- are valuable resources serving multiple

EROSION EROSION

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY.
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY

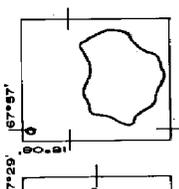
Financial assistance provided in part by Coastal Zone Management Act of 1972, administered
 by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



0 5 10
 millas (miles)
 0 5 10 15
 kilometros
 (kilometers)



ISLA DE CULEBRA



ISLA DE SECHEO



ISLA MONA



ISLA DE VIEQUES

LA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:
 RELOCK, JACK. FINAL REPORT: SURVEY OF BEACHES
 D. BEACH PROCESS. PUERTO RICO (MAYAGUEZ, P.R.).
 PT. OF MARINE SCIENCE, (1974.)

AREAS EN CONDICIONES SEVERAS DE EROSION
AREAS OF SEVERE EROSION CONDITIONS

functions. Coral reefs are an important component of the coastal natural system of tropical seas and offer protection to the inner waters of the continental shelf and the coasts. They constitute a food resource, provide for recreation, tourism, education, and scientific investigation; and play an important role in coastal ecology because of their interaction with other ecosystems.¹

Coral reefs are among the most biologically productive ecosystems, containing corals as well as a great variety of benthic organisms and providing a habitat for large numbers of juvenile fish of many species. Reefs shelter the majority of fish and crustaceans that are commercially extracted from Puerto Rico's coastal waters.

Rock reefs, which exhibit various degrees of coral growth over rock outcrops, are much less biologically productive than coral reefs. Like coral reefs, however, rock reefs provide a buffer against seas pounding shorelines and thus influence the deposit of sand on beaches. The calm waters and deposited sands of Luquillo Beach, for example, would be lost if the protecting rock reefs were to disappear.²

Map 8 shows known coral reef communities.

Coral reefs are fragile and can be easily destroyed by marine or land-based activities. Reefs are created by colonies of corals, which are living organisms. Like other tropical marine communities, they are extremely sensitive to environmental changes. Sedimentation (such as that from dredging and fillings), water pollution from sewage discharges or oil spills, and changes in salinity balances are principal threats. "Sediments settling on corals may kill them within a few days if the blanket is thick enough.... Dredging and coastal land filling associated with harbors, marinas, ship channels, etc., and sand removal for construction and beach replenishment has injured or destroyed hundreds of reef communities. Sewage is probably the second worst form of pollution stress on reef communities... Another stress due to bad land management (accelerated runoff of fresh water) has sometimes lowered coastal salinities to the point where shallow reef communities have been completely killed within a few hours."³

Some of Puerto Rico's coral reefs are threatened by sedimentation and other pollution.

Some of Puerto Rico's coral reefs are threatened by a variety of man's activities,

namely, sedimentation from dredging; poor use of coastal land; sewage pollution; and oil, thermal, and chemical pollution from industries.⁴ The extent of ecological damage to Puerto Rico's reefs has not been fully assessed because of the absence of comprehensive background studies of our coral reef systems. However, attention has been called over the years to specific examples of reefs that have suffered appreciable destruction and degeneration. The progressive degeneration of the reefs off Isla Verde, for example, is directly attributable to the dredging of the Boca de Cangrejos channel and the escape of lagoon sediments, creating murky waters that coral cannot tolerate.⁵

Extraction of coral is also a threat to Puerto Rico's reefs. Recreational and commercial users of reefs sometimes damage or destroy them by extracting coral as souvenirs or for sale. This is a particularly serious problem in the northeast reefs off Fajardo.

Coral reefs regenerate slowly, if at all. After a reef dies, wave action progressively destroys its crest, effectively removing the protective barrier. Once destroyed, reefs regenerate slowly at best, and it cannot be taken for granted that the reef community will ever replace itself. Some surveys 30 years after destruction of a reef have found no sign of regeneration.

POLICY

The Objectives and Policies element of the Planning Board's Islandwide Land Use Plan, quoted in Chapter 2, has established as general policy the avoidance of "activities and land subdivision which could cause the deterioration or destruction of...reefs..." (see Policy 18.03).

IMPLEMENTING THE POLICY

PROTECTING REEFS AGAINST SEDIMENTATION AND OTHER POLLUTION

By far the most serious threats to Puerto Rico's reefs are sedimentation, pollution from sewage discharges, oil spills, and changes in salinity balances resulting from excessive freshwater runoff. Measures responding to these threats are discussed in the section on Coastal Waters.

PROTECTING REEFS AGAINST EXTRACTION OF CORAL

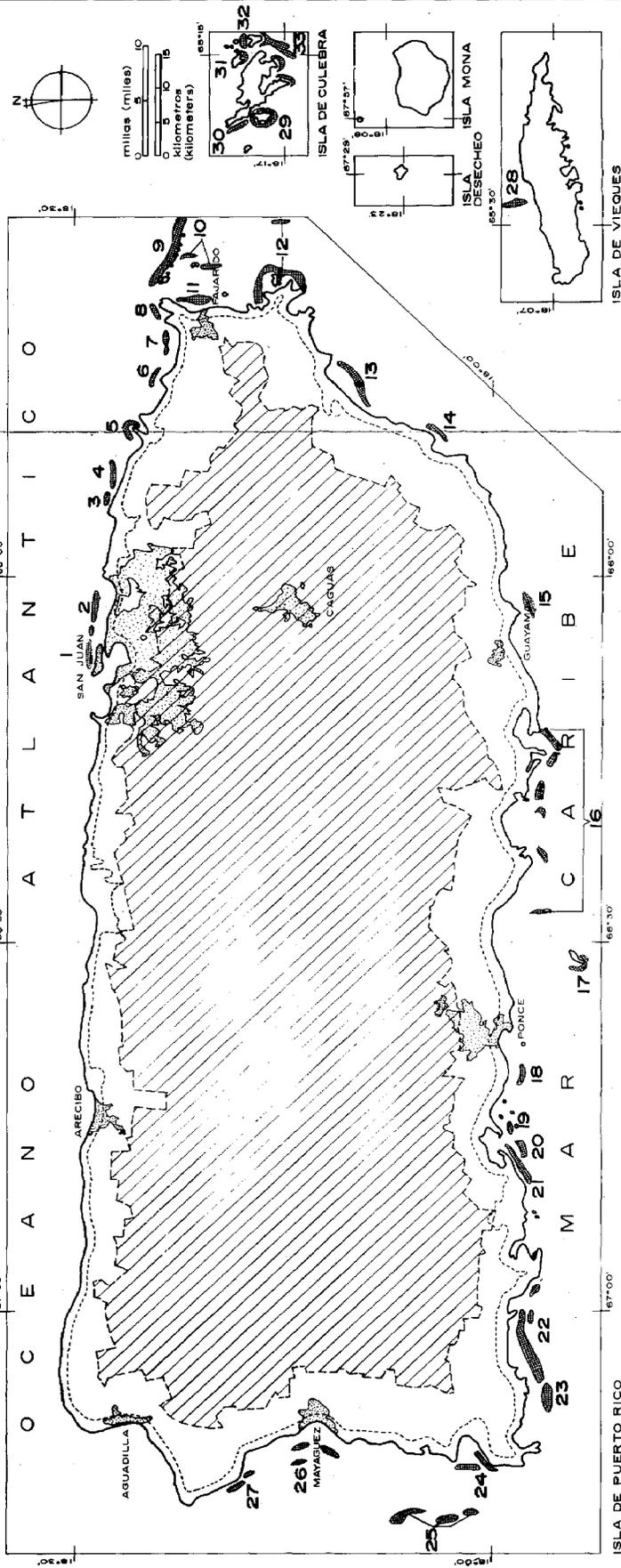
There is no Commonwealth regulation prohibiting the taking, destroying, or selling of

- | | | | |
|----------------------|--|------------------|-----------------|
| 1 - SAN JORGE | 10 - PALOMINITO | 19 - FANDUCO | 28 - MULAS |
| 2 - LAS MARIAS | 11 - ZANCUDO | 20 - UNITAS | 29 - LUIS PEÑA |
| 3 - VACIA TALEGA | 12 - MEDIO MUNDO | 21 - GUAYANILLA | 30 - FLAMENCO |
| 4 - IGLESIAS - UVERO | 13 - HUMACAO | 22 - MEDIA NOCHE | 31 - NORTE |
| 5 - MIQUILLO | 14 - MAUNABO | 23 - MARGARITA | 32 - BOTELLA |
| 6 - EMBARCADERO | 15 - GUAYAMA | 24 - BOQUERON | 33 - MANZANILLA |
| 7 - BORRAS | 16 - PASTILLO - SANTA ISABEL - AGUIRRE | 25 - TOMALINES | |
| 8 - LAS CABEZAS | 17 - CAJA DE MUERTOS | 26 - MAYAGUEZ | |
| 9 - LA CORDILLERA | 18 - RATONES | 27 - RINCON | |

ARRECIFES REEFS

Finacial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY



ISLA DE PUERTO RICO
 PUENTE DE INFORMACION / SOURCE:
 NATIONAL OCEANIC AND ATMOSPHERIC
 ADMINISTRATION, NATIONAL OCEANIC
 AND ATMOSPHERIC ADMINISTRATION, NATIONAL
 OCEANIC SURVEY, 1959

FORMACIONES CONOCIDAS DE ARRECIFES DE CORAL
 KNOWN CORAL REEF COMMUNITIES

Puerto Rican coral. In the early 1970's the Environmental Quality Board prepared a draft regulation intended to protect the reefs both from extraction and sedimentation, but it was never adopted. Bills banning coral extraction have been introduced in the Legislative Assembly but have failed to pass.

Federal law, however, appears to prohibit the taking of coral within Puerto Rico's coastal zone. The Solicitor of the U.S. Department of the Interior has concluded in an opinion of June 1975 that "...the submerged lands of Puerto Rico belong to the United States and that the United States Congress has made no provision under its Constitutional authority for the sale or disposition of these lands or their resources. Consequently, any removal of sand or any other material from these lands constitutes a trespass against the United States." A bill recently introduced in Congress (H.R. 7827) would, however, give Puerto Rico ownership and jurisdiction over submerged lands and natural resources "to the same extent" that such ownership and jurisdiction are vested in the states. After enactment of any such legislation, coral extraction would apparently be subject to Federal control only to the extent that work in navigable waters requires a permit from the Corps of Engineers.

Needs: prohibition of coral extraction. There is need for a Commonwealth law or regulation to (1) establish that aquatic plants and coral formations are the property of the Commonwealth and (2) prohibit the extraction and sale of coral in Puerto Rico without a permit from DNR. The best legislative approach is probably to amend the Fisheries Act (Act No. 83 of May 13, 1936), as recommended by the citizen's report, Puerto Rico and the Sea.

MANAGEMENT AND PROTECTION

Need: Natural Reserves. Since the Commonwealth has limited resources available for reef protection and management, there is need to concentrate those resources on reefs known to be particularly important. Among the Natural Reserves* recommended in

*Natural Reserves are the "Areas for Preservation and Restoration" (APR's), provided for in Federal regulations.

Chapter 4, reefs chosen for their quality and extensiveness are included in the following:

La Cordillera Reserve Jobos Bay and Mar Negro Reserve

Guanica Forest Reserve

La Parguera Reserve

Mona Island Reserve

Tormalines Reefs Reserve

Guayama Reef Reserve

Natural reserves will be designated by Commonwealth legislation or administrative action. In some cases, reefs may be protected by designation as sanctuaries.

In addition, a number of reefs in Culebra have been designated for preservation; see the document describing the Culebra Segment of the Puerto Rico Coastal Management Program.

RESEARCH (HIGH PRIORITY)

Need: Completion of reef inventory. The above listing of Natural Reserves is based on reef inventories which, although the best available, are known to be incomplete. Some of Puerto Rico's reefs, and any threats they may face, are scarcely known. There is an important need for completion of a detailed inventory of Puerto Rico's reefs. This is needed both to aid in identifying additional reefs deserving special protection, and to aid in the management of those already recommended for designation as Natural Reserves.

MANGROVE WETLANDS

FINDINGS

Mangrove wetlands are a multi-purpose resource providing varied benefits.¹ Historically, mangroves were viewed as areas of low economic productivity, providing principally wood and charcoal. Since mangroves were also breeding areas for the malarial mosquito,

TABLE 1
TYPES OF MANGROVES IN PUERTO RICO

MANGROVE TYPE	USUALLY FOUND	CHARACTERISTICS	PRINCIPAL VALUES	NEEDS AND USES
Overwash mangrove islands	South Coast	Overwashed by daily tides; most "marine" of mangroves; dense red prop roots; multiplicity of islands; dominated by red mangroves.	Wildlife refuges; fishing; purification of overwash waters; production of organic detritus.	Leave them alone--regeneration is slow. Use for indirect services--refuges, fishing, cleaner and calmer marine waters.
Fringe mangrove wetlands	South Coast	Found along shorelines, canals rivers, lagoons; dominated by red mangroves; two variations--coastal and inland.	Protection of shorelines; "land building"; high rate of organic exports; wildlife habitat.	Coastal fringe wetlands: Timber production possible, even limited clear-cutting. Recovery rapid. Production of oysters and shellfish. Recreational facilities, homes, other structures on stilts possible with sufficient buffer and other safeguards. Inland fringe wetlands: More valuable as supporters of fish and other marine life. Direct human use--limit to recreation, fishing, study, selective cutting.
Scrub mangrove wetlands	South Coast	Smallest (less than 2 m. tall) of mangrove forests; least productive; grow on hypersaline soils where no other plant can; red or black mangroves predominate.	Water storage and quality control; soil stabilization; pan-organic; wildlife support.	Leave them alone. If disturbed, regeneration is extremely slow (often more than 50 years) and nothing will grow in their place.
Riverine mangrove	North Coast	Found in saline portions of flood plains of rivers and other freshwater courses. All species, but red mangroves predominate.	Exceptionally high resource values; organic exports; water quality control; wildlife habitat; flood buffers.	Timber and tannin production. Sewage processing possible. Precautions must be taken to maintain natural productivity.
Basin	North Coast	Found inland in depressions where water movement is slow, or flat areas inundated only by highest tides. Black mangroves predominate.	Efficient nutrient traps; link with downstream fisheries.	Sewage recycling and timber production possible as long as normal water levels, tidal inundation and overland sheetflows are maintained; seasonal recreation.

2

their filling was regarded as a public good.* With modern methods of disease control, malaria is no longer a problem in Puerto Rico.

Now, as a result of growing ecological awareness, it is recognized that mangroves may have several values: As buffers against natural catastrophes, refuges for wildlife, nurseries for marine life, as fishing and shellfishing areas, as sources of organic detritus and as natural filters for purifying water.

Because of their specialized root system, which form an intertwined mass beneath the water surface, mangroves generally retard water movement and trap suspended materials, much of which is produced by the mangrove itself in the form of leaves and twig fall, dead branches, and the remains of organisms associated with the mangroves. Gradually the accumulation of this organic material contributes to raise the soil level. Continued accumulation of soil particularly by sea-fringing mangrove stands, builds the shoreline seaward. In the course of this process, the rich protected substrata provide a habitat for a large variety of organisms that serve as food for marine fauna, including oysters and crabs, which are directly harvestable.

Some fish of commercial importance, such as snapper, are found among mangrove roots. Others spend part of their life cycle there during breeding and spawning. According to one estimate, 60-70 percent of fish production in Puerto Rico depends upon the reef and mangrove systems that fringe the Island. In addition, mangroves form the nesting habitat for many species of native and migratory birds, including both game and endangered species.

Mangroves can be harmed or destroyed by dredging, filling, sedimentation, oil spills, and sometimes by other pollutants as well. Land reclamation through filling is the most serious and direct threat to mangroves. Land reclamation of adjacent areas may also affect mangroves indirectly by altering the water table. Other major threats

*Reflecting these views, an old Commonwealth law ("Ley para la Reclamacion de Tierras Pantanosas y Aridas", Ley Num 40 do June 9, 1948, 28 LPRA 71 et seq.) established a mangrove policy that is now out of date. The law established a reclamation program under the jurisdiction of the Land Authority, and provided tax and other incentives for reclamation. Although the reclamation program of the Land Authority was abandoned years ago, the law has never been repealed.

are sedimentation, dredging to accommodate shipping, and oil spills. Mangroves tend to trap and concentrate pollutants. The extent to which various types of pollutants, other than oil spills and sedimentation, contribute to mangrove destruction has not been established. However, in mangrove-fringed estuarine areas, the concentration of pollutants in coastal waters tends to upset the delicate balance of microscopic life, drastically altering the entire coastal ecosystem.

Three-quarters of Puerto Rico's original mangroves have been destroyed, and some of the remaining ones are threatened. About 75 percent of Puerto Rico's original mangrove area has already been destroyed, according to estimates of the U.S. Forest Service. ³ Some 50,000 cuerdas of mangroves have been "reclaimed," that is, drained or filled, and put to other uses such as wharves, agriculture, and industrial and residential sites. The greatest destruction has occurred in the larger estuaries now used for harbor facilities such as San Juan and Jobos Bays.

Mangrove destruction is not simply a matter of historical interest. Destruction from the mid-1960's through 1970, for example, was much greater than during the previous decades. ⁴ Bonqueron, formerly the fifth largest stand, was 88 percent destroyed during the period as a result of its use as a dump by the municipality of Cabo Rojo and the construction of retention works to contain fresh water for a bird refuge.

Depending on their type and location, remaining mangroves are variously subject to further reduction and destruction from man-made intrusion. Possibly the most serious threat is to the mangroves along the northeast coast, from Boca de Cangrejos to Fajardo, where development pressures are intense. Within this region, litigation has already resulted over the threat to the Pinones-Torrecillas-Vacia Talego Forest, one of the largest and most productive mangroves in Puerto Rico.

Only about 15,800 cuerdas of mangroves remain.

The remaining mangroves are shown on map 9.

There are five kinds of mangroves in Puerto Rico, each with different characteristics and different special values. Five kinds of mangroves have been identified (briefly

described in Table 1). Each has distinctive characteristics, values, and management
5
needs. Although all mangroves require protection against willful destruction through
filling, other needs vary. One type, for example, is suitable for recreational facilities
or houses (on stilts, to prevent interference with water flows and with suitable protection
against raw sewage and solid waste) but others are not. Some regenerate rapidly and
can tolerate selective cutting; others can survive only if left completely alone.

POLICY

The Objectives and Policies element of the Planning Board's Land Use Plan, quoted
in Chapter 2 above, has established as a general policy the avoidance of "activities
and land subdivision which could cause the deterioration or destruction of ...mangroves..."
(See Policy 18.03.)

6
The Environmental Quality Board's Mangrove Resolution, adopted in 1974, states the
need to:

- ..Preserve, protect, and as far as possible, restore the mangroves of Puerto Rico.
- ..Reduce to the minimum any changes in the quantity and quality of water that nourishes
mangroves.
- ..Protect mangroves from dredging or the harmful effects of dredge spoils.
- ..Promote to the maximum environmental measures for mangrove protection.

ADDITIONAL POLICIES ESTABLISHED: To supplement the above policies and increase the
certainty of their application, the following additional policies are hereby established:

SPECIAL PROTECTION FOR MANGROVE WETLANDS.

All remaining mangrove wetlands--as well as buffer areas necessary to protect their
water areas, vegetation, waterfowl, fish and other wildlife values--shall be protected
as follows:

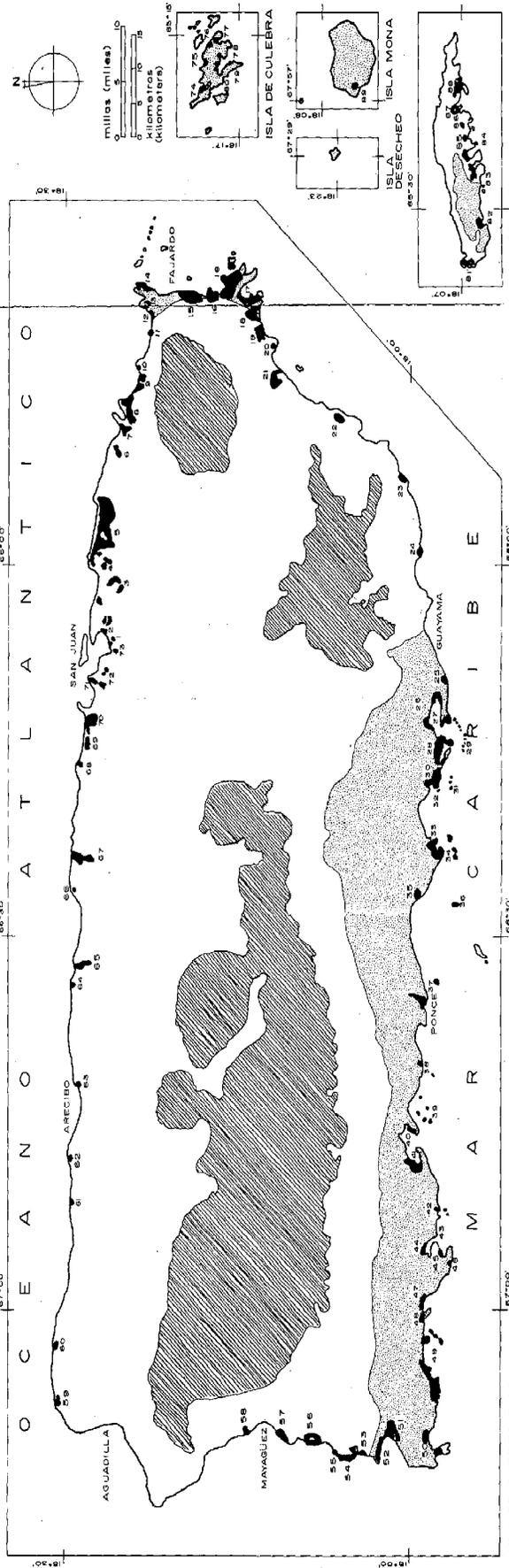
- ..Restrict new development in mangrove wetlands. New development, including diking,
filling, and dredging, in existing or restorable mangrove wetlands shall be permitted
only as follows:

- ..Natural Reserves. Any alteration of those mangrove wetlands designated as Natural
Reserves shall, to the maximum extent practicable, (a) maintain or enhance the

MANGLAR	SUERDAS	MANGLAR	SUERDAS	MANGLAR	SUERDAS	MANGLAR	SUERDAS
1. Río Puerto Nuevo	34.27	24. Punta Viento	112.99	46. Punta Mangilla	14.25	68. Río La Plata	33.59
2. Martín Peña	164.92	25. Los Mareas	10.18	47. Bahía Montaña	97.71	69. Mamaya	72.57
3. Laguna San José	171.34	26. Puerto de Jobs	795.76	48. Bahía Fofarrescente	69.21	70. Río Codi	286.81
4. Congrejos	200.51	27. Cayo Caribelo	244.27	49. La Pargara	1063.28	71. Río Bayamón	36.67
5. Vado de Arrecillo	3510.94	28. Mar Negro	121.80	50. La Garra y Bahía Sucia	101.78	72. Las Cucharillas	75.31
6. Río Herrera	79.39	29. Cayo Barba	167.26	51. Refugio de Aves y Caño Boquerón	513.32	73. Pueblo Viejo	50.56
7. Río Espiritu Santo	333.84	30. Punta Arenas	67.51	52. Bahía de Boquerón	55.64	CULEBRA	
8. La Plúa	673.45	31. Cayo de Ratonas	44.11	53. Punta La Mala	10.16	74. Flamenco	13.23
9. Río Maneyes	95.34	32. Cayo Mata	54.28	54. Puerto Real	59.03	75. Playa Rpsaca	2.85
10. Punta La Bandera	25.45	33. Bahía de Jauca	62.43	55. Punta Caribes	176.76	76. Playa Blava	10.18
11. Río Juan Martín	26.26	34. Punta Peirana y Cayos	471.08	56. Laguna Joyuda	75.32	77. Playa Larga	6.92
12. El Corvato	74.64	35. Playa Cortada	34.37	57. Caño Corazonas	211.03	78. Puerto del Manglar	10.52
13. Laguna Aguas Prietas	46.14	36. Cayo Berbería	79.05	58. Caño Boquilla	63.44	79. San Ildefonso	13.23
14. Laguna Grande	109.25	37. Cayo Frijos	104.50	59. Moleza Alta	17.64	80. Estación del Caránel y del Camarero	61.55
15. Río Fejarde	159.46	38. Laguna de las Salinas	34.61	60. Baluras	41.05	VIEQUES	
16. Puerto Medio Mundo (Celba)	1047.66	39. Bahía de Tallaboa	87.87	61. Maracayo (Camuy)	39.34	81. Punto Arenas-Laguna Miami	159.49
17. Ensenada Honda	553.01	40. Bahía de Guayanilla	47.50	62. Carrizales (Pta. Maracayo)	25.44	82. Laguna Playa Grande	57.68
18. Río Dagao	416.96	41. Puerto de Guayanilla	352.49	63. Tiburones-Isleta	111.96	83. Puerto Mosquito-Sombe	102.12
19. Bahía Algodones	315.18	42. Caño Gorda	109.31	64. Palmas Altas	16.28	84. Puerto Ferro	48.18
20. Bahía Lima	19.34	43. Faro de Guánica	17.30	65. La Boca	44.44	85. Bahía Tapón	20.36
21. Río Antón Ruiz	750.13	44. Bahía de Guánica	32.57	66. La Esperanza	24.64	86. Bahía Chiva	34.27
22. Punta Candaleiro	31.55	45. Ensenada Las Pardas	11.97	67. Río Cibuco	564.21	87. Laguna Yanuel	27.48
23. Punta Tuna	16.28					88. Ensenada Honda	66.16
						89. Mangle de MONA	3.08

LEYENDA

-  Bosque Subtropical: Muy Húmedo y Pluvial.
-  Bosque Montano Bajo: Muy Húmedo y Pluvial
-  Bosque Subtropical Seco
-  Bosque Subtropical Húmedo



ISLA DE PUERTO RICO.
FUENTE DE INFORMACION: SOURCE:
MANGLALES DE PUERTO RICO, DEPARTAMENTO DE RECURSOS NATURALES, 1974.

DISTRIBUCION DE MANGLALES Y ZONAS DE VIDA
MANGROVE DISTRIBUTION AND LIFE ZONES

existing functional capacity of the wetland (i.e., some alteration but no net reduction in the quantity and quality of species); and (b) conform to a mangrove management plan approved by the Planning Board following issuance of an Environmental Impact Statement pursuant to Law No. 9 of June 18, 1970; and (c) be limited to minor incidental public service facilities (e.g. burying cable or pipelines), restorative measures, or nature study.

...Other mangrove wetlands. Any alteration of other mangrove management plans approved by the Planning Board following issuance of an Environmental Impact Statement pursuant to Law No. 9 of June 18, 1970; and (b) limited to the following:

- (1) essential military facilities; (2) expansion of existing commercial fishing harbors, ports, or airports; (3) the minimum necessary entrance channel to a marina or other boating facility excavated from dry land; (4) those portions of coastal-dependent energy facilities that cannot be located on dry land or in open water areas; (5) minor incidental public service facilities such as buried cable or pipelines; (6) measures undertaken to restore biological productivity of degraded mangrove wetlands; and (7) nature study, aquaculture, or similar resource-dependent activity.

..Prepare and implement mangrove management plans. Before any significant alteration of a mangrove wetland is permitted, a management plan shall be prepared by the public agencies and private interests involved for review and approval by DNR.* The plan shall be based on the study of each mangrove wetland and its surrounding areas. The plan shall (1) place first priority on natural resource protection and restoration, research and educational opportunities, and recreational and aesthetic values; (2) assess public health issues, aquaculture potential, possible alternative sources of fresh water, and the impact of any proposed facilities that can be provided in accordance with other policies; and (3) specify the management programs necessary to protect, enhance, and restore natural resources, including controls on development in adjoining upland areas. For intensification of use in areas now committed to industrial or port use,

*As explained in Chapter 4, responsibility within DNR for the preparation of mangrove plans will rest with the Coastal Management Unit.

a port master plan certified by the Ports Authority may be substituted for the otherwise required management plan.

7

IMPLEMENTING THE POLICIES

A. PROTECTING MANGROVES AGAINST DREDGING, FILLING, LAND DEVELOPMENT

1. Public ownership and custody

The Commonwealth's Department of Natural Resources already has custody of some significant mangroves in the coast. These are contained in four coastal forests: (1) the Aguirre Forest near Jobos Bay on the south coast (2,464 cds.); (2) the Boqueron Forest on the west coast of Mayaguez (2,040 cds.); (3) the Ceiba Forest on the east coast south of Fajardo (363 cds.); and (4) the Pinones Forest on the north coast, between San Juan and Loiza (1,608 cds. including the Pinones Lagoon).

Other Commonwealth agencies and corporations own significant mangroves. The most notable ones are those at Boca de Cangrejos owned by the Puerto Rico Industrial Development Company (PRIDCO). The Federal government owns magnificent mangroves at Roosevelt Roads. Still other mangroves are privately owned. Boundaries between public and private property in mangroves are often unclear.

Because of the costs, there are few opportunities either (1) to acquire additional privately owned mangroves or (2) to obtain transfer of custody to DNR from Commonwealth corporations that now control significant mangroves. It would clearly be desirable to provide additional protection in these ways, however, particularly for the mangroves recommended as Natural Reserves. (See Map 29).

2. Management and protection

Need: Natural Reserves. Since the Commonwealth has limited resources available for mangrove protection and management, there is need to concentrate those resources on mangrove wetlands that are particularly important. Among the Natural Reserves recommended in Chapter 4, mangrove wetlands chosen because of their extent, uniqueness, or complexity, are included in the following:

- Constitution Bridge Mudflats Reserve
- Pinones Forest Reserve
- Rio Espiritu Santo Reserve
- El Faro Reserve
- Ceiba State Forest Reserve
- Jobos Bay and Mar Negro Reserve
- Punta Petrona Reserve

Guanica Forest Reserve
La Parguera Reserve
Boqueron Reserve
Laguna Joyuda Mangroves Reserve
Vieques Bioluminescent Bays Reserve

In addition, some mangrove wetlands in Culebra are designated for preservation by the Culebra Segment of the Puerto Rico Coastal Management Program.

Need: Designation of Special Planning Areas.* Although the most important of Puerto Rico's mangrove wetlands are those recommended above as Natural Reserves, other mangrove wetlands are of sufficient importance to warrant protection against avoidable destruction by development or other activities. In allocating Commonwealth resources available for resource inventoring and detailed planning--which can often protect mangrove wetlands, without significantly reducing development opportunities nearby--there is need to assure that mangrove wetlands receive the attention they deserve. Accordingly, the Special Planning Areas designated in Chapter 4 include all mangrove wetlands.

3. Development controls

Federal law provides additional protection against the filling of most mangroves in Puerto Rico. All filling in of wetlands, including the placement of dredged or fill material into a mangrove wetland, requires a permit from the Corps of Engineers, and Corps regulations (42 CFR37122-37164) discourage unnecessary alteration or destruction of wetlands, including mangroves. DNR can prevent the granting of a Corps permit by denying an "endorsement." Also, any Federal permit must be consistent with this coastal management program. The cutting of mangroves is not subject to any Federal permit requirements, however. (See separate discussion of dredging and filling in the section on Coastal Waters.)

The Commonwealth has not established specific rules for development in and near mangroves; some guidelines were prepared by DNR staff in 1973, but they were not adopted.

*Special Planning Areas are the "Areas of Particular Concern" (APC's) provided for in Federal regulations.

The Puerto Rico Planning Board has protected some mangrove wetlands by imposing protective conditions during the development control process described in Chapter 4. These conditions are often recommended by the Environmental Quality Board during its review of environmental impact statements. The more detailed mangrove wetland policies established by this program document are to be applied to public as well as private land, via that same control process, as well as in evaluating applications for Commonwealth and Federal permits.

It is impractical at this time to identify in advance every site to which this policy applies. Case-by-case evaluation of the impact of proposed development on mangrove wetlands accordingly remains essential. In a few instances, however, it is feasible to identify in advance particular sites where mangrove preservation is a paramount objective; these sites have been recommended above for designation as Natural Reserves. Mangrove management plans, mentioned above, will detail application of the policy to other mangrove wetlands.

Need: regulation prohibiting mangrove alteration. Planning Regulation No. 13, the Floodable Areas Regulation, should be amended to prohibit man-made alteration of mangrove wetlands within coastal high hazard areas (except alterations shown not to increase potential flood damage). Future adoption of such a regulation will be required in any event by Federal flood insurance regulations (24 CFR 1910, 3(e)(8); 41 FR 46978, October 26, 1976).

B. PROTECTING MANGROVES AGAINST SEDIMENTATION, OIL SPILLS

Measures to reduce damage to mangroves from sedimentation and oil spills are discussed in parts of this report dealing with "Minimizing erosion and sedimentation" and "Reducing damage from oil spills" in the section on Coastal Waters.

C. PROTECTING MANGROVES AGAINST SOLID WASTE DISPOSAL

Although various municipalities have used mangroves as solid waste disposal sites in the past, the EQB reports that only one -- Salinas -- continues to do so. Salinas will soon terminate this practice in favor of a new site near Central Aguirre.

DUNES

FINDINGS

Dunes once provided important protection against storm surges along much of Puerto Rico's north coast. The dunes that originally extended along much of Puerto Rico's north coast provided important protection to life and property as well as naturally limiting coastal erosion. (See Map 10.)

Because of massive sand extraction, few dunes now remain. The extraction of sand for use in construction has completely eliminated many kilometers of protective dunes. The few that remain--principally at Isabela plus a few at Boca de Cangrejos and elsewhere--have in most cases been radically reduced in size. Dune destruction is not simply of historical interest; it is continuing today.

Dune destruction has increased potential damage from storm, although the exact extent of the increase is not yet known. The whole or partial removal of dunes has enlarged the areas subject to flooding during hurricanes and other storms. Until completion of detailed flood mapping of these areas, however, their exact extent is unknown. Dune removal has also probably contributed greatly to coastal erosion.

POLICY

The Objectives and Policies element of the Planning Board's Land Use Plan, quoted in Chapter 2 above, has established, as general policy, the avoidance of "activities and land subdivision which could cause the deterioration or destruction of ...dunes..." (See Policy 18.03.)

IMPLEMENTING THE POLICY

A. PREVENTING EXCESSIVE EXTRACTION OF SAND FROM PROTECTIVE DUNES

1. Commonwealth regulations governing sand extraction

Commonwealth law prohibits the extraction of sand, from dunes or any other source, on public or private property, without a permit from the Department of Natural Resources. Sand extraction from navigable waters (river mouths and submarine deposits) also requires a Federal permit from the Army Corps of Engineers. (See discussion of dredging and filling in the section on Coastal Waters.)

A recent Commonwealth statute (Law No. 144 of June 3, 1976) strengthens statutory requirements governing permits for extraction of sand, gravel, and other materials from the earth's crust. Additional environmental factors specified in the law, must be considered before authorizing a permit; permits remain in force for a shorter time; the fine for illegal extraction is raised, and administrative fines are authorized.

Also, a special fund is created, from royalty income, for use in administering the law and policing extraction.

The law covers extraction in general, without explicitly differentiating beach, dune, and other types of deposits. This sometimes creates an expectation on the part of petitioners that all permit requests will be governed by the same standards regardless of type of deposit. Administrative difficulties sometimes result, particularly when discretion exercised by DNR personnel is construed as discriminatory.

Need: Revised regulations. To obtain the full benefit of the statutory changes, additional refinements of the regulations prepared and adopted at the end of June, 1977 could enhance their effectiveness.

While the regulations distinguish different types of extraction, more specific standards for each type should be set. The need for distinct standards is particularly important in considering possible exploitation of submarine deposits as discussed in the section on Sand for Construction. It is expected that any submarine sand operation would produce two to four million cubic meters per year. This sizable production would create unprecedented problems--of distribution, for example, and of market dominance by a few large firms.

2. Enforcement of extraction regulations

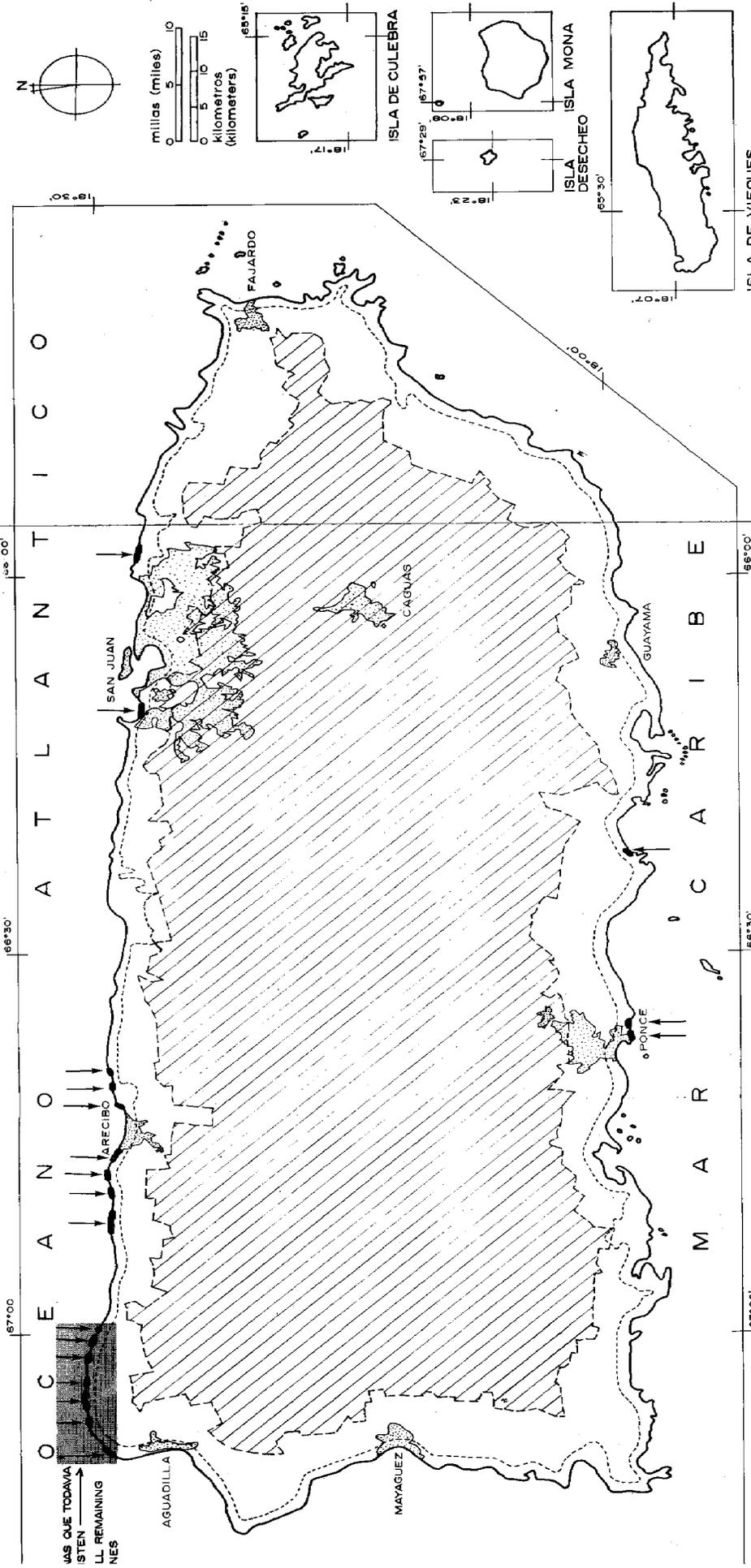
Enforcement of sand extraction regulations is a problem of long standing in Puerto Rico. There are really two enforcement problems.

..The first arises when permit holders--often large-scale commercial operators excavating dunes--extract more sand than their permits allow. A permit may, for example, allow extraction of only part of a dune--so that the dune will

DUNAS ■ **DUNES**

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

LÍMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APPROXIMATE COASTAL ZONE INLAND BOUNDARY
 LÍMITE TERRESTRE DEL ÁREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY

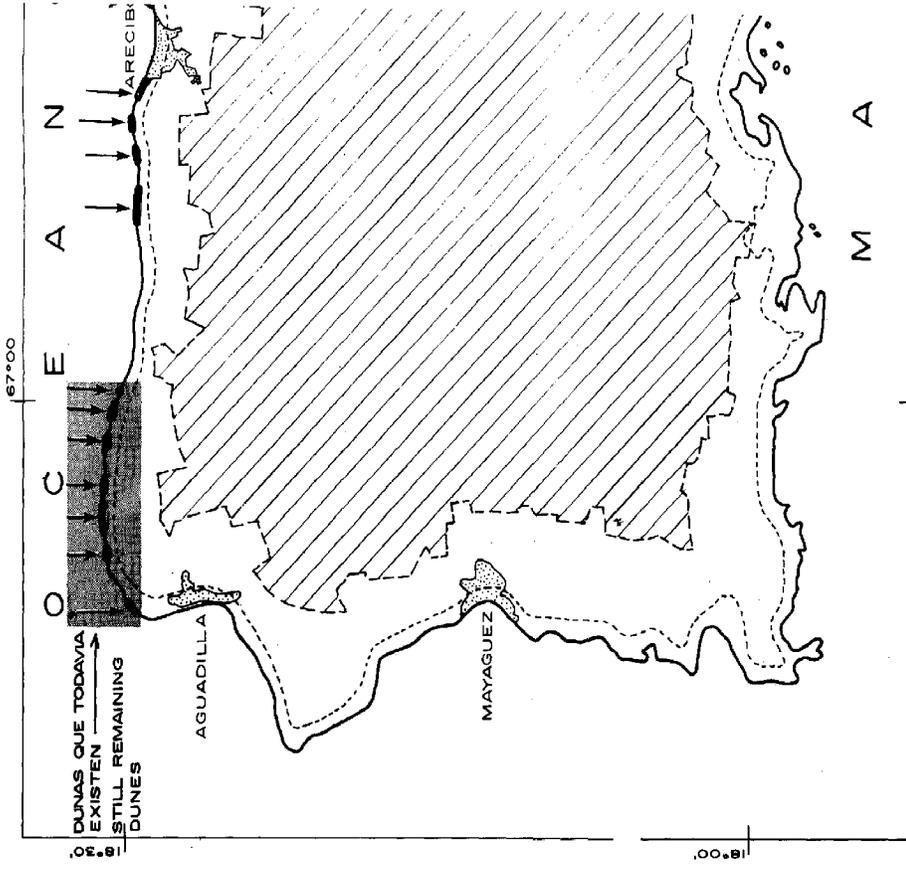


10

FORMACIONES ORIGINALES DE DUNAS
ORIGINAL SAND DUNE FORMATIONS

PUERTO RICO
 INFORMACION/SOURCE:
 EXTRACTED FROM MAPS OF BUREAU OF
 CHEMISTRY AND SOIL, 1936
 DEPARTMENT OF NATURAL RESOURCES
 SCIENTIFIC INVENTORY OF 1972

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXI
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY



ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:

EXTRACTED FROM MAPS OF BUREAU OF
 CHEMISTRY AND SOIL, 1936.
 DEPARTMENT OF NATURAL RESOURCES
 SCIENTIFIC INVENTORY OF 1972.

remain available to provide essential protection against storm surges.

When extractors take more than permits authorize, serious damage sometimes results.

..The second problem arises when sand is extracted without any permit. These extractors often operate at a very small scale--typically one or two men with shovels and a truck. They often take sand from public beaches, and some of them have done so for years; they do not think of themselves as sand thieves. These numerous, small-scale operators represent an exceedingly difficult enforcement problem.

Need: Larger, better trained staff. The Department of Natural Resources needs a lawyer, better trained staff, as well as more sophisticated equipment and methods for surveillance of sand extraction.

3. Management and protection

Ideally, all present and former dune areas of Puerto Rico would be designated as natural reserves; this ideal should be attained as rapidly as possible. Attainment is impractical, however, until suitable alternative sources of sand are found for the construction industry. Until then, some extraction will probably continue--within regulatory limits intended to preserve the most essential protective functions of dunes.

Need: Designation of Special Planning Areas. The few remaining dune areas are, however, areas of intense conflict among competing demands: For flood protection, for sand extraction, for recreation and tourism. (This is notably the case in the Isabela area, where sand pits and summer homes are often only a few meters apart.) As such, the dune areas should receive attention from Commonwealth officials in allocating the limited resources available for inventorying and detailed planning. Both principal dune areas remaining in Puerto Rico--the Isabela and Boca de Cangrejos areas--are accordingly included among the Special Planning Areas designated in Chapter 4.

Long-term need: Designation of Natural Reserves; regulations prohibiting alteration. As soon as alternative sand sources become available for the construction

industry, dune areas should be redesignated as Natural Reserves. At that time, moreover, Planning Regulation No. 13, the Floodable Areas Regulation, should be amended to prohibit man-made alteration of dunes within coastal high hazard areas (except alterations shown not to increase potential flood damage). Future adoption of such a regulation will be required in any event by Federal flood insurance regulations (24 CFR 1910, 3(e)(8); 41 FR 46978, October 26, 1976).

B. PROVIDING SAND FOR THE CONSTRUCTION INDUSTRY

Need: Alternative supply sources. Protection of dunes (and even public beaches) by regulatory means will remain difficult--both at the policy and enforcement level--until the construction industry obtains adequate supplies of sand at reasonable prices from alternative sources. Assisting in the development of those sources is, accordingly, a key program recommendation discussed in the section on Sand for Construction.

BEACHES

INTRODUCTORY FINDINGS

The beaches of Puerto Rico are coastal resources of great importance. These beaches vary from tiny pockets to broad deposits as much as a kilometer in length (e.g., Mediana Beach in Loiza, Levittown beach). Beaches are of incalculable importance to Puerto Rico for recreation and tourism. Some 109 kilometers of the island's 608 kilometers of beaches are naturally suited to be prime recreation beaches. These are shown on Map 11.

In addition, beaches are important for the protection of natural resources. For example, beaches on Mona and some other offshore islands are known nesting sites for sea turtles, including some endangered species. (See the section on Wildlife.)

Composition of the individual beach systems is dependent on the source of available beach materials. There are three dominant mineral assemblages which characterize Puerto Rico's beaches: Quartz sands with some feldspar; volcanic rock; serpentinite, heavy mineral assemblages, and calcium carbonate sands. The isolation of individual beach systems is emphasized by striking differences in composition between many adjacent beaches.

- * 1 - ISLA VERDE
- 2 - PIÑONES TORRECILLA
- 3 - VACIA TALEGA
- 4 - UVEROS
- * 5 - LUQUILLO
- 6 - EL CONVENTO
- 7 - SOROCO
- 8 - LAS CROABAS
- 9 - ICACOS

- * 10 - HUMACAO
- 11 - EMAJAGUA
- 12 - MAUNABO
- 13 - PUNTA TUNA
- 14 - MALA PASCUA
- * 15 - ARROYO
- * 16 - EL TUQUE
- 17 - LA VENTANA
- 18 - LA BALLENA

- * 19 - CAÑA GORDA
- 20 - MANGLILLO
- 21 - MONTALVA
- 22 - PLAYA ROSADA
- 23 - PAJAROS
- 24 - EL COMBATE
- * 25 - BOQUERON
- 26 - SABANETA
- 27 - LA PUENTE

- * 28 - AÑASCO
- 29 - CORCEGA
- 30 - CRASH BOAT
- 31 - EL POZO DE JACINTO
- 32 - LOS NEGRITOS
- 33 - MAR CHIQUITA
- 34 - TORTUGUERO
- * 35 - CERRO GORDO
- * 36 - SARDINERA

- 37 - PUNTA SALINAS
- 38 - PALO SECO
- * 39 - ENSENADA SOMBE
- * 40 - PLAYA LAGUNA DEL CONDADO
- * 41 - ESCAMBRON

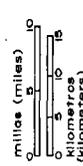
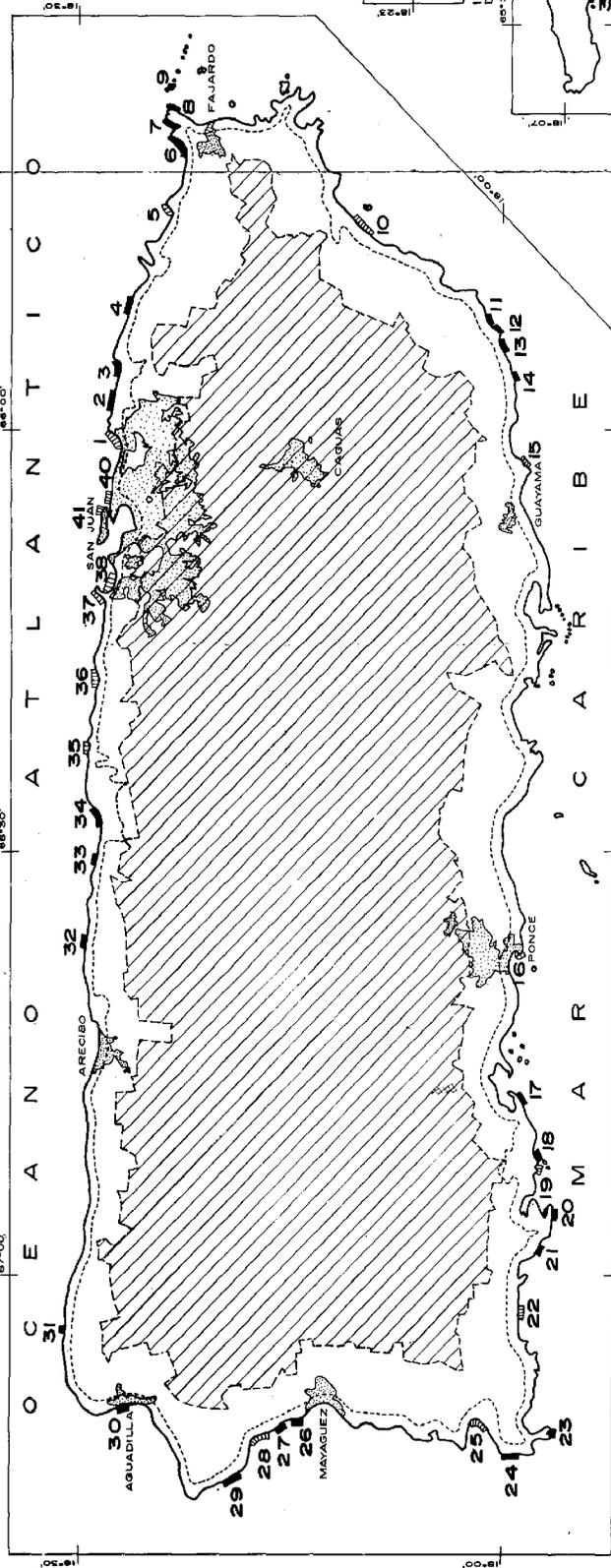
* BALNEARIOS BAJO LA JURISDICCION DE LA ADMINISTRACION DE PARQUES Y RECREOS PUBLICOS.
 * BEACHES UNDER THE JURISDICTION OF THE PUBLIC PARKS AND RECREATION ADMINISTRATION.

PLAYAS SIN DESARROLLAR  UNDEVELOPED BEACHES

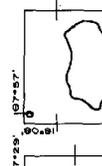
PLAYAS DESARROLLADAS  DEVELOPED BEACHES

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO - - - - - STUDY AREA INLAND BOUNDARY

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



ISLA DE CULEBRA



ISLA DE MONA



ISLA DE Desecheo



ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/ SOURCE:
 PLANIFICACION Y DESARROLLO DE RECREACION
 P.R. PLANNING BOARD, CENTER FOR RECREATION
 DEVELOPMENT, UNIVERSITY OF PUERTO RICO,
 RUCO DE PUERTO RICO, SAN JUAN, PUERTO RICO
 THE DEPARTMENT OF REGIONAL AND LOCAL BEACHES IN PUERTO RICO
 ADMINISTRATION, DEPARTMENT OF RECREATION AND TOURISM
 DE RECREACION Y TURISMO, GOBIERNO DE PUERTO RICO
 DE RECREACION Y TURISMO, GOBIERNO DE PUERTO RICO

Extraction of sand from beaches, long a cause of severe damage, is no longer extensive.

In the past, some beaches were stripped of virtually all their sand, which was then sold for use in construction. At present, however, there are no outstanding Commonwealth permits for sand extraction from beaches.* There does remain a problem of unauthorized extraction (see discussion in the section on Dunes); but beaches are no longer a major resource for the unauthorized extractors, who now prefer river-mouth and other deposits.

Erosion and water pollution affect beaches as well as other parts of the coast. Erosion has drastically reduced the size of some beaches; responsive measures are considered in the section on Coastal Erosion. Water pollution interferes with full recreational use of some beaches, notably in the Condado and Ocean Park sections of San Juan, where the Environmental Quality Board has found it necessary to place pollution-warning signs.

Several additional obstacles prevent recreational enjoyment of beaches by the general public:

- A. Legal barriers exclude the public from a few beaches.
- B. Some beaches, though legally public, are inaccessible because the public cannot cross adjoining land. Obstacles to access may be legal (no right of passage), or practical (e.g. no automobile access or parking area).
- C. When recreational users reach the beach (or another part of the coast), they may find that squatters got there first.
- D. Nearby highrise buildings may cast shadows or visually dominate the beach.
- E. The narrow strip of beach available to the public may prove too small for optimum recreational use.
- F. Inadequate public services--notably beach cleaning--may render the beach less enjoyable.

These obstacles, all of which must be overcome to assure optimum present and future use of beach resources, are discussed below.

A. ASSURING THE PUBLIC'S LEGAL RIGHT TO USE THE BEACHES THEMSELVES

FINDINGS

Most beaches in Puerto Rico are legally open to use by the general public. The

*Also, Federal law apparently prohibits extraction of sand from submerged lands (below mean high tide). See discussion above in the section on Reefs.

"space on the coasts ... that is bathed by the sea in its ebb and flow" is included¹ in the maritime zone (zona marítimo-terrestre).² The maritime zone is public domain.

The principal exceptions are beaches on the Federal military reservations at Roosevelt Roads and in Vieques.* A number of additional beaches formerly reserved for recreational use by military personnel (e.g. "Crashboat" in Aguadilla, Punta Sardinias) are now available for public use.

Spanish crown grants, issued prior to the Law of Ports of 1886, may authorize some private landowners to exclude the general public from some beach areas. The number of such grants, their legal validity, and the beach areas subject to them are unclear. Some proprietors do assert rights under such grants, however.

Compared to other beach access problems in Puerto Rico, the absence or uncertainty of public right to use a few beaches is of relatively minor importance. It remains a problem, however, to be addressed as opportunities present themselves.

RESPONDING TO THE FINDINGS

1. Registration of crown grants

More information is needed to determine whether or not crown grants represent a significant potential threat to open beaches in Puerto Rico. To deal with similar uncertainties, the Commonwealth's recently enacted Water Law (Law No. 136 of June 3, 1976) requires registration of crown grants to water supplies.

There is no comparable law, however, to deal with crown grants that may authorize exclusion of the general public from any portion of maritime zone. The statute should establish a reasonable registration period, of perhaps one year, after which (1) unregistered grants would be void, and (2) the validity of registered grants would be expeditiously adjudicated in a manner fixed by the statute.³

*The legal status of the Caribe Hilton Hotel site, formerly part of the San Juan Naval Station and now held by a Commonwealth government corporation under a 999-year lease granted by the Federal government, is unique and unclear. (See opinion of the Attorney General of Puerto Rico, November 25, 1970, and *La Haba v. Trib. de Contribuciones*, 76 DPR 923 (1954); a right to exclude the public from a beach on that site has been asserted. The Federally owned beaches of Culebra are discussed in the Culebra Segment of the Puerto Rico Coastal Management Program.

2. Surplus Federal land

NEW POLICY ESTABLISHED. From time to time, the Federal government has declared some of its coastal holdings to be surplus. Future declarations of this type may present opportunities to extend beach access. The following policy is hereby established to take advantage of any such opportunities that may arise:

APPROPRIATE ACCESS TO FEDERAL BEACHES HEREAFTER DECLARED SURPLUS. If any beaches now owned by the Federal government in Puerto Rico are hereafter declared surplus to the needs of the Federal government, such beaches shall to the maximum extent possible be held for permanent recreational use by the general public.

B. PUBLIC ACCESS TO THE COAST*

FINDINGS

Some beaches, though legally public, are inaccessible because the public cannot cross adjoining land to reach them. In some places, there is no legal right to cross the adjoining land. In others, a right of passage exists, but there are practical obstacles to access--most often an absence of vehicle access or parking space.

Lack of access to the coast has not traditionally ranked high among Puerto Rico's problems. In towns and cities traditional street patterns often provided access. In the country, fishermen and others needing access were often able to cross shorefront property--sometimes with a legal right of passage, sometimes without one.

The access problem has become significant in recent years, principally as a result of increased demand for access and changing shorefront development patterns,

..There were only 60,000 automobiles in Puerto Rico in 1950; today, there are more than 900,000. More and more people are using cars to go to outlying beaches that once seemed remote from urban centers. Effective demand for recreational use of outlying beaches has increased sharply.

..Yet much new shorefront development in outlying areas fails to provide public access to the coast. Traditional residential urbanizations in Puerto Rico

*A planning process for shoreline access is now being developed in accordance with Section 305(b)(7) of the CZMA.

have provided access: The developers have created lots served by public streets which could be designed (or redesigned at Planning Board insistence) to provide coastal access to the general public. Today, however, many shorefront projects--hotels, second-home projects, major industries--occupy large unsubdivided tracts with no public streets or other accessways.

The access problem has attracted most attention in the northeast part of the Island, where several shorefront projects are concentrated in outlying areas close to the San Juan Metropolitan Area.¹

Unless new shorefront development provides access at least equivalent to that provided in the past, exclusion of the general public from public beaches could become a serious problem. As the citizens' report, Puerto Rico and the Sea, put it:

"In the past, Puerto Rico has rarely encountered the beach exclusion problems that plague so many places in the United States and the Caribbean. The Island could well experience them in the future, however, together with the resentments and tensions they inevitably create. Steps are needed, and needed now, to assure that they do not arise as a result of developments being approved."²

There are several kinds of opportunities to provide needed access. Requiring access at new shorefront development appears to present the most important of these opportunities. Others include purchasing accessways, allowing access across land already owned by Commonwealth agencies and corporations, and protecting and clarifying existing accessways. A detailed beach access inventory and plan are needed to use these opportunities effectively.

POLICY

The Objectives and Policies elements of the Planning Board's Land Use Plan establishes the following the following policy on public access to beaches:

"To avoid the unnecessary loss of options for future use of these resources resulting from the establishment of new activities and from authorizing subdivisions. The following criteria, among others, must be considered:

"...

- Avoid the construction of buildings in beach areas and discourage activities or land subdivision in neighboring areas which would impede free physical access

to these areas, prohibit the appreciation of panoramic view, and prevent free access to and enjoyment of the sun by the citizenry." (See Policy 17.04.)

No statute, however, formally establishes for all of Puerto Rico, an access policy like the one established for Culebra. There, a statute bars development which "may interfere in any way with the free access of the public to the sea and beaches..."³

NEW POLICY ESTABLISHED. The following policy, based on one recommended by the citizens' report, Puerto Rico and the Sea, is hereby established:

PUBLIC ACCESS TO BEACHES. All people shall, to the maximum extent practicable, have equal opportunity in fact as well as in law to enjoy the beaches and other public shorelands of Puerto Rico's maritime zone. Shorefront development, governmental and private, shall, to the maximum extent practicable, be designed to facilitate rather than obstruct shoreland access by the general public. Wherever access is restricted by regulation (e.g. critical environmental areas needed for scientific study or for protection of endangered species), regulations shall apply equally to all persons. De facto segregation of public beaches, as a result of development patterns that facilitate use by shorefront landowners while obstructing or preventing access by the general public, is explicitly rejected and is declared unacceptable anywhere in Puerto Rico.⁴

IMPLEMENTING THE POLICY

1. Beach access inventory and plan

Detailed information on beach access is being compiled for parts of the Island, and a planning process for beach access is being developed. Map 12, for example, suggests access opportunities and limitations in the Island's northeast corner. A great deal of detailed inventoring and planning remains to be done, however.

Need: Beach access inventory. There is need for a detailed access inventory for the entire coastline. The inventory should identify and describe all known access points and facilities; should map beach areas deemed accessible and inaccessible; and should map adjoining property holdings, whether public or private, that separate beaches from public streets.

Need: Beach access plans. To provide guidance in safeguarding and increasing access, there is also need for a beach access plan designed to assure maximum feasible coastal access by the general public. The plan should take account of:

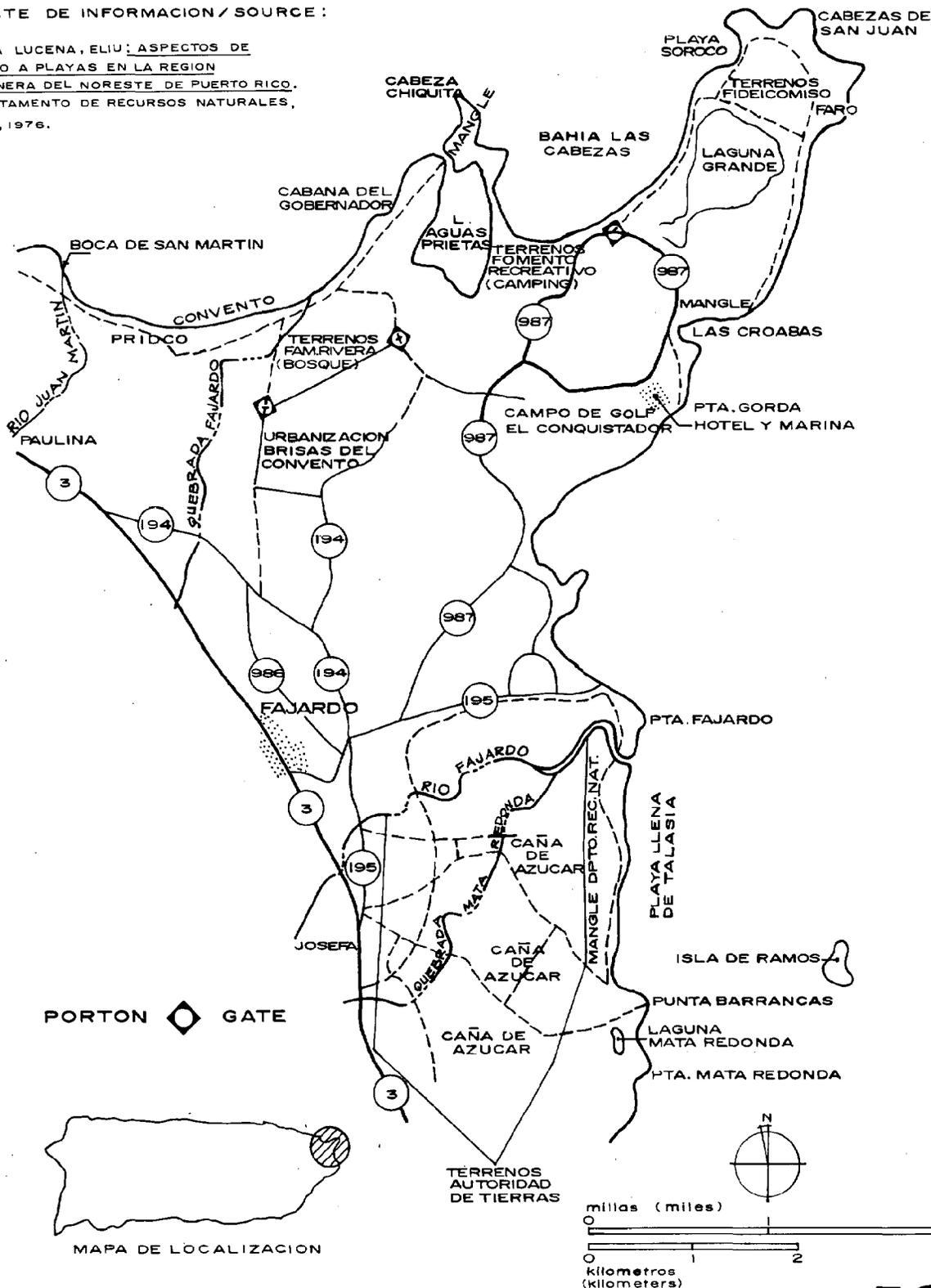
- ..the varied character of the coast from place to place (e.g., the long, continuous beaches in some areas, the tiny beaches and rocky headlands in others).
- ..the varied ways people enjoy using the coast (e.g., picnicking, sports, birdwatching) and the opportunity to plan access arrangements to restrict some areas for less intensive uses. "There is no need to make all shorefront access equally convenient: Some of the more rugged areas can be⁵ effectively reserved for the hardy few."
- ..the varied means by which access can be established. For example, coastal access can be assured by designing new shorefront highways at locations that preclude the construction of buildings between the highway and the coast. Access can also be provided by providing a series of intensive-use facilities (such as Luquillo Beach), with nearby shorelands accessible to those who walk along the shore from those facilities. Other possibilities include permitting pedestrians access from a street near the shore and providing a place to park, or access by hiking or boat along if the firm intent is to preserve the area in its undeveloped form.
- ..the need for public facilities (including, where appropriate, highways, public beach installation, parking facilities, pedestrian access ways). These must be sufficient to remove physical obstacles that could exclude the general public from the maritime zone. They must also be sufficient to assure that public access does not itself prevent enjoyment of the beach (e.g., where cars are parked on the beach itself). Since it is impractical to provide optimum facilities for all 109 kilometers of potential recreational beach, the plan should establish priorities.

2. Requiring new shorefront projects to provide access

The Planning Board has used the development control process, described in Chapter 4, to implement a longstanding policy of requiring public accessways at shorefront

FUENTE DE INFORMACION / SOURCE :

RIVERA LUCENA, ELIU; ASPECTOS DE
 ACCESO A PLAYAS EN LA REGION
 COSTANERA DEL NORESTE DE PUERTO RICO.
 DEPARTAMENTO DE RECURSOS NATURALES,
 JUNIO, 1976.



ACCESO A PLAYAS DE FAJARDO
 BEACH ACCESS IN FAJARDO

projects. Approval of the Cerromar Hotel, for example, was conditioned on the
6
establishment of a public accessway from the hotel parking lot to the beach.
Similarly, construction of an access road to the beach was required between the
7
Rio Mar project in Rio Granda, and an adjacent project.

In requiring accessways in projects such as these, the Board has apparently
relied principally on its discretionary review powers. The only regulation
requiring accessways through coastal developments in Planning Regulation No. 11,
the Simple Subdivision Regulation, which applies only to small subdivisions.

Even Regulation No. 11 does not prescribe access requirements in any detail.
As a result, specific access arrangements are established on an ad hoc basis
for each project, without detailed policy guidance and usually without public
awareness or discussion. The resulting arrangements vary from project to project
8
and sometimes provide little access opportunity.

Need: Regulation or statute specifying access dedication requirements. A reg-
ulation or, preferably, a statute should establish with certainty the obligation
of shorefront developers to provide public accessways and should specify the nature
of that obligation in as much detail as possible. The following requirements is
recommended:

Require Access Through New Developments. New developments shall provide
public accessways to the shoreline except in those cases where it is deter-
mined that public access is inappropriate, such as where (1) adequate access
exists nearby, (2) the topography makes access dangerous, (3) the proposed
development is too small to include an accessway, (4) the coastal resources
are too fragile to accommodate general public use, (5) public safety or military
security precludes public use, or (6) the public accessway would adversely
9
affect agricultural uses or natural systems. Any decision that public access
is inappropriate shall be consistent with a beach access plan recommended by
the Secretary of Natural Resources and adopted by the Puerto Rico Planning
Board.

The regulation or statute should assure that the accessway is permanent. The following is recommended:

In private developments, public access shall be ensured (1) either by dedication of fee title or an easement for the reserved accessway to a public agency, or (2) by the recording of a deed restriction, at the owner's option. Dedicated accessways shall not be required to be opened to public use until a public agency or private association agrees to accept responsibility for maintenance and liability for the accessway.

So that the general public may be aware of arrangements made for its access to the coast, the regulation or statute should require public notice and hearing before approval of any shorefront development.

3. Government purchase of accessways

The beach access plan, recommended above, may show that public purchase of land (or rights-of-way) is appropriate to provide access to some portions of the coast. This could be true, for example, in some rural areas where access is blocked and where no shorefront development is planned.

Federal financial assistance may be available to assist in the purchase of accessways:

The Federal Land and Water Conservation Fund Act of 1965 enables the Bureau of Outdoor Recreation to provide funds to Puerto Rico for outdoor recreation areas and facilities. An estimated \$2.1 million in aid is available for Fiscal Year 1977.

A recent amendment to the U.S. Coastal Zone Management Act (Section 315(2)), authorizes Federal aid for the acquisition of land to provide for access to public beaches and other public coastal areas of particular value.

To obtain Federal aid under these programs, however, the Commonwealth must provide matching funds. In the future, competing demands for funds may leave the Commonwealth unable to afford substantial amounts to acquire beach accessways.

Need: Plan element evaluating need for acquisition to provide access. The beach access plan, already recommended, should evaluate the need for Commonwealth purchase of additional accessways and should identify accessways whose acquisition has highest priority.

4. Allowing public passage across shorefront property already owned by the Commonwealth or public corporations

The public is excluded from some beaches by property owned or leased by the Commonwealth or public corporations (e.g., at El Convento, in Farjardo; at Central San Francisco, in Guayanilla). It may be possible to open some (though not necessarily all) of these properties without sacrificing resources or other public needs and without harming adjacent public or private lands.

Need: Plan element evaluating feasibility of providing passage. The beach access plan already recommended should (1) identify all shorefront properties, owned by the Commonwealth or public corporations, that are closed to the general public; (2) identify inaccessible beaches that could be made accessible to the general public by allowing passage across those properties; (3) determine the feasibility of providing passage, consistent with public safety, security, and resource protection.

5. Protecting and clarifying existing accessways

Law and customary use may have created important access rights to the coast. Protecting and clarifying these rights appears to present a limited, but still important, opportunity to assure adequate access.

- a. Rights-of-way from "time immemorial." Where the public has passed across property from "time immemorial," a legal right of passage exists. Use must have begun so long ago that "man cannot remember" the moment when it began,¹⁰ and prior to 1889,¹¹ when the Civil Code went into effect.

Need: Identification of immemorial rights-of-way. The beach access inventory, already recommended, should identify longstanding accessways that may have been used since "time immemorial." If affected property is later developed, these accessways should be protected. In a few cases, the passages may be important enough to warrant the bringing of judicial proceedings or other measures to protect or clarify their status.

The burden for proving immemorial usage is heavy, however, so the opportunity to guarantee access by proving immemorial usage seems correspondingly limited.

- b. Other rights-of-way. Except for immemorial rights-of-way, prolonged public use rarely results in a legal right of passage across private property in Puerto Rico.* Assertion of prescriptive rights accordingly appears to present few opportunities to assure beach access.
- c. Servidumbre de vigilancia. The Law of Ports of 1886 establishes a servidumbre de vigilancia ("easement of vigilance"), apparently to facilitate the governmental function of patrolling the coasts.** The servidumbre adjoins the maritime zone, extending inland six meters from its landward edge; where the six-meter strip is impassable, shorefront landowners must permit authorized people to pass at a convenient place nearby.

The servidumbre, if still valid, may create a highly beneficial right of access. As citizens' report, Puerto Rico and the Sea, noted:

Today, as concern about pollution and its consequences (such as fish kills and oil spills) accentuates age-old needs for vigilance over coastal areas, it is essential that the existence of the servidumbre be definitely determined, publicized and enforced. The servidumbre creates, for purposes of coastal vigilance and also perhaps for the purposes, a right of passage along the entire coast of Puerto Rico. To create such a right anew, if it did not already exist, would be enormously burdensome and expensive.

The validity and interpretation of the servidumbre are unclear, however. Statutory clarification has been suggested.

*Only rights-of-way that are continuous and apparent may be acquired without title. See Civil Code, Art.475 (31 LPRA 1653). An even prolonged, continuous use has been interpreted as a use tolerated by the owner, who may prohibit it at any time. See *Goenage v. O'Neill*, 1962, 85 DPR 170; *Martin v. Correa*, 1954, 76 DPR 12; *Benet v. Registrador*, 1945, 65 DPR 489; *Polanco v. Ruiz*, 1939, 55 DPR 785.

**The same law establishes a servidumbre de salvamiento (easement of salvage and life saving"), extending 20 meters inland, apparently for the benefit of shipwrecked sailors and fishermen driven from the sea by storms. Even if this servidumbre remains legally valid, it appears to create no access rights enabling the general public to get from the highways to the coasts. Any access rights created appear to run from sea toward land, not the other way around.

Need: Statute reaffirming legal validity of servidumbre. To remove present legal uncertainties, beach access legislation should include provisions reaffirming the continuing legal validity of the servidumbre de vigilancia.

C. REMOVING SQUATTERS FROM THE COAST

FINDINGS

Squatters have built structures on public property--both lands and waters--at several coastal locations. The most widely known of these invasions have occurred at La Parguera (Lajas), El Combate (Cabo Rojo), and Culebra.*

Squatting creates problems of exclusion and pollution. Squatters, relatively few in number, exclude the general public from the public space they occupy. They also despoil nearby areas, particularly by creating problems of sewage and solid waste disposal.

The squatter problem along the coast of Puerto Rico has two origins. One, which is not limited to public lands on the coast, arises from an acute shortage of housing for poor people.

The other arises, typically, from the desire of well-to-do people to have a second home for use on weekends and vacations.

The problem, particularly the removal of established squatters, is exceedingly difficult to solve. Even though squatting is illegal, the removal of existing squatter homes presents delicate issues requiring sensitive handling. Some squatter communities have existed for many years, and squatters have come to expect that they will continue. Removal becomes even more difficult when squatters have no other homes.

RESPONDING TO THE FINDINGS

1. Controlling future land invasions

The Commonwealth has established a detailed administrative procedure that permits rapid action by the responsible agencies to terminate new land invasions and prevent expansion of old ones.

*The squatter problem in Culebra, as well as the special laws and programs established to respond to it, are discussed in the Culebra Segment of the Puerto Rico Coastal Management Program.

2. Existing invasions by squatters who have no other homes

Law No. 132 of July 1975, enables some squatters to obtain title to the public land they occupy; titles are available only to squatters who had built a home and lived in it when the law was passed, and who had no other home.

Beaches, however, being public domain, cannot be privately owned.³ Therefore, squatters on beaches (or any other part of the maritime zone) cannot obtain title to the land they occupy.⁴

In Culebra, squatters on public domain land may be removed, but a home must generally be provided for squatters who have no other home.⁵ There is no comparable statutory right to a replacement home, however, for squatters removed from public domain lands elsewhere in the Commonwealth.

Needs: Housing for squatters. To permit removal from public domain lands of squatters who have no other homes, there is need to provide them with adequate housing elsewhere.

3. Other invasions of coastal lands and waters

The Commonwealth's Public Service Commission issued an administrative order in 1970 against the owners of summer homes built in coastal waters at La Parguera. A legal challenge ensued, which was finally resolved in 1976 in favor of the squatters; the Supreme Court of Puerto Rico concluded that the Public Service Commission lacked jurisdiction in the matter.⁶

Need: Sensitive regulation of established squatter communities. Provision of housing for needy squatters, though essential, is not a sufficient governmental response to the problems created by established squatter communities. In dealing with long-standing communities, such as that of La Parguera, the government must somehow take account of squatters' expectations developed during years of occupancy. Yet it must also respond to the problems of exclusion and pollution that squatters create.

Regulations responsive to these multiple concerns are now being prepared by the Department of Natural Resources for application at La Parguera and are expected to be issued in the summer of 1978. These would continue the present prohibition of new squatter homes, would prohibit rebuilding of existing homes destroyed by fire

or storm, and would require squatters to pay a reasonable rent for the public space they occupy for homes and piers. The regulation would further require each home to tap into a newly constructed sewer system or, for offshore homes where that is impossible, to provide tertiary treatment of sewage before discharge.

D. PROTECTING BEACHES AGAINST THE SHADOWS AND VISUAL DOMINATION OF HIGH-RISE BUILDINGS

FINDINGS

High-rise buildings on shorefront property cast shadows on some public beaches and dominate them visually. In the Condado and Isla Verde sections of the San Juan Metropolitan Area, tall buildings cast shadows on public beaches favored by sunbathers; during the winter tourist season, large sections of beach are shaded during much of the day.¹ Moreover, these buildings psychologically dominate the beach, detracting from its appeal as a natural recreation site. (See illustration, next page.)

Future development need not cast shadows on public beaches and other coastal areas.

At the winter solstice, when northern shadows are longest, the longest shadow between 10:00 a.m. and 4:00 p.m. is about 2.9 times the height of the structure. If future buildings are set back that distance, they will not cast a shadow on the publicly owned maritime zone.^{2*}

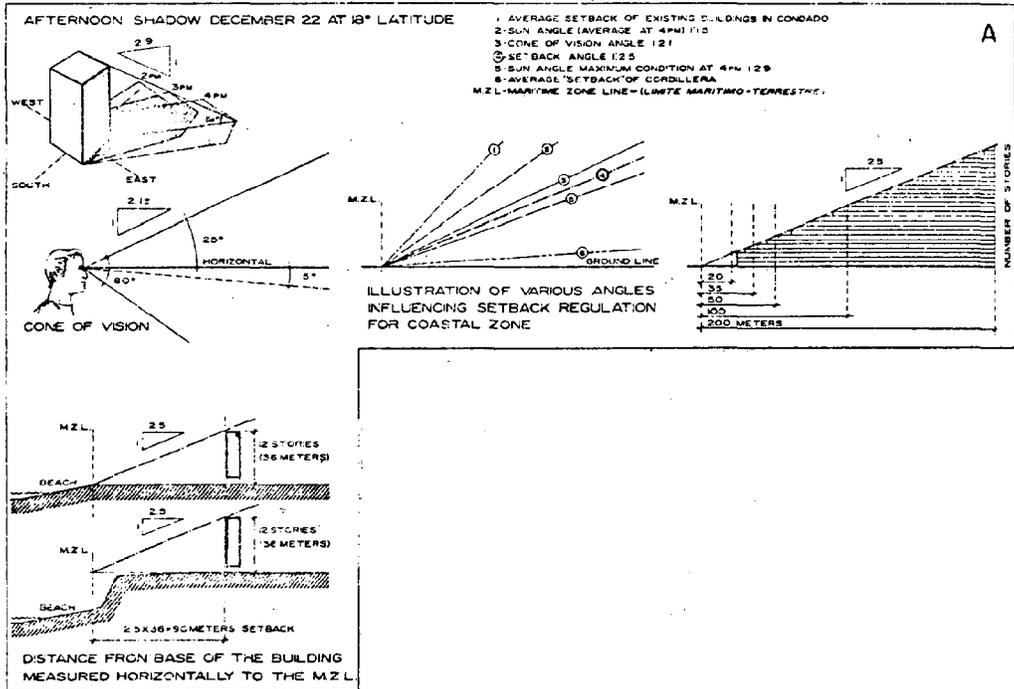
Visual domination by buildings can also be avoided. There is a subjective element to determining when buildings dominate beaches. In general, however, structures appear to confine space when they exceed the upper limit of the normal cone of vision of a person looking forward. The cone of vision has a relationship of approximately 1:2.1. Thus, a building set back 2.5 times its height would not appear to confine or dominate the beach.³

POLICY

The Objectives and Policies element of the Planning Board's Islandwide Land Use Plan establishes, as general policy, the avoidance of "...the construction of buildings in beach areas and discourage activities or land subdivision in neighboring areas which would ... prevent free access to and enjoyment of the sun by the citizenry."

(See Policy 17.04.)

*Greater setbacks may be needed in some cases for other purposes, notably for protection of buildings from coastal storm surges. See section of Flooding (including Hurricane Flooding).



A- COASTAL ZONE: THE SHORELINE SETBACK

Source: Puerto Rico Planning Board, The San Juan City Edges Project, Technical Report. August 1976, page 63.

IMPLEMENTING THE POLICY

Planning Regulation No. 4, the Zoning Regulation, was amended late in 1975 to require new buildings to be set back from the maritime zone a distance of at least 2.5 times their height.⁴ This requirement applies in all zoning districts. Provision is made for exceptions in cases of small pre-existing lots, ports, and other specified cases.

E. PROTECTING AND ENLARGING PUBLIC BEACH HOLDINGS

FINDINGS

The narrow strip of beach accessible to the public is often too small for optimum recreational use. Even at little-used rural beaches, recreational opportunity may be enhanced by assuring public access to shady areas beyond the vegetation line. At intensively used beaches, still more space is needed for parking and other facilities. The narrow beach strips accessible to the public at many locations are insufficient to satisfy these needs.

There are opportunities to enlarge the publicly accessible areas, principally by acquiring shorefront property at the time of development.

RESPONDING TO THE FINDINGS

Acquiring shorefront land and facilities at coastal developments.

Developers have sometimes dedicated shorefront property to the Commonwealth. They have done so, for example, in conjunction with the establishment of coastal roads (e.g., Levittown). The dedication may also be specifically for recreational use (e.g., Parque Barbosa in Santurce; the recreation spaces in the Vacía Talega project as approved by the Planning Board in 1975).

Planning Board Regulation No. 9, the Community Facilities Regulation, obligates developers to furnish sites and facilities for recreation in new developments. The regulation does not, however, establish special requirements for shorefront projects. No provision requires (or even explicitly authorizes) the substitution of coastal recreation space and facilities (e.g., parking lots, bath houses) for the baseball fields and playgrounds normally required. Although the Board authorized such a tradeoff at Vacía Talega, this was done solely as an exercise of discretion.

Need: Refinement of Regulation No. 9 for coastal situations. Planning Regulation No. 9 should be amended to make explicit provision for beach recreation space and facilities at shorefront developments.

F. PROVIDING SERVICES AND FACILITIES FOR BEACH USERS

FINDINGS

There are 13 "full service" recreational beaches (balnearios) on the Island.

At these beaches, identified on Map 11, the Commonwealth's Public Parks and Recreation Administration (PPRA) provides one or more services (e.g., lifeguards, first aid, beach cleaning) or facilities (e.g., parking lots, changing houses, rain shelters). These beaches occupy 20.85 kilometers of the coast.

Most of the Island's recreation beaches, however, including many intensively used urban ones, are largely unserved. Vast stretches of beach are simply common property accessible to the general public, but without facilities and largely or wholly without services. This is true not only of relatively out-of-the-way beaches in rural areas, but also of intensively used urban ones.

It is neither feasible nor desirable to provide a full range of recreational services and facilities at all beach areas accessible to the public. The cost of providing full services and facilities would be prohibitive.* At the 13 balnearios, beach cleaning costs PPRA about \$900,000 a year and occupies a staff of 245. In any event, many people enjoy-- or even prefer--a beach experience without fences, lifeguards, and rain shelters.

It is accordingly essential that the beach access plan establish, as already recommended, priorities for providing additional beach facilities and services.

Early attention needs to be given to the problem of beach litter. Beach litter detracts from public enjoyment of many beaches. Although it is a problem even on many little-used beaches, it is acute at those (other than PPRA's balnearios) used intensively for recreation. Examples include Boca de Cangrejos and Mar Chiquita. Recreational boating has brought the problem even to offshore islands such as Cayo Icacos off the east coast.

Given competing demands for funds, there is little likelihood that optimum trash pickup can soon be provided for all 109 kilometers of potential recreation beaches.¹ Nevertheless, there are some opportunities to improve responses to the litter problem.

*Extension of facilities and services might, in addition to direct costs, subject the Commonwealth to additional liability--and thus costs--for personal injury to beach users. The legal and other aspects of this issue may need to be explored.

RESPONDING TO THE FINDINGS

1. Establishing clear responsibility for beach cleaning

Divided, unclear responsibility is a principal obstacle to adequate cleaning of the beaches (other than those in custody of PPRA):

The Department of Natural Resources has legal custody of all the public coastal areas "left over" after specific assignment of some areas to PPRA, the Ports Authority, and other public entities.

Municipalities are responsible for collecting solid waste (including litter) from beaches within their borders, according to a regulation of the Environmental Quality Board.²

The Tourism Development Company, in cooperation with the Right to Work Administration, has a beach brigade which cleans beaches between the Condado and Boca de Cangrejos in the San Juan Metropolitan Area.

Legislation proposed in 1973 by the Environmental Quality Board would create a Solid Waste Management Authority which would conduct a beach litter control program. Under bylaws proposed by EQB, the Authority would assume beach cleaning functions.³

Need: DNR assistance in beach cleaning. Until a Solid Waste Authority is established, DNR should assist the municipios in carrying out their beach cleaning responsibilities. Areas of intensive cleaning should be selected by DNR, in cooperation with the municipios concerned, the EQB, and PPRA.

2. Providing adequate funds for beach cleaning manpower and equipment

DNR's 1976 budget for beach vigilance and cleaning, islandwide, was \$525,000. The Department's five regional offices have a combined staff of 120 assigned to beach cleaning and surveillance. These staff members have only rakes and other simple equipment. Trash collected by DNR staff is normally removed in trucks belonging to the municipalities.

Use of machines can improve beach cleaning at relatively low cost. In 1974, the Puerto Rico Industrial Association donated a beach cleaning machine to the Tourism Development Company (TDC). For the past 3 years, TDC's beach brigade has used this machine 5 days a week to clean beaches in metropolitan San Juan. Experience with the machine has been positive: beaches are being cleaned more often, and at a fraction of the cost and time required by manual labor.⁴

Need: Additional beach cleaning machines, manpower. Adequate funding should be made available for the purchase of additional beach cleaning machines and the hiring of manpower to operate them.

Need: Experimentation with renting beach concessions. Renting beach concessions to private individuals, contingent on their cleaning the beach in the concession area, warrants experimentation in areas where adequate public pickup cannot soon be provided. The granting of such concessions is authorized, subject to numerous safeguards, by Law No. 38 of September 27, 1949 (28 LPRA sec. 18); areas subject to such concessions must be open to the general public.⁵ Adoption of regulations governing the use of beaches, presumably including concessions, is authorized by section 16(2) of the Planning Board Organic Act.

3. Litter reduction

Need: Litter reduction measures. Since trash cannot be picked up frequently from all beach areas, especially those that are remote and those where rocks or vegetation preclude use of beach cleaning machines, litter reduction measures are essential. Such measures should include:

- ..Persuasion: There should be a continuing public education campaign.
- ..Assistance: Many more trash containers should be placed at beach sites convenient to the public; and better arrangements for emptying them should be made.
- ..Enforcement: The anti-litter law (Law No. 21 of September 4, 1969) should be enforced.
- ..Incentives: The use of returnable bottles and cans should be encouraged.

WILDLIFE

FINDINGS

Puerto Rico's native wildlife species are limited. Of an estimated 200 native bird species, 13 are endemic (found nowhere else). There are an additional 94 local breeders as well as 72 migrants and 21 strays.¹ Four species that once flourished in Puerto Rico are now extinct. Other animal species include: turtles (5 species), snakes (7), toads (2), frogs (15), lizards (31), bats (15), whales (4), the manatee, and numerous fish species. Five predator species have been introduced: the mongoose, the dog, the cat, and two species of rat.

The Federal endangered species list, established pursuant to the Endangered Species Act of 1973, includes a number of species and subspecies found in Puerto Rico.² Species and subspecies listed as of September 19, 1977, are shown below, and their known habitats are shown on Map 13.

Endemic to Puerto Rico:

1. Puerto Rican Whip-poor-will (*Caprimulgus noctitherus*)
2. Puerto Rican Parrot (*Amazona vittata*)*
3. Puerto Rican Boa (*Epicrates inornatus*)
4. Yellow-shouldered Blackbird (*Agelaius xanthomus*)

Non-endemic:

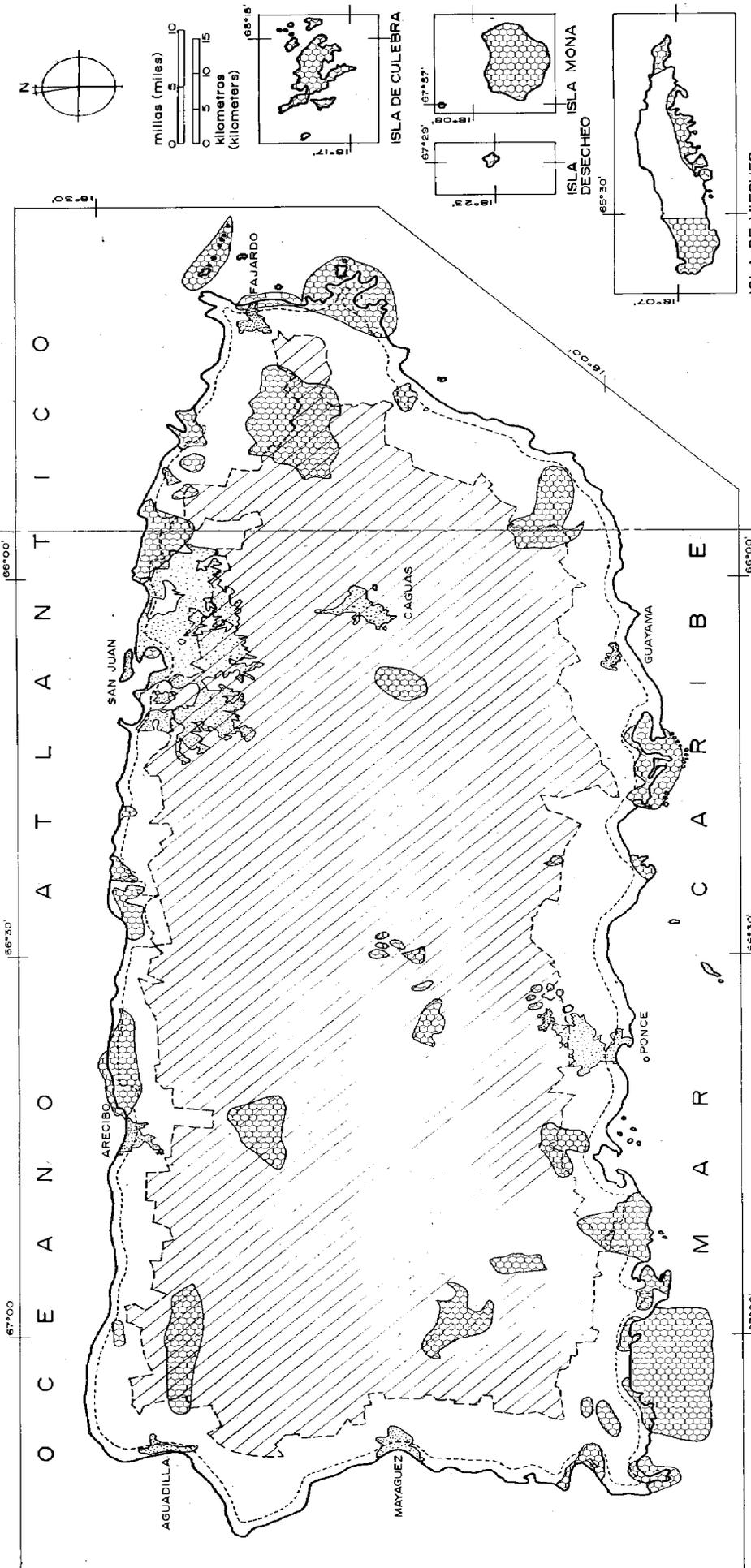
5. Plain Pigeon (*Columba inornata wetmorei*)
6. Hawksbill Turtle (*Eretmochelys imbricata*)
7. West Indian Manatee (*Trichechus manatus*)
8. Leatherback Turtle (*Dermochelys coriacea*)
9. Brown Pelican (*Pelecanus occidentalis*)
10. American Peregrine Falcon (*Falcon peregrinus anatum*)
11. Humpback Whale (*Megaptera novaeangliae*)
12. Sei Whale (*Balaenoptera borealis*)
13. Finback Whale (*Balaenoptera physalus*)
14. Sperm Whale (*Physeter catodon*)
15. Atlantic Ridley Turtle (*Lepidochelys*)

The listing and delisting of endangered species and subspecies is an ongoing process, however. Recent rulemaking, effective August 22, 1977, has added the Culebra Island giant anole (*Anolis roosevelti*) to the endangered list and designated critical habitat for the species. A proposed rule, published May 26, 1977, would determine threatened status and critical habitat for three Mona Island species--the Mona boa (*Epicrates monensis*), the Mona blind snake (*Typhlops monensis*), and the Mona ground iguana (*Cyclura steinegeri*).

*The near extinction of the Puerto Rican Parrot is the most celebrated example of endangerment in Puerto Rico. Driven from the lowland by land clearing and heavy hunting, the remaining 17 birds (census, November 1972) are restricted to the upper areas of the Luquillo Experimental Forest.³

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

APPROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO



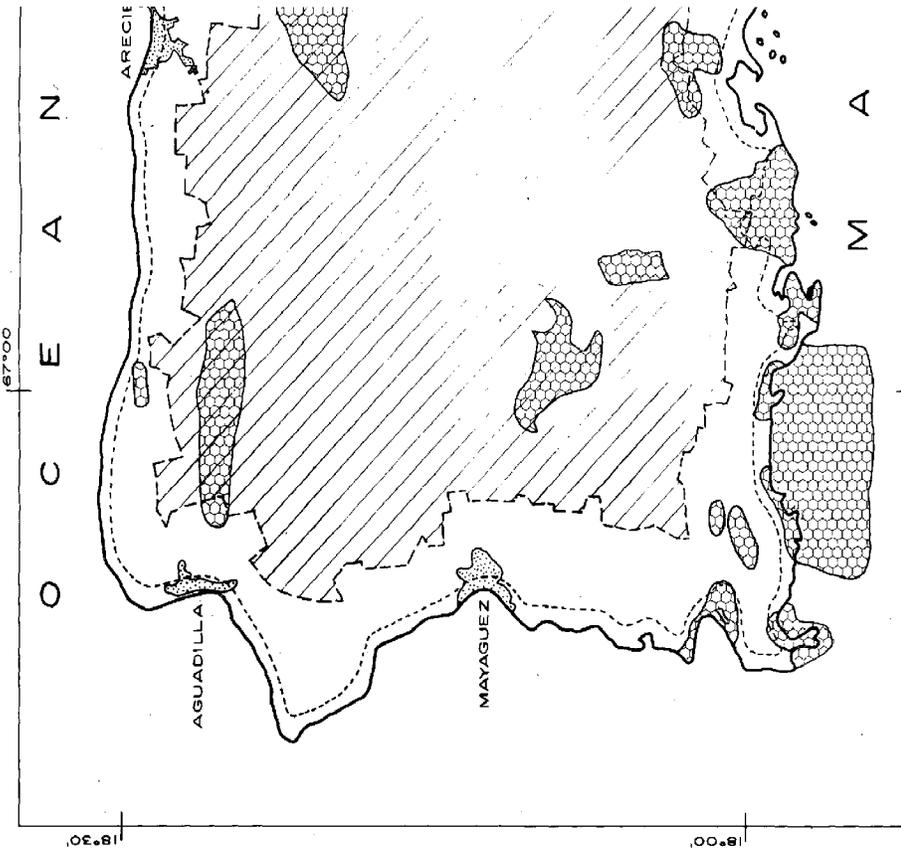
LA DE PUERTO RICO
 ENTE DE INFORMACION/SOURCE:
 "WELL-HERBERT" EVALUATION OF WILDLIFE VALUES
 WATER BODIES AROUND PUERTO RICO'S COAST, D.R.N.I. 1975
 DELINEATION OF AREAS OF NATURAL RESOURCES, D.R.N.I. 1972
 RE AND ENDANGERED ANIMALS OF P.R., SOIL
 NSERVATION SERVICE, 1973.

ISLA DE VIEQUES

13

AREAS CRITICAS PARA VIDA SILVESTRE EN PELIGRO DE EXTINCION
 CRITICAL AREAS FOR ENDANGERED WILDLIFE

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROX
LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY



ISLA DE PUERTO RICO
FUENTE DE INFORMACION/SOURCE:
RAFAEL MERRITT. EVALUATION OF WILDLIFE VALUES
OF WATER BODIES AROUND PUERTO RICO'S COAST. D.R.N.I. 1975
GUIDELINES OF AREAS OF NATURAL RESOURCES. D.R.N.I. 1972.
RARE AND ENDANGERED ANIMALS OF P.R., SOIL
CONSERVATION SERVICE. 1973.

AREAS

The Commonwealth Department of Natural Resources issued a more extensive list of endangered species in 1973. This list was prepared by a committee of Federal and Commonwealth officials and representatives of private groups. Species endangered in Puerto Rico are included on the list, whether or not they are endangered elsewhere. According to this list, 28 species are very endangered, 33 endangered, 15 on the verge of being endangered, 9 status undetermined, and 3 peripheral. Of these, 17 species and 5 subspecies are endemic to Puerto Rico. The committee report also grouped the animals by causes of their endangerment, which include habitat destruction or disturbance, hunting, predation by mongooses and rats, and pesticides or other chemicals.

Wildlife, including unendangered as well as endangered species, represents a significant natural resource. The importance of wildlife is recognized in the Commonwealth's new Wildlife Law (Law No. 70 of May 30, 1976):

This law has the purpose, through modern scientific approaches relative to the preservation of these resources, of attaining an adequate balance between the rights of the citizens to carry out activities related to the hunting of animals and the needs of the State to avoid, as a result of urban and economic development, the continuous extermination of wildlife species with habitats in the Commonwealth of Puerto Rico.

Although the decline of wildlife in Puerto Rico may be attributed to several causes, habitat destruction is the most important. The drainage of marshlands in the Lajas Valley, for example, damaged the rich aquatic environment that supported wild bird populations. Other important threats to wildlife are hunting, mongoose and rat predation, and the use of chemicals. All of these occur in the coastal zone as well as in the remainder of the Island.

POLICY

The Objectives and Policies element of the Planning Board's Land Use Plan, quoted in Chapter 2 above, has established, as general policy, the avoidance of "activities and land subdivision which could cause the deterioration or destruction of . . .habitats of endangered species." (See Policy 18.03)

IMPLEMENTING THE POLICIES

A. PROTECTING HABITAT AGAINST DISRUPTION

1. Public ownership and custody

The Commonwealth Department of Natural Resources has custody of some significant wildlife habitats on the coast. Examples include the Guanica Forest and the Boqueron Bird Refuge. Other Commonwealth agencies and corporations own important habitat, at Boca de Cangrejos and Caño Tiburones, for example.

The Federal Fish and Wildlife Service has two small National Wildlife Refuges located on the coast: Cabo Rojo Refuge (588 acres) in extreme southwest Puerto Rico, and Desecheo Refuge (360 acres) at Desecheo Island. The Federal military bases on Vieques and at Roosevelt Roads also provide important habitat protection.

Because of the high costs, there are few opportunities either (1) to acquire additional private lands for inclusion in nature reserves or (2) to obtain transfer of custody to DNR from Commonwealth corporations that now control significant habitat areas. It would clearly be desirable to provide additional protection in these ways, however, particularly for the sites of species on the Federal endangered list. (See Map 13.)

2. Management and protection

The Conservation Program on Endangered Species is a cooperative agreement submitted by the Commonwealth Department of Natural Resources to the Federal Fish and Wildlife Service in October 1976. This would establish a protection and management program for the species on the Federal list.

It is anticipated that in the future when a delayed joint study by the DNR and NMFS/FWS to survey sea turtle nesting sites gets under way, the results of this study will make it possible to formulate policy which designates certain areas of beaches as critical environmental areas where people will be restricted during specific times of the year which, in turn, will lead to the establishment of enforcement procedures, the initiation of a public awareness program, and vigilance of selected areas by the Ranger Corps--all aimed at protecting endangered sea turtles.

Need: Designation of Natural Reserves. Since resources available for wildlife management are limited, it is useful to select particularly important habitat areas where management efforts may be focused. Most of the Natural Reserves recommended in Chapter 4 are of wildlife interest, as explained in Appendix C.

3. Development controls

The Planning Board's policy against disruption of the habitat of endangered species is to be applied, to public as well as private property, via the development control system described in Chapter 4, as well as in evaluating applications for Federal and Commonwealth permits.

It is impractical to identify in advance every site to which this policy applies. Case-by-case evaluation of the impact on wildlife of proposed development accordingly remains essential. A few sites where habitat preservation should clearly be a paramount objective are recommended in Chapter 4 for future designation as Natural Reserves.

Moreover, section 7 of the Federal Endangered Species Act, requires Federal agencies to assure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of threatened and endangered species, or result in the destruction or adverse modification of the "critical habitat" of such species. For some listed species, the yellow-shouldered blackbird, for example, there have been formal rulemaking proceedings to designate the specific geographic area(s) considered critical for survival of the species. Such a "critical habitat" designation can be an aid to Federal agencies in carrying out their responsibilities under the Act.

4. Zoning

The Planning Board's Zoning Regulation is being applied in at least one instance for the specific purpose of protecting habitat: a limited area in Cidra was zoned R-0 in 1975, to protect the habitat of the Plain Pigeon.

B. PROTECTING WILDLIFE AGAINST INAPPROPRIATE HUNTING

1. Regulations

Pursuant to the Commonwealth's new Wildlife Law, the Department of Natural Resources has prepared draft regulations governing hunting. Among other innovations, these regulations:

- a. Specify species that may be hunted; the hunting of all other species is prohibited. This regulation protects all species on the 1973 Commonwealth list mentioned above (except for minor discrepancies, which reflect new knowledge obtained since the 1973 list was prepared).
- b. Close some areas to all hunting (e.g., portions of Vieques that are breeding grounds for the white-crowned pigeon and white-cheeked pintail).

2. Enforcement of regulations

Responsibility for enforcement of hunting regulations in Puerto Rico is assigned to DNR's Division of Fish and Wildlife. At the Federal level, the U.S. Fish & Wildlife Service has an enforcement officer stationed in Mayaguez and the National Marine Fisheries Service has an enforcement officer stationed in Aguadilla.

Need: Enforcement. Strengthened Commonwealth enforcement efforts should be undertaken as part of the improved management capability described in Chapter 4.

COASTAL WATERS

INTRODUCTORY FINDINGS

Puerto Rico's coastal waters are a resource of incalculable importance. They are essential for economic transportation of goods to and from the Island. They serve the cultural and biological function of isolating the Island and giving Puerto Rico a special identity. They provide a major recreation resource for Puerto Ricans and for the tourism industry. They are the source of supply for a potentially important fishing industry. They support other coastal resources such as dunes, beaches, reefs, and mangrove wetlands. They serve as a final disposal ground for many of the Island's wastes. And they are part of the earth's largest unexplored wilderness--a great recreational, scientific, and industrial frontier.

Coastal waters include freshwater lagoons and swamps and saltwater bays and lagoons, as well as the ocean. Laguna Tortuguero is the largest remaining freshwater lagoon on the Island, and there are only a few freshwater swamps, such as Caño Tiburones and several Pterocarpus swamps. Salt water lagoons include Laguna Torrecillas, Lagune Piñones, Laguna Grande, Laguna Aguas Prietas, and Laguna Joyuda. Of the numerous bays, only one is located on the north coast: San Juan Bay. Other principal commercial bays include Guanica, Jobos, and Guayanilla. And there are four principal bioluminescent bays, two on the south coast of Puerto Rico, and two on Vieques.

To assure that coastal waters keep serving their varied essential functions, there must be continuing attention to four principal problems. These problems are discussed in the following sections:

- A. Reducing pollution from municipal and industrial waste discharges;
- B. Reducing damage from oil spills;
- C. Minimizing erosion and sedimentation; and
- D. Minimizing environmental damage from dredging, diking, and filling.

A. REDUCING POLLUTION FROM MUNICIPAL AND INDUSTRIAL WASTE DISCHARGES

FINDINGS

Ocean water quality has apparently been improving in recent years. According to the limited available data, ocean waters comply with water quality standards in most areas.¹ Most violations occur where streams discharge to the ocean² and near municipal and industrial waste discharges.

Water quality of bays and estuaries is much poorer. Several principal bays (San Juan, Mayagüez, Guayanilla, Guanica) and estuarine areas (Río Grande de Loiza, Río Grande de Arecibo, Río Grande de Añasco) fail to meet water quality standards for one or more established criteria.

Municipal waste discharges are a major source of pollution. Wastes from nearly all island municipalities, inland as well as coastal, reach coastal waters relatively undiluted and without having been completely broken down biologically. Twenty-five of the 43 coastal municipios discharge municipal wastes directly to waters within the coastal zone. Of the 25, nine (San Juan, Arecibo, Isabela, Mayagüez, Aguadilla, Arroyo, Guayama, Ponce and Vieques) discharge directly to the ocean or bays; treatment varies from zero (wastes from 5 towns are still untreated) to secondary treatment.

Industries (including power plants) are also principal dischargers. Numerous industries discharge wastes directly to coastal waters after varying levels of treatment.³

Discharge of heated waters is most serious at the thermoelectric complexes on the Island (Puerto Nuevo and Palo Seco in the San Juan Metropolitan Area, Guayanilla, and Aguirre).⁴ Toxic industrial wastes, such as those from pharmaceutical plants, are also a special problem. Some industries, notably north-coast pharmaceutical plants, have their wastes barged out to sea (42 miles north of Arecibo) and discharged there under an EPA-granted ocean-dumping permit. This ocean dumping is subject to termination.

POLICY

All wastewater discharges shall comply with Federal and Commonwealth regulations. Federal and Commonwealth water quality standards, as well as the regulations and programs established to achieve them, are incorporated as part of the Puerto Rico Coastal Management Program.

IMPLEMENTING THE POLICY

The Environmental Quality Board (EQB), which has principal responsibility within the Commonwealth government for implementing this policy, works closely with:

- ..The Puerto Rico Aqueduct and Sewer Authority (PRASA)--the Commonwealth agency that builds and operates "municipal" wastewater treatment facilities in Puerto Rico.
- ..The Puerto Rico Planning Board, which approves sites of treatment plants and sewer lines.
- ..The U.S. Environmental Protection Agency (EPA)--the Federal agency that administers the Federal Water Pollution Control Act. EPA sets minimum effluent standards for municipal treatment facilities and industrial sources, although the EQB, through its water quality standards, could set higher restrictions. EPA also grants permits to dischargers; sets requirements for Commonwealth water quality planning; and administers a construction grants program for municipal sewerage facilities.

1. Establishing water quality standards and discharge limitations.

Water quality standards, adopted by the EQB, establish five classifications of waters in the coastal zone (See Map 14):

Class SA, the highest standard, is applied to coastal waters whose existing characteristics should not be altered in order to preserve natural phenomena. Bioluminescent bays at La Parguera and Vieques are classified SA.

Class SB, is applied to coastal waters intended for direct-contact uses, such as swimming.

Class SC, is applied to coastal waters intended for indirect-contact uses, such as fishing or boating. Most ports are in class SC. So are the areas seaward from Class SA and SB waters, which extend only 500 meters out from shore.

Class SD, is applied to surface waters intended as raw water sources for public water supply, and in propagation and preservation of desirable species. All surface waters, including Laguna Tortuguero, are so classified.

Shellfish growth areas may be designated by EQB, although none have been.

The EQB water quality standards also include the following anti-degradation requirement:

Waters, whose existing quality as of the effective date of these regulations, is better than the standards established herein will be maintained at such quality. These and other waters of the Commonwealth will not be lowered in quality unless it has been affirmatively demonstrated to the Board that such a change is justified as a result of necessary economic or social development and will not interfere or become injurious to any assigned uses made of, or presently possible, in such waters. This will require that any industrial, public or private project, or development which would constitute a new source of pollution, or a modified source of pollution, to a high quality water body, possess as a part of the initial project design the best practicable control technology currently available. This decision of the Board shall be preceded by adequate public notice.⁵

In addition to EQB water quality standards, Puerto Rican coastal waters are protected by Federal regulations governing individual wastewater discharges. Current Federal law establishes deadlines for secondary treatment of municipal waste discharges and "best practicable" treatment by industries.⁶ The EQB water quality standards incorporate by reference all applicable waste discharge limitations established by EPA under the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), as amended.

2. Constructing treatment facilities.

The EQB and PRASA have established a program, approved by EPA, to construct all needed municipal sewerage facilities. When completed, this program will result in all municipal waste discharges receiving sufficient treatment to comply with the water quality standards established by EQB and waste discharge limitations set by EPA. (See Map 15.) Current efforts will affect 13 of the 25 municipios that discharge directly to waters within the coastal zone. These current efforts include completion of the first stage of regional systems for 2 municipios, expansion of existing facilities for 1 municipio, construction of regional plants for 3 municipios, and final stages of planning for regional systems for 7 municipios.

B. REDUCING DAMAGE FROM OIL SPILLS

FINDINGS

Oil spills are a serious hazard to coastal waters. The most common sources of oil contamination of coastal waters are bilge pumping, deballasting of tankers, ship accidents, and vessel operations. During 1975, some 150 oil spills occurred in Puerto Rican waters, mostly small spills of less than 50 gallons each.¹ Major spills occurred in 1969, when the tanker Ocean Eagle broke up in San Juan Bay, and in 1974 when the Colocotronis ran aground off the south coast.

Damage caused by oil spills depends on the quantity and type of oil, the degree to which it has been refined, wind and wave conditions, and the location of the spill. The most serious damage normally occurs in near-shore waters and enclosed bays and estuaries.

Some cleanup procedures may be more destructive than the spill itself, such as the use of detergents or techniques that coagulate and sink oil to the ocean floor.²

Long term effects of oil spills in the tropical environment are unknown. The 1974 oil spill off the south coast trapped 750,000 gallons of oil in Bahía Sucia. Large quantities of oil seeped into the sand and mangrove wetlands. Monitoring indicates little or no natural decomposition of the oil remaining after cleanup operations.

LAGOS Y BAHIAS BIOLUMINESCENTES SA BIOLUMINESCENT LAKES AND BAYS OR
O AREAS CRITICAS

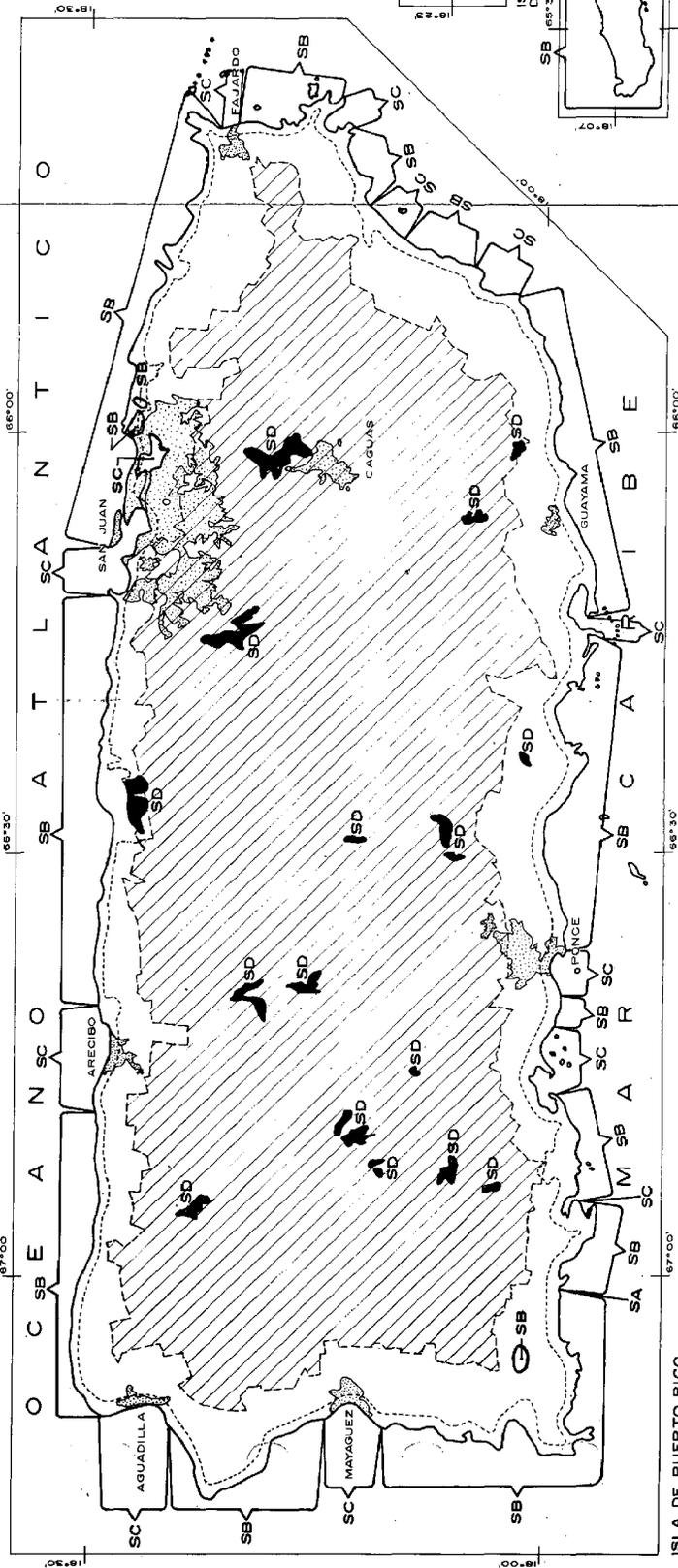
ZONA SUJETA A LA ACCION DE LAS MAREAS SB ZONE SUBJECT TO THE EBB AND FLOW OF TIDES
HASTA 500 M. MARAFUERA DE DICHA ZONA UNTIL 500 M. SEAWARD FROM SAID ZONE

ZONA SUJETA A LA ACCION DE LAS MAREAS SC ZONE SUBJECT TO THE EBB AND FLOW OF TIDES
HASTA TRES MILLAS NAUTICAS MARAFUERA TO THREE NAUTICAL MILES SEAWARD

TODAS LAS AGUAS SUPERFICIALES SD ALL SURFACE WATERS INCLUDING
INCLUYENDO LAGUNA TORTUGUERO TORTUGUERO LAGOON

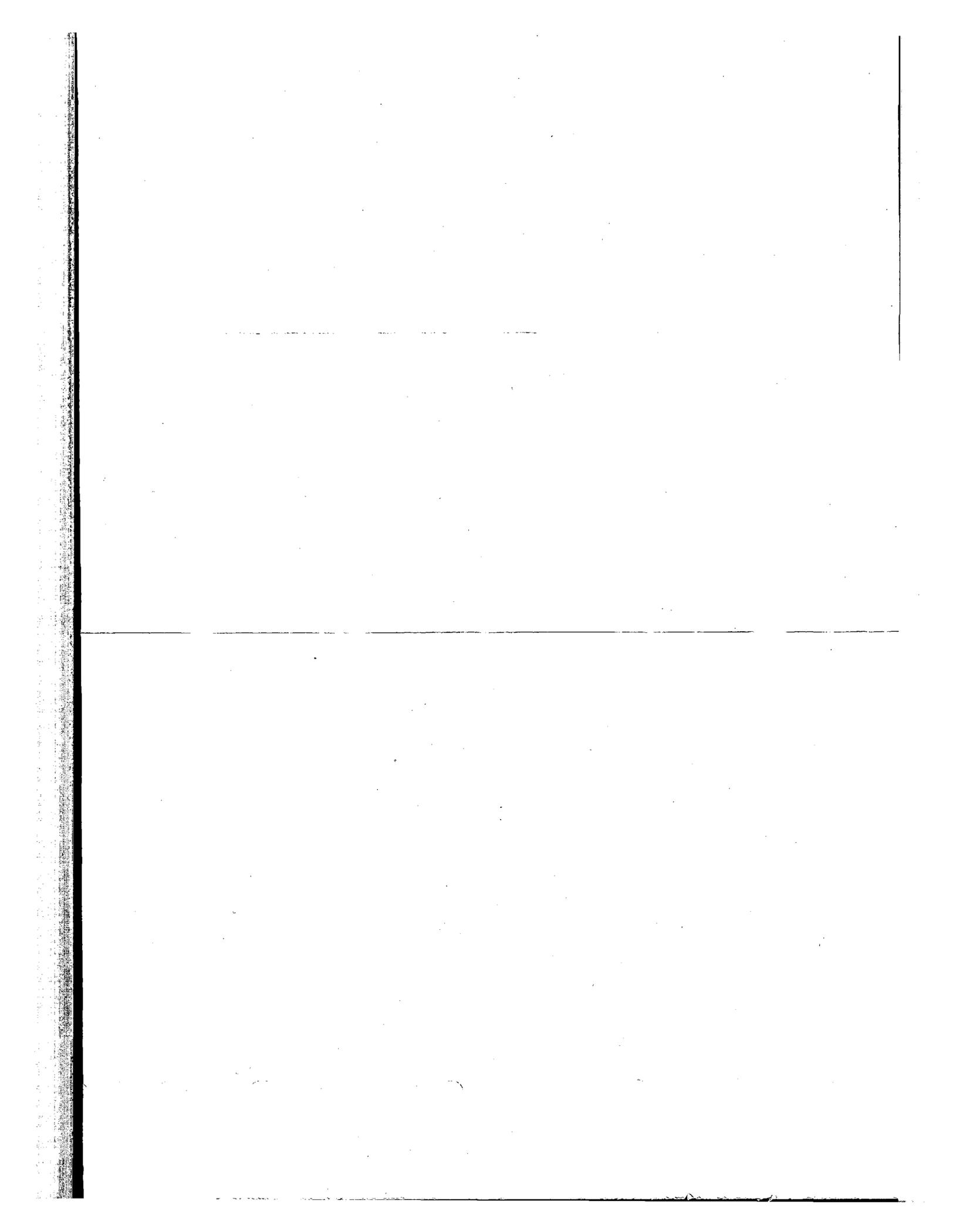
Financial assistance provided in part by Coastal Zone Management Act of 1972, administered
by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY



ISLA DE PUERTO RICO
FUENTE DE INFORMACION / SOURCE:
WATER QUALITY STANDARD REGULATIONS,
E.O.S. OFFICE OF THE GOVERNOR, MAY, 1974.

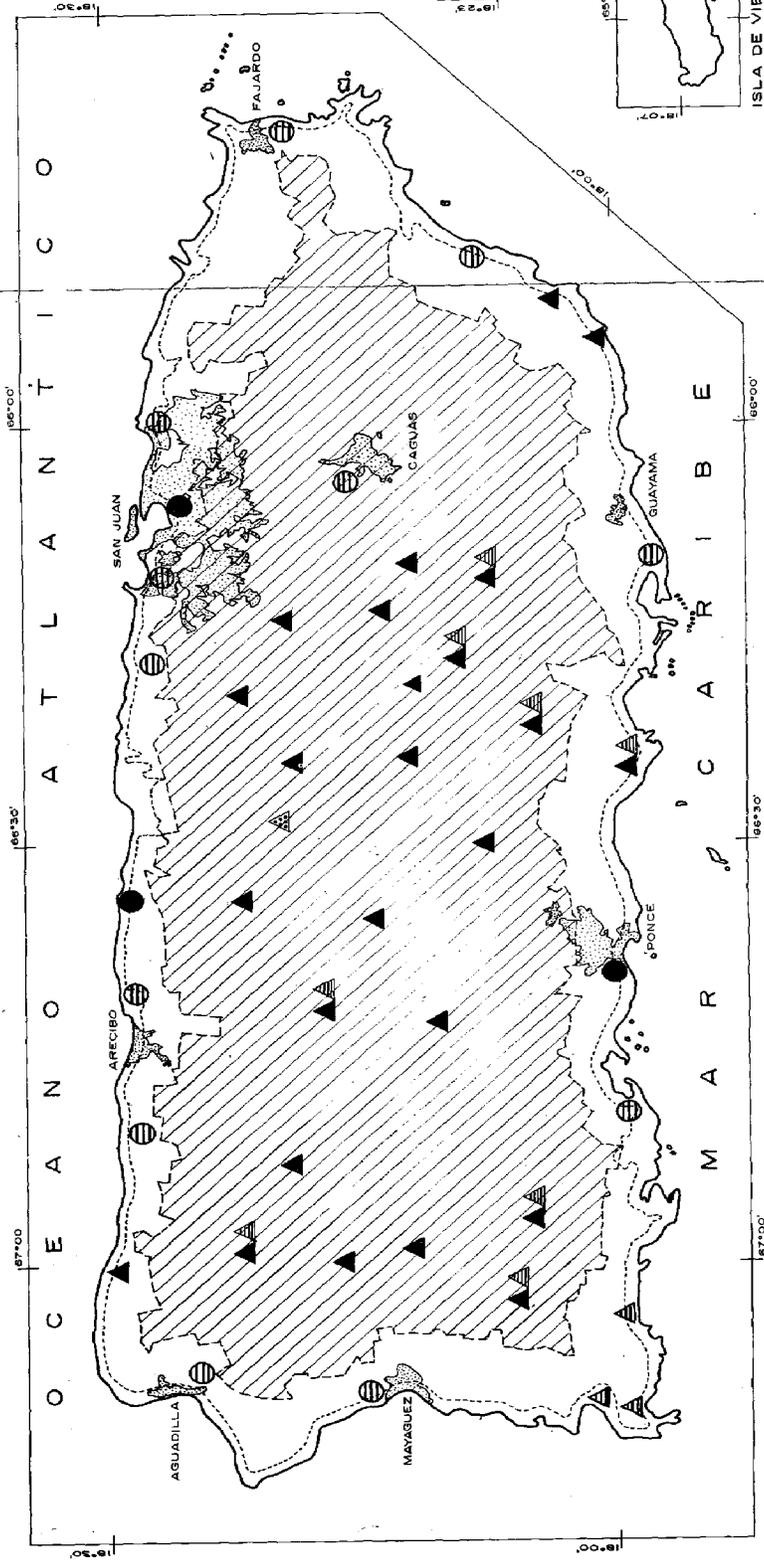
CLASIFICACIONES DE CALIDAD DE AGUAS
WATER QUALITY CLASSIFICATIONS



- PLANTAS DE TRATAMIENTO REGIONALES ○ REGIONAL SEWAGE TREATMENT PLANTS
 PLANTAS DE TRATAMIENTO LOCALES △ LOCAL SEWAGE TREATMENT PLANTS
- EXISTENTE ■ EXISTING
 EN CONSTRUCCION ▨ UNDER CONSTRUCTION
 PROPUESTO ▨ PROPOSED

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APPROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered
 by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:
 MAPAS DE AGUAS Y ACANTILLADOS:
 REGIONAL LOS LOCAL SEWAGE TREATMENT
 FACILITIES EXISTING, PROPOSED AND UNDER
 CONSTRUCTION, APRIL, 1977.

SISTEMA DE PLANTAS DE TRATAMIENTO
 PLANNED SEWAGE SYSTEM

More spills must be anticipated. The existence of several petroleum refineries on the Island results in a heavy traffic of tankers loaded with petroleum and petroleum derivatives in Puerto Rico's coastal waters. Moreover, the Commonwealth is negotiating with major oil companies to allow oil exploration in coastal waters. Puerto Rico must recognize the unavoidable risk of more spills and must be prepared to respond to them.

RESPONDING TO THE FINDINGS

1. Preparing oil spill contingency plans

Both the U.S. Coast Guard and EPA are required to maintain national, regional, and local oil spill contingency plans. In Puerto Rico, both agencies use the Oil Spill Contingency Plan prepared by the Coast Guard for Puerto Rico and the U.S. Virgin Islands. The Coast Guard is currently updating the plan.

The Environmental Quality Board, which also has authority to promulgate an oil spill contingency plan, is currently revising its plan. Until that revision is completed, no effective EQB plan exists.

Need: Updating of EQB contingency plan. As recommended by the citizens' report, Puerto Rico and the Sea, the EQB's oil spill contingency plan should be revised and updated to provide for immediate and coordinated action.³ In addition, the plan should include provisions for coping with other hazardous materials, such as industrial chemicals. Such a plan is potentially an important supplement to the Federal plan.

2. Establishing oil spill liability measures

The Federal Water Pollution Control Act, as amended, makes tanker owners and operators liable for cleanup costs up to certain prescribed limits (section 311(f)). Liability is unlimited if there is willful negligence or misconduct; but there is no liability if the discharge was caused solely by an act of God, act of war, negligence by the U.S. Government, or the act or omission of a third party. There is also a National Contingency Fund of \$35 million, provided by the U.S. Treasury for use of the Coast Guard or EPA in cleaning up spills, or for reimbursement to states of their costs incurred in cleanup. These laws apply to cleanup liability, but do not provide compensation for damages.⁴

Under Puerto Rico's Mining Law, companies exploiting mineral resources must pay the costs of cleaning up any oil spills they cause. And under EQB's Water Quality Standards, the owner of any source may be compelled to take necessary steps to control spills of oil or toxic substances. Puerto Rico has not, however, established any fund to pay the costs of oil spill damages. Instead it relies on the Commonwealth's Department of Justice to file suit, against appropriate contingency or compensation funds or against other parties, to recover cleanup costs and damages incurred by the Commonwealth. Individuals damaged by oil spills must seek their own relief.

Competing demands for Commonwealth funds make it unlikely that Puerto Rico can provide funds for cleanup of major oil spills. A number of proposed Federal laws would extend oil pollution liability and compensation rights. Puerto Rico will seek to assure that it is included in any such legislation.

C. MINIMIZING EROSION AND SEDIMENTATION

FINDINGS

Sediment resulting from erosion and runoff inevitably causes some damage to coastal waters. Steep topography, heavy rainfall, and easily erodable soils all contribute to a high erosion potential in Puerto Rico.

Additional erosion results from current agricultural and development practices in coastal areas. Sedimentation is increased by unsuitable agricultural practices, overgrazing of rangeland, and indiscriminate deforestation, all of which help remove the leafy humus base that protects the soil in coastal areas.

Rapid urban development in many parts of the Island has also caused major erosion and sedimentation. Improper cutting and grading practices at construction sites accelerate erosion. So do poor sloping and lack of revegetation on cuts, fills, and ditches, especially in major highway developments.¹

Resulting impacts include increased flooding, reduced water quality, and an increased need for dredging. Accelerated runoff rates have increased flood hazards. Some lands never seriously flooded now suffer severe damage.

Sedimentation alters the quality and quantity of water supplies. Turbidity affects both the physical and biological characteristics of surface waters and of the coastal waters into which they discharge. The washout and transport of pesticides and other toxic materials into surface and ground waters is also increased.² Sedimentation and increased turbidity can also destroy coral reef communities.

Excessive sediment loads in streams are deposited in calm waters, reducing channel capacities and blocking river mouths. This has necessitated constant dredging of the Río Grande de Loiza and channelization at Mayagüez. (Although normal levels of sedimentation have never been established, some deposition is beneficial in the replenishment of beaches and formation of fertile alluvial valleys.)

POLICIES

Commonwealth Law No. 211, of March 26, 1946, which authorized creation of Soil Conservation Districts, found that improper land-use practices were causing erosion of farm and grazing lands. The law established a policy of preserving and protecting these lands which it found to be basic assets of the Island.

The Objectives and Policies element of the Planning Board's Land Use Plan establishes relevant islandwide policies in its section on protection of natural resources:

"To control those activities and land subdivisions which may adversely affect water quality, particularly in areas for aquifer recharge, and in watersheds contiguous to lakes and reservoirs--activities such as elimination of the vegetative layer, soil movement causing erosion, the excessive use of paving resulting in increased runoff, and the indiscriminate use of fertilizers and pesticides causing water quality to deteriorate."

(See Policy 18.02.)

IMPLEMENTING THE POLICY

1. Conducting programs of education and assistance

The U.S. Soil Conservation Service (SCS) operates several programs in Puerto Rico that respond to problems of sedimentation and runoff, including the small watershed program, reforestation, and flood control program. Some of these have been described above in the section on Flooding. SCS also has conducted soil surveys in Puerto Rico to facilitate soil conservation efforts in farming practices and as an aid for future development. SCS has classified soils by hydrologic groups which represent the potential infiltration capacity of the soils.

Some 17 soil conservation districts inform farmers of sound soil conservation practices and encourage farmers to use them. With the ratification of Commonwealth Law 211 in 1946, the municipal governments were permitted to establish and finance these districts. The SCS provides technical assistance through these districts to landowners and operators in carrying out locally adapted soil and water conservation programs.

2. Regulating the sources of sedimentation

A variety of standards for grading and other sources of sedimentation are currently in use. The Department of Transportation and Public Works reports reliance on guidelines issued by Federal EPA (Guidelines for Erosion and Sediment Control Planning and Implementation). The SCS has its own standards. The Planning Board will rely on standards to be derived from the 208 planning process.

Soil Conservation Districts are authorized by Commonwealth law to establish erosion control regulations for their districts and to impose fines on violators. No such regulations have been adopted,* although the Puerto Rico Association of Soil Conservation Districts drafted a proposal for a "Sediment Control Program for Non-Agricultural Development."

*The Federal Soil Conservation Service has proposed model legislation governing erosion control from agricultural sources. The SCS proposes that this legislation be adopted by the Legislative Assembly. Implementation would be by Soil Conservation Districts.

The Environmental Quality Board has prepared draft regulations governing erosion control, as part of its proposed reef-protection regulation, but has never adopted them.

Need: (HIGH PRIORITY): Runoff and erosion control regulation. A runoff and erosion control regulation, broad enough to include coverage of grading as well as other urban and agricultural practices that affect runoff, should be adopted using the joint resources of EQB, DNR, the Planning Board, and the Department of Agriculture.³

D. MINIMIZING ENVIRONMENTAL DAMAGE FROM DREDGING, DIKING, AND FILLING

FINDINGS

Maintenance and harbor-improvement dredging are essential, continuing activities in Puerto Rico. The navigability of harbors is essential to the Island's commerce. To maintain navigability, dredging must combat the results of natural erosion and sedimentation, intensified by man's activities.

The Army Corps of Engineers has conducted several dredging projects in the recent past:

San Juan. Three maintenance dredging projects since 1972: in the first two, 1.5 million cubic yards were removed; in the third, 2.2 million cubic yards. Wastes from all three were deposited 3 miles offshore.

Mayagüez. One project: 100,000 cubic yards, deposited at sea.

Ponce. Two projects: in the first, 200,000 cubic yards of fill were deposited on land. In the second, 100,000 cubic yards were deposited at sea.

Arecibo. One project: 100,000 cubic yards, deposited at sea.

Improvements at the Port of Ponce are to begin in 1978, and improvements at San Juan will be considered for 1979-80. Disposal sites will be at sea, since onshore sites are lacking.

Additional dredging has been conducted from time to time for ports, airports, and other coastal-dependent facilities. Although no additional dredging is known to be contemplated at present, it is reasonable to assume that more will occur in the future.

Dredging and filling can create environmental problems. Dredging projects raise legitimate environmental concerns. Dredging may cause pollution at both the removal and the spoil disposal sites. The direct effects of dredging, especially those that are confined to the project area, are generally short term and include: turbidity effects, sediment build-up, removal of substrata materials, and resuspension of solids. In shallow coastal lagoons, however, experience at Laguna Piñones and elsewhere suggests that effects can be more serious and long lasting.

There is little firm data and analysis available concerning the long-term effects of dredging and dredge spoil disposal. The Corps' draft environmental impact statement for maintenance dredging in Puerto Rico noted potential long-term effects including destruction of benthic organisms in the channel and covering of bottom-dwelling organisms at the offshore disposal sites. Destruction of benthic organisms will, in turn, cause changes in water quality in the immediate area, and destruction of adjacent flora and fauna.

RESPONDING TO THE FINDINGS

1. Regulating dredging, filling, and construction in navigable waters. Dredging, filling, and construction in navigable waters are subject to a permit program operated by the U.S. Army Corps of Engineers pursuant to two Federal laws:

Under the River and Harbor Act of 1899 (sections 9 and 10), the Corps generally requires permits for discharges into wetlands below mean high tide on coastal areas or into rivers, lakes, and streams presently or historically used or susceptible to use for navigation.

Under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), Federal permits are required for the discharge of dredged or fill material into all navigable waters, including lakes, streams, rivers and oceans, as well as their tributaries and adjacent wetlands.

Unlike Section 10 permits, for which the Corps has sole Federal responsibility, permits under the 404 program must conform with discharge criteria established by EPA. Additionally, EPA can prohibit the issuance of a 404 permit if the proposed discharge will have an unacceptable adverse effect on certain environmental areas.

The Commonwealth government also exercises control over activities for which Corps permits are required. This is done through the endorsement program of the Department of Natural Resources. If DNR denies an endorsement, the Corps does not grant permits for dredging, filling, or construction in Puerto Rican waters (42 FR 37138).

Under the Commonwealth Pier and Ports Law of 1968, dredging and disposal activities in port zones also require approval by the Ports Authority.

2. Establishing criteria for dredging.

Need: Additional criteria for dredging and filling. To guide it in deciding whether or not to endorse applications for Corps permits, the Department of Natural Resources will establish the following criteria which will be incorporated into the Coastal Management Program.

Criteria for diking, filling, dredging, and deposit of dredged sediments.

..Criteria for diking or filling. Diking or filling of coastal waters (other than for shoreline structures*) shall, to the maximum extent practicable, be permitted only where necessary and where there is no less environmentally damaging alternative for: (1) port or airport expansion, national defense or coastal-dependent facilities; or (2) land restoration (e.g., diking to reduce sedimentation or to restore land previously lost because of coastal erosion).

..Criteria for dredging. Dredging of coastal waters shall to the maximum extent practicable (a) minimize the disruption of natural systems, and (b) be limited to the following: (1) port, energy, or national defense facilities; (2) navigational channels, turning basins, vessel berthing and mooring areas, and boat launching ramps; (3) entrance channels or minor deepening of harbor areas for recreational boating facilities; (4) commercial fishing harbors; (5) flood control projects; (6) extraction of sand, gravel, and minerals; (7) other public service purposes (e.g., to restore water circulation) provided that the results are carefully

*Shoreline structures are being considered in the shoreline erosion planning process being conducted pursuant to section 305(b)(9).

monitored and evaluated for restorative value. The need for dredging shall be minimized by careful design and location of facilities with respect to existing water depths, water circulation, siltation patterns, and by efforts to reduce controllable sedimentation. Where bottom materials are highly contaminated, dredging or mining shall be avoided to the maximum extent practicable.

Criteria for deposit of dredged sediments. Dredged sediments meeting criteria specified by EPA for freshwater, estuarine, or marine disposal may be deposited at openwater sites designated to minimize potential adverse impacts on marine organisms or in fill sites specifically authorized by DNR. Dredge material shall not be transported from coastal waters into mangrove wetlands, estuarine, or freshwater areas for water disposal. Dredged material exceeding approved water quality criteria must be placed either on dry land in a manner that prevents pollution of marine, underground, or surface water or, if land disposal is infeasible or environmentally unacceptable, at designated deep ocean sites (depths greater than 100 fathoms) approved by EPA.¹

COASTAL FORESTS

FINDINGS

The forests that once covered Puerto Rico's coasts are now greatly reduced. At the time of its discovery in 1493, Puerto Rico was nearly 100 percent forested. But only about 20 percent is forested today. Most lowland forests are gone, cleared to make space for agriculture.¹

Of the coastal forests that do remain, most are mangrove wetlands. (See Mangrove Wetlands section above). Other coastal forests of particular interest include (1) Pterocarpus forests, and (2) the dry forest at Guanica.* (See Map 16.)

Pterocarpus forests (Pterocarpus officinalis) exist in several locations in Puerto Rico, although they do not grow naturally in any of the states. Pterocarpus has an impressive root system and forms swamp forests, chiefly on the landward side of mangrove wetlands.

*In addition, a 15-cuerda grove of asubo trees, located in a PRIDCO industrial park in Canovanas, has been designated by the Planning Board as a natural area to be preserved.

Known locations in Puerto Rico include the following six in the coastal study area:

1. Torrecilla Alta - Loiza
2. Río Espíritu Santo area
3. Humacao Pterocarpus Forest - Humacao
4. Palmas del Mar - Humacao (small)
5. Pantano de Espinar - Aguadilla (small)
6. Dorado Pterocarpus Forest - Dorado

The Guanica dry forest is a unique resource area.² The Guanica Forest, in southwestern Puerto Rico, is a unique natural area, exceptionally fragile, with no counterpart in Puerto Rico.

The Commonwealth owns 10,195 cuerdas of the forest in two separate segments separated by Guanica Bay. More than 80 percent of the forest is surface limestone rock. Rainfall is scarce, and temperatures are high.

The 10,195 cuerdas of public land contain a great richness of plant life: 346 genera of plants and trees with 671 species represented. At least 48 of these species, if lost at Guanica, would virtually disappear from Puerto Rico. Sixteen species are endemic, found nowhere else in the world.

Birds are abundant in the forest. Half of all the species of land birds found in Puerto Rico are represented, including 9 of the 14 endemic species. It is by far the richest forest in Puerto Rico in avian fauna. In 1951, the Puerto Rican Whip-poor-will, a bird previously considered extinct from the world, was rediscovered in the Guanica Forest. Today, 300 pairs breed here and nowhere else. The Puerto Rican Whip-poor-will is on the Federal endangered species list.

Recreational use is putting increased pressures on the Guanica Forest. Recreational use of the forest has risen sharply since the mid-1960's. (The forest is now only a 2½-hour drive from San Juan, and is easily accessible to, at least, half the Island's population in an hour or less.) Also, users are no longer content to use only the developed beach areas that have traditionally served the recreation needs of the southwest part of the Island; users now seem to be seeking undeveloped beach areas for snorkeling, picnicking, and swimming. Interior areas of the forest are reasonably accessible, but no facilities exist to provide users with alternatives to hiking. No water lines serve the forest, although one is now being built.

RESPONDING TO THE FINDINGS

A. PROTECTING AND USING THE COASTAL FOREST RESOURCES

1. Public ownership and custody

All Pterocarpus forests in the coastal study area are believed to be privately owned.

Some 10,195 cuerdas of the Guanica Forest are owned by the Commonwealth and administered by the Department of Natural Resources. Another 600 cuerdas are included in the adjacent Bahía Ballena area integrally related to the State Forest. This and several other nearby areas are recommended for public acquisition in a draft management plan prepared by staff of the Department of Natural Resources. (See Map 17.)

Because of the costs, there are few opportunities to acquire additional coastal forests now in private ownership. Acquisition would clearly be desirable, however, particularly of the areas recommended for future designation as Natural Reserves. (See Map 29.)

2. Management and protection

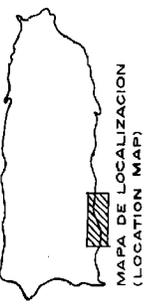
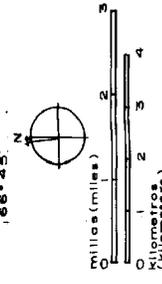
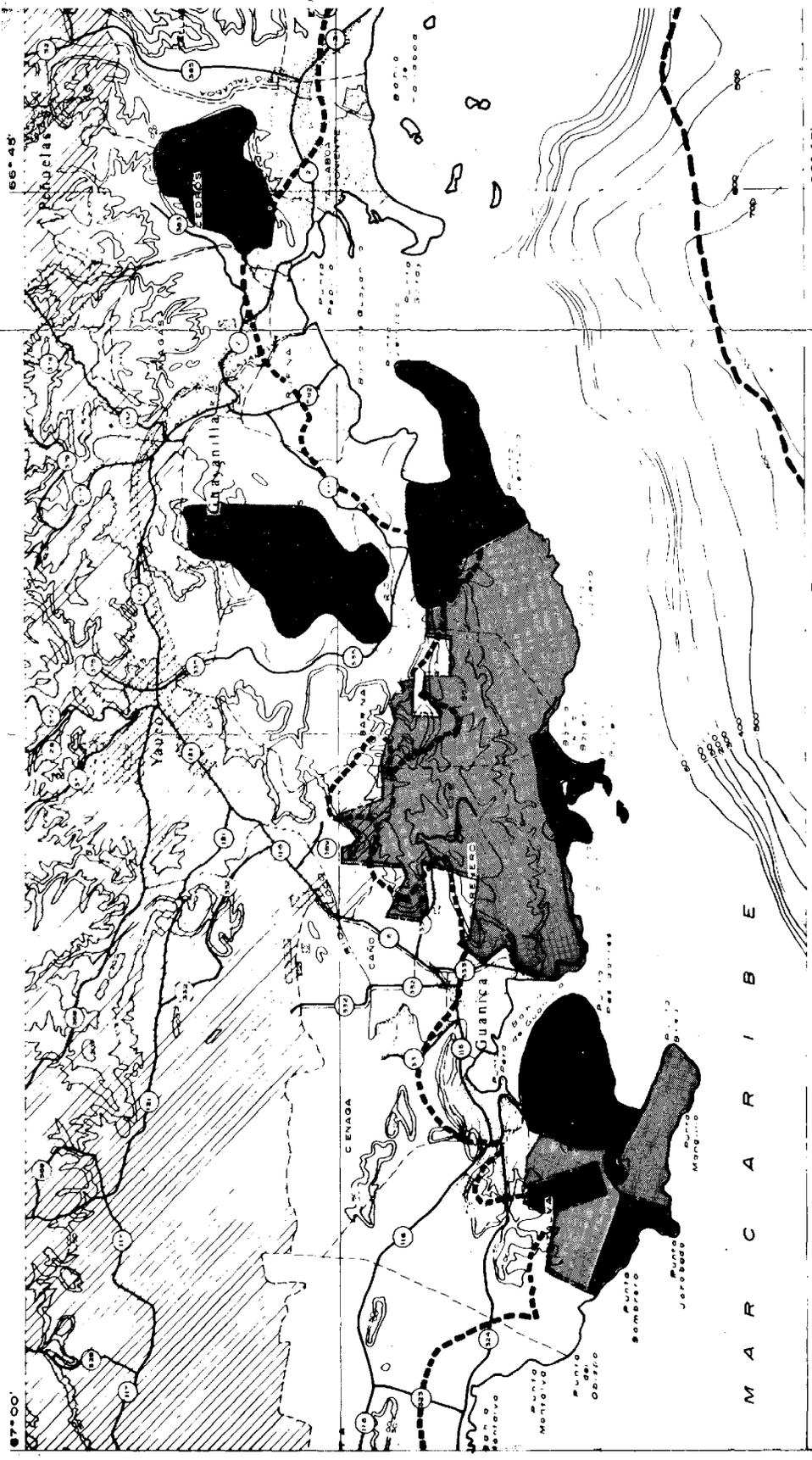
Need: Natural Reserves. Because of its unique natural features, its important habitat, and its high quality recreational potential, the Guanica Dry Forest, and the adjacent Bahía Ballena area, are recommended in Chapter 4 for designation as Natural Reserves.

So are the following Pterocarpus forests in the coastal zone:

Torrecilla Alta Pterocarpus Forest Reserve
Río Espíritu Santo Reserve
Humacao Swamp and Pterocarpus Forest Reserve
Dorado Pterocarpus Forest Reserve

Need: Management plan for Guanica Forest. The Guanica Forest has never had a management plan. A draft plan has been prepared by staff of the Department of Natural Resources, but it has not been adopted.³ The plan calls for managing the entire forest as a wildlife sanctuary, as well as for appropriate recreational development, with emphasis on birdwatching, wildlife, photography, and other uses suited to the forest's unique environment.

After evaluating staff recommendations, the Department of Natural Resources should adopt a management plan for the Guanica Forest. Such a plan is needed to respond to increasing recreational demand and, at the same time, protect the unique natural values of the forest.



AREAS PROPUESTAS PARA ADQUISICION ■ PROPOSED AREAS FOR ACQUISITION
 UN KILOMETRO TIERRA ADEENTRO ■ ONE KILOMETER IN-LAND
 TRES MILLAS TERRITORIALES ■ ■ ■ THREE TERRITORIAL MILES
 AREA DE BOSQUE ■ FOREST AREA

FUENTE DE INFORMACION/SOURCE:
 GUANICA FOREST: POSSIBLE ACQUISITION AREAS.
 DEPARTMENT OF NATURAL RESOURCES,
 OCTOBER, 1976.

BOSQUE ESTATAL DE GUANICA 17

GUANICA STATE FOREST

B. RESEARCH

Need: The Guanica Dry Forest should be regarded as a field laboratory for a wide range of scientific and applied research.

The Scientific Division of the Department of Natural Resources should undertake studies such as the following:

- a. Ecology of life forms found in Cueva de los Murcielagos de Guanica;
- b. A more complete survey of plant and animal life; and
- c. Effects of air pollution on plant and animal forms, particularly insects.

CULTURAL AND HISTORIC SITES

FINDINGS

Puerto Rico's coast includes a rich heritage of historic sites. The Institute of Puerto Rican Culture has designated numerous historic monuments in Old San Juan, as well as 13 historic monuments in other parts of the coast.¹ A revision now under way will add more sites to the Institute's official list.

The National Register of Historic Places, maintained by the National Park Service, includes 13* sites in Puerto Rico.² Of these, most are on the coastal plain.

There are 20 known archeological sites ("concheros") on the coast, as well as some 15 pre-Columbian settlements whose exact locations have not been determined.³ Also, there are a number of sunken ships in coastal waters.⁴

Cultural and historic sites, including important shipwrecks, are shown on Map 18.

POLICY

The Objectives and Policies of the Planning Board's Land Use Plan, quoted in Chapter 2 above, has established, as general policy:

"To avoid the destruction, mutilation, deterioration, or demolition of important cultural resources such as archaeological deposits, historic sites, and/or buildings and others which have been so declared by the Institute of Puerto Rican Culture."

(See Policy 18.04.)

*As of February 1977, listing of additional sites on the National Register of Historic Places is an ongoing process. Several other sites have already been nominated for possible inclusion in the National Register. Ongoing consultation with Historic Preservation Officer in Puerto Rico, as well as with the Institute of Puerto Rican Culture is expected to result in nomination of additional coastal sites during the implementation phase of the PRCMP.

IMPLEMENTING THE POLICY

PROTECTING AND MANAGING KEY SITES

1. Public ownership and custody

The Institute of Puerto Rican Culture is the Commonwealth agency principally responsible for cultural and historic sites. The agency owns and manages a number of historic and archeological sites, and its staff advises and assists other agencies and private citizens concerned with such sites. Most of the historic monuments on the Institute's official list are owned by the Institute itself, by other Commonwealth agencies, or by municipalities. The rest are owned by the Federal Government or the Catholic Church.⁵

At the Federal level, the National Park Service owns Forts El Morro and San Cristobal, as well as the old city walls in the Old San Juan Historic Site. The Coast Guard owns four historic highhouses (Fajardo, Cabo Rojo, Mona, Culebrita).

The Archeological, Anthropological, and Historical Foundation of Puerto Rico, a non-profit corporation, is dedicated to the conservation of Puerto Rico's cultural resources. The Foundation is engaged in research projects, focusing particularly on archeological aspects of the Island's cultural resources. The Foundation also serves as advisor to the U.S. National Park Service, the U.S. Army Corps of Engineers, and other agencies on archeological matters.

Need: Inventory of Archeological sites. Archeological sites have not been completely inventoried. Commonwealth agencies own a few of them; many others are private. There is need for an inventory of archeological sites so that effective measures may be taken to protect them.

2. Development control and regulations

The Institute of Puerto Rican Culture administers Historic District regulations which apply to private as well as public property in the Old San Juan and Ponce Historic Districts.

Sites on the National Register of Historic Places are protected by the National Historic Preservation Act of 1966 (P.L. 89-665) against disturbance by Federal, and Federally-financed projects. The Federal Archeological and Historic Preservation Act of 1974, (P.L. 93-291) similarly protects archeological sites.

- * 1 - RUINAS DE VILLA CAPARRA
- 2 - FORTIN DEL CARUELO
- * 3 - ZONA HISTORICA DEL VIEJO S.J.
- 4 - N.S. BEGOÑA GALEON
- 5 - VARIAS NAVES DE MADERA
- 6 - 3 NAVES NO IDENTIFICADAS
- 7 - NAVE MERCANTE
- 8 - NAVE SANTA MARIA DE JESUS
- 9 - GALEON ESPAÑOL
- 10 - URCA HOLANDESA
- 11 - BARCO DE VAPOR
- 12 - 3 NAVES ESPAÑOLAS
- 13 - AVISO ESPAÑOL
- 14 - DESCONOCIDO
- 15 - NAVE SAN ESTEBAN

- 16 - BARCO FRANCES
- * 17 - IGLESIA DE SAN PATRICIO
- 18 - CARMONA
- 19 - MONSERRATE
- 20 - FARO
- 21 - ADMIRAL DE GRASSE (CAPITANA)
- 22 - BARCO SUECO
- 23 - CORCHO
- 24 - DESCONOCIDO
- 25 - PITAHAYA
- 26 - PLAZA PUBLICA
- * 27 - MOLINO VIENTO HACIENDA VIVES
- 28 - JOBOS
- 29 - CAYITO
- 30 - LA FLORIDA

- 31 - SAN NICOLAS CARABELA ESPAÑOLA
- 32 - COLLORES
- 33 - BARCO DE PASAJERO INGLES
- * 34 - PARQUE DE BOMBAS Y CATEDRAL
- NTRA. SRA. DE GUADALUPE
- 35 - CANAS
- 36 - AGUEYBANA
- 37 - FARO
- 38 - ABRA
- 39 - FARO
- 40 - LLANOS TUNAS
- 41 - GALLARDO
- 42 - DESCONOCIDO
- 43 - COROZO
- 44 - BOQUERON

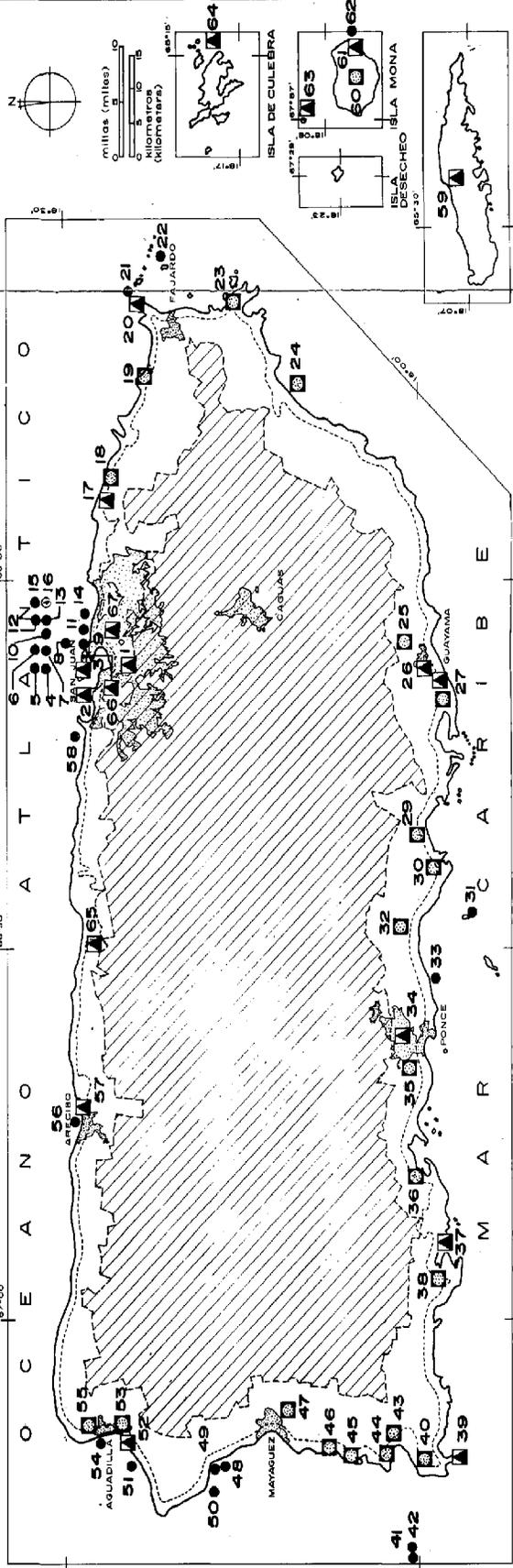
- 45 - PUNTA OSTIONES
- 46 - JOYUDA
- 47 - LAS MESAS
- 48 - BALANDRIA ESPAÑOLA
- 49 - LA VICTORIA
- 50 - GALEON ESPAÑOL
- 51 - CAPITANA
- 52 - DESEMBARCO DE COLON
- 53 - ENSENADA
- 54 - PROSERPINA
- 55 - PUNTA BOQUERON
- 56 - BARCO FRANCES
- 57 - FORTIN VICTOR ROJAS
- 58 - ANTONIO LOPEZ NAVE MERCANTE
- 59 - FORTIN

- * 60 - MONA
- 61 - FARO
- 62 - GALEON ESPAÑOL
- * 63 - MONITO
- 64 - FARO
- * 65 - HACIENDA AZUCARERA LA ESPERANZA (MANATI)
- * 66 - ANTIGUA CARTEL DE PUERTA DE TIERRA
- * 67 - PLAZA DE MERCADO (SANTURCE)

YACIMIENTOS ARQUEOLOGICOS
 MONUMENTOS HISTORICOS
 (ANTES DE 1900) BARCOS HUNDIDOS
 ARCHEOLOGICALLY IMPORTANT SITES
 HISTORIC SITES
 SHIPWRECKS (BEFORE 1900)

SITIOS HISTORICOS QUE APARECEN EN EL REGISTRO NACIONAL DE MONUMENTOS HISTORICOS WHICH APPEAR IN THE NATIONAL HISTORIC LANDMARK REGISTER.

FINANCIAL ASSISTANCE PROVIDED IN PART BY COASTAL ZONE MANAGEMENT ACT OF 1972, ADMINISTERED BY OFFICE OF COASTAL ZONE MANAGEMENT, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION.



ISLA DE PUERTO RICO
 FUENTE DE INFORMACION / SOURCE:
 PRECINTO ONEN N. A. (AVISO DE NAVES DE MADERA, FORTIN DEL CARUELO, ZONA HISTORICA DEL VIEJO S. J., N.S. BEGOÑA GALEON, VARIAS NAVES DE MADERA, 3 NAVES NO IDENTIFICADAS, NAVE MERCANTE, NAVE SANTA MARIA DE JESUS, GALEON ESPAÑOL, URCA HOLANDESA, BARCO DE VAPOR, 3 NAVES ESPAÑOLAS, AVISO ESPAÑOL, DESCONOCIDO, NAVE SAN ESTEBAN)
 PRECINTO ONEN N. A. (AVISO DE NAVES DE MADERA, FORTIN DEL CARUELO, ZONA HISTORICA DEL VIEJO S. J., N.S. BEGOÑA GALEON, VARIAS NAVES DE MADERA, 3 NAVES NO IDENTIFICADAS, NAVE MERCANTE, NAVE SANTA MARIA DE JESUS, GALEON ESPAÑOL, URCA HOLANDESA, BARCO DE VAPOR, 3 NAVES ESPAÑOLAS, AVISO ESPAÑOL, DESCONOCIDO, NAVE SAN ESTEBAN)
 PRECINTO ONEN N. A. (AVISO DE NAVES DE MADERA, FORTIN DEL CARUELO, ZONA HISTORICA DEL VIEJO S. J., N.S. BEGOÑA GALEON, VARIAS NAVES DE MADERA, 3 NAVES NO IDENTIFICADAS, NAVE MERCANTE, NAVE SANTA MARIA DE JESUS, GALEON ESPAÑOL, URCA HOLANDESA, BARCO DE VAPOR, 3 NAVES ESPAÑOLAS, AVISO ESPAÑOL, DESCONOCIDO, NAVE SAN ESTEBAN)
 PRECINTO ONEN N. A. (AVISO DE NAVES DE MADERA, FORTIN DEL CARUELO, ZONA HISTORICA DEL VIEJO S. J., N.S. BEGOÑA GALEON, VARIAS NAVES DE MADERA, 3 NAVES NO IDENTIFICADAS, NAVE MERCANTE, NAVE SANTA MARIA DE JESUS, GALEON ESPAÑOL, URCA HOLANDESA, BARCO DE VAPOR, 3 NAVES ESPAÑOLAS, AVISO ESPAÑOL, DESCONOCIDO, NAVE SAN ESTEBAN)

Need: Commonwealth protection of archeological sites. Commonwealth law currently establishes no procedures comparable to those established by the Federal Archeological and Historic Preservation Act of 1974. There is need for enactment of Commonwealth laws or regulations establishing such procedures, particularly because some previously unknown "concheros" may not be discovered until development is under way.

COASTAL DEVELOPMENT

COASTAL-DEPENDENT INDUSTRY

FINDINGS

Some development critical to Puerto Rico's future is likely to be coastal-dependent. Some development must have a coastal location to function at all. Examples include ports, shipyards, and the extraction of coastal minerals (including offshore oil). Some other kinds of development are strongly benefited by a coastal location. These kinds include (1) power plants and other industries that need cooling water or that use very large quantities of imported products, and (2) industries that serve, or are supplied by, water-related industries and therefore seek locations near them.

Commonwealth agencies have identified a number of sites that they believe are potentially suitable for these coastal-dependent industries. (See Map 19)

..The Economic Development Administration (Fomento) has designated several sites as potential industrial ports.

..In addition, the staffs of the Planning Board and the Puerto Rico Industrial Development Company, have tentatively identified other areas suitable for industry.

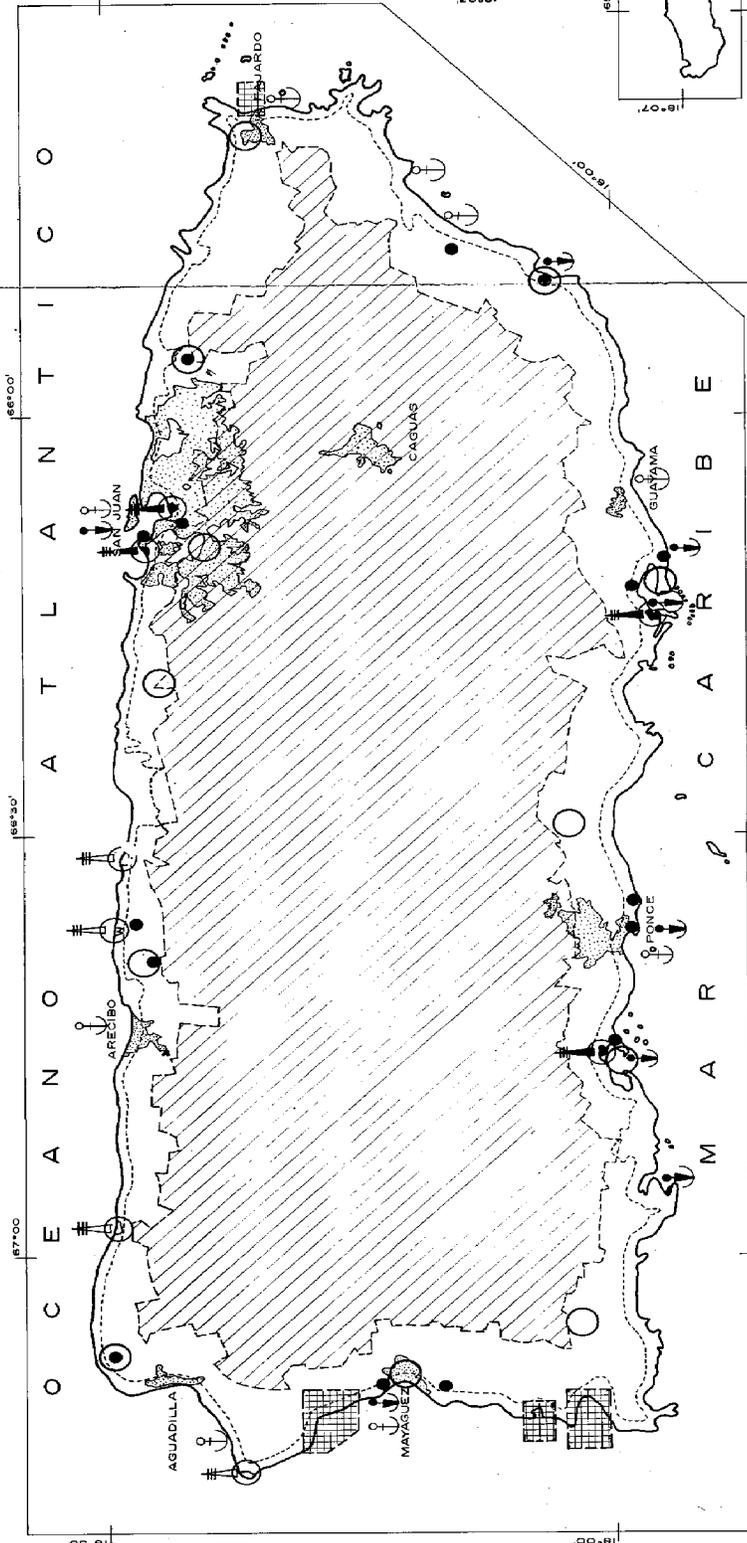
..Energy and mineral extraction needs, discussed in a following section of this chapter, generate additional site demands.

The needs of these coastal-dependent industries can be satisfied at only a few locations on the Island. Sites suitable for the coastal-dependent uses are severely limited because of shoreline configuration and water depth. Most sites suitable for ports lie on the Island's south and west coasts, between Yabucoa and Punta Rincon.

The same scarce locations are also important for other purposes. Natural values, in particular, would conflict with industrial development at some of these locations. Some types of development could, with careful planning, occupy portions of some of these areas without totally sacrificing their natural values. In other situations, sacrifice is unavoidable if development occurs.

- MAJOR EXISTING INDUSTRIAL AREA
- PROPOSED REGIONAL INDUSTRIAL AREA
- ▨ AREA SUITABLE FOR PORT SITING
- ⚓ EXISTING INDUSTRIAL PORT
- ⚓ EXISTING COMMERCIAL PORT
- ⚡ EXISTING POWER PLANT
- ⚡ PROPOSED POWER PLANT

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA
 APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO
 STUDY AREA INLAND BOUNDARY

LOCALIZACION DE FOCOS INDUSTRIALES DE LA COSTA
 MAJOR COASTAL INDUSTRIAL SITES

ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:
 TA LIANG, AN INVESTIGATION OF ON-SHORE AND OFF-SHORE PHYSICAL FEATURES OF POTENTIAL PORTS AND INDUSTRIAL SITES OF PUERTO RICO, BASED ON PRISCO/PLANNING BOARD MAPS, FEBRERO, 1978.

Other activities--including some kinds of recreation and tourism, urban development, and industries that do not require a coastal location--are also attracted to some of these critical sites:

..The Tourism Development Company has designated much of the Island's coast as a zone of tourism interest.²

..Even activities having no dependence on the coast often prefer a coastal location. Prime examples are urban residential development and the many types of industry not requiring a coastal location. Experience suggests that these activities will, if permitted, occupy scarce sites suitable for coastal industry.

Air and water quality standards, mandated by Commonwealth and Federal law, impose another constraint on the choice of locations for heavy industry. Some of the critical sites suitable for coastal dependent industry may prove unacceptable because of pollution problems. Also, choices may sometimes have to be made between air and water quality objectives and natural-systems-preservation objectives. Some new industries that might otherwise be concentrated at Guayanilla, for example, may have to go elsewhere because of air pollution problems there.

POLICY

The Objectives and Policies element of the Planning Board's Land Use Plan, quoted in Chapter 2 above, establishes general policy:

"To avoid the unnecessary loss of options for future use of these resources resulting from the establishment of new activities and from authorizing subdivisions." (See Policy 17.04); and

"To concentrate industries in those areas most appropriate for this use (industrial), and at the same time, to promote the most intensive use possible for these lands." (See Policy 4.00)

More specific policies are also established, for example,

"In those exceptional cases where it is essential to establish industries which pollute (as defined by the EQB), these will be located in preselected sites, with

adequate provision made to minimize their adverse impact on the environment. (See Policy 4.03).

NEW POLICIES ESTABLISHED. In keeping with the above overall policy, the following more detailed policies are hereby established:

SITES FOR COASTAL-DEPENDENT DEVELOPMENT

- ..Urban development, including those kinds of industry not requiring (or strongly benefiting from) a shorefront location, shall, to the maximum extent practicable be located away from the shorefront. This is in keeping with the Planning Board policy calling for stimulating development "perpendicular to the coast" in coastal towns.
- ..Coastal Sites designated by the Planning Board as shall, to the maximum extent practicable, be (1) protected against other kinds of development, and be (2) reserved for coastal-dependent industry except in those instances where natural systems destruction is unacceptable.
- ..Sites reserved for coastal-dependent industry, but which are also important from the standpoint of natural values, shall be developed for industry only after the fullest practicable consideration of location and design alternatives available to protect natural systems.

IMPLEMENTING THE POLICIES

A. PROTECTING SITES FOR COASTAL-DEPENDENT INDUSTRY AGAINST OTHER KINDS OF DEVELOPMENT

1. Public ownership and custody

The Commonwealth government owns, directly or through public corporations, parts of several sites regarded as appropriate for coastal-dependent development.

Examples include public holdings at Guanica Bay and Jobos Bay.

The citizens' report, Puerto Rico and the Sea, recommended that the Commonwealth "inaugurate an immediate program to acquire full property ownership (or, where sufficient, easements of development rights or other lesser property interests) of the relatively few remaining coastal sites suitable for ports, power plants, and heavy industry."³

Such acquisition, although the most direct way to protect these sites, is expensive. Competing demands for Commonwealth funds make it unlikely that many critical sites can be acquired far in advance of need. The Commonwealth must rely on the cooperation of property owners, who are likely to benefit from future intensive development of their land, and on development controls.

2. Development controls

The Planning Board relies on the development control process, described in Chapter 4, to prevent inconsistent development of sites deemed suitable for ports and coastal-dependent industry. Adoption of the Objectives & Policies element of the Land Use Plan strengthens the Board in dealing with proposals for inconsistent development.

B. RESOLVING CONFLICTS AMONG INDUSTRIAL DEVELOPMENT, NATURAL SYSTEMS, AND AIR AND WATER QUALITY OBJECTIVES

1. Development controls and regulations

The Planning Board will continue to apply the development control process, described in Chapter 4, to resolve these conflicts. Required Environmental Impact Statements will consider location and design alternatives.

Moreover, many heavy industrial installations are major sources of air pollutants and, as such, subject to section 3.3 of the Environmental Quality Board's air pollution regulation. This section permits major sources of air pollutants only if the applicant shows:

"that the proposed location is at least as favorable, from the standpoint of environmental impact, as any suitable alternative location for the proposed source. In determining environmental impact, the Board shall consider the proximity of population concentrations, topography, microclimate, vegetation, and any other factors which the Board deems relevant. In determining the suitability of alternative locations, the Board shall not limit its consideration to environmental matters but shall consider the full range of economic, technical, and other factors relevant to source location. Due weight shall be given to any available plans and planning studies."⁴

2. Need: Designation of Special Planning Areas. Some of the areas suitable for coastal-dependent industry appear to present the most important potential use

conflicts in Puerto Rico's coast. Parts of some of these areas are, as already indicated, recommended in Chapter 4 for designation as Natural Reserves; for these areas, it is clear that neither industry nor other development should occur. For other areas, however, it is impractical to decide now how best to reconcile several conflicting objectives. Rather, the need is to assure that use conflicts at these sites receive the special study and attention warranted by their importance. To this end, the sites designated in Chapter 4 as Special Planning Areas include the following in which industrial demand has been felt:

Jobos Special Planning Area
Southwest Special Planning Area

These areas will be the subject of an ongoing research effort intended to provide baseline and other data needed to facilitate evaluation of future development proposals. The research will be conducted as part of Puerto Rico's Coastal Management Program with cooperation of the Commonwealth agencies most directly concerned: the Department of Natural Resources, the Planning Board, the Environmental Quality Board, Fomento, and the Water Resources Authority.

SAND FOR CONSTRUCTION

FINDINGS

Puerto Rico's construction industry needs huge quantities of sand. For many years, sand consumption in Puerto Rico increased rapidly in response to the demands of the construction industry. During 1972, the peak year, total consumption of aggregates (sand, gravel, and crushed stone) reached an estimated 6.8 to 8.2 million cubic meters. Reflecting a recession-induced decline since 1972, consumption during fiscal year 1975-1976 was estimated at 5.16 to 6.25 million cubic meters.

For many years, natural sand and gravel deposits were used to satisfy nearly all needs.

Beach and dune deposits (as noted in the sections of this report dealing with those features) were exploited to satisfy much of the demand. The remainder came largely from river channel, flood plain, and terrace deposits.

These traditional sand sources are now running out. As early as 1969, a study by the United States Bureau of Mines warned that several deposits then being worked would be

depleted by 1975; by 1990, the only conventional sources remaining would be the few that are naturally replenished. A 1973 DNR study concluded that most dune deposits along the northwest coast would be exhausted even sooner than estimated in 1969.

Today, as indicated in the section on Dunes, the remaining dune deposits along the northwest coast have been largely depleted.

Sands from river channel deposits (which are located in the river beds themselves and are therefore publicly owned) have been extensively worked because the government has not charged the high prices demanded by private landowners. The best of these deposits are gone or are being exploited now. Although natural processes will continue to replenish some channel deposits, the future volume of sand and gravel from this source will fall far short of anticipated needs.

Sands from flood plain and terrace deposits (which were formed during periods of high water when rivers overflowed their banks) still exist in enormous quantities. Most of these deposits are on private land, however, and are available, if at all, only at very high prices. Some of the best agricultural land on the Island, as well as some sites with important potential for urban or tourism development, are included within these flood plain and terrace deposits.

Sand from these traditional sources accounted for about 34 percent of the total sand made available through permits in fiscal year 1975-76. To replace these declining sources, alternative sources must be found to provide some two million cubic meters of sand -- even assuming no increase in consumption levels.

Excessive extraction of remaining natural deposits would accentuate problems of erosion and landform alteration. Sand extraction has contributed to coastal erosion (as noted in the sections on Coastal Erosion and Dunes.) Excessive extraction has also contributed to inland erosion along rivers (e.g., by deepening rivers so much that banks collapse during the rainy season). And extraction from river terraces and other alluvial deposits has often altered the landscape; sand "workings" have not generally been reclaimed for reuse, with the result that lagoons and depressions sometimes remain long after extraction ends. Excessive extraction of remaining natural deposits would be likely to aggravate these problems.

Manufactured sand, already produced in several quarries, represents one possible alternative to natural sand. Crushed stone for the manufacture of sand in Puerto Rico is available in almost unlimited quantities. In addition to limestone, a variety of volcanic rocks could be crushed to varying sizes as substitutes for gravel, concrete sand, and fine sand to meet the future needs of the construction industry. The extraction process has a relatively small land demand compared to the production potential. Under controlled conditions, dust generation could be kept within environmentally acceptable limits.

Because of higher price levels, several quarries have recently been established, and many of them currently rely on stone crushing to produce increasingly smaller particle sizes. Most of these quarries are located away from the coast, in the interior of Puerto Rico.

Two firms now have capacity to produce the fine particle sizes needed for plastering sand. Production by these firms will partially replace dune sand from Isabela. The prices of manufactured sand are competitive with those of the remaining Isabela deposits mainly for two reasons: first, the manufacturers serve markets that are quite distant from Isabela; second, they produce sand from limestone, which competes successfully with the siliceous sand coming from Isabela because of savings on the mortar mixture.

The specifications for concrete sand can be met more readily because it requires less crushing and is thus less costly to produce than plastering sand; secondly concrete sand does not require a specific type of crushed rock. Location strongly affects the economic feasibility of manufacturing concrete sand; those deposits closer to metropolitan areas will have an advantage because of savings on transportation costs.

Submerged sand deposits are another potential source of sand for construction. Presently untapped sand deposits are believed to occur in several submarine locations near the coasts of Puerto Rico and Vieques. There are two general types of submarine sand deposits. The first are nearshore deposits, found in protected waters and near coral reefs. The second are found in deeper water (from 80 to 100 feet) and farther from the shore. Thus far, none of these deposits are being exploited.

Ideally, sand could also be obtained by dredging reservoirs where submerged sediment deposits are causing loss of water storage capacity. These sediments would probably

require some additional processing, however, to remove the great amount of silt that is mixed with the sand.

RESPONDING TO THE FINDINGS

DETERMINATION FEASIBILITY OF ALTERNATIVE SOURCES

To satisfy construction needs, both sand manufacturing and the extraction of submarine deposits represent important options worthy of exploration.¹ One option is to stimulate additional sand manufacturing. Several economic and geographical factors will need to be considered in evaluating this option. Administrative action and acquisition of land to protect areas which are potential sources for manufacturing sand should also be evaluated. Any program should assure that adequate supplies of sand will be available to all regions of the Island.

Another option is to encourage the extraction of sand from submarine deposits. Four issues need to be addressed before proceeding with submarine extraction:

First, is distribution of the extracted sand. The sand will have to be transported to one or more ports for subsequent inland movement to consumer centers.

Second, is economic feasibility. For any venture to be economically feasible, a large volume of sand will need to be produced. The scale of operations also affects the number of submarine operations that could be operated simultaneously. Even two submarine operations may surpass the consumption requirements for Puerto Rico, creating a need to market surplus sand outside of Puerto Rico.

Third, is Congressional action confirming Commonwealth jurisdiction over submerged lands.

Fourth, is environmental impact evaluation. Possible impacts include: creation of sedimentation basins and subsequent anaerobic bottom waters, physical damage to reefs by dredging equipment, sedimentation of corals, and removal or burial of seagrasses occurring on or adjacent to the mining area.

Need: feasibility study on alternative sources. Determining the commercial feasibility of exploiting submarine sand deposits and expanding the supply of manufactured sand from crushed stone is a priority area for research.

MINERAL DEVELOPMENT

FINDINGS

Puerto Rico has limited commercial mineral resources. Gold was mined during Spanish colonial days. During the last 100 years, small mining ventures obtained other metals including copper, manganese, iron, and silver. Most of these operations were marginal, based on easily accessible, high-yield deposits of limited size. Within the last 20 years, however, some mineral deposits of commercial value have been discovered.

Construction-related minerals. The extraction of limestone and clay, and particularly sand and gravel to supply the construction industry, has become a major mining activity. (See the section on Sand for Construction.)

Nickel. Commercial quantities of nickel laterite deposits have been discovered in the Guanajibo Valley near Mayaguez. According to current estimates, this deposit could permit production of some 40 tons per day of nickel oxide for about 25 years. The mining of this deposit could progressively demand up to 1,850 cuerdas. Besides Guanajibo, other deposits of nickel were identified by the U.S. Bureau of Mines in 1959. They are Las Measas (near Mayaguez), Maricao, and Rosario. However, these deposits (particularly Las Measas) lie in areas that have been urbanized, thus increasing considerably the cost of mineral extraction.

Copper. Porphyry copper deposits were discovered in the Utuado-Adjuntas-Lares area in the 1950's. Some 243.5 million tons of copper ore reserves assaying 0.75% copper have been estimated. Two large mining companies have sought permission from the Commonwealth government to mine these copper reserves.

Although the copper deposits are in the central mountains, most studies have proposed construction of a smelter on the coast. A refinery and other associated industry may also be located near the smelter.

Copper mining would also have an impact on the coast by using a great deal of water. The mining operation, including the concentrator, smelter, refinery, and sulphuric acid

plant, would use approximately 4.5 million gallons of water per day. Also tailings from the concentrator would have to be disposed of either at sea or in tailing ponds inland.

Expected output of the smelter is about 151 tons daily, with a yearly output of approximately 50,000 tons. Approximately one square mile of land area with access to the sea, would be required for the smelter, refinery, and other facilities.

Beside the proven reserves in the Utuado-Adjuntas-Lares, there are neighboring sub-marginal copper deposits which have not been explored in detail. There is also a copper ore body at La Muda (between Caguas and San Juan) and another at Pico La Mina within the El Yunque Rain Forest. Urban development in La Muda minimizes the possibilities to exploit this deposit.

Oil. Responding to geologic evidence of offshore oil deposits, major oil companies have expressed an interest in obtaining rights to explore for oil in Puerto Rican coastal waters. Proposed legislation (H.R. 7827) would confirm Commonwealth ownership of these resources, and clarify the right of the Commonwealth to authorize exploration and extraction. (See discussion above in the section on Reefs.)

The nature of facilities required to support oil extraction, should oil be discovered in economically recoverable quantities, is not yet clear.

POLICY

The Objectives and Policies element of the Planning Board's Land Use Plan, quoted in Chapter 2 above, establishes policy concerning both renewable and nonrenewable resources. To insure judicious management and utilization of these resources, the policy statement calls for the identification of these resources and evaluation of potential for damaging or exhausting them. For development of the resources, the policy statement would:

"...promote the prudent use of the resources identified in this inventory, in a manner consistent with the conservation of renewable resources, and at the appropriate time in the case of non-renewable resources." (See Policy 17.02)

As stated above in the section on Coastal-Dependent Industry, the Planning Board policy

also calls for maintaining options for future use of resources.

IMPLEMENTING THE POLICY

The Commonwealth's Mining Law assigns to the Department of Natural Resources (DNR) responsibility to explore, develop, process, refine, sell, and otherwise utilize Puerto Rico's mineral resources. The Corporation is responsible for the investigation of mineral reserves, and for promoting and guaranteeing the capital investment necessary to achieve their optimum use.

It is not yet clear when nickel, copper, or petroleum extraction may occur. Exploratory drilling for petroleum, however, is now expected to begin as soon as federal legislation clears up present uncertainties about legal jurisdiction over submerged lands surrounding Puerto Rico; this could occur by mid-1978.

Given the Commonwealth's policy of judiciously developing its natural resources, there is need to identify sites necessary for development of mineral resources and to maintain them for possible future use. The section on Coastal-Dependent Industry discusses means of responding to this need.

ENERGY

FINDINGS

Puerto Rico depends almost exclusively on imported oil to satisfy its energy requirements.

Less than two percent of the Island's energy is procured by hydroelectric units. Petroleum, all of it imported, was used as follows during fiscal year 1975¹:

	Million Barrels	%
Electricity	19.1	18.0
Transportation	17.4	16.4
Manufacturing	23.5	22.4
Others	<u>4.1</u>	<u>3.9</u>
Subtotal	64.4	60.7
Exports	<u>41.7</u>	<u>39.3</u>
Total (imports and change in inventories)	106.1	100.0

Historically, Puerto Rico has depended upon, and greatly benefitted from, inexpensive foreign oil imports--principally from Venezuela.* The availability of low-priced energy was one of the key elements of the Island's industrial promotion program.

Cheap oil also brought three refineries to the Island: the Caribbean Gulf Oil refinery at Bayamon, on the north coast; the Sun Oil refinery at Yabucoa, on the southeast coast; and the Commonwealth Oil refinery at Penuelas, on the south coast.² ** These refineries, with a combined capacity of 283,000 barrels per day, meet all of the Island's needs, as well as producing refined products for export. By 1978, the internal consumption is expected to be 200,000 barrels per day, permitting exports of about 75,000 barrels per day.

Through the years, Puerto Rico's electrical energy demand paralleled the growth of the Island's economy. Electrical production capacity grew approximately 15% annually, during the 1960's and early 1970's, rising from 995,000 kw in 1965-66 to 3,000,000 kw in 1973-74.

The 1973 oil price increase drastically changed the energy situation for Puerto Rico. Previously cheap foreign oil supplies suddenly became more expensive than U.S. domestic oil, greatly increasing the cost of energy production and consumer prices. Increased energy costs, combined with a severe downturn in the economy, resulted in a rapid decline in the rate of increased energy usage. In 1973-74, energy usage increased only 2.9%, and in 1974-75 it declined 1.7%. 1975-76 showed an increase⁴ of 3.7% from the previous year.

* Puerto Rico received special treatment in 1959 and 1965 under the U.S. quota system for the importation of crude oil and feedstock from foreign sources.³

**The Phillips refinery, on the south coast, processes naphtha.

Current growth estimates are for 5 percent to 6 percent annually. If these growth estimates are correct, additional generating capacity should not be required until the 1990's. It may take that long for electrical consumption to again reach pre-1973 levels.

The Puerto Rico Water Resources Authority (PRWRA) is the sole supplier of electric power in Puerto Rico. PRWRA was created to develop and utilize Puerto Rico's energy resources and to generate and distribute electricity at the lowest possible cost. Electricity is now available to more than 89% of the Island's residents. PRWRA's electrical generating capacity is as follows:

Type of Unit	Number of Units	Capacity (MWE)	Percentage of Total System Capacity
Oil-Fired Steam	20	3132	73%
Gas Turbines	21	920	21%
Jets	11	170	4%
Hydroelectric	12	96	2%
TOTAL	64	4318	

Since the PRWRA cannot interconnect with other electrical systems outside Puerto Rico, it must provide a large reserve capacity to insure adequate system reliability.

Puerto Rico has limited alternatives to continued use of imported oil for production of electricity. Importation of electric power from outside the Island is not feasible. Essentially all hydroelectric sites are already being used.* No significant potential for geothermal heat energy is known to exist on the Island. There are no known reserves of natural gas, and shortages of this fuel make importation (except for

* An opportunity has been identified for a pump storage system, with a capacity of 2,000 megawatts, in the Rio Grande de Manati (known as the Matacanas-Sanamuertos pump storage project).

limited use of bottled gas) impracticable. Nor are there any known coal reserves, and importation costs make this energy source prohibitively expensive. The search for offshore oil has already been mentioned. Despite these severe limitations, Puerto Rico is searching for viable alternative energy sources. Nuclear energy is one possible alternative, although high capital costs and potential environmental and safety hazards have so far impeded its use. Other alternative sources are being studied, and pilot projects being undertaken, but they offer small opportunities for any immediate impact on Puerto Rico's energy situation. Among the alternate energy sources being studied are energy and material recovery from solid waste; ocean thermal energy conversion; solar cooling and heating; and wind turbine generators.

POLICY

Policies already described, in the section on Coastal-Dependent Industry, affect many types of energy-related facilities. In addition, the Objectives and Policies element of the Planning Board's Land Use Plan recognizes that electrical power and other infrastructure is not available. Therefore, the Planning Board has established a policy statement to "insure the closest coordination possible among the public agencies responsible for providing infrastructure so that it may be available in the place and time most suited to the attainment of full and prudent land use in urban as well as rural areas." (See Policy 14.00)

IMPLEMENTING THE POLICY

- A. INSTITUTIONAL REORGANIZATION. A law recently enacted by the Legislative Assembly creates an Energy Office responsible to the Governor. The new office consolidates energy-related functions previously scattered among several agencies.

B. PROTECTING SITES SUITABLE FOR POWER PLANTS AND OTHER ENERGY RELATED FACILITIES. In the early 1970's, PRWRA had to abandon plans for a nuclear-powered generating station at Aguirre on the south coast, largely as a result of geologic and environmental problems at the proposed site.

As a result of this experience, PRWRA conducted a review of potential sites for energy facilities. Fifteen potential sites, (see figure below), were submitted to the Environmental Quality Board (EQB) for approval. Applying the environmental protection criteria in section 3.3 of EQB's air pollution regulation (set forth above in the section on Coastal-Dependent Industry), EQB has approved five:

- 1) Punta Higuera, Rincon
- 2) Islote, Arecibo
- 3) Punta Manati, Manati
- 4) Quebrada del Toro, Isabela
- 5) Aguirre (conditional on clarifying EIS)

A planning process that can anticipate and manage the impacts from energy facilities in or affecting the coastal zone is being developed pursuant to Section 305(b)(8) of the CZMA. Discussion of the need to reserve coastal-dependent sites, including sites for energy facilities, is included in the section on Coastal-Dependent Industry.

C. CONSERVATION MEASURES. A Utilities Conservation Action Now (UCAN) Draft Plan, submitted by PRWRA in 1976 to the Federal Energy Administration (now the Department of Energy) contains a number of conservation measures.

1. Public education. One objective of the UCAN Draft Plan is the development of a consumer education program to promote efficient use of electric energy.

Currently, the Consumer Affairs Department of the Commonwealth Government is coordinating an inter-agency effort to implement energy conservation measures. The Office of Petroleum Fuel Affairs of Puerto Rico edited a pamphlet with guidelines for making the most efficient use of energy by avoiding wasteful practices.⁸ Consumer education is expected to be a key element of this inter-agency effort.

2. More efficient power production. The UCAN Draft Plan contains several measures designed to promote more efficient power production:

Improve system load factor by providing incentives to shift loads from daytime to nighttime use and also determine the optimum load factor for the system.

Increase the capacity factor commensurate with good system reliability.

Encourage growth in kilowatt-hour sales without incurring waste.

Reduce the annual peak kilowatt demand growth rate.

Improve system heat rate to reduce fuel oil consumption.

3. Revised rate structures. The UCAN Draft Plan also recommends reforming the tariff rate structure. Puerto Rico already has moved in this direction. In 1974, the Commonwealth enacted a lifeline-rate incentive, aimed at alleviating the impact of high energy costs on low-income customers. This has created an effective incentive to promote energy conservation.

According to the law, all residential customers consuming less than 425 Kwh per month are exempted from fuel adjustment charges for the first 400 Kwh consumed. The Commonwealth Government pays this charge to PRWRA. During the last fiscal year, 515,000 residential customers (almost 70% of residential customers) received this subsidy. The amount subsidized was \$29,302,089.⁹

- D. ALTERNATIVE ENERGY SOURCES. As already discussed, Puerto Rico is studying the possibilities of using alternate energy sources. The UCAN Draft Plan recommends research on solar and solar-assisted sources, as well as cooperation in solid-waste energy and material-recovery efforts.

RECREATION

FINDINGS

The coast of Puerto Rico offers a rich variety of recreational opportunities.* The coastal features of Puerto Rico are so varied that they offer, at least potentially, something for everyone. Beaches (discussed in the section on Beaches) are the most widely known recreational attractions. Others include mangroves, lagoons, freshwater swamps, rocky coastlines, scenic vistas, islands, coral reefs, marine life, and the open sea.

The diverse recreational experiences now or potentially available range from deep-sea fishing to shelling, from water skiing to sunbathing, from motorboat racing to picnicking. In addition to beach- and water-based recreation, there are opportunities for camping, hiking, birdwatching, and other activities that take advantage of the uniqueness of the coast.

The 1977 revision of Puerto Rico's Comprehensive Outdoor Recreation Plan (SCORP) identifies 2,049 developed recreational sites -- 1,825 provided by the public sector and 224 by the private sector. There are 13 beaches with facilities; 38 water areas (seas, bays and islands) -- 25 with minimum facilities (boat ramps and public access) and 13 with full facilities (harbors); and 2 marine-related facilities.

*Detailed information on recreation can be found in the 1977-80 Puerto Rico Comprehensive Outdoor Recreation Plan (SCORP).

Recreational development in Puerto Rico has traditionally focused on active, competitive sports. Facilities for such sports as baseball, softball, basketball, track and field are in great demand, and recreational development has tried to satisfy those demands.

One consequence of this emphasis has been to provide relatively more recreational opportunities for youth than for other segments of the population. Young children, most adults, the elderly, and the handicapped find limited facilities available.

Another consequence is that Puerto Rico still has enormous unrealized potential for coastal recreation; the network of fine recreational beaches ("balnearios") responds to only a small part of that potential (See Map 11). There remains great opportunity to foster aquatic sports, for example. And there is perhaps an even more important opportunity to provide for "environmental" recreation--the enjoyment of scenery, for example, and nature study, and other ways of appreciating unspoiled natural resources of the coast.

Participation in water-based recreation, both active and passive, has increased significantly in recent years. More Puerto Ricans are participating in water-based recreation activities, such as boating, swimming, sport fishing, surfing, snorkeling, scuba diving, and underwater photography. Citizen interest in these activities is likely to continue growing with increasing urbanization and rising incomes. This rising citizen interest, coupled with the continuing importance of water-based recreation to tourists from outside the island, increases the need to provide more amply for varied coastal recreation.

Puerto Rico is renowned for its international fishing tournaments on the high seas. Recreational boating and sport fishing have expanded rapidly; the number of marinas and shops for marine equipment has also increased.

RESPONDING TO THE FINDINGS

- A. PLANNING, DEVELOPING, OPERATING PUBLIC FACILITIES. The Public Parks and Recreation Administration (PPRA) is the principal Commonwealth agency responsible for recreation. The Recreation Development Company (RDC), administratively attached to PPRA, develops recreational facilities, including parks, beaches, picnic areas, athletic parks and facilities, marinas, pools, and hunting and sport fishing facilities. Once these facilities are constructed, RDC transfers them to PPRA for operation.

PPRA is the lead agency responsible for Puerto Rico's Comprehensive Outdoor Recreation Plan (SCORP), originally issued in 1970 and revised in 1972. Other agencies principally involved in review and development of that Plan were RDC and the Federal Bureau of Outdoor Recreation (BOR). The current version of the plan, covering the period from 1977-80 was submitted to BOR in March 1977.

Other Commonwealth agencies that administer recreation facilities, or otherwise contribute to the formulation or implementation of recreation policy, include the Planning Board, the Department of Housing, the Department of Public Instruction, and the Institute of Puerto Rican Culture. The Department of Natural Resources regulates sport fishing and hunting and is responsible for recreational development of Commonwealth forests.

- B. ACCESS TO THE COAST: BEACH FACILITIES AND SERVICES

Better access to the coast is needed to improve coastal recreation opportunities, including recreational fishing. So are improved beach facilities and maintenance, particularly beach cleaning. Both these needs are discussed in the section on Beaches.

- C. ENCOURAGING PRIVATE INVESTMENT IN RECREATION FACILITIES

Public investment for recreation must satisfy the needs of broad groups of people, particularly people who cannot provide facilities

for themselves. Specialized facilities for smaller groups (e.g., marinas for pleasure boats) can normally be provided, if at all, only through private investment. The possibility of granting beach concessions to encourage private investment (subject to stringent regulation, including compliance with statutory requirements that any concession areas be open to the general public) is noted in the section on Beaches. In the interests of enriching recreational opportunity, the possibility of granting such concessions should be evaluated.

D. RESEARCH AND DEVELOPMENT FOR RECREATIONAL FISHING

A program for sport fishing is conducted by the Department of Natural Resources, which also operates a fish nursery at Maricao.

Research on the development of marine-recreational fishing was initiated through the Dingell-Johnson Program in 1955. In 1973, the Fishery Development and Research Program conducted a survey on sport fishing in Puerto Rico.

At present, the National Marine Fisheries Service is conducting a socio-economic study of recreational fishing in the United States, Virgin Islands and Puerto Rico.

TRANSPORTATION

FINDINGS

The transportation network is a major determinant influencing the location of urban and industrial development. Increasing mobility and an increasing number of automobiles have paralleled Puerto Rico's economic growth in the last three decades. The number of automobiles on the Island increased from 60,000 in 1950 to more than 900,000 today. The highway network has been greatly expanded to serve increasing demands. New expressways, in particular, increase accessibility of many parts of the coast from urban centers. In some cases, however, the highway network has contributed to urban sprawl and the necessity of long commutes to places of work.

The primary surface network is around the periphery of the Island, through the relatively flat coastal plains, although an expressway connecting the north and south coasts has recently been built across the interior of the Island. Goods movement on-Island is mainly by highway. (See Map 20).

Buses, "publicos" and taxis provide public transportation. Bus service in the San Juan Metropolitan Area is provided by a public corporation, the Metropolitan Bus Authority. Private bus companies provide service between large cities, such as Caguas and San Juan, and within the remaining large cities, such as Ponce.

"Publicos" (public cars) serve travelers throughout Puerto Rico. Publico service is characterized by its flexibility, rapid service, frequent trips, and relative moderate cost. The quality of service is usually unsatisfactory, however, on Sundays, holidays, and during off-peak hours.

Taxis complement the public transportation service.

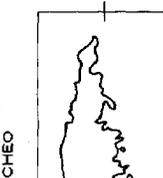
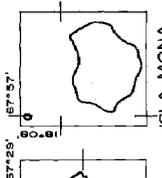
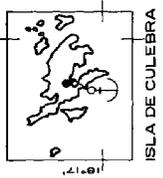
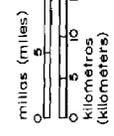
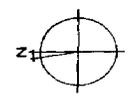
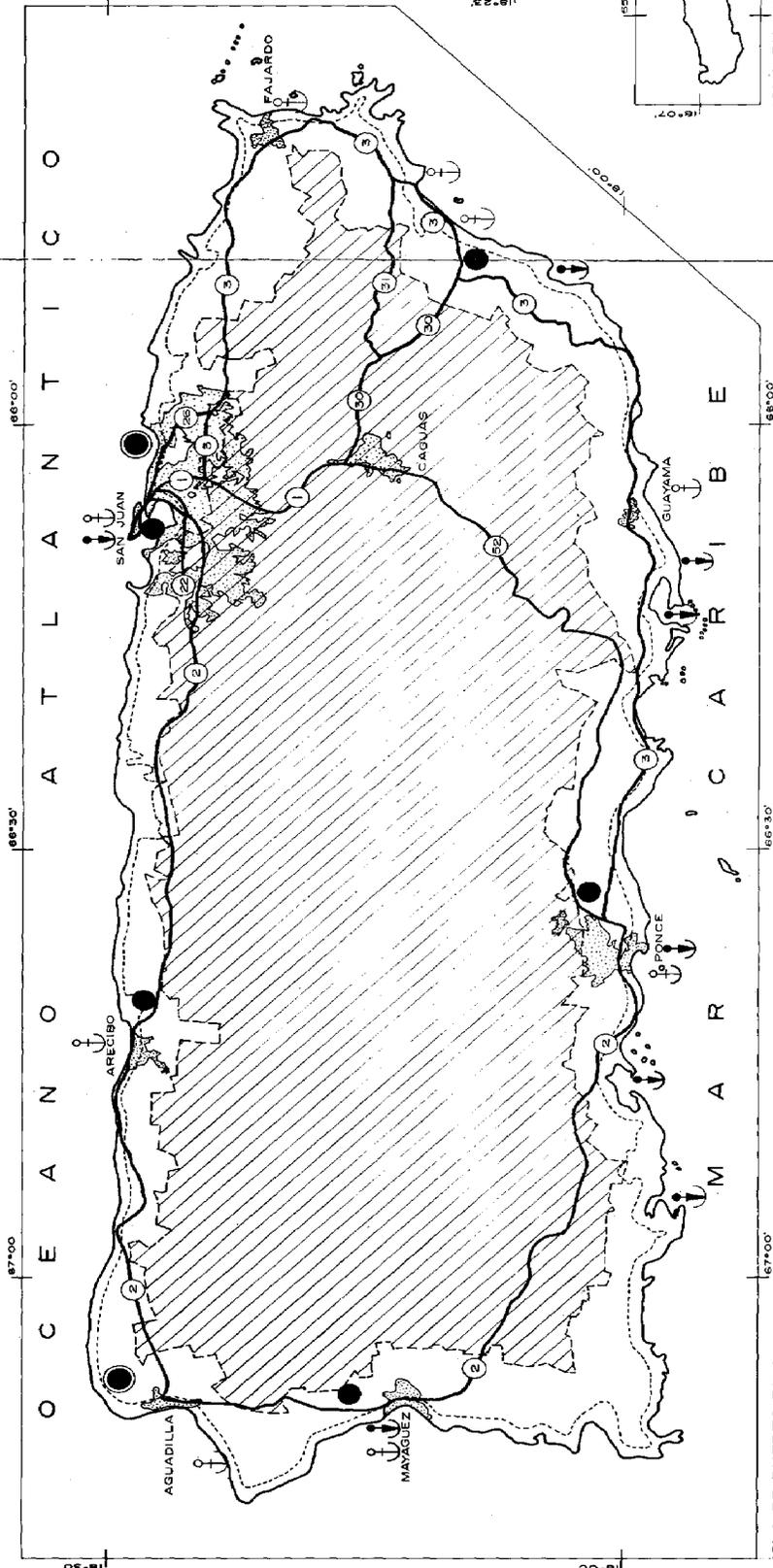
The bicycle is envisioned as an important part of the transportation network. A 1975 Bicycle Transportation Study, prepared for the Department of Transportation and Public Works (DTPW), proposes a 24-kilometer bikeway along the coast in the San Juan Metropolitan Area. The Bicycle Transportation Study is now under review by DTPW and the City of San Juan.

Water-based transportation, already an important part of the transportation network, is envisioned to play an even more important role in the future. At present, the Port Authority

- CARRETERAS ——— ROADS
- AEROPUERTO INTERNACIONAL ● INTERNATIONAL AIRPORT
- AEROPUERTO PUBLICO ● PUBLIC AIRPORT
- PUERTO INDUSTRIAL ● INDUSTRIAL PORT
- PUERTO COMERCIAL ● COMMERCIAL PORT

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



ISLA DE VIEQUES

ISLA DE SAN JUAN

ISLA DE SAN FELIPE

ISLA DE SAN GERONIMO

ISLA DE SAN ANDRES

ISLA DE SAN ANTONIO

ISLA DE SAN PEDRO

ISLA DE SAN PABLO

ISLA DE SAN MARCOS

ISLA DE SAN MATEO

ISLA DE SAN NICOLAS

ISLA DE SAN SEBASTIAN

ISLA DE SAN CRISTOBAL

ISLA DE SAN ANDRES

ISLA DE SAN ANTONIO

ISLA DE SAN PEDRO

ISLA DE SAN PABLO

ISLA DE SAN MARCOS

ISLA DE SAN MATEO

ISLA DE SAN NICOLAS

ISLA DE SAN SEBASTIAN

ISLA DE SAN CRISTOBAL

ISLA DE SAN ANDRES

ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:

AUTORIDAD DE CARRETERAS; MAPA DE CARRETERAS
 ESPECIALES DE P.R. (DEPTO. DE TRANSPORTACION Y
 OBRAS PUBLICAS), 25 DE JUNIO, 1973.

20

FACILIDADES PRINCIPALES DE TRANSPORTACION
 MAJOR TRANSPORTATION FACILITIES

provides ferry service between Old San Juan and Catano; Fajardo and Culebra; Fajardo and Vieques. Renewed efforts by the City of San Juan to clean up the Martin Pena Channel and eventually provide water transportation throughout the metropolitan area are under study by a Federal Congressional committee.

Ports and airports are critical elements of the transportation system. Puerto Rico imports most of its foodstuffs, as well as manufactured goods and raw materials. Airports are also especially important to the tourism industry. (Industrial and commercial ports are discussed in the section on Coastal-Dependent Industry.)

RESPONDING TO THE FINDINGS

A. PLANNING AND DEVELOPING TRANSPORTATION FACILITIES

Current responsibility within the Commonwealth for transportation planning and development lies with several agencies:

"...the Planning Board guides overall transportation planning as part of its comprehensive, Island-wide planning process. The Objectives and Policies of the Planning Board's Island-wide Land Use Plan recognizes the importance of infrastructure to the efficient utilization of the Island's resources." (See Chapter 2.)

"...three public corporations -- the Highway Authority, the Ports Authority, and the Metropolitan Bus Authority -- act as the operational arms of DTPW. These agencies have development authority for their respective functional area."

"...coordination among the agencies is accomplished through a Policy Committee for Planning Organizations which reviews transportation programs and major projects. The Committee includes representatives from Federal agencies (HUD, FHWA, and UMTA), from Commonwealth entities (Planning Board, DTPW, Government Development Bank, Public Service Commission, Regulations and Permits Administration, Ports Authority, Highway Authority), as well as the mayors of Ponce, Mayaguez, Hormigueros, and 10 municipios in the San Juan Metropolitan Area.

B. PREPARING TRANSPORTATION PLANS

The Puerto Rico Planning Board, in cooperation with relevant agencies and local authorities, prepared the National Transportation Needs Study for Puerto Rico and submitted it to the U.S. Department of Transportation in 1971. This report was the first multi-agency attempt toward the development of a coordinated, comprehensive transportation policy and program for Puerto

Rico. The study covers the period from 1970 to 1990, and includes general goals and objectives as well as specific ones for the various sectors--ports and airports, highways, and mass transit. A revised report was submitted in 1975.

In addition, the Ports Authority has prepared an Airport Systems Plan which was submitted to the U.S. Federal Aviation Administration.

Highway plans have recently been prepared by DTPW for the major urban areas along the coast: the metropolitan areas of San Juan, Ponce and Mayaguez. The Land Use and Transportation Plan for the metropolitan area of San Juan, prepared and adopted in 1971 and revised in 1973, is being updated by DTPW and the Planning Board. Draft plans for metropolitan Ponce and Mayaguez are being reviewed, and it is anticipated that they will be approved in the near future.

D. TRANSPORTATION SAFETY MEASURES AND PROGRAMS

Two Federal agencies -- the Federal Aviation Administration and the U.S. Coast Guard -- maintain transportation safety devices in Puerto Rico. In addition, the National Highway Traffic Safety Administration and the Federal Highway Administration are involved in highway-related safety programs.

COMMERCIAL FISHING

FINDINGS

Puerto Rican waters cannot sustain high biological productivity. Puerto Rico is located in a tropical fishing zone characterized by a diversity of species, rather than commercially important quantities of single species; deep waters low in nutrients; and an insular shelf which is narrow and without outcrop. These conditions cannot support high biological productivity.

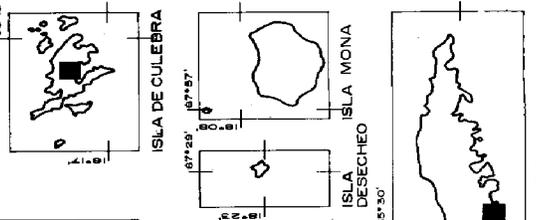
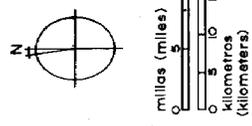
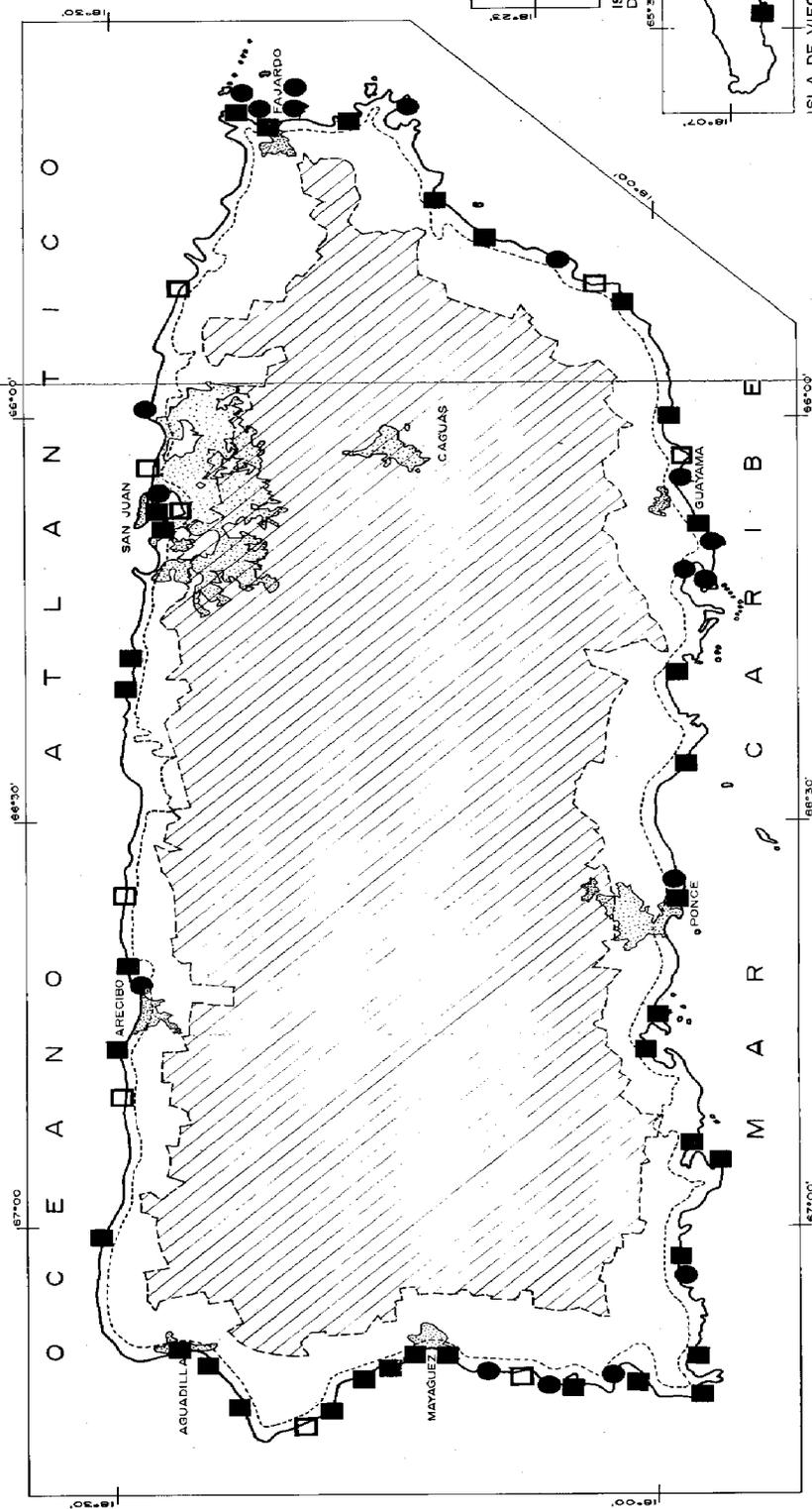
Most fishing here is of a rudimentary type with average annual production of only 3,000 pounds per fisherman. According to data obtained from the Office of Fishery Statistics of the Department of Agriculture, fish production in Puerto Rico was 5.9 million pounds in 1976. Fourteen percent of the catch was shellfish; 86 percent fish. There were 2,000 fishermen (1,230 full-time) and 865 boats, most of them small (less than 20 feet long and less than 21 HP motors). These were distributed among most of the coastal municipios, including the islands of Vieques and Culebra. The highest production was obtained in the west coast (52%), followed by the east and south coasts (40%), and 8% in the north coast.

Puerto Rico also has a tuna fish industry which is considered one of the biggest in the world. About 55 domestic boats fish in the Pacific and in the North and South Atlantic. In 1977, these boats caught a total of 61,000 tons of tuna.

- PUERTOS PESQUEROS EXISTENTES ■ EXISTING FISHING PORTS
- PUERTOS PESQUEROS PROPUESTOS □ PROPOSED FISHING PORTS
- MARINAS RECREATIVAS ● RECREATIONAL MARINAS

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY



ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:
 AREA DE SERVICIOS ESPECIALES,
 DEPARTAMENTO DE AGRICULTURA
 Y PESQUERA, PUERTO RICO,
 FEBRERO, 1978.

FACILIDADES PARA PESCA COMERCIAL Y RECREATIVAS

COMMERCIAL FISHING FACILITIES

Aquaculture of marine organisms is another form of commercial fishing. A project to cultivate oysters was carried out in Puerto Rico, and a privately operated shrimp nursery is located on the coast in Aguada.

RESPONDING TO THE FINDINGS

A number of established programs promote and assist the fishing industry in Puerto Rico: The Commonwealth Department of Agriculture promotes fishing in several ways.

...the program for Credit conducted by the Agricultural Credit Corp., has granted fisherman loans from \$50 to \$100,000, to buy boats and equipment. Total loans average \$250,000 annually.

...the program for the Construction of Fishing Ports constructs fishing facilities around the Island, including ramps, piers, storage buildings, cold-storage rooms, and ice plants. Annual expenditures range from \$50,000 to \$1,000,000.

...the Program for the Selling of Fishing Products and Materials established in the 1950's, owns stores that sell materials and fishing equipment (motors, fishing rods, fish hooks, etc.) to fisherman at reasonable prices.

...the Program for Fishing Development and Research, created in 1966 using Federal and Commonwealth funds, has established a system to keep data and statistical analyses which are basic for fishing promotion in the Island. In addition, the Program has carried out fishing explorations, demonstrations of techniques and fishing equipment, fishing training, aquaculture studies, marine culture, and economic studies about commercial fishing in Puerto Rico.

...under the Shrimp Aquaculture Project, the Department has made grants and loans to Caribe King Shrimp, Inc. for aquaculture of the shrimp Macrobrachium rosenbergii.

Through the Department of Labor's Agency for Community Action, 17 fishing projects have been established, in which fishermen's associations have been organized. The Agency aids them by providing boats, administrative services (e.g., accounting) materials, and equipment. The investment of the Federal and Commonwealth Governments exceeds 10 million dollars for the first three years of operation.

Two elements of the University of Puerto Rico have programs directly related to fishing:

At Mayaquez, there is an academic program for marine sciences at the masters and Ph.D. levels. The University also has been working for more than six years, under contract with the Department

of Agriculture on aquaculture of fresh water fish.

...the Humacao Regional College started a marine sciences program this year, at the bachelors level. The College also has a Sea Grant Program which orients and educates coastal communities for better preservation and use of the natural resources of the coast. The communities in which it has worked have included the fishing communities of the east coast of the Island.

The Department of Education, through its Program of Vocational Education, has established a small fishing school in Arroyo. In the past, the Department has also offered short courses for fisherman on such subjects as mechanics and maintenance of outboard motors.

The Department of Natural Resources is responsible for granting commercial fishing licenses and keeping records of fishing boats. DNR also has a program to study the aquatic ecosystems of inland waters in Puerto Rico, including the dynamics of the biological population of the lagoons and rivers.

The Caribbean Fishery Management Council is responsible for preparing fishing management plans for the area within 200 miles of Puerto Rico and the U.S. Virgin Islands. The Council, one of eight councils in the United States, was established under the Fishery Conservation and Management Act of 1976.

The Council is currently preparing two fishing management plans (for lobster and fish of coral reefs). These plans include data about biology, ecology, and use of the species, as well as sociological and economic data about the fishery. In addition, the plans will provide options for fishery management, will determine standards for evaluating fishing activities, and will recommend areas to be preserved in their natural condition for the benefit of local fishing.

Because Commonwealth programs concerned with commercial fishing are spread among several agencies, it has been difficult to focus governmental efforts and avoid duplication. In his State of the Commonwealth message at the beginning of 1978, Governor Carlos Romero Barcelo called for the unification of fishing-related programs in a single entity. Legislation to accomplish this reorganization is currently being prepared.

Several measures already recommended will assist fishing as well as serving other needs. For example, provisions for better access to the coast (see section on Beaches) will assist fishermen, who find many of their traditional access points blocked by development. Also, the

designation of Special Planning Areas will assist careful allocation of areas for fishing and other needs. (e.g. Boqueron Bay, in Cabo Rojo, which is suitable for oyster cultivation, but also for tourism).

The new entity may also be able to deal more effectively with some longstanding problems. Attention should be given, for example, to pollution control in shellfish breeding grounds. Also, there is need throughout the island for community education of the kind now being provided along the east coast by the Sea Grant Program of the Humacao Regional College.

CONCLUSION

In its examination of the principal coastal problems of Puerto Rico, this chapter has identified a number of needs: modifications of established programs or new measures that need to be taken. Puerto Rico's Coastal Management Program, described in the next chapter, attempts to satisfy many of these identified needs. It is useful, therefore, to recall here all of the needs identified in Chapter 3, as well as new policies established or recommended.

TABLE 3-2 SUMMARY OF COASTAL PROBLEMS AND NEW RESPONSES*

COASTAL PROBLEMS	NEW RESPONSES	
	New Measures Effective on Approval of PRCMP	Additional New Measures Needed During Implementation Phase of PRCMP
FLOODING		Public education program Refinement of Reg. No. 13 Rate Maps for coastal hazard areas - HIGH PRIORITY
GEOLOGIC HAZARDS		Research
COASTAL EROSION	(Planning process to meet OCZM requirements will be submitted by Oct. 1, 1978)	Comprehensive study of coastal erosion
REEFS		Prohibition of coral extraction Designation of Natural Reserves Completion of reef inventory - HIGH PRIORITY
MANGROVES	New policies: Special protection for mangrove wetlands. Designation of Special Planning Areas.	Designation of Natural Reserves Amendment of Reg. No. 13 to prohibit mangrove alteration. Mangrove management plans

*This table includes only new measures, which become effective on approval of the PRCMP, or are needed during implementation of the PRCMP. For measures already in effect, see the text of Chapter 3.

COASTAL PROBLEMS	NEW RESPONSES	
	New Measures Effective on Approval of PRCMP	Additional New Measures Needed During Implementation Phase of PRCMP
DUNES	Designation of Special Planning Areas.	Improved surveillance of extraction Research on alternative sources of sand. Designation of Natural Reserves Amendment of Reg. No. 13 to prohibit alteration of dunes. Revision of sand extraction regulations
BEACHES		
Legal Rights	New policy: Access to Federal beaches hereafter declared surplus	Statute requiring registration of crown grants
Public Access	New Policy: Public access to beaches. (Planning process to meet OCZM regulations will be submitted by Oct. 1, 1978)	Beach access inventory, -identify "immemorial" rights of way on: -need for acquisition -feasibility of providing passage Regulation or statute on access dedication requirement Statute to reaffirm <u>servidumbre de vigilancia</u>
Squatters		Housing for squatters (without the use of CZM funds)
Shadows and Visual Domination		
Public Beach Holdings		Refinement of Reg. No. 9 (Neighborhood Facilities Regulation)
Services and Facilities		DNR assistance in beach cleaning. Additional beach cleaning machines, manpower. Renting beach concessions. Litter reduction measures
WILDLIFE		Designation of Natural Reserves Better enforcement of regulations

COASTAL PROBLEMS	NEW RESPONSES	
	New Measures Effective on Approval of PRCMP	Additional New Measures Needed During Implementation Phase of PRCMP
COASTAL WATERS		
A. Pollution		
B. Oil Spills		Updating EQB's oil spill contingency plan
C. Erosion & Sedimentation		Runoff and erosion control regulations - HIGH PRIORITY
D. Dredging, diking, filling	Criteria for diking, filling, dredging, and deposit of dredged sediments	
COASTAL FORESTS		Designation of Natural Reserves Management plan for Guanica Forest Research in Guanica Forest (field lab)
CULTURAL & HISTORIC SITES		Inventory of archeological sites Law or regulation to protect archeological sites
COASTAL-DEPENDENT INDUSTRY	New policies: Sites for coastal-dependent development Designation of Special Planning Areas	Detailed management plans for Special Planning Areas
SAND FOR CONSTRUCTION		Feasibility study on alternative sources. See also, DUNES, above
MINERAL DEVELOPMENT	New policies (from section on Coastal Dependent Industry)	Identify and protect potential sites

COASTAL PROBLEMS	NEW RESPONSES	
	New Measures Effective on Approval of PRCMP	Additional New Measures Needed During Implementation Phase of PRCMP
ENERGY	New policies (from section on Coastal Dependent Industry) (Planning process for energy facilities to meet OCZM requirements will be submitted Oct. 1, 1978)	Identify and protect sites for coastal-dependent facilities
RECREATION		Improved beach access, facilities, and maintenance -- see Section on BEACHES, above. Renting beach concessions -- see section on BEACHES, above.
TRANSPORTATION		
COMMERCIAL FISHING		Feasibility studies (without the use of CZM funds.

FOOTNOTES TO CHAPTER 3

Flooding

1. Puerto Rico Planning Board, Propuestas sobre los objetivos y politicas publicas del plan de usos de terrenos, Borrador Para discusion en vistas publicas, May 1976, p. 61.
2. Puerto Rico Department of Natural Resources (DNR), The 1973 Water Resources Assessment for Puerto Rico, April 1974, p. 118.
3. Planning Board, Propuestas. . . , p. 61.
4. 1974 Water Resources Assessment, p. 118.
5. Ibid.
6. Puerto Rico Environmental Quality Board (EQB), Environmental Report 1971, May 1971, p. 6-4.

Reefs

1. Additional information on reefs can be found in "Los Arrecifes de Coral de Puerto Rico," unpublished report prepared in 1974 by the staff of the Coastal Zone Management Project.
2. Puerto Rico and the Sea, An Action Program for Marine Affairs, A report to the Governor, 1972, p. 25.
3. Johannes, R.E., "Coral Reefs," Unpublished ms in John Clark, Coastal Ecosystems, The Conservation Foundation (Washington, D.C. 1974) pp. 60-61.
4. Puerto Rico and the Sea, p. 26.
5. Ibid.

Mangroves

1. Additional information on mangrove wetlands can be found in "Los Sistemas de Mangles de Puerto Rico," unpublished report prepared in 1976 by the staff of the Coastal Zone Management Project.
2. EQB, Office of Scientific Assessment, Draft Environmental Impact Statement for Proposed Regulation of Coral Reef Extraction, November 1972.
3. Wadsworth, F. H. (Testimony) Proceedings of the Puerto Rico Public Meeting, National Estuarine Pollution Study, Federal Water Pollution Control Administration, 1968.
4. Heatwole, Harold, Survey of the Mangroves of Puerto Rico, Report for the Area of Natural Resources, Puerto Rico Dept. of Public Works, 1971.
5. The table is adapted from Lugo, Ariel E., Mangrove Classification and Principles of Management, draft report prepared for the Puerto Rico Department of Natural Resources Coastal Zone Management Project, 1976.
6. EQB, "Resolucion sobre los manglares para implementar la politica publica a seguirse," October 1974.

7. This policy is derived from the California Coastal Plan.

Beaches - Introduction

1. Morelock, Jack, Las Playas de Puerto Rico, draft report prepared for the Puerto Rico Department of Natural Resources Coastal Zone Management Project, 1976.

Beaches - A. Assuring the Public's Legal Right to Use the Beaches Themselves

1. Ley de Muelles y Puertos de 1968, 2103(n).
2. Civil Code of Puerto Rico, 31 LFRA, art. 254. See also Gonzalez Aviles and Assoc., "Report on Access to the Beaches of Puerto Rico," 1975 (unpublished report in files of PRCZM), page 9.
3. This recommendation first appeared in Puerto Rico and the Sea, p. 59-60.

Beaches - B. Public Access to the Coast

1. Citations of Carmelitas and other cases.)
2. Puerto Rico and the Sea, p. 62
3. Law for the Conservation and Development of Culebra, Act. No. 66 of June 22, 1975, art. 6
4. Puerto Rico and the Sea, p. 59.
5. Puerto Rico and the Sea, p. 62
6. (citation for Cerromar Hotel conditioned approval)
7. (citation for Rio Mar project requirement on access)
8. Puerto Rico and the Sea, p. 63
9. This policy is derived from the California Coastal Plan. Precedent for this type of requirement may be found in Calif. Public Resources Code, Sec. 27403 (a); Calif. Subdivision Map Act (Govt. Code, Sec. 66410).
10. Laws of Castile (the Siete Partidas), I, II, Title 31, Law 15; Figueroa v. Guerra, 1949, 69 DFR 607; Trujillo v. Lopez, 1933, 45 DPR 815.
11. Gonzalez Aviles, page 90.
12. Law of Ports for the Island of Puerto Rico of May 3, 1886.
13. Letter from Wallace Gonzalez Oliver, Secretary of Justice, to Enrique Solar Cloquell, President of the Planning Board, April 24, 1972. See also Puerto Rico and the Sea, p. 60.
14. Law of Ports for the Island of Puerto Rico of May 3, 1886.

15. Puerto Rico and the Sea, p. 60.
16. See Law of Ports of 1886, Art. 8 and Gonzalez Aviles, p. 88.

Beaches - C. Removing Squatters from the Coast

1. Penal Code of Puerto Rico (Law No. 115 of July 22, 1974), Art. 177.
2. "Procedimiento para bregar y tramitar casos de invasiones de terrenos," Office of the Governor, January 20, 1975.
- 3.
- 4.
5. Law for the Conservation and Development of Culebra, Act. No. 66 of June 22, 1975, art. 5.
6. Asociacion de Duenos de Casas Veraniegas de la Parguera, etc. v. Hon. Comision de servicio Publico de Puerto Rico (Num. 0-75-475, en el Tribunal Supremo de Puerto Rico, September 27, 1976).

Beaches - D. Protecting Beaches Against the Shadows and Visual Domination of High-Rise Buildings

1. Puerto Rico Planning Board, The San Juan City Edges Project, Technical Report, August 1976; see also harris Sobin, "Building Shadow," Puerto Rico Planning Board, 1969.
2. The San Juan City Edges Project, p. 65.
3. Ibid.
4. Puerto Rico Planning Board, "Enmiendas adoptadas al reglamento de zonificacion," Reg. No. 4, December 13, 1975, Sec. 57.01

Beaches - E. Providing Services and Facilities for Beach Users

1. EQB, Environmental Report, 1971, p. 5-5
2. EQB, Regulation for the Control of Solid Waste, sec. 4.1.
3. EQB, Proposed Solid Waste Management Authority, p. 72.
4. Gonzalez Puig, Miguel, Estudio evaluativo de la factibilidad de impelmentacion de un sistema de limpieza mecanizada de playas en las costas sur y oeste de Puerto Rico, Puerto Rico Department of Natural Resources, August, 1976.
5. Opinion of the Secretary of Justice (Trias Monge) 1956-12.

Wildlife

1. (Gran Enciclopedia).
2. (Federal endangered species list).

Coastal Waters - A. Reducing Pollution from waste discharges

1. EQB, Goals and Progress of Statewide Water Quality Management Planning, Annual State 305 (b) Report, Puerto Rico, 1976.
2. Ibid.
3. EQB, Comprehensive Water Quality Management Plan, A Summary Report, Draft, January 1974.
4. See "Energia - usos y implicaciones en Puerto Rico" (EQB) for more information.
5. EQB Water Quality Standards Regulation, 1974, as amended, article 4.7, page 21.
6. P.L. 92-500; Sec. 301(b)(1)(A)-(B).

Coastal Waters - B. Reducing Damage from Oil Spills

1. Telephone interview, U.S. Coast Guard Official, San Juan.
2. California Coastal Plan, p. 35.
3. Puerto Rico and the Sea, p. 74
4. The Federal Deepwater Port Licensing Act of 1974 (P.L. 93-627) created an additional liability fund, the Deepwater Port Liability Fund, Sec. 18 (f) of the Act.

Coastal Waters - C. Minimizing Erosion and Sedimentation

1. DNR, The 1973 Water Resources Assessment for Puerto Rico, April 1974, p. 29.
2. Ibid.
3. A similar recommendation was contained in the report, Puerto Rico's Water Resources Problems and Research Needs; Proceedings of Workshop No. 1, DNR and Water Resources Research Institute, Mayaguez Campus University of Puerto Rico, July 10-12, 1974.

Coastal Waters - D. Minimizing environmental damage from dredging, diking and filling

1. This policy is derived from the California Coastal Plan.

Coastal Forests

1. Lugo, Ariel E. "Terrestrial Coastal Ecosystems of Puerto Rico With Emphasis on the Guanica Subtropical Dry Forest," draft report prepared for the Puerto Rico Department of Natural Resources Coastal Zone Management Project, January 1977.
2. Descriptive material and management recommendations abstracted from The Master Plan for the Commonwealth Forests of Puerto Rico, Department of Natural Resources, October 1976, pp. 51-70.
3. DNR, Area of Planning and Evaluation of Resources, Master Plan for the Commonwealth Forests of Puerto Rico, October 1976

Cultural and Historic Sites

1. Information from the Institute of Puerto Rican Culture.
2. 42FR 6317, 6362 Feb. 1, 1977.
3. Information from the Institute of Puerto Rican Culture.
4. Dept. of Marine Sciences, Univ. of Puerto Rico (Mayaguez), A Marine Atlas of Puerto Rico, 1976.
5. Information from the Institute of Puerto Rican Culture.

Coastal-Dependent Industry

1. (Citation for WRA application for power plant sites).
2. (Citation for Zones of tourism interest)
3. Puerto Rico and the Sea, p. 68
4. EQB, A Regulation for the Control of Atmospheric Pollution, amended version, 1974, Sec. 3.3.3.

Sand for Construction

1. See Environmental Report 1971, EQB for discussion of other alternatives for sand for construction.

Energy

1. Bonnet, Juan A., Jr., and Fernando L. Perez, The Energy Dilemma of Puerto Rico, a paper presented at the UMR-MEC Conference on Energy at the University of Missouri - Rolla, October 12, 1976.
2. Ibid
3. Sanchez, Cordera, and Cladari, "The Struggle for Puerto Rico," Environment, Vol. 7, No. 4, June 1975.
4. Bonnet and Perez, supra.
5. U.S. Nuclear Regulatory Commission, Draft Environmental Statement : Isote Site, North Coast Nuclear Plant, Unit No. 1, August 1976.
6. Ibid.
7. Bonnet and Perez, supra.
8. Ibid.
9. Ibid.

Transportation

1. San Juan Bicycle Transportation Study/Feasibility Study and Preliminary Plan, Dept. of Transportation and Public Works, prepared by TUS Planning, July 1975.

CHAPTER 4

THE COASTAL MANAGEMENT PROGRAM: PRINCIPAL ELEMENTS

CHAPTER 4

THE COASTAL MANAGEMENT PROGRAM: PRINCIPAL ELEMENTS

As Chapter 3 makes clear, Commonwealth and Federal programs already address many of the problems of Puerto Rico's coast. The main thrust of the Coastal Management Program is to extend, refine, and improve those programs, particularly the Commonwealth programs, so that they respond more effectively to coastal problems.

Many of the needed measures have been described in Chapter 3. In discussing reefs, for example, Chapter 3 identified a need for a regulation barring coral extraction. And in discussing flooding, it identified a need for mapping coastal high hazard areas. A full list of the identified needs appears in the Conclusion section of Chapter 3.

Puerto Rico's Coastal Management Program described in this chapter, includes most of the needed measures identified in Chapter 3. (A few are omitted, for reasons that are explained in each case.) Instead of grouping the measures by problem areas (e.g., reefs, flooding), however, this chapter groups them under four broad program elements: Guiding development on public and private property; Active management of coastal resources; Promoting coastal development; Research.

The Program described in this chapter includes additional elements as well. Besides the needs identified in Chapter 3, opportunities to increase program effectiveness are to be found in ongoing measures such as training and enlarging professional staffs and streamlining administrative procedures. Also, because several Commonwealth agencies will need to work together to carry out the Program, an organizational change is needed: establishment of a Coastal Management Unit in the Department of Natural Resources. Needed measures, such as these, are included in Puerto Rico's Coastal Management Program.

The first section of this chapter deals with the first broad program element: Guiding Development on Public and Private Property. The first portion of this section provides a description of development guidance activities already established, including the four Commonwealth agencies principally responsible for those activities. The remainder of the section describes the relevant elements of the Coastal Management Program: policy and regulatory refinements as well as procedural and organizational changes.

The second section of this chapter deals with the second broad program element: Active Management of Coastal Resources. Established activities are described first, followed by program elements intended to improve their effectiveness.

I. GUIDING DEVELOPMENT ON PUBLIC AND PRIVATE PROPERTY

Guiding development on public and private property is one emphasis of the Coastal Management Program. Responsibility for guiding development, on the coast as in the rest of Puerto Rico, falls principally to four Commonwealth agencies:*

The Puerto Rico Planning Board, which, for more than a generation, has played a uniquely powerful role in guiding land use and in integrating the programs of Commonwealth agencies.

The Regulations and Permits Administration, established in 1975, to handle building and use permits and some other operational duties previously handled by the Planning Board.

The Environmental Quality Board, established in 1970, whose responsibilities include the establishment of environmental public policy, as well as pollution control and the processing of environmental impact statements.

The Department of Natural Resources, operating since 1973, which has a number of operational functions pertaining to conservation and natural resources.

These four agencies are described below, with emphasis on their development guidance powers and programs and on principal linkages among them. "The Development Control Process of RPA and the Planning Board" is summarized following the description of the Regulations and Permits Administration. This is followed by a description of program refinements included in the Coastal Management Program.

*In addition to the four principal agencies, other agencies play a role in guiding coastal development. The Institute of Puerto Rican Culture, for example, exercises historic-district controls in Old San Juan and Ponce. And, the Culebra Conservation and Development Authority exercises controls in Culebra.

The third and fourth sections of the chapter deal with the two remaining program elements: Promoting Coastal Development, and Research. For convenience, a summary of Chapter 4 is included in Figure 1.

Figure 4-1

THE COASTAL MANAGEMENT PROGRAM: PRINCIPAL ELEMENTS

I. GUIDING DEVELOPMENT ON PUBLIC AND PRIVATE PROPERTY

1. ONGOING ACTIVITIES: FOUR COMMONWEALTH AGENCIES RESPONSIBLE FOR GUIDING DEVELOPMENT

THE PUERTO RICO PLANNING BOARD
THE REGULATION AND PERMITS ADMINISTRATION
THE DEVELOPMENT CONTROL PROCESS OF RPA AND THE PLANNING BOARD
THE ENVIRONMENTAL QUALITY BOARD
THE DEPARTMENT OF NATURAL RESOURCES
LINKAGES ASSURING CONSISTENT ACTION IN GUIDING DEVELOPMENT

2. IMPROVING COASTAL DEVELOPMENT GUIDANCE

A. REFINING THE POLICIES AND REGULATIONS THAT GUIDE DEVELOPMENT

Policy making in more detail
Mangrove wetland protection: policies established
Beach access: policies established
Coastal-dependent development: policies established

Refining regulations and criteria
Runoff and erosion control (HIGH PRIORITY)
Community facilities along the shorefront
Access dedication requirements
Floodable areas
Dredging and filling

Site specifications: Special Planning Areas and Natural Reserves

Detailed policies, plans, and regulations for Special Planning Areas and Natural Reserves

B. PROCEDURAL AND ORGANIZATIONAL CHANGE: THE COASTAL MANAGEMENT UNIT

Preparing detailed policies and plans for Special Planning Areas and Natural Reserves

Proposing additional Special Planning Areas and Natural Reserves

Participating in the review of development proposals within Special Planning Areas and Natural Reserves and within other portions of the coast

II. ACTIVE MANAGEMENT OF COASTAL RESOURCES

1. ONGOING ACTIVITIES: THE DEPARTMENT OF NATURAL RESOURCES AND OTHER AGENCIES PARTICIPATING IN MANAGING COASTAL RESOURCES

DEPARTMENT OF NATURAL RESOURCES
OTHER AGENCIES

Figure 4-1 (cont.)

2. IMPROVING RESOURCE MANAGEMENT IN COASTAL AREAS

A. BUILDING UP FIELD SERVICES AND FACILITIES

Training and enlarging field staffs
Providing equipment for field staffs
Instructing children and adults about natural systems of the coast
Planning for field services and facilities
Establishing concentrated management areas

B. ORGANIZATIONAL CHANGES

The Coastal Management Unit
Preparing detailed plans for field services and facilities
Coastal overview, monitoring, grant administration

The Ranger Corps ("Cuerpo de Vigilantes de Recursos Naturales")

C. ESTABLISHING A SYSTEM OF NATURAL RESERVES

Preparing legislation

D. CLARIFYING AND EXTENDING PUBLIC PROPERTY RIGHTS IN COASTAL RESOURCES

Buying additional coastal property

Clarifying public property rights
Legislation for registration of exclusionary crown grants
Legislation reaffirming validity of vigilance easement

Obtaining public access rights to surplus Federal beaches
Policy established

E. OTHER MEASURES TO PROTECT COASTAL RESOURCES

Adopting additional regulations: coral extraction; sand extraction; squatter communities; archeological site protection

Updating oil spill contingency plan

III. PROMOTING COASTAL DEVELOPMENT

FEASIBILITY STUDIES OF ALTERNATIVE SOURCES OF SAND FOR CONSTRUCTION

IV. RESEARCH

1. POLICY RESEARCH

Coastal erosion hazards, beach access, geologic hazards

2. ECONOMIC FEASIBILITY STUDIES

Alternative sources of sand for construction

3. RESOURCE AND HAZARD INVENTORIES

Mapping of coastal high-hazard areas (HIGH PRIORITY)
Complete inventory of coral reefs (HIGH PRIORITY)
Detailed resources inventories of Special Planning Areas and Natural Reserves
Field laboratory activities in the Guanica Forest

1. ONGOING ACTIVITIES: FOUR COMMONWEALTH AGENCIES RESPONSIBLE FOR GUIDING DEVELOPMENT

THE PUERTO RICO PLANNING BOARD

The Puerto Rico Planning Board, created in 1942, derives its principal powers from the Puerto Rico Planning Board Organic Act, Law No. 75 of June 24, 1975. The Board seeks to coordinate the activities of all governmental sectors so as to accomplish an integral, balanced development of Puerto Rican society.

Administratively attached to the Office of the Governor, the Board has 3 members (and one alternate member). The Governor appoints all the members and names one as Chairman. The Chairman, in addition to his other duties, serves as executive director of the agency. He is empowered to designate one of the other members as vice-chairman.

The Organic Act requires the Board to adopt three principal kinds of planning documents:

- a. The Integral Development Plan of Puerto Rico. This is to set forth overall strategies for integral development. The plan (and its future amendments) become effective when adopted by the Board and approved by the Governor (Sec. 13).
- b. Land-Use Plans.* These are to be adopted by the Board, although they may be prepared either by the Board or by other governmental entities. After a land-use plan is adopted by the Board and approved by the Governor, compliance with the plan is mandatory: "Every work or project to be performed by any person or entity shall be consistent with the recommendations of the land-use plans..." Land use plans also provide a basis for zoning maps. (Sec. 14). (See Map 22)

*The term "land" is defined by the Planning Board Organic Act (Sec. 3) to include water as well as land.

- c. The Four-Year Investment Program. This is to assure Planning Board control over the plans and programs of the other agencies. The Act specifies (in Sec. 15) that "All the government bodies shall submit to the Planning Board their respective functional and/or operational programs of 4 years, which the Board shall integrate upon preparing and adopting the Four-Year Investment Program...no government body shall develop any work, project, or investment not contemplated within the Program adopted by the Board, unless said work, project, or investment be authorized by the Governor."

Several statutory provisions are intended to assure that property, both public and private, is not used in conflict with adopted plans. First, the Law (Sec. 21) bars any improvement, acquisition, sale, or change in the use of public property unless its proposed location, nature, and extent are free from conflict with the integral development plan, the land-use plans, and the four-year investment program. Second, as already noted, Sec. 14 requires "every work or project to be performed by any person or entity" to be consistent with the recommendations of approved land-use plans. Third, the Board is given broad regulatory powers (Sec. 16). The Board is directed to adopt the following regulations:

- a. Zoning regulations, which may be applied anywhere in Puerto Rico. (Former law restricted zoning to urban and certain other areas.) One of the several elements that may be included in the regulations is designation of areas to be preserved for farming and for natural areas (Sec. 16(1)).
- b. Regulations on Control of the Use of Beaches, Bathing Resorts, and other Bodies of Water (Section 16(2)). No such regulation has been prepared or adopted, however.*
- c. Subdivision Regulation. The law directs the Board to take into account, among other matters, the desirability of avoiding subdivision in areas not ready for development because of a lack of public facilities; distance from other built-up areas; the agricultural importance or exceptional beauty of the land; or other analagous social, economic, physical, or environmental deficiencies (Sec. 16(3)).

*The possible benefits of such a regulation--for example, to encourage private investment for the development of publicly-owned beaches--have been noted in Chapter 3, in the sections on Beaches and Recreation.

PARQUES INDUSTRIALES □ INDUSTRIAL PARKS

DESARROLLO URBANO BASADO EN POLITICAS PUBLICAS PROPUESTAS POR LA JUNTA DE PLANIFICACION

URBAN DEVELOPMENT BASED ON PROPOSED POLICY BY PLANNING BOARD

TERRENOS CUYO POTENCIAL DE PRODUCCION AGRICOLA ESTA CLASIFICADO DEL I AL IV DE ACUERDO AL SERVICIO DE CONSERVACION DE SUELOS DE LOS ESTADOS UNIDOS

LANDS WHERE THE AGRICULTURAL PRODUCTION POTENTIAL HAS BEEN CLASSIFIED AS RANGING BETWEEN I TO IV BY THE U.S. SOIL CONSERVATION SERVICE.

AREAS DE IMPORTANCIA AMBIENTAL, NATURAL Y CULTURAL

AREAS OF NATURAL, ENVIRONMENTAL AND CULTURAL IMPORTANCE

PUERTOS INDUSTRIALES

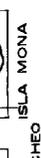
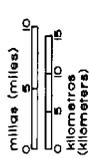
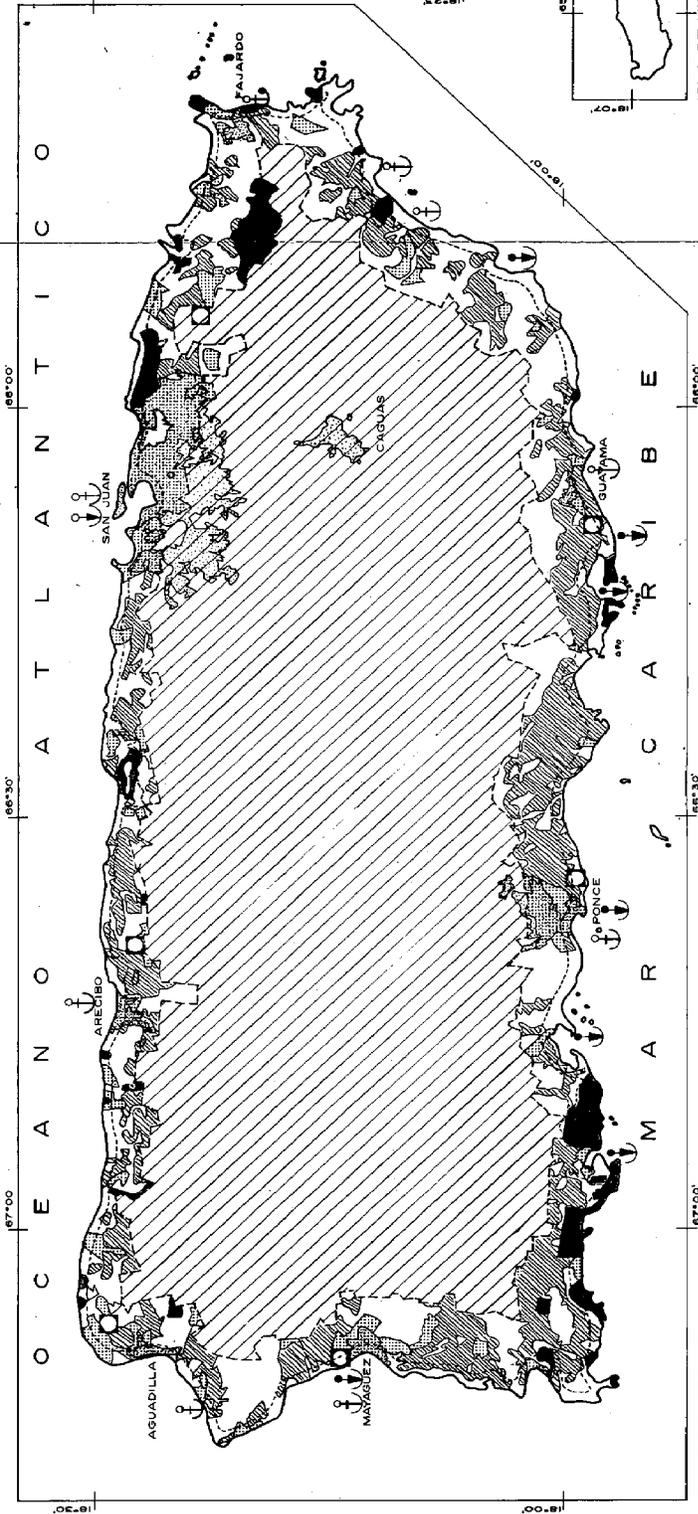
INDUSTRIAL PORTS

PUERTOS COMERCIALES

COMMERCIAL PORTS

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO - - - - - STUDY AREA INLAND BOUNDARY

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



ISLA DE PUERTO RICO
 FUENTE DE INFORMACION / SOURCE:

SORRADOR PARA DISEÑAR EN VISTAS PUBLICAS:
 PROYECTO SOBRE LOS OBJETIVOS Y POLITICAS
 DE DESARROLLO URBANO BASADO EN POLITICAS
 PUBLICAS PROPUESTAS POR LA JUNTA DE PLANIFICACION
 SANTURCE, P.R.

ILUSTRACION GRAFICA DE LOS OBJETIVOS Y POLITICAS PUBLICAS
 ISLANDWIDE LAND USE POLICIES ILLUSTRATIVE MAP

In special cases, where application of regulations would be impractical and where approval of a project would be undesirable because of factors such as health, safety, order, public improvements, more adequate use of the lands, environmental conditions, or exceptional beauty, the Board may deny authorization for projects even if they comply with applicable regulations (Sec. 17).

Plans adopted by the Board. The Objectives and Policies element of the Board's Islandwide Land Use Plan, quoted in Chapter 2, was formally adopted by the Board on June 8, 1977, and approved by the Governor on June 22, 1977. The Board has also adopted, in principle, Urban Expansion Plans for each municipality (except those in the San Juan Metropolitan Area). A draft of the Integral Development Plan is currently being reviewed by the Board. This Coastal Management Program document will, by virtue of its adoption by the Board and approval by the Governor, constitute the coastal element of the Land Use Plan.

Regulations adopted by the Board. A number of planning regulations have been adopted by the Board. Some of these apply throughout the Commonwealth, while others apply only in limited areas. The more important of these regulations are the following:

Reg. No. 3: The Subdivision Regulation, controls land subdivision everywhere in Puerto Rico. It exempts only subdivisions in rural areas creating lots of at least 25 cuerdas each, for agricultural use.

Reg. No. 4: The Zoning Regulation, controls development in any area for which the Board has adopted zoning maps. Much of the coast is subject to the Zoning Regulations (see Map 23); the remainder, though unzoned, is subject to other development controls as described below in the section on "The Development Control Process of RPA and The Planning Board."

Reg. No. 7: The Building Regulation, establishes a building code applicable everywhere in Puerto Rico.

Reg. No. 9: The Neighborhood Facilities Regulation, prescribes the improvements that subdividers must provide in new developments. The regulation applies everywhere in Puerto Rico.

Reg. No. 11: The Simple Subdivision Regulation, provides standards, which are often less strict than those otherwise applicable under Regs. No. 3 and 4, for "simple" subdivisions (those containing no more than 10 lots and requiring only "simple" public facilities).

Reg. No. 12: Regulation for the Certification of Construction Projects, provides for the certification of construction plans by architects and engineers as a means to facilitate issuance of construction and use permits.

Reg. No. 13: The Floodable Areas Regulation, restricts construction in areas subject to flooding. It applies to floodable areas everywhere in Puerto Rico.

"A-95" Agency. The Planning Board derives additional control powers by virtue of its designation as the Commonwealth's clearing house for purposes of U.S. Office of Management and Budget Circular A-95.*

Judicial Review of Planning Board Decisions. Planning Board decisions are subject to judicial review as described below in "The Development Control Process of RPA and the Planning Board."

THE REGULATIONS AND PERMITS ADMINISTRATION

The Regulations and Permits Administration (RPA), created in 1975, derives its power from its Organic Act, Law No. 76 of June 24, 1975. The agency was established to handle permitting and other operational duties previously handled by the Planning Board.

RPA is headed by an Administrator, who is appointed by the Governor. Permitting lies at the heart of RPA's duties. Under the RPA Organic Act (Sec. 17), no building may be built, altered, or moved, nor may any facilities be installed, nor may any land be subdivided or developed or urbanized, without authorization of RPA. The Administrator may dispense with permit requirements, however, for certain buildings in those unzoned areas having population densities of no more than four families per cuerda (Sec. 20). RPA also grant variances in cases of hardship (Sec. 10).

RPA exercises additional powers delegated to it by the Planning Board pursuant to its Organic Act (Sec. 11, clause 19). Such delegated powers must be exercised consistently with Board policies and regulations.

Most of the regulations and standards applied by RPA in exercising its powers are established by the Planning Board. RPA does have power to adopt some additional regulations (e.g., those governing simple subdivisions (Sec. 9)). All, however, must be approved by the Planning Board (Sec. 7), except emergency regulations, which must be approved by the Governor (Sec. 15).

*As explained in Appendix B, the Planning Board will also have extensive responsibility for Federal consistency procedures established pursuant to section 307 of the Coastal Zone Management Act (CZMA).

**DISTRICTS ZONED LOW DENSITY RESIDENTIAL
(WITH A MINIMUM SIZED LOT OF 8,000 SQUARE METERS)**



**DISTRITOS ZONIFICADOS RESIDENCIALES DE BAJA
DENSIDAD POBLACIONAL
(CON SOLAR MINIMO DE 8000 METROS CUADRADOS)**

**TODOS LOS DISTRITOS ZONIFICADOS RESTANTES
(RESIDENCIAL, COMERCIAL, INDUSTRIAL, PUBLICO, DETERIORADO)**

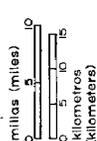
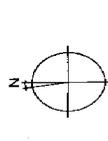
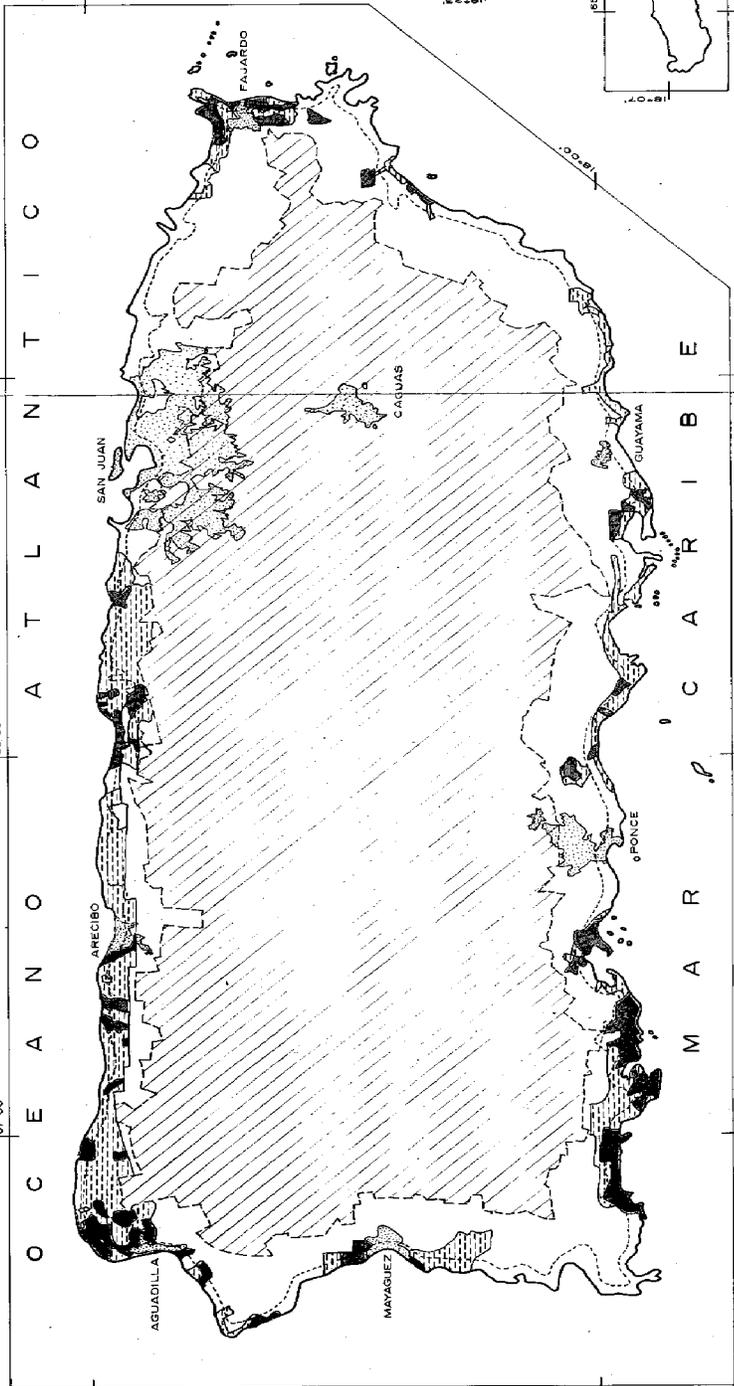


**ALL OTHER ZONED DISTRICTS
(RESIDENTIAL, COMMERCIAL, INDUSTRIAL, PUBLIC, DETERIORATED)**

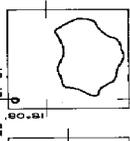
DISTRITOS NO ZONIFICADOS



LIMITE TERRIESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY
 Financial assistance provided in part by Coastal Zone Management Act of 1972, administered
 by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



ISLA DE CULEBRA



ISLA DE SECHECHO



ISLA DE VIEQUES

ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:
 MAPAS COMPAÑADOS DE ZONIFICACION
 DE PUERTO RICO DE PUERTO RICO
 OFICINA DEL GOBERNADOR
 JUNTA DE PLANEACION, SANTURCE, P.R.

A five-member Board of Appeals on Constructions and Subdivisions, whose members are appointed by the Governor, hears appeals from certain decisions of RPA (Sec. 30). The Board may not, however, alter any Land Use Plan adopted by the Planning Board or review decisions on project locations or densities. Board of Appeals decisions are subject to judicial review, solely on issues of law, on petition of RPA, the Planning Board, or any aggrieved party.

THE DEVELOPMENT CONTROL PROCESS OF RPA AND THE PLANNING BOARD

Statutes, regulations, and Planning Board resolutions establish the principal development control process applicable in Puerto Rico. In general, major development is subject to review in all areas. In zoned areas, regulations apply even to minor development (e.g., homes on individual lots).

In zoned areas, all development requires a building permit from RPA. Two principal issues must be resolved before RPA can grant a permit:

First, does the proposed project comply with applicable zoning?

Second, is the project classified, by Planning Board Resolution JPI-12-1, as one that presents no risk of causing significant environmental impact? (The zoning classification, the nature of the project, and its proximity to natural and other features all affect its classification under this resolution.) For example, a project is deemed potentially significant if it is located within 100 meters of a lake or mangrove, or within 50 meters of a river or other specified feature, or involves leveling of land to a height or depth of more than 3 meters, or is located outside zoning districts specified for each use.

If the project both complies with zoning and is classified as environmentally insignificant, RPA grants a permit. If the project complies with zoning but is not classified as environmentally insignificant, RPA submits the project to the Planning Board for review before deciding to grant or deny the permit. (The Board, if appropriate, seeks advice from the EQB or DNR before making its recommendation to RPA.) If the project does not comply with zoning because of the proposed use or density, no permit can be granted unless the project is reviewed and approved by the Planning Board.

In addition, urbanizations in zoned areas require Planning Board approval under other regulations, including Reg. No. 3, The Subdivision Regulation, and Reg. No. 9, The Neighborhood Facilities Regulation.

In unzoned areas, RPA has waived building permits pursuant to the RPA Organic Act, for many types of development. Most large projects, however, are subject to permit requirements or are otherwise controlled:

Urbanization (generally, residential projects that create 11 or more lots or condominium units) are subject to discretionary review and approval by the Planning Board, pursuant to Board Resolution P-139. In reviewing these projects, the Board normally determines compliance with the urban expansion plans that have been approved in principle for nearly all municipalities. (After adoption of this coastal program document as an element of the Board's Islandwide Land-Use Plan, the Board will also determine compliance with this document.)

Simple subdivisions (less than 11 lots) are subject to discretionary subdivision review by RPA pursuant to Planning Reg. No. 11.

Any industrial project, commercial center, hotel, "villa turistica," or "trailer camp," requires a building permit, pursuant to a directive by the Planning Board and agreement between RPA and the Planning Board (July 21, 1976, as revised June 8, 1977). Before approval, RPA submits these projects to the Planning Board for review. Although these projects need not be located within urban expansion limits, the Board reviews them for compliance with its Islandwide Land Use Plan. (After adoption of this document as an element of that Plan, the Board will also determine compliance with this document.)*

The statute authorizes appeals from control decisions of RPA and the Planning Board. In the case of RPA:

Many decisions are appealable to the five-member Board of Appeals on Constructions and Subdivisions, already described. The types of decisions appealable are specified in Sec. 30 of the RPA Organic Act. Decisions of the Board of Appeals are judicially reviewable.

RPA decisions on housing development cases are also judicially reviewable (on matters of law only). (Sec. 32, RPA Organic Act.)

Certain RPA decisions, taken pursuant to Planning Board delegations, are reviewable in the same manner as Board decisions. (Sec.32(c), Planning Board Organic Act.)

*Additional review procedures for development within Special Planning Areas and Natural Reserves established by the Coastal Management Program are set forth below.

Planning Board decisions are appealable as follows:

Decisions disapproving public works projects are appealable to the Governor. (Sec. 21, Planning Board Organic Act)

"Any party aggrieved by an action, decision, or resolution" of the Board, "in its adjudicatory function" may (after seeking reconsideration by the Board) file a petition for review in the Superior Court of Puerto Rico. Review is limited to matters of law. (Sec. 32(a), Planning Board Organic Act)

"Quasi-legislative" decisions, such as the adoption or amendment of regulations, are final, subject only to challenge within 30 days for noncompliance with statutory requirements for adoption or promulgation. (Sec. 32(b), Planning Board Organic Act)

THE ENVIRONMENTAL QUALITY BOARD

The Environmental Quality Board (EQB) derives its powers from Law No. 9 of June 18, 1970, as amended. The Act establishes a Commonwealth environmental policy virtually identical to that established for the United States by the National Environmental Policy Act of 1969 (NEPA).

Administratively attached to the Office of the Governor, the Board has eight members. Five of these are ex-officio: the Secretaries of Agriculture, Health, Natural Resources, and Transportation and Public Works, and the Chairman of the Planning Board. The three remaining members are appointed by the Governor. The staff of the Board is headed by an Executive Director, who is also appointed by the Governor.

Although the EQB has broad responsibilities, two are of particular importance in guiding public and private development of coastal areas:

Environmental impact statements. Law No. 9 requires the preparation of environmental impact statements in connection with governmental actions significantly affecting the environment. Responsibility for administering the requirement is assigned to the EQB. The requirement of Law No. 9 is substantially identical to the one contained in NEPA, and the administrative responsibilities of EQB for impact statements are comparable to those of the U.S. Council on Environmental Quality.

Pollution control. The EQB is the Commonwealth agency responsible for air and water pollution control. It adopts and administers pollution-control plans, standards, and regulations, and it receives Federal aid under the Clean Air Act and the Water Pollution Control Act Amendments of 1972. (The EQB does not build or operate wastewater treatment facilities, however; those are the responsibility of the Puerto Rico Aqueduct and Sewer Authority.) EQB also certifies Federal NPDES permits for wastewater discharge, prior to their issuance by the U.S. Environmental Protection Agency, pursuant to the Federal Water Pollution Control Act Amendments of 1972, as amended.

The EQB is also the Commonwealth agency responsible for control of solid waste. Actual collection and disposal of solid waste, however, is carried out by municipalities.

Law No. 9 gives the EQB broad powers to adopt and enforce regulations, including the power to issue cease and desist orders, and to request execution of such orders in the event of noncompliance.

Coordination between the EQB and the Planning Board is mandated by the Planning Board Organic Act (Sec. 25). All plans and policies formulated by the Environmental Quality Board must, immediately after their preliminary approval, be submitted to the Planning Board so that it may determine their conformity with integral development policies and strategies of the Planning Board. If an impasse develops between the agencies, the Governor is empowered to resolve it.

THE DEPARTMENT OF NATURAL RESOURCES

The Department of Natural Resources (DNR), which began operating in 1973, derives its powers from its Organic Law, Law No. 23 of June 20, 1972, and from earlier laws establishing programs that were transferred to DNR by its Organic Law. The Law directs that the Department discharge its operational responsibilities consistently with public policies established by the Environmental Quality Board.

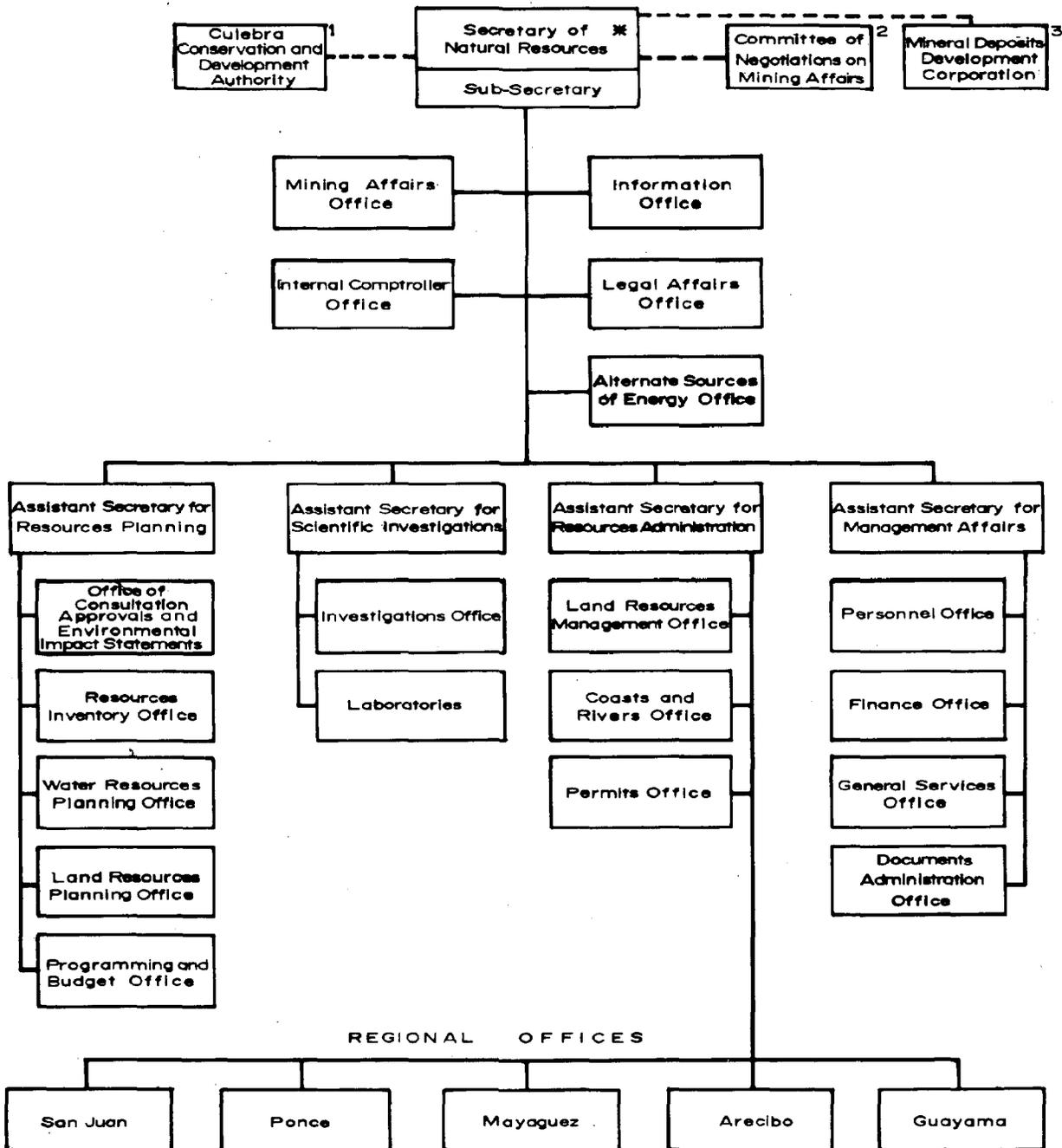
The Department of Natural Resources is a cabinet-level agency, headed by the Secretary of Natural Resources.

Among the statutory responsibilities of the Department are those relating to:

1. "Economic minerals," including the granting of mining concessions.
(Art. 6(a) of the Department's Organic Law.)
2. Water, including the granting of franchises for the use of public waters.
(Art. 5(q), Art. 6(d), and (g))

DEPARTMENT OF NATURAL RESOURCES

ORGANIZATIONAL DIAGRAM



1 Appointed Organization

2 Counseling Group

3 Autonomous Corporation, the norms of which are adopted by the Secretary of Natural Resources

* Coastal Management Unit and Ranger Corps attached to the Office of the Secretary

3. Sand and other "materials from the earth's crust," including the regulation of sand extraction (Art. 6(c)).*
4. Wildlife and sportfish, including the regulation of hunting and fishing (Art. 6(f)).
5. Forests, including the management of Commonwealth forests (Art. 6(f)).
6. Territorial waters, submerged lands, and the maritime-terrestrial zone, including the granting of permits and franchises for the use thereof (Art. 5(h)).*

Although most of the Department's efforts are related to the management and protection of resources (and are, therefore, considered in the next section of this chapter), the Department does participate in the development guidance process:

Of particular importance to the coastal management program is DNR's power to endorse or disapprove applications for dredging or for construction of piers and other structures in navigable waters. When a Corps permit is required, the Corps does not grant them if the Department denies an endorsement.

The Department also reviews and comments on (1) Draft Environmental Impact Statements referred to it by the Environmental Quality Board, and, (2) major development applications referred to it by the Planning Board and RPA.

LINKAGES ASSURING CONSISTENT ACTION IN GUIDING DEVELOPMENT

Numerous linkages assure consistent action, not only by the four agencies principally responsible for development guidance, but also by the other Commonwealth agencies and corporations. The linkages fall into three categories: (a) linkages at the level of policies and plans, (b) linkages at the level of regulatory adoption and amendment, and (c) linkages at the level of permitting and project review.

*Federal law appears to prohibit extraction of resources from the submerged lands surrounding Puerto Rico. Proposed legislation (H.R. 7827) would confirm Commonwealth ownership of submerged resources and clarify the right of the Commonwealth to authorize extraction.

- a. Linkages at the level of policies and plans. As already noted, this Coastal Management Program document will, by virtue of its adoption by the Planning Board and approval by the Governor, constitute the coastal element of the Planning Board's Islandwide Land Use Plan. As such, it will establish Commonwealth policy with respect to coastal management. Compliance by all Commonwealth agencies will, thereafter, be required by statutory provisions already described.
- Moreover, the Planning Board has a continuing obligation, established by Sec. 13(3) of its Organic Act, to advise, coordinate, and assist government bodies in the "preparation, adoption, and implementation of their respective functional and sectorial plans and programs..." This obligation includes the coastal management sector, for which the Department of Natural Resources has responsibility.
- DNR, as already noted, is required by its own Organic Law to discharge its operational responsibilities consistently with policies established by EQB. Moreover, it is required by the Planning Board Organic Act to submit its functional and operational four-year program to the Planning Board for integration into the Four-Year Investment Program. The Planning Board prepares guides for use by the Department and other agencies in preparing their functional and operational programs.
- EQB, as already noted, is required by the Planning Board Organic Act, to submit any proposed policies to the Planning Board, so that it may determine conformity with integral development policies and strategies of the Planning Board.
- Policy coordination between the Planning Board and RPA is assured because RPA's principal duty is to administer regulations adopted by the Board. RPA's own regulations require approval by the Board. And RPA is required, by statute, as already indicated, to exercise delegated responsibilities consistently with Board plans and policies, as well as to maintain close liaison with the Board, EQB, and DNR.
- b. Linkages at the regulatory level. At the regulatory level, all four agencies principally responsible for development guidance may adopt or amend regulations. Informal consultation among the agencies, at executive, as well as staff levels, provides continual linkage, which is supplemented by technical consultation via required public hearings. Among links at the regulatory level are these:

Planning Board. The Board's Land Use Plans (including this coastal element of the Board's Islandwide Use Plan) serve as a basis for zoning maps. All Board regulations and amendments become formally effective only when signed by the Governor.

RPA. Regulations adopted by RPA do not become effective until approved by the Planning Board (except emergency regulations, which require approval of the Governor).

EQB. EQB regulations and amendments must be approved by an eight-member Board whose membership includes the Chairman of the Planning Board, the Secretary of Natural Resources, and three other cabinet members.

DNR. The few DNR regulations that guide development do not require formal approval by other agencies. Nevertheless, informal referral and consultation, at both staff and executive levels, occur as a matter of course with the Planning Board and EQB. (DNR is, of course, the Commonwealth agency bearing sectorial responsibility for coastal management, so interagency linkages are not critical to assure adherence to coastal management policies.)

- c. Linkages at the level of permitting and project review. At the level of permitting and project review, informal and formal linkages are also extensive.

As already described, statutory provisions require public projects to be in compliance with Planning Board plans and programs. To assure compliance, public projects are individually reviewed by the Board (site approvals), or RPA (other elements). After site approval by the Board, additional elements (e.g., construction plans) of some types of projects are exempt from additional review. The Board's review process includes the referral of many project proposals to the EQB and DNR for their comments.

Private projects subject to development controls are reviewed individually by the Board or RPA, as explained above in the section on the "Development Control Process of RPA and the Planning Board." These projects, too, are often referred to DNR and EQB, and often other agencies as well, for comment or consultation. RPA has the power and duty to establish close coordination with the Planning Board, EQB, and DNR. (Sec. 5(r) of RPA Organic Act.)

In addition, many Federally-funded projects require A-95 clearance. The Planning Board is the A-95 agency.

Projects having significant environmental impact are subject to Environmental Impact Statement requirements of Commonwealth law, administered by the EQB. EQB routinely refers EIS's to DNR and other agencies for comment and coordinates its review with the Planning Board.

DNR grants Commonwealth endorsements for Corps of Engineers permits. Requests for such endorsements are transmitted to DNR by the Planning Board as part of its review of project proposals.

2. IMPROVING COASTAL DEVELOPMENT GUIDANCE

Puerto Rico's traditional process for guiding development provides essential control for coastal management. But, there are important opportunities to make the process more effective. Many needed refinements of the process have been identified in Chapter 3 as responses to specific coastal problems; these are included in the Coastal Management Program described below. In addition, the Program includes a number of other improvements not previously identified; these include organizational and procedural changes and measures to increase staff capabilities.

A. REFINING THE POLICIES AND REGULATIONS THAT GUIDE DEVELOPMENT

Puerto Rico's traditional process for guiding major projects is characterized by broad policies applied on a discretionary basis to individual development proposals. This approach remains the best one available in many situations where facts are too complex or rapidly changing to permit the reconciliation of policy conflicts before development is proposed. Wherever possible, however, the Coastal Management Program seeks to refine policies and regulations so that they may provide clear early guidance. These refinements are intended both to increase the effectiveness of the guidance process and to alleviate hardships sometimes created by its uncertainties.

The Coastal Management Program includes several kinds of policy and regulatory refinements, as described below. Some of these are accomplished by the adoption of this Program document. Others are to be accomplished as rapidly as practicable under Puerto Rico's Coastal Management Program.

- (1) Policymaking in more detail. The program includes the establishment of policies, in greater detail than the general policy statements previously adopted, to govern the following:

Mangrove wetlands (for which the new, more detailed policies are set forth in Chapter 3, in the section on Mangrove Wetlands;

Beach access (for which the new, more detailed policies are set forth in Chapter 3, in the section on Beaches); and

Coastal development (for which the new, more detailed policies are set forth in Chapter 3, in the section on Coastal-Dependent Industry).

This program document, by virtue of its adoption as an element of the Planning Board's Land Use Plan, establishes these policies.

- (2) Refining regulations and criteria for improving development guidance. The program includes the revision of regulations and criteria governing the following:

Runoff and erosion control (HIGH PRIORITY) (as discussed in Chapter 3, in the section on Coastal Waters);

Community facilities along the shorefront (as discussed in Chapter 3, in the section on Beaches);

Access dedication requirements (as discussed in Chapter 3, in section on Beaches);

Floodable areas (as discussed in Chapter 3, in sections on Flooding, Mangrove Wetlands and Dunes);

Dredging and filling (as discussed in Chapter 3, in section on Coastal Waters).

These revisions are to be prepared and adopted as rapidly as practicable:

Federal Coastal Zone Management funds (306 funds) may be requested for this purpose.*

*Section 306 funds are funds available pursuant to the Federal Coastal Zone Management Act of 1972, for implementation of state coastal management programs. Under some circumstances, funds may also be available to Puerto Rico under other sections of that Act.

(3) Site specifications: Special Planning Areas and Natural Reserves

The Program includes designation of Special Planning Areas* and the recommendation of several sites for future designation as Natural Reserves.*

(a) Special Planning Areas

Special Planning Areas are defined as important coastal resource areas subject to serious present or potential use conflicts, and, therefore, requiring detailed planning. The following are hereby designated as Special Planning Areas:

- All mangrove wetlands; and
- The following areas as shown on Map 29:
 - A. Boca de Cangrejos Special Planning Area
 - B. Pandura-Guardarraya Special Planning Area
 - C. Jobos Bay Special Planning Area
 - D. Southwest Special Planning Area
 - E. Isabela Special Planning Area
 - F. Laguna Tortuguero Special Planning Area
 - G. Vieques Special Planning Area

(b) Natural Reserves

Natural Reserves are important coastal resource areas, subject to serious present or potential use conflicts, which are to be preserved in substantially their present condition (or, in the case of natural areas whose restoration is practicable, restored to their previous natural condition). The following areas, as shown on Map 29, are hereby recommended for future designation as Natural Reserves:

*For convenience of the general public in reviewing this document, the terms "Special Planning Areas" and "Natural Reserves" are used in place of the terms "Areas of Particular Concern" and "Areas for Preservation and Restoration" used in Federal regulations.

1. Constitution Bridge Mudflats Reserve
2. Piñones Forest Reserve
3. Torrecilla Alta Pterocarpus Forest Reserve
4. Río Espíritu Santo Reserve
5. El Faro Reserve
6. La Cordillera Reef Reserve
7. Ceiba State Forest Reserve
8. Humacao Swamp and Pterocarpus Forest Reserve
9. Guayama Reef Reserve
10. Jobos Bay and Mar Negro Reserve
11. Punta Petrona Reserve
12. Caja de Muertos Reserve
13. Guanica Forest Reserve
14. La Parguera Reserve
15. Boquerón Reserve
16. Laguna Joyuda Mangroves Reserve
17. Tourmalines Reefs Reserve
18. Espinar Swamp Reserve
19. Arecibo Lighthouse Reserve
20. Caño Tiburones Reserve
21. Cueva del Indio Reserve
22. Hacienda la Esperanza Reserve
23. Laguna Tortuguero Reserve
24. Dorado Pterocarpus Forest Reserve
25. Mona and Monito Islands Reserve
26. Vieques Bioluminescent Bays Reserve

The Special Planning Areas listed are not the only coastal resource areas subject to serious use conflicts, and the Natural Reserves listed are not the only coastal resource areas that warrant preservation. It may be possible, as planning proceeds, to establish additional Planning Areas and Reserves in the future. Even without these designations, all of Puerto Rico is subject to Commonwealth planning and regulatory processes intended to reconcile use conflicts. And, general policies calling for the protection of natural areas apply to all such areas, not just to Natural Reserves.

The Planning Area and Reserve designations do have important consequences, however. One consequence is to specify these as areas deserving priority in the allocation of scarce public resources for inventorying, planning, regulation, enforcement, and the provision of public facilities and services consistent with their planned uses. An additional consequence of Natural Reserve designation (though not of Special Planning Area designation) is to specify these as areas in which preservation and restoration are the dominant public policies--and from which activities inconsistent with preservation and restoration are therefore to be excluded, except in cases of overriding public necessity.

This program document, by virtue of its adoption as an element of the Planning Board's Land Use Plan, establishes the Special Planning Areas listed above, and recommends future establishment of the Natural Reserves listed above. Future designation of Natural Reserves will be formalized by statute or by amendment of the Board's Land Use Plan.

- (4) Detailed policies, plans and regulations for Special Planning Areas and Natural Reserves. Designation of Planning Areas and Reserves is only the first step toward assuring wise use of these resource areas. Continuing management efforts are essential. One element of those management efforts will be continuing refinement of the policies, plans, and regulations that guide development in Planning Areas and Reserves.

Policies: Detailed policies, such as the mangrove wetlands protection policies established by this program document, strengthen the process that controls development in Special Planning Areas and Natural Reserves. The Coastal Management Program includes, as a continuing element, the preparation of additional detailed policies, comparable to those already established for mangrove wetlands, to guide development of other resource features designated as Special Planning Areas and Natural Reserves. Federal Coastal Zone Management funds may be requested for this purpose.

Plans: Detailed plans, based on resource inventories and full consideration of use alternatives, present additional opportunities to optimize the use of these areas. The Planning Board has already adopted such a plan for the Laguna Tortuguero Special Planning Area, and draft plans have been prepared for the Commonwealth forests. The Coastal Management Program includes the preparation of detailed plans for additional areas designated as Special Planning Areas and Natural Reserves. Federal Coastal Zone Management funds may be requested for this purpose.

Regulations: The development control process appears largely adequate to control development within Special Planning Areas and Natural Reserves. This is clearly the case in the many areas owned by the Commonwealth government or its

instrumentalities. Even for areas in private ownership, there should be few instances of inconsistent development. To minimize these instances, the Commonwealth will rely on its development control powers (including the application of those powers to require the "clustering" of development on those portions of private lands that are not designated as Natural Reserves). The Commonwealth will also rely on the denial of Federal dredge and fill permits for activities inconsistent with approved policies and plans (and, if necessary, on denial of Commonwealth endorsements necessary to obtain those permits). In some instances, however, it may prove desirable to supplement these measures with special zoning regulations so that minor, as well as major, development will be controlled. The Coastal Management Program includes the preparation of any special zoning designations that prove desirable to provide additional protection for Special Planning Areas and Natural Reserves. Federal Coastal Zone Management funds may be requested for this purpose.

B. PROCEDURAL AND ORGANIZATIONAL CHANGE: THE COASTAL MANAGEMENT UNIT

The Commonwealth agencies responsible for development guidance in the coastal zone are chronically short of staff members trained in the professional disciplines necessary for protection of natural areas and systems. Accordingly, the Program includes the hiring of additional professionals, coupled with the procedural and institutional changes that will bring their skills to bear on important coastal development problems.

To this end, the Program includes the establishment of a Coastal Management Unit, which will include specialized professionals competent to evaluate the impact of development on natural systems. The Unit, administratively located in the Office of the Secretary of Natural Resources, will have several responsibilities, of which three affect development control.

(Additional responsibilities are described below.) These three responsibilities are:

(1) Preparing detailed policies and plans for Special Planning Areas and Natural Reserves

The Coastal Management Unit will have primary responsibility for preparing detailed policies and plans for areas designated as Special Planning Areas and Natural Reserves. Working closely with the staff of the Planning Board, the Unit will prepare draft plans for submission to the Secretary of Natural Resources who, after any appropriate modifications, will submit them to the Planning Board with a recommendation that they be incorporated as elements of the Board's Land Use Plan.

(2) Proposing additional Special Planning Areas and Natural Reserves

The Coastal Management Unit will also have primary responsibility for recommending the designation of additional areas as Special Planning Areas and Natural Reserves. Such recommendations, together with the inventories and studies necessary to support them, will be submitted to the Secretary of Natural Resources who, after any appropriate modifications, will submit them to the Planning Board with a recommendation that they be incorporated as elements of the Board's Land Use Plan.

(3) Participating in the Review of Development Proposals

As the principal source of expertise on the impact of development on coastal systems, the Unit will assist the Secretary of Natural Resources in carrying out the following responsibilities for reviewing coastal development:

(a) Within Special Planning Areas and Natural Reserves: Neither the Planning Board, the Department of Natural Resources, the Environmental Quality Board, nor the Regulations and Permits Administration will grant any permit or approval (including A-95 clearance) for the kinds of development specified below, until the Secretary of Natural Resources has had a reasonable opportunity (not less than 30 days) to evaluate the impact of the proposed development on natural systems.

Within Special Planning Areas, other than mangrove wetlands: This mandatory referral will occur before approval of any land subdivision, urbanization, industrial project, commercial center, hotel, or "villa turistica," and, before approval of any development of the publicly-owned maritime zone ("zona maritimo-terrestre"), or of coastal waters or submerged lands.

Within mangrove wetlands and Natural Reserves: This mandatory referral will occur before approval of development of any kind.

Assisted by the Secretary's evaluation of impact on natural systems, the originating agency will proceed to make its decision in accordance with applicable laws, regulations, and plans, including this document after its adoption as an element of the Planning Board's Islandwide Land Use Plan.

(b) Within other portions of the coast: Whenever the Department of Natural Resources reviews proposals for coastal development, including proposals referred to it by other agencies, the Department will not approve such proposals if such proposals are inconsistent with this Management Program.*

Organizational changes--specifically, the formation of the Coastal Management Unit--can facilitate implementation of the above program elements by DNR. This change can aid forceful implementation by establishing a focus of responsibility within the Department for coastal management.

*Federal consultation and consistency are discussed in Appendix B.

II. ACTIVE MANAGEMENT OF COASTAL RESOURCES

Actively managing coastal resources is a second emphasis of Puerto Rico's Coastal Management Program. This management includes measures to protect and maintain the resources--through permitting, franchising, surveillance, enforcement, and the like. It also includes measures to enhance public use and enjoyment of the resources--through such measures as property acquisition, beach cleaning, and the provision of appropriate recreational facilities.

The Department of Natural Resources has principal responsibility for management of Puerto Rico's coastal resources. This section, after describing the Department and noting other Commonwealth agencies that also participate in management, describes management improvements included in the Coastal Management Program.

1. ONGOING ACTIVITIES: THE DEPARTMENT OF NATURAL RESOURCES AND OTHER AGENCIES PARTICIPATING IN MANAGING COASTAL RESOURCES

Paramount responsibility for managing coastal resources falls to the Department of Natural Resources. Other agencies contribute to management, however, most often by managing portions of the coast over which they have custody.

THE DEPARTMENT OF NATURAL RESOURCES

The Department of Natural Resources, in addition to the development control responsibilities described in the previous section, has extensive responsibilities for affirmative management of coastal resources. These include regulatory and franchise powers as well as responsibilities arising from Departmental custody of extensive coastal areas.

Regulatory and franchise responsibilities of the Department pertain to four principal kinds of resources--"economic minerals," sand and gravel, water, fish and wildlife (See Organization Chart):

- "Economic minerals": As explained in Chapter 3, copper, nickel, and petroleum, are among the minerals that may be suitable for commercial extraction in Puerto Rico.
- Sand and other "materials from the earth's crust" are also a responsibility of the Department. As described in Chapter 3, regulations governing the extraction of these materials from public and private property are adopted and administered by the Department.

- Water: Departmental management of ground waters is exercised principally through a permitting system that controls the quantity and rate of groundwater extraction. With respect to surface waters, dredging or filling require a permit from the U.S. Corps of Engineers. The Department can prevent the granting of a Corps permit by denying an endorsement.
- Fish and Wildlife: The Department has responsibility for managing sport fish and wildlife resources. As explained in Chapter 3, this responsibility includes habitat modification and preservation, inventory of species and populations, and regulation of sport fishing and hunting activities.

The Department also has jurisdiction over extensive public lands, including:

- The Commonwealth forests. As indicated in Chapter 3, in the sections on Mangrove Wetlands and Coastal Forests, some Commonwealth forests are wholly or partly within the coastal zone. These include the Guanica Dry Forest and mangroves in four other forests.
- Territorial waters, submerged lands, and the maritime zone,* including public beaches, except those relatively limited areas assigned by law to the custody of other agencies.

Other Agencies

Among other agencies that have some responsibility for management of coastal resources, several administer publicly owned portions of the coast. These include:

- The Public Parks and Recreation Administration, which administers 13 bathing beaches. (See Chapter 3, sections on Beaches, Recreation.)
- The Puerto Rico Ports Authority, linked to the Department of Transportation and Public Works, which administers 15 ports and 13 airports. (See Chapter 3, section on Transportation.)
- The Institute of Puerto Rican Culture, which administers numerous Commonwealth-owned historic and cultural monuments in the coastal area. (See Chapter 3, section on Cultural and Historic Sites.)
- Several agencies whose operations include the administration of some sites in the coastal zone. These include the Water Resources Authority (power plants), the Aqueduct and Sewer Authority (sewage treatment plants and outfalls), the Land Authority (agricultural land), and the Land Administration (agricultural and other land).

*The "space on the coasts...that is bathed by the sea in its ebb and flow."
Law of Piers and Ports of 1968, Sec. 2103(n).

In addition to these operating agencies, two other entities deserve mention as participants in the active management of coastal resources:

- The Tourism Development Company which, as part of its overall mission, assists in beach cleaning, as described in Chapter 3, in the section on Beaches.
- The Puerto Rico Conservation Trust, organized as a charitable trust with governmentally-appointed trustees, administers a fund of several million dollars (contributed by some of the Island's major petroleum refiners) for acquiring or preserving natural areas. The Trust has acquired in recent years a number of key coastal properties, including "El Faro" at the northeast corner of Puerto Rico.

2. IMPROVING RESOURCE MANAGEMENT IN COASTAL AREAS

There are important opportunities to increase the effectiveness of Puerto Rico's established programs for managing coastal resources. A number of improvements that can help to protect the resources and foster their optimum use have been identified in Chapter 3. Additional measures, notably institutional changes and other measures to increase staff capabilities, are also needed. Both kinds of improvements are included in the Coastal Management Program described below.

A. BUILDING UP FIELD SERVICES AND FACILITIES

No element of Puerto Rico's Coastal Management Program is more important than building up services and facilities in the field--at beaches, forests, reefs, dunes, and other key coastal areas. Needed services are extensive--from maintenance and protective surveillance to educational and recreational programs for children and adults. Needed equipment and facilities, too, run a broad range--from beach cleaning machinery and parking lots to underwater nature trails.

The Program puts particular emphasis on services and facilities that will foster use and enjoyment of coastal areas by the general public. Use of the coasts for recreation and education, beneficial in itself, appears also to be the best available way to enhance public awareness of coastal resources and thus to enlarge the "constituency" demanding their protection. Also, some of the needed management measures, notably surveillance and beach cleaning, are labor-intensive measures that present an opportunity to create badly needed jobs.

The Program includes the following components intended to build up field services and facilities:

- (1) Training and enlarging field staffs. The Department of Natural Resources needs a field staff that is larger and substantially better trained than the one now available for management of coastal resources. Staff training is a high-priority component of the Program. Federal Coastal Zone Management funds may be requested for this purpose.
- (2) Providing equipment for field staffs. Beach cleaners in much of the Island have no mechanized equipment. Some personnel assigned to surveillance and maintenance of coastal forests have virtually no equipment at all. The Coastal Management Program includes the provision of basic equipment suitable for increasing the productivity of field staff responsible for coastal resources. This includes beach cleaning machinery (as discussed in Chapter 3, in the section on Beaches).
- (3) Instructing children and adults about natural systems of the coast. Understanding of natural systems that affect coastal resources contributes to public appreciation of those resources. The most effective instruction for this purpose is that provided at coastal sites themselves. Accordingly, the Program includes the provision of nature instruction in coastal resource areas. Instruction will be initiated at the Guanica Forest (as recommended in Chapter 3, in the section on Forests).
- (4) Planning for field services and facilities. Although the training, equipment, and instruction programs just described can begin immediately, their future dimensions must be determined by a continuing, detailed planning process for individual resource areas. The needed planning process is very closely related to the process described in the previous section on development guidance. Accordingly, that process will consider field service needs--including staffing, facilities construction and maintenance, educational and recreational services--in addition to measures necessary to guide development.
- (5) Establishing concentrated management areas. Because the Department of Natural Resources has such limited funds and trained field personnel available for coastal resource management, it cannot provide optimum services at all of the coastal resource areas--particularly beaches--under its jurisdiction. Concentration of

services in key management areas, selected because of their importance or because of the intensity of the pressures upon them, appears essential. Accordingly, the Program includes the establishment of concentrated management areas. The first of these should be the Southwest Special Planning Area because of its size and importance, and because of the concentration of Natural Reserves in the area. A marine-focused area at the proposed La Cordillera Natural Reserve would also be appropriate.

B. ORGANIZATIONAL CHANGES

The Program includes two organizational changes, both within the Department of Natural Resources. The first of these, establishment of a Coastal Management Unit, was described in the previous section on development guidance. The second is the Ranger Corps.

(1) The Coastal Management Unit. In addition to the development guidance responsibilities already described, the Coastal Management Unit will have responsibilities for active coastal resource management. These responsibilities include:

(a) Preparing detailed plans for field services and facilities. Detailed planning for management needs--staffing, facilities, services--will, as already noted, be carried out in conjunction with planning needed for development guidance. This integrated planning will be a responsibility of the Coastal Management Unit.

(b) Coastal overview, monitoring, grant administration. The Unit will also have responsibility for continuing coastal management initiatives; for coordinating and monitoring progress in implementing the Program; for recommending coastal spending priorities to the Secretary of Natural Resources each year, and for obtaining and administering Federal grants for coastal management.

(2) The Ranger Corps ("Cuerpo de Vigilantes de Recursos Naturales"). The training, equipment, and other management measures already described would have substantial beneficial impact even in the absence of institutional change. The opportunity for effective action is greatly increased, however, by creation of a Ranger Corps, a new unit of the Department of Natural Resources. Legislation establishing the Corps was enacted by the Legislative Assembly in June 1977, and the Corps has already begun operations.

Creation of such a corps had been proposed for several years. To cite one important example, the citizens' committee on Puerto Rico and the Sea had recommended legislation establishing a Natural Resources Marine Environmental Sanctuary Warden Division.

The Ranger Corps is the focus for improvement of field services for management of coastal resources. To this end:

- Intensive efforts are being made to provide professional leadership for the Corps.
- Staff training efforts, described previously, are being focused initially on the Corps.
- The Corps will be assigned responsibility for the concentrated management areas, described previously, and the number and size of these areas will be increased only as the growing capability of the Corps permits.

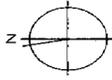
Funding for the Ranger Corps is being provided, in part, by the Federal Department of Labor, pursuant to the Comprehensive Employment and Training Act of 1973. In addition, Federal Coastal Zone Management funds may be requested for costs incurred during initial years of the Corps.

C. ESTABLISHING A SYSTEM OF NATURAL RESERVES

Administrative action, without legislation, appears sufficient both to improve the management of coastal resources and to protect them--particularly Natural Reserves--against inappropriate development. Nevertheless, legislation designating some publicly owned coastal resources as natural reserves appears desirable. Statutory designation would fix public attention on the reserves, would establish preservation and management policy with additional formality, and might increase practical opportunities to obtain Commonwealth funds for management.

The citizens' committee on Puerto Rico and the Sea recommended legislation creating a system of Marine Environmental Sanctuaries and Critical Environmental Areas. The general locations of the proposed marine sanctuaries are shown on Map 24. A bill to establish these sanctuaries is pending in the Legislative Assembly, as are bills to designate Mona and Monito Islands as natural reserves.

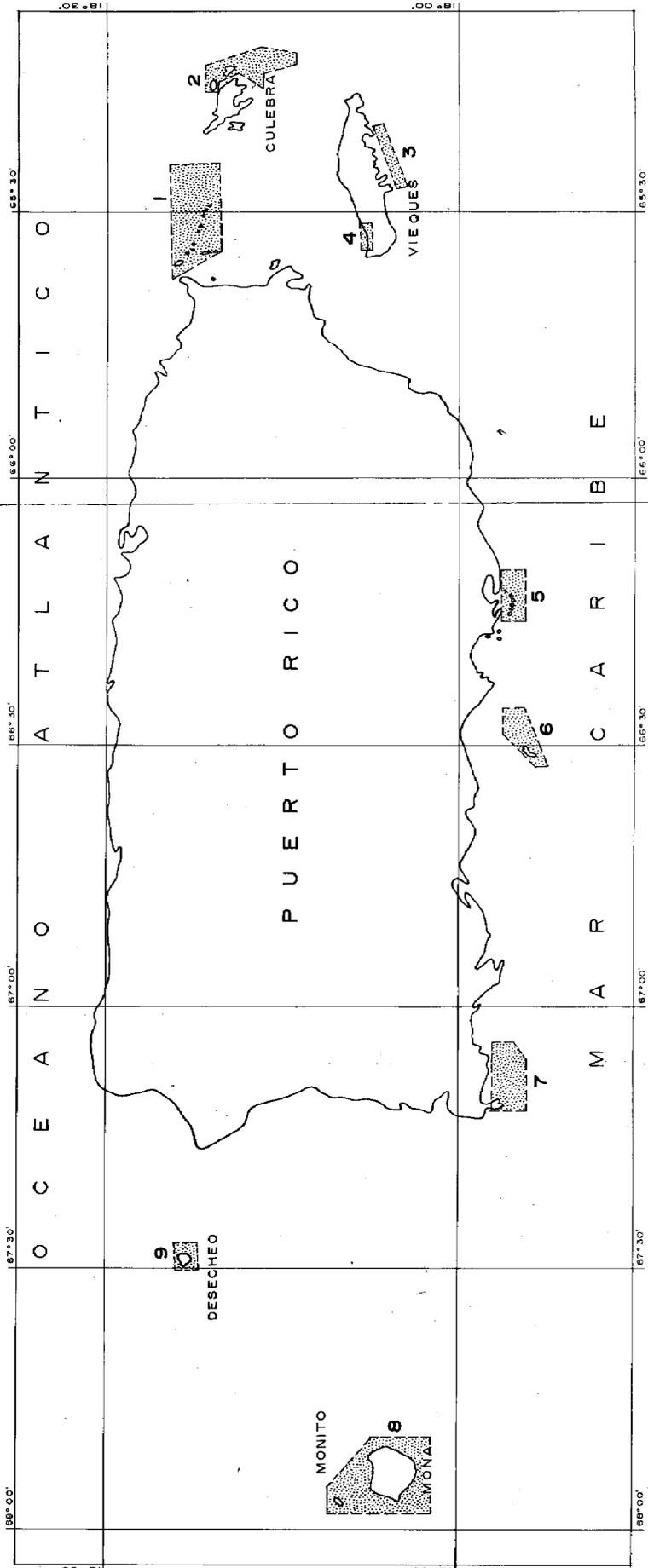
- 1-SANTUARIO CORDILLERA
- 2-SANTUARIO ISLA CULEBRA
- 3-SANTUARIO VIEQUES SUR
- 4-SANTUARIO VIEQUES NORTE
- 5-SANTUARIO BAHIA DE JOBOS
- 6-SANTUARIO ISLA DE MUERTOS
- 7-SANTUARIO MARGARITA
- 8-SANTUARIO ISLA MONA
- 9-SANTUARIO DESECHEO



miles (miles)
0 5 10 15 20 25

kilometers
0 5 10 15 20 25

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



FUENTE DE INFORMACION/SOURCE:
COMITE DE P.R. PUERTO RICO Y EL MAR, 1974.

In keeping with these approaches, the Coastal Management Program includes the preparation of legislation to create a system of Natural Reserves, ultimately to include marine, estuarine, and terrestrial areas. The draft legislation will designate Mona and Monito Islands as initial components of the system and will make clear that additional areas may be added in the future. Federal Coastal Zone Management funds may be requested for preparation of future legislation of this type.

D. CLARIFYING AND EXTENDING PUBLIC PROPERTY RIGHTS IN COASTAL RESOURCES

The measures discussed above for management of coastal resources focus on lands and waters owned by the public. Extending and clarifying public property rights presents some opportunity to extend the benefits of the management program.

- (1) Buying additional coastal property. Opportunities for buying additional public lands are limited because lands are expensive and funds are scarce; no purchase of privately-owned coastal resources are, therefore, anticipated at this time. The Program does not rule out future purchases, however, if the continuing planning process shows them to be desirable and sufficient, funds can be obtained.

Possible acquisitions to provide beach access will be evaluated during the 1977-78 fiscal year when the Department of Natural Resources conducts the shorefront access planning mandated by the 1976 amendments to the Federal Coastal Zone Management Act. Other acquisitions, which are likely to be concentrated in or adjoining Special Planning Areas and Natural Reserves, will be evaluated as an integral part of the continuing planning process to be conducted by the Department. Federal Coastal Zone Management funds may be requested for this purpose.

- (2) Clarifying public property rights. The program includes the preparation of the following draft legislation, for submission to the Legislative Assembly of Puerto Rico. This legislation is intended to remove present uncertainties about the extent of certain public property rights in coastal resources.

- Legislation requiring the registration of any Spanish crown grants alleged to authorize the exclusion of the general public from any part of the maritime zone. (The need for this legislation is noted in Chapter 3, in the section on Beaches.)
- Legislation reaffirming the validity of the easement of vigilance (servidumbre de vigilancia) created by Spanish law. (The need for this legislation is noted in Chapter 3, in the section on Beaches.)

This legislation is to be prepared as rapidly as practicable. Federal Coastal Zone Management funds may be requested for this purpose.

- (3) Obtaining public access rights to surplus Federal beaches. The Program includes the establishment of the following beach access policy:

If any beaches now owned by the Federal Government in Puerto Rico are hereafter declared surplus to the needs of the Federal Government, such beaches shall, to the maximum extent practicable, be made accessible for permanent recreational use by the general public. (The need for this policy is noted in Chapter 3, in the section on Beaches.)

This program document, by virtue of its adoption as an element of the Planning Board's Land Use Plan, establishes this policy.

E. OTHER MEASURES TO PROTECT COASTAL RESOURCES

The following additional measures are needed to refine requirements and procedures presently available to protect coastal resources. The need for these refinements has been identified in Chapter 3.

- (1) Adopting additional regulations. The Program includes the adoption of regulations governing the following:

- Coral extraction. (The need for this regulation is discussed in Chapter 3, in the section on Reefs.)
- Sand extraction. (The need for updating of the existing regulation is discussed in Chapter 3, in the section on Dunes.)
- Squatter communities. (The need for this regulation is discussed in Chapter 3, in the section on Beaches.)
- Archeological site protection. (The need for this is discussed in Chapter 3, in the section on Cultural and Historic Sites.)

These regulations are to be prepared as rapidly as practicable. Federal Coastal Zone Management funds may be requested for this purpose.

(2) Updating oil spill contingency plan. The Program includes the updating of the Commonwealth oil spill contingency plan by EQB. (The need for this revision is discussed in Chapter 3, in section on Coastal Waters.) Federal Coastal Zone Management funds may be requested for this purpose.

III. PROMOTING COASTAL DEVELOPMENT

Promoting and assisting coastal development is a third element of the Coastal Management Program. Most of the few development measures identified as necessary in Chapter 3, however, are of concern to other ongoing programs and do not appear to warrant the use of Federal Coastal Zone Management funds. Promoting coastal development accordingly represents only a minor program element.

The following developmental needs identified in Chapter 3 are to be satisfied without use of Federal Coastal Zone Management funds:

Provision of housing for displaced squatters. This is an ongoing activity of the Department of Housing and its attached corporation, the Urban Renewal and Housing Corporation. Since Federal regulations do not, in any event, permit Federal 306 funds to be used for housing construction, their potential usefulness to satisfy this need would, at best, be limited to planning and design costs.

Promotion of commercial fishing and aquaculture. These are ongoing activities of the Department of Agriculture, the Agency for Community Action, and other agencies, which receive substantial funding under other Federal programs.

The Coastal Management Program does include measures responding to another developmental need identified in Chapter 3: The need to assure adequate supplies of sand for construction. As Chapter 3 makes clear, this is a high-priority item, essential to reduce pressure for extraction of sand from beaches, dunes, and other inappropriate sites. Specifically, Chapter 3 identifies a need for studies to determine the economic feasibility of various alternative sources--such as sand manufacturing and the extraction of underwater deposits. These studies should be conducted by, or with the cooperation of, the Commonwealth's Economic Development Administration. Every effort will be made to obtain financial assistance for such studies from other Federal programs. If funding is not otherwise obtainable, however, Federal Coastal Zone Management funds may be requested for this purpose.

IV. RESEARCH

Research is the fourth element of the Coastal Management Program. Only research deemed necessary for the early solution of specific coastal problems is included in the Program. Much of the needed research has already been identified elsewhere in this program document, but it is useful to stress the importance of research by considering it separately here.

1. POLICY RESEARCH

Policy research, to determine the scope and nature of known problems, is the first needed type of research. Several examples were identified in Chapter 3, including research on:

- Coastal erosion hazards;
- Beach access, including the preparation of an inventory and plan; and
- Geologic hazards.

The first two types of research--on coastal erosion and beach access--are included in the Coastal Management Program, and are scheduled to begin during FY 1977-78. The third type--research on geologic hazards--is not deemed a specifically "coastal" problem warranting a request for Federal Coastal Zone Management funds.

2. ECONOMIC FEASIBILITY STUDIES

Economic feasibility studies are a second type of research included in the Program. Specifically, as noted previously, Federal Coastal Zone Management funds may be requested for studies of the feasibility of alternative sources of sand for construction.

3. RESOURCE AND HAZARD INVENTORIES

Resource and hazard inventories are a third type of research, which is essential for solution of some critical coastal problems. The Program includes the following research of this type:

- Mapping of coastal high-hazard areas (HIGH PRIORITY). (The need for this research is discussed in Chapter 3, in the sections on Flooding, Mangrove Wetlands and Dunes.)
- Completing the inventory of coral reefs (HIGH PRIORITY). (The need for this research is discussed in Chapter 3, in the section on Reefs.)

Detailed resource inventories of Special Planning Areas and Natural Reserves.
(The continuing inventory and planning process for these areas is discussed
previously in this chapter.)

Field laboratory activities in the Guanica Forest. (The need for these activities
is noted in Chapter 3, in the section on Forests.)

These, and similar tasks identified in the future as needed for early action in response
to recognized coastal problems, are to be undertaken as rapidly as practicable. The
"306" or other Federal Coastal Zone Management funds may be requested for this purpose.

PART THREE: IMPACTS

A. DESCRIPTION OF THE ENVIRONMENT AFFECTED

Three sections of the Puerto Rico Coastal Management Program* describe the natural and man-made resources in Puerto Rico's coastal zone -- Chapters 1 and 3 and Appendix C. An overview of Puerto Rico's coastal resources, as well as a summary of overall problems and objectives to which coastal management must be related, is provided in Chapter 1 of the PRCMP. This chapter also describes the coastal features of the eight regions into which the Island has been divided for study purposes, and discusses socio-economic features, such as population distribution, income, employment, and others. Maps 30 to 37 show the natural and man-made features of these regional sectors, as well as the coastal zone boundary.

Chapter 3 considers Puerto Rico's coastal problems in three broad categories: Coastal hazards, coastal resources, and coastal development. The maps accompanying Chapter 3 provide additional illustrative information concerning these coastal problems.

Appendix C describes the Special Planning Areas designated in Chapter 4 of the PRCMP and those areas which are recommended for designation as Natural Reserves. An island-wide summary map (Map 29) shows these areas.

B. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AREA

The objectives and policies elements of Puerto Rico's Islandwide Land Use Plan, which establishes the policy framework for the PRCMP, is included in Chapter 2 of the program document. When adopted by the Puerto Rico Planning Board and approved by the Governor, the PRCMP will be the coastal element of the Land Use Plan.

Chapter 4 explains how the Commonwealth government is organized -- including the relationships among the responsible agencies -- to guide development, manage coastal resources, and promote coastal development. Discussion of relevant plans, regulations, permitting and project review procedures, additional statutory authorities, and other measures is included in this chapter.

Discussion of applicable plans, policies, and controls in relation to specific coastal problems can also be found in Chapter 3 of the program document.

*All cross-references are to Parts II and IV of this DEIS.

C. PROBABLE IMPACTS OF THE PROPOSED ACTION ON THE ENVIRONMENT

1. Impacts Directly Resulting from Federal Approval

- A. Program Funding. Federal approval of the PRCMP will permit OCZM to award program administrative grants (pursuant to Sec. 306 of the CZMA) to Puerto Rico. The types of activities for which Puerto Rico will use these funds are described in Chapter 4 of the program document. These include increased funding for DNR's Ranger Corps, refining and preparing regulations, providing additional beach cleaning services, and developing detailed plans and policies for areas of particular concern.
- B. Federal Consistency. Approval of the PRCMP will mean that all Federal agencies must follow the provisions of Section 307(c) and (d) of the CZMA. These consistency provisions and the manner in which Puerto Rico intends to implement them are described in Appendix B.
- C. National Interest. Federal approval of the Program is dependent in part on a finding that the Commonwealth has adequately considered national interests in the siting of facilities and management of areas that are of more than local concern, such as energy facilities, recreational areas, wetlands, etc. While a State is not compelled to propose a program which accommodates certain types of facilities, the impact of this procedure will assure that such national interests are not arbitrarily excluded or restricted from the coastal zone. The national interest in Puerto Rico's coastal zone is outlined in Appendix B.
- D. Other Coastal Management Assistance. Federal approval will also assure continued eligibility of the Commonwealth to receive funds under additional coastal zone management assistance programs, such as Coastal Energy Impact Program, interstate coordination, beach access, island preservation and research and training.

2. Impacts Resulting From Commonwealth Government Implementation

Since the PRCMP relies in great part on existing management and regulatory techniques, changes and impacts of program implementation will not be as extensive as in many coastal states. For example, as previously discussed, the basic (islandwide) policies and objectives (Chapter 2) have already been adopted and would be applied to coastal

as well as inland use* decisions even without the Coastal Management Program. However, the improvements and refinements to existing techniques (new policies, institutional reorganization, etc.) will have significant impacts. The following discussion focuses on the impacts of these measures.

A. Summary of Environmental Impacts. Several measures of the PRCMP will have beneficial impact on habitat areas and other natural resources. The coastal resources policies will protect important natural resources -- mangrove wetlands, reefs, coastal forests, etc. Twenty-six areas are recommended as natural reserves. Once these reserves are formally established, the protection of key resources and preservation of habitat areas will be further enhanced.

In addition, the designation of mangrove wetlands and seven geographical areas as Special Planning areas will lead to concentrated management efforts for more balanced development. While some resources within these areas may be lost, the overall effect will be to reduce destruction through a careful balancing of social, economic, environmental, and cultural values. Similarly, detrimental effects may result from dredging and filling activities in coastal waters, for port expansion or energy facilities, as examples. However, under new criteria established in Chapter 3, DNR would not endorse permits for dredging activities unless there is no less environmental damaging alternative.

Losses from natural hazards will be mitigated. Expediting the mapping of coastal high hazard areas and refinement of the Floodable Areas regulation (Reg. No. 13) will protect natural systems as well as reduce loss of life and property from flooding. In turn, protection of key resources (reefs, mangrove wetlands, dunes) will enhance the natural hazard mitigation mechanisms.

Protection of offshore islands will be assured. Mona and Monito Islands, specifically, are to be the initial components of a system of Natural Reserves. Culebra is subject to special protection under the Law for the Conservation and Development of Culebra, as explained in The Culebra Segment of the Puerto Rico Coastal Zone Management Program, which has been incorporated in full in the PRCMP.

*As explained in Chapter 4, the term "land" is defined by the Planning Board Organic Act (Sec. 3) to include water as well as land.

Better enforcement of regulations by DNR's Ranger Corps will also have beneficial effects on coastal resources.

- B. Summary of Institutional Impacts. The major institutional impact will be more efficient management of the coastal area. The commitment to maintaining consultation efforts will result in better coordination among government agencies in carrying out their responsibilities in coastal areas. More specifically, designation of Special Planning Areas will provide the means for the Planning Board and DNR to work directly with other agencies, including Fomento and PRIDCO, to concentrate planning efforts in areas of significant potential conflict. Enhanced management capabilities will also be obtained through increased funding for DNR's Ranger Corps.

Administratively, DNR will acquire additional responsibilities. DNR will participate in the review of all development proposals within Special Planning Areas and provide overall coastal monitoring. DNR will also be primarily responsible for preparing detailed plans, policies, and regulations for Special Planning and facilities.

Other Commonwealth agencies will be able to receive funds for certain implementation measures. For example, the Program recommends updating of EQB's oil spill contingency plan, and refinement of the Planning Board's Community Facilities Regulation and Floodable Areas Regulation.

The Planning Board will retain its overall responsibility for policymaking and principal development controls. As the A-95 agency, the Planning Board will acquire responsibilities in procedures for determination of consistency of Federal actions in the coastal zone.

- C. Summary of Social and Economic Impacts. The PRCMP seeks to conserve and protect important coastal resources, while it encourages needed economic development. The designation of Special Planning Areas, in particular, will enhance rational, environmentally acceptable decision making in regard to development projects. The coastal development policies (Chapter 3) will encourage development in the

most appropriate sites. Coastal development policies give priority to coastal-dependent uses, and state that sites suitable for coastal-dependent industry should be reserved for those uses, except where natural systems destruction is unacceptable. New development will be restricted in some instances by the policy on mangrove wetlands protection and the criteria for dredging (both in Chapter 3). The overall effect of the PRCMP, however, through increased planning efforts and improved management techniques, is expected to provide greater efficiency in facility siting and balanced use of resources.

The islandwide objectives and policies (Chapter 2) seek to provide the maximum benefits to the general public through planned use of Puerto Rico's land and water resources.

Certain implementation measures of the PRCMP will also provide additional public benefits. The beach access policies, plans, and regulations (Chapter 3) will maximize feasible use and enjoyment of Puerto Rico's beaches. Certain groups may incur increased costs -- for example, squatters, in complying with regulations on sewage discharge. The PRCMP, though, recognizes a governmental responsibility to assist in the provision of adequate housing for some displaced squatters. Coastal zone management funds will be requests to improve public facilities and services, such as beach cleaning. The PRCMP will devote additional funds also for public education efforts -- an education program for residents of coastal hazard areas and nature instruction in coastal resource areas.

D. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The probable effects of implementation of the Puerto Rico Coastal Management Program will, on the whole, be environmentally beneficial. The aim of the Puerto Rico Program has been to accommodate economic growth and development while maintaining or enhancing the quality of the environment. The overall assessment is environmentally beneficial with two possible reservations.

The program will protect and conserve some areas, while encouraging development in others. Some development (for example, some non-coastal-dependent uses) will be displaced inland. While this may provide greater protection for fragile and valuable coastal resources, it may

place greater stress on inland areas and result in some resource damage. However, some loss of inland resources is inevitable, and the coastal management program represents an improvement over present land use allocation.

Areas available for commercial and industrial growth will be limited, with the result that this growth may be more densely concentrated. This may have the effect of concentrating pollution and other adverse affects such as traffic congestion. However, implementation of the program with existing environmental laws should act to mitigate such effects.

Some damage or loss of resources within Special Planning Areas may occur when there is no preferable (i.e. no less environmentally damaging) alternative for needed development.

E. RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

In certain instances the approval of the proposed Program will restrict local short-term uses of the environment. It will also provide a long-term assurance that the natural resources and benefits of the Puerto Rico coastal zone will be available for future use and enjoyment.

With or without the implementation of the Program, intense short-term uses and gains, such as provided by residential, industrial, and commercial development, are expected to be realized. Without the aid of specifically coastal guidance as provided by the Program, this development could result in long-term restrictions on coastal resource use and benefit because of degradation to the environment and loss of basic coastal resources. With coastal management, however, a framework is provided for better resolution of the traditional conflict among coastal resources users.

The PRCMP provides a sound basis for decision making, protects the important natural systems and directs uses to areas with natural capabilities and infra-structure capabilities to absorb growth. The PRCMP recognizes the importance of the coastal zone to Puerto Rico's economic well-being and the dynamic nature of coastal processes. It establishes a process for balanced management of the coast -- allowing growth to continue while protecting key resources.

F. IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES THAT WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

The approval of the Puerto Rico Coastal Management Program will not prevent certain areas of the coast from being intensely, and for all practical purposes, irreversibly developed. This will result in the loss of some environmental resources. However, development would occur in the absence of Program approval. The coastal management program channels development away from fragile and important coastal resource areas and to appropriate sites based upon land and water resource consideration. In some cases, alternative locations may not be feasible and disruption or total loss of natural systems unavoidable -- for example, loss of some mangroves for port or airport expansion, when there is no less environmentally damaging alternative. However, the mangrove protection policies, dredging criteria, and provisions for detailed planning of Special Planning Areas seek to minimize such irreversible losses.

G. ALTERNATIVES TO THE PUERTO RICO COASTAL MANAGEMENT PROGRAM

Introduction:

Given the nature of the proposed action of approving the Puerto Rico Coastal Management Program, all alternatives would involve a decision to delay or deny approval. Delay or denial of approval could be based on the failure of the Puerto Rico Program to meet any one of the requirements of the Federal Coastal Zone Management Act (CZMA). In approving a CZM program, affirmative findings must be made by the Assistant Administrator for Coastal Zone Management on over twenty such requirements.

During the early development of the Puerto Rico Coastal Management Program several areas of potential deficiencies were identified. However, those deficiencies have now been addressed by Puerto Rico and the Assistant Administrator has made a preliminary determination that Puerto Rico has met the requirements for approval under Section 306 of the Coastal Zone Management Act. In order to elicit public and agency comment and assure that the Assistant Administrator's preliminary assessment is correct, this section identifies areas where there are possible deficiencies and considers alternatives of delay or denial based upon each.

The generalized impacts of delay or denial of approval of the Puerto Rico Coastal Management Program, regardless of delay or denial, are as follows:

(1) Loss of Federal monies to administer the program

Under Section 306, Puerto Rico would receive approximately \$1 million per year to administer its coastal management program. Most basic to a loss of Federal funds will be the inability of the Commonwealth to provide adequate staffing and administrative support to its regulatory, and special management and natural resource planning elements of the program.

Additionally, the drafting and adopting of refined regulations would not take place. Such additional refinements would be aimed at simplifying permit decisions and increasing the predictability of those decisions.

(2) Loss of consistency of Federal actions with Puerto Rico's coastal management program

Program approval would mean that Federal actions, in or affecting the Puerto Rico coastal area would have to be consistent with the Commonwealth's management program under Section 307(c) of the CZMA. Loss of consistency would be of particular concern as the coastal area is heavily influenced by Federal activities (i.e., Corps, Navy, FWS, etc.).

(3) Loss of adequate consideration of the national interest in the siting of facilities which are other than local in nature as required by Section 306(c)(8) of the CZMA

By delaying or denying program approval, Commonwealth would be under no obligation to give adequate consideration to coastal resources and facilities that are of national interest. This may result in loss of public benefit that the use of such resources may provide. The national interest also encompasses a concern for the protection of resources such as water, air, wetlands, and wildlife. Consideration of the need for the national interest in facilities must take into account the impacts of facilities on these key resources.

Alternative 1: The Assistant Administrator could delay or deny program approval if the new policies and criteria established in the program were not enforceable or sufficient.

Federal regulations require that sufficient policies be of an enforceable nature to ensure the implementation of and adherence to the management program.

The Commonwealth establishes with the adoption of the program, four new policies dealing with mangrove wetlands protections, beach access, and coastal development.

The following are the new policies:

(A) Mangrove wetlands

All remaining mangrove wetlands--as well as buffer areas necessary to protect their water areas, vegetation, waterfowl, fish and other wildlife values--shall be protected as follows:

- ..Restrict new development in mangrove wetlands. Any alteration of those mangrove wetlands designated as Natural Reserves, shall to the maximum extent practicable: (a) maintain or enhance the existing functional capacity of the wetland (i.e., some alteration but no net reduction in the quantity and quality of species); (b) conform to a mangrove management plan approved by the Planning Board following issuance of an Environmental Impact Statement pursuant to Law No. 9 of June 18, 1970; and (c) be limited to minor incidental public service facilities (e.g., burying cable or pipelines), restorative measures, or nature study.
- ..Other mangrove wetlands. Any alteration of other mangrove wetlands shall to the maximum extent practicable: (a) conform to a mangrove management plan approved by the Planning Board following issuance of an Environmental Impact Statement pursuant to Law No. 9 of June 18, 1970; and (b) be limited to the following: (1) essential military facilities; (2) expansion of existing commercial fishing harbors, ports, or airports; (3) the minimum necessary entrance channel to a marina or other boating facility excavated from dry land; (4) those portions of coastal-dependent energy facilities that cannot be located on dry land or in open water areas; (5) minor incidental public service facilities such as buried cable or pipelines; (6) measures undertaken to restore biological productivity of degraded mangrove wetlands; and (7) nature study, aquaculture, or similar resource-dependent activity.

(B) Appropriate access to Federal beaches hereafter declared surplus

..If any beaches now owned by the Federal Government in Puerto Rico are hereafter declared surplus to the needs of the Federal Government, such beaches shall to the maximum extent practicable be accessible for permanent recreational use by the general public.

(C) Public access to beaches

..All people shall, to the maximum extent practicable, have equal opportunity, in fact as well as in law, to enjoy the beaches and other public shorelands of Puerto Rico's maritime zone. Shorefront development, governmental and private, shall, to the maximum extent practicable, be designed to facilitate rather than obstruct shoreland access by the general public. Wherever access is restricted by regulations (e.g., critical environmental areas needed for scientific study or for protection of endangered species), such regulations shall apply equally to all persons.

De facto segregation of public beaches, as a result of development patterns that facilitate use of shorefront landowners while obstructing or preventing access by the general public, is explicitly rejected and is declared unacceptable anywhere in Puerto Rico.

(D) Sites for coastal-dependent development

..Urban development, including those kinds of industry not requiring (or strongly benefitting from) a shorefront location shall, to the maximum extent practicable, be located away from the shorefront. This is in keeping with the Planning Board policy calling for stimulating development "perpendicular to the coast" in coastal towns.

Coastal sites designated by the Planning Board as suitable for coastal dependent industries shall to the maximum extent practicable, be (1) protected against other kinds of development, and (2) be reserved for coastal-dependent industry except in those instances where natural systems destruction is unacceptable.

Sites reserved for coastal-dependent industry, but which are also important from the standpoint of natural values, shall be developed for industry only after the fullest practicable consideration of location and design alternatives available to protect natural systems.

There has been some concern or misunderstanding expressed during the program's development as to how these new policies are established and whether they are sufficiently comprehensive.

First, the above policies, as well as the program, are established as the coastal zone element of the Islandwide Land Use Plan with their adoption by the Planning Board. The formal adoption of the PRCMP by the Planning Board will take place during the DEIS review period.

Secondly, the development of policies and criteria to guide coastal management was an ongoing process throughout the project effort. Numerous alternatives were considered at each stage of this process, but the basic decisions concerned the following:

1. Whether to develop a wholly new set of policies for the coastal management program, or
2. To build on established policies, adding refinements necessary for coastal management.

The second option was chosen. The decision was accordingly made to base PRCMP on the objectives and policies element of the Planning Board's Islandwide Land Use Plan (adopted and approved in June 1977). This element establishes policy in six areas--urban development, industrial development, agricultural development, floodable areas, infrastructure, and natural areas. These objectives and policies (quotes in Chapter 2), which apply to the entire Island, establish the framework for coastal management. When adopted and approved, the PRCMP will be the coastal element of the Islandwide Land Use Plan.

A thorough examination was made of the land use policies, as well as additional existing policies and criteria, for their applicability to, and effectiveness for, coastal management. Where specific policies from the islandwide plan apply to specific coastal problems, these are quoted in Chapter 3. Where other existing policy statements or criteria were judged applicable, these were incorporated as part of the PRCMP, and are quoted in Chapter 3 (for example, the EQB's mangrove wetlands resolution), or incorporated by reference (for example, Commonwealth and Federal standards on wastewater discharges).

In most instances, the islandwide policies, coupled with other existing policies were found to provide a sufficient policy base for coastal management. However, in a few cases, new policies appeared to be necessary. (See Chapters 3 and 4.)

Alternative 2: The Assistant Administrator could delay or deny program approval if the Commonwealth lacks the ability to continue to consider the national interest.

The Federal regulations require the Commonwealth continue to consider the national interest during the implementation of the program.

In Appendix B, the program states that all affected Commonwealth agencies will consider the national interest in siting of facilities. By adoption of this document by the Planning Board, and the transmittal of PRCMP to OCZM by the Governor, this statement is considered binding.

The Commonwealth considered the option of making the consideration of national interest of the siting of facilities a new policy, but determined that the consideration, as such, is procedural and part of an ongoing and continuing process which is closely related to continuing Federal consultation.

H. CONSULTATION AND COORDINATION WITH OTHERS

Several sections of the PRCMP document describe involvement and coordination with other agencies and the general public in development of the program. Appendix B summarizes public participation efforts, Federal and Commonwealth agency consultation, and local government participation. Appendix D provides documentation of Commonwealth and Federal agency consultation, including reports of meetings and agency comments on a preliminary draft of the PRCMP. Appendix E provides additional information on public participation.

PART FOUR: APPENDICES

APPENDIX A

**COMMONWEALTH AND FEDERAL
AGENCIES AFFECTING THE COAST**

Appendix A

COMMONWEALTH AND FEDERAL AGENCIES AFFECTING THE COAST

The Coastal Zone Management Act of 1972 has created a new opportunity to mold the activities of all major contributors to the management of coastal resources into a comprehensive management program exhibiting internal consistency. Coordination is a complex task, encompassing Federal as well as Commonwealth agencies.

I. COMMONWEALTH AGENCIES

In addition to the four principal agencies* described in Chapter 4, numerous Commonwealth agencies (including public corporations) have programs and responsibilities that affect the coastal zone. Brief descriptions of these agencies are included here.

Department of Transportation and Public Works (DTPW)

The Department, operating in its current form following reorganization in 1971, has a number of responsibilities which are important to the management of the coast:

Highways -- the Highway Authority of DTPW plans and constructs highways. The DTPW maintains highways, bridges, and related structures.

Ports and airports -- the Port Authority, linked to DTPW, is in charge of planning, construction and operation of harbors and airports and the administration of sea and air transportation of passengers and cargo.

Flood prevention -- DTPW shares responsibility with DNR for providing flood control in the Commonwealth.

Department of Agriculture

The Department of Agriculture has islandwide responsibility for numerous agricultural programs and activities. Affiliated agencies and public corporations include the Agricultural Council, the Agricultural Development Corporation, the Agricultural Credit Corporation, and the Land Authority.

Department of Housing

Functioning since 1972, the Department of Housing coordinates housing plans with guidelines established by the Planning Board and supervises governmental activities related to housing

*The Puerto Rico Planning Board, the Regulations and Permits Administration, the Environmental Quality Board, and the Department of Natural Resources.

and urban renovation. The Department's related public corporation is the Urban Renewal and Housing Corporation.

The Public Parks and Recreation Administration

The Public Parks and Recreation Administration, operating since 1950, is in charge of development and maintenance of Puerto Rico's public recreation facilities. Under its jurisdiction in the coast are 13 balnearios (bathing beaches) and public beaches. PPRA's related public corporation is the Recreation Development Company.

Community Action Agency

The Community Action Agency, which is affiliated with the Puerto Rico Department of Labor, is involved in a number of programs geared toward improving the health and social welfare of the Island's population by generating employment.

Tourism Development Company

In recognition of the tourist industry's economic importance, the Tourism Development Company was created in 1970 to promote and improve tourism on the Island. The Company may acquire property to carry out its programs, and has a number of programs related to enhancing tourism.

Water Resources Authority

The Puerto Rico Water Resources Authority, originally established to develop the Island's hydro-electric potential, is the Commonwealth's power authority. It generates electric power, principally at major steam generating plants located along the coast, and distributes it, throughout the Island.

Puerto Rico Aqueduct and Sewer Authority (PRASA)

The Puerto Rico Aqueduct and Sewer Authority is responsible for building, operating, and maintaining the Island's water and sewer system, including wastewater treatment facilities and ocean outfalls. The planning, design and construction of wastewater treatment facilities must be consistent with requirements of EQB, the Planning Board, and the U.S. Environmental Protection Agency.

Institute of Puerto Rican Culture

The Institute of Puerto Rican Culture is responsible for preserving and restoring monuments of historical or cultural significance. The Institute has directed the restoration of almost 300 buildings in the Historic Districts of San Juan and Ponce and the preservation of other historic

monuments on the Island. The Institute administers Historic District regulations and is currently updating its list of historic sites.

Land Administration

The Land Administration, a public corporation created in 1962, has the responsibility for promoting efficient land use, particularly to achieve compact and contiguous urban residential development. To this end, the Administration has broad authority to buy and sell land. Among its other activities, the Administration often acquires land needed for public purposes by other Commonwealth agencies.

Economic Development Administration (Fomento)

Fomento coordinates the Commonwealth's economic development efforts. Along with its associated public corporation, the Puerto Rico Industrial Development Company (PRIDCO), Fomento is instrumental in implementing programs to accelerate Puerto Rico's economic development, principally through industrial promotion.

II. FEDERAL AGENCIES

A prerequisite to the establishment of a comprehensive coastal management program is identification of the roles played by Federal agencies in coastal areas. This identification has aided the Commonwealth in providing an opportunity for Federal agencies to participate, to acknowledge their views and consider the national interest, and to provide a means for continuing coordination and consultation on the coastal management program.

Many of the Federal agency programs and activities mentioned in this appendix are described more fully in Chapter 3.

AGENCIES OF THE EXECUTIVE BRANCH

Two Agencies representing the executive branch of the Federal government contribute significantly to coastal management in Puerto Rico:

The Office of Management and Budget (OMB)

An important tool of OMB is circular A-95, which provides for a review and comment process among agencies affected by Federal proposals. The use of the A-95 process as a mechanism for insuring coordination and consistency with the Puerto Rico Coastal Management program is discussed in Appendix B.

The Council on Environmental Quality (CEQ) The CEQ was created by the National Environmental Policy Act of 1969, and among other duties, provides guidelines for preparation of the environmental impact statements required by the Act.

DEPARTMENTS OF THE FEDERAL GOVERNMENT

Seven of the eleven departments of the Federal government have important responsibilities for the management of Puerto Rico's coasts. Some assist the public or private sectors through the administration of grant and loan programs. Others have regulatory or licensing responsibilities in coastal areas or perform a variety of direct actions, such as conducting research or managing Federal facilities.

DEPARTMENT OF AGRICULTURE

Three of the Department's program areas are significant to management of the coast:

The Farmers Home Administration (FmHA) FmHA administers several loan programs which encourage development of the coast, for example, industrial development loans and water and waste development systems loans.

The Forest Service (FS) FS maintains and conducts research at the Institute of Tropical Forestry at the University of Puerto Rico.

The Soil Conservation Service (SCS) SCS conducts five major programs in cooperation with Commonwealth and local agencies and with the private sector: Conservation operations, river basin surveys, watershed planning, flood prevention, and resource development. SCS has also conducted soil surveys and studies on sedimentation rates in selected reservoirs and has planned multi-purpose flood control projects, as well as participated in flood hazard mapping.

DEPARTMENT OF COMMERCE

Many of this Department's administrative divisions potentially affect Puerto Rico's coastal zone, including the Industry and Trade Administration, the Office of Science and Technology, and the Office of Minority Business Enterprise. Three other divisions have noteworthy importance to coastal management:

The Economic Development Administration (EDA) EDA provides grants, loans, and technical assistance to aid in the development of public facilities and private enterprises that create jobs in areas experiencing severe unemployment and low income problems. Puerto Rico is eligible for EDA assistance.

The Overall Economic Development Program for 1976-77, as prepared by the Puerto Rico Planning Board and submitted to EDA, includes 122 projects in Puerto Rico.

The Maritime Administration (MARAD). MARAD administers Federal laws designed to promote and maintain an efficient merchant marine. MARAD is involved in a number of activities related to the commercial fishing industry and port facilities, including ship construction and operation aid.

The National Oceanic and Atmospheric Administration (NOAA), which includes the Office of Coastal Zone Management, the National Marine Fisheries Service, the National Weather Service, the Office of Sea Grant, and the National Ocean Survey. Among NOAA's constituent elements, those that promise to have the greatest impact on Puerto Rico's coastal zone are:

1. The Office of Coastal Zone Management (OCZM), through its administration of the Coastal Zone Management Act; and
2. The National Marine Fisheries Service (NMFS). NMFS has a number of responsibilities related to marine resources and their habitats, including protection of endangered species and marine mammals; permit review pursuant to the Fish and Wildlife Coordination Act; protection and conservation of valuable and necessary fishery resources pursuant to the Fishery Conservation and Management Act of 1976; and, in cooperation with the states, in carrying out research and development projects under the Commercial Fisheries Research and Development Act of 1964.

DEPARTMENT OF DEFENSE

The Department of Defense impacts Puerto Rico by permitting, construction, and mapping, as well as by its holdings:

The U.S. Army Corps of Engineers (CoE). The Corps is a focal point of long standing for significant coastal regulatory control. The Corps issues permits to private parties and public agencies to fill, dredge, or build in, on, over, or beneath navigable waters. The Corps is also involved in Puerto Rico through its Flood Plain Management Services Program (flood plain mapping and reports), and in flood control, water resources, navigation, urban and beach erosion control studies or projects.

Department of Defense land holdings. Department of Defense land holdings in Puerto Rico's coastal areas are shown on Map 27, Excluded Federal Lands.

DEPARTMENT OF ENERGY

The Department of Energy was created to administer effective management of energy functions of the Federal government, including, the effective management of energy supply and conservation programs. The Department is responsible for the formulation and implementation of National energy policies. Within the specific directives of the CZMA, the Department encourages states to develop CZM programs to:

- Demonstrate in both broad policy statements and substance of the program; recognition of the national interest aspects of energy facility siting and acknowledge the unique importance of coastal locations for the siting of many energy facilities;
- Establish land use measures which accommodate the siting and development of energy facilities;
- Develop energy facilities siting process;
- Designate GAPC's which include areas where energy development may be suitable.

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE (HEW)

Social services programs of HEW assist many Puerto Ricans through the Department's many operating components.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD's impact takes the form of grants, loans, and insurance measures. For example, the HUD 701 program has provided comprehensive planning assistance, which supports a broad range of planning and management activities of the Puerto Rico Planning Board. Two sub-programs of HUD also impact the coast:

1. The Federal Disaster Assistance Administration (FDAA) manages and coordinates the Federal disaster assistance and relief program; and
2. The Federal Insurance Administration (FIA) administers the National Flood Insurance Program.

DEPARTMENT OF THE INTERIOR (DOI)

Five subagencies of DOI have impact on Puerto Rico's coast:

The Bureau of Outdoor Recreation (BOR). Among many measures serving the recreational needs of the nation, BOR administers a grant program under the Land and Water Conservation Act of 1965 to provide assistance in planning, acquiring, and developing outdoor recreation areas and facilities. In Puerto Rico, the Recreation Development Company and the Public Parks and Recreation Administration have been most active in utilizing these funds. BOR also has responsibility for formulating and implementing a comprehensive Nationwide Outdoor Recreation Plan.

The Fish and Wildlife Service (FWS). FWS guides the conservation, development, and management of the nation's fish and wildlife resources. Functions of FWS relative to coastal management include responsibilities under the 1973 Endangered Species Act, permit reviews pursuant to the Fish and Wildlife Coordination Act, management of National Wildlife Refuges and the management of certain transferred lands in Culebra. FWS also provides assistance for fish and wildlife restoration.

The U.S. Geological Survey (USGS). The significant contributions of USGS include water resource studies, hydrologic data collection, and dissemination of the resulting data. USGS has prepared geological maps for the entire Island, has mapped coastal flood plains, and has conducted hydrologic investigations in cooperation with Commonwealth agencies. The USGS is also engaged, in close cooperation with the Department of Natural Resources, in a program of mapping the insular shelf that surrounds Puerto Rico, determining the potential mineral deposits there, and training Puerto Ricans in marine geology and in the techniques of scientific work at sea. USGS also has responsibility for evaluating, regulating, and inspecting Federal lands (including the OCS) in regard to mineral operations.

The Bureau of Land Management (BLM). BLM has responsibilities for managing Outer Continental Shelf (OCS) mineral resources, including, for example, the identification of areas to accommodate facilities which might be necessary for the development and protection of OCS resources. BLM also has responsibilities for managing mineral resources on Federal lands.

The National Park Service (NPS). NPS, in cooperation with Commonwealth agencies, is responsible for the national program of historic preservation. NPS maintains the National Register of Historic Places, manages two historic forts in Old San Juan, and provides grants for the preservation of non-Federal historic properties.

DEPARTMENT OF TRANSPORTATION (DOT)

Three subagencies of DOT have principal impact on the coast:

The U.S. Coast Guard. The Coast Guard affects Puerto Rico principally by promoting water safety; enforcing water pollution and oil spill regulations; placing, operating, and maintaining public navigation aids as required; permitting private navigation aids, bridges, and deepwater ports; and performing maritime search and rescue services. The Coast Guard maintains lighthouses at several locations and numerous other buoys and warning lights.

The Federal Aviation Administration (FAA). The purpose of the FAA is to foster air commerce and safety, and to promote a national system of airports. FAA conducts airport planning and development aid grant programs.

The Federal Highway Administration (FHWA). FHWA programs include financial incentives for highway planning and construction and highway beautification, FHWA's responsibilities also include jurisdiction over the transport of hazardous materials on the nation's highway system.

INDEPENDENT FEDERAL AGENCIES

In addition to the agencies of the executive branch and subagencies of the major departments of the Federal government discussed above, six independent agencies have coastal functions affecting Puerto Rico:

The Community Services Administration (CSA). CSA administers a number of projects directed at solving basic social and economic problems by providing economic and educational opportunity and financial assistance to low income groups. For example, CSA provides funds to Puerto Rico for a fishery development program.

Environmental Protection Agency (EPA). EPA has a broad mandate to preserve and protect the physical environment. EPA has assisted in the preparation of air and water pollution controls applicable to Puerto Rico. EPA's impact on the coast is through the agency's enforcement, policy making and review functions, and the administration of several grant programs.

The Federal Maritime Commission (FMC). FMC regulates the waterborne foreign and domestic offshore commerce of the U.S. FMC also has responsibilities under P.L. 92-500, as amended, with respect to evidence of financial responsibility of vessel owners or operators which may be subject to liability to the U.S. for removal of hazardous substances, including oil, from U.S. navigable waters and adjoining shorelines.

General Services Administration (GSA). GSA has authority over the transfer and disposal of surplus Federal lands to other governmental entities and sales to the private sector.

Federal Regional Council (FRC). Of the Federal agencies that have a major impact on the coast, most include Puerto Rico in their New York regions. The New York FRC, which seeks to attain coordination among programs of its constituent agencies, has provided a forum for participation by many of those agencies in the development of the Puerto Rico Coastal Management Program.

The Water Resources Council (WRC). WRC is instrumental in the preparation of Commonwealth water and related land resources plans in cooperation with the Puerto Rico Environmental Quality Board and the Department of Natural Resources.

APPENDIX B

**THE PUERTO RICO PROGRAM AND
THE COASTAL ZONE MANAGEMENT ACT**

Appendix B

THE PUERTO RICO PROGRAM AND THE COASTAL ZONE MANAGEMENT ACT

The Federal Coastal Zone Management Act of 1972, as amended, (the CZMA) authorizes the Secretary of Commerce to make annual grants to any coastal state for the costs of administering the state's management program in accordance with Section 306 of the CZMA.

Sections 306(a), (c), (d), (e), and (h) and Sections 307(b) and (f) of the CZMA establish requirements that must be satisfied before the Secretary approves a management program. This appendix relates Puerto Rico's Coastal Management Program to those requirements.

REQUIREMENTS OF SECTION 306(a) OF THE CZMA

Pursuant to Section 306(a), the Assistant Administrator for Coastal Zone Management must find, before approval of a management program, that the program meets the requirements of Section 305(b). (The requirements of subsections 305(b)(7), (8), and (9), however, need not be met until October 1, 1978.)

(1) BOUNDARIES

The Management program must include "an identification of the boundaries of the coastal zone subject to the management program." (Sec. 305(b)(1))

(a) Inland boundary

Sec. 304 specifies that the coastal zone "extends inland from the shorelines only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on coastal waters."

The coastal zone of the Commonwealth of Puerto Rico includes:

1. A coastal strip, on the Island of Puerto Rico, extending (a) 1,000 meters inland from the shoreline, and extending (b) additional distances inland where necessary to assure the inclusion of key natural systems of the coast. The resulting inland boundary is shown on Maps 30-37.
2. In addition, all islands in the Commonwealth other than the Island of Puerto Rico. The coastal zone thus includes the entire area of Culebra, Vieques, Mona and all other offshore islands and keys.

Although there has been consensus that the boundary should include all offshore islands, selection of an inland boundary on the Island of Puerto Rico requires a choice among several possible

alternatives. The following possibilities have been considered, singly and in various combinations:

1. "Natural systems" boundaries, which would include ecological systems peculiar to the immediate littoral areas, with buffer areas needed to assure sound management.
2. "Fixed distance" boundaries paralleling the shoreline at some fixed distance inland.
3. "Key areas" boundaries, which would include those areas designated by the Program as particularly significant to the achievement of its objectives.
4. "Political jurisdiction" boundaries, which would follow the boundaries of municipalities or of barrios.
5. A "perimeter road" boundary, which would include the entire area lying seaward of the main highways that encircle the island (routes 2 and 3).
6. A "coastal plain" boundary, which would include all of the relatively flat, buildable areas that surround the largely mountainous center of the Island.
7. No boundary, thereby including the entire Island within the coastal zone.

The purpose of drawing a boundary between the coastal zone and the rest of Puerto Rico is to identify the area subject to the Federally-aided Coastal Management Program. The nature of that Program substantially determines the appropriate boundary.

While the nature of the Program was still being determined, during a study period that lasted roughly three years, it proved useful to establish preliminary study boundaries that included much of Puerto Rico's coastal plain. A variety of modified "political jurisdiction" boundaries were tentatively selected during the study period. Several studies, and some maps in this document, consider data within a "second barrio study boundary", located about 7 kilometers inland, which generally includes shorefront barrios as well as contiguous barrios inland.

It was ultimately concluded, however, that the Program boundary should be drawn quite close to the shoreline. Several factors influenced this conclusion:

The unique opportunity presented to Puerto Rico by the Coastal Management Program is to promote development and resource management that is sensitive to the natural systems and features

of the immediate coastal area -- features such as mangroves, beaches, dunes, reefs, and coastal waters. The need for this sensitivity is clear, and no other program provides a comparable opportunity to foster it.

The anticipated funding level of the Coastal Management Program in Puerto Rico is not excessive for a program focused on the immediate coastal area. That is, the importance and complexity of nearshore resources warrants the expenditure of all the Commonwealth and Federal funds expected to be available for coastal zone management.

The Commonwealth government already exercises direct land-use planning and control powers everywhere in Puerto Rico, and local governments have no such powers. There is thus no need to rely on the Coastal Management Program -- or to extend its boundaries substantially inland -- to obtain Commonwealth land-use control powers or to curb abuses of local powers.

The coastal plain comprises 80 percent of Puerto Rico's readily developable land (that is, of the land with a slope of less than 45 per cent). The coastal plain therefore receives most development pressures and much of the attention of the islandwide land-use planning and control processes. Therefore, if the Coastal Management Program were to include much or all of the coastal plain, the Program would substantially overlap or duplicate the islandwide program, and the unique opportunity to concentrate attention on problems of the immediate coastal area would be reduced.

The above factors pointed to a Program focused on the littoral area and to a Program boundary drawn close to that area. There remained the task of choosing among several possible nearshore boundaries. To help in making that choice, several objectives were established:

First, the boundary should include the important ecological systems of the immediate coastal area, since these are a major focus of the Program.

Second, the boundary should also include key sites for coastal-dependent development, since these sites are of great importance to the Island.

Third, the boundary should be drawn loosely enough to permit minor Program refinements, responsive to a continuing planning process, without the formality of boundary amendments (A boundary drawn tightly around key areas, for example, could hamper later enlargement of the areas, or enlargement of buffer areas around them, in response to future studies.)

Fourth, for administrative convenience, the boundary should be simple to describe and understand.

Neither a "natural systems" boundary, nor a "key areas" boundary, could satisfy these criteria. A "fixed distance" boundary, 1,000 meters inland, did appear to satisfy them except in a few places where key coastal systems extend somewhat farther inland. The result was the boundary finally chosen: 1,000 meters inland plus greater depths in the few places necessary to assure inclusion of key natural systems.

(b) Territorial sea

Section 304 defines the coastal zone as extending seaward to the outer limits of the United States territorial sea. "At present," according to comments received from the Office of Coastal Zone Management (OCZM), "this limit is 3 nautical miles from the appropriate baselines recommended by international law and defined precisely by the United States,"

The coastal zone of the Commonwealth of Puerto Rico extends seaward 3 nautical miles from all land areas--including offshore islands and keys--that are subject to Commonwealth jurisdiction. Map 25 shows the seaward boundary. (The Commonwealth does not relinquish any authority it may have over areas lying beyond the 3-mile limit specified by OCZM.)

(c) Island, transitional and intertidal areas, salt marshes, wetlands, beaches

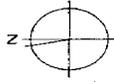
Section 304(a) specifies that the coastal zone include "islands, transitional and intertidal areas, salt marshes, wetlands, and beaches."

The Puerto Rico coastal zone, as just described, includes all such coastal features. (See Map 26.)

Puerto Rico, being subtropical, has no salt marshes as such, for these are mainly temperate ecosystems. Some types of mangrove wetlands may be regarded as roughly equivalent ecosystems, however.

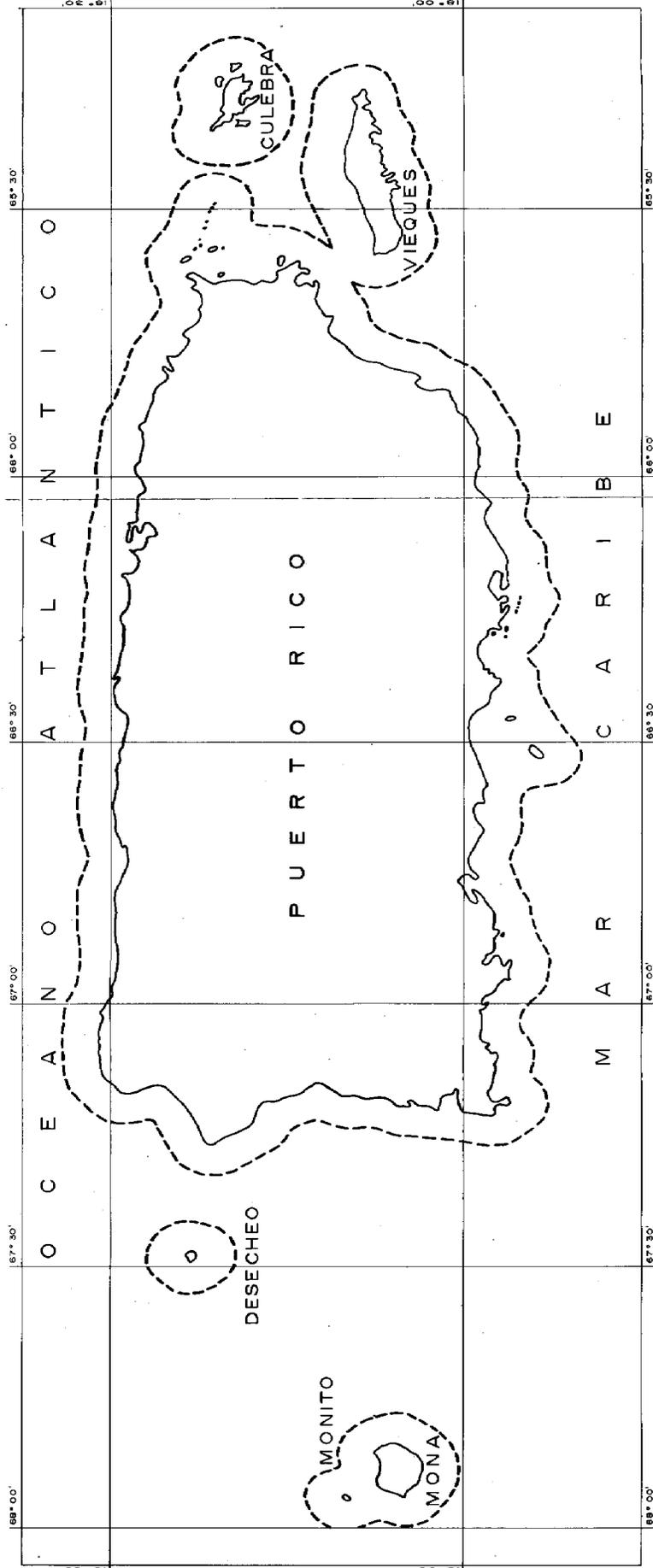
Wetlands in Puerto Rico may be divided into two principal classifications--mangrove wetlands and other wetlands:

Mangroves: This category includes natural tropical and subtropical ecosystems characterized by coastal forests, dominated (in Puerto Rico) by one or more of



Special boundaries established in part by Coastal Zone Management Act of 1972, as amended by the Office of Coastal Zone Management National Oceanic and Atmospheric Administration.

TRES MILLAS NAUTICAS - - - THREE NAUTICAL MILES



25

LIMITE MARINO DE LA ZONA COSTANERA
COASTAL ZONE SEAWARD BOUNDARY

FUENTE DE INFORMACION/SOURCE:
OFICINA DEL PROGRAMA DE MANEJO DE LA
ZONA COSTANERA PARA PUERTO RICO,
DEPARTAMENTO DE RECURSOS NATURALES.

the following species: Rhizophora mangle, Avicennia germinans, Laguncularia racemosa, or Conocarpus erecta, subjected to and influenced by the rise and fall of the tides, or fluctuations in salinity. Brackish waters provide the best growth conditions, but mangroves are also well developed in regions of pure sea water, around hypersaline lagoons and salt flats, and up rivers and streams, or behind coastal barriers (e.g., sand dunes) where salt water only occasionally reaches.

Other Wetlands: In Puerto Rico, this category includes all other swampy areas. Principal among these are freshwater lagoons and their typical surrounding vegetation and those inland areas along drainage depressions that channel terrestrial runoff toward the coast, usually being part of floodplains. Typical freshwater swamps, such as pterocarpus communities, are a small but important constituent of this category.

Beaches are defined as unconsolidated shores of sand or gravel. The nature and origin of the materials that form the beach can be terrigenous, marine, or volcanic. The particle size can range from 0.625 to 128 mm., which includes the size classifications for sand, pebbles, and cobbles. Islands, mangrove wetlands, other wetlands, and beaches are identified on Maps 30-37.

(d) Interstate boundaries

Puerto Rico has no common boundary with any state or territory of the United States.

(e) Excluded Federal lands

Sec. 304 defines the coastal zone as excluding "lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government, its officers, or agents." An opinion of the U.S. Attorney General has established that all lands owned, leased, held in trust, or otherwise used solely by the Federal Government are excluded from the coastal zone by the Act.

The Puerto Rico Coastal Management Program is intended to exclude from the coastal zone all those lands, but only those lands, whose exclusion is required

by the quoted language of Sec. 304, Map 27 identifies lands owned, leased, held in trust, or otherwise used solely by the Federal Government. Exclusion of such lands is believed to be required by that section. (The Commonwealth does not relinquish any authority it may have, separate from the requirements of the CZMA, over lands shown on the map as being excluded from the coastal zone for purposes of the Coastal Zone Program only.) Several maps (e.g., Map 13, Critical Areas for Endangered Wildlife) show resources or other features regardless of boundaries of Federal land. These maps are intended to show the full extent of coastal resources, even though some of these are excluded by law from the coastal zone.

The submerged lands surrounding Puerto Rico, according to an opinion of the Solicitor of the U.S. Department of the Interior dated June 19, 1975, are the property of the Federal Government. A bill recently introduced in Congress (H.R. 7227) would confirm Commonwealth ownership of submerged lands.

(2) USES SUBJECT TO MANAGEMENT

The management program must identify land and water uses which have a direct and significant impact on the coastal waters. (sec. 305(b)(2)). These uses are subject to the terms of the management program.

For this determination, the following definitions were developed:

Impact is any modification in an element of the coastal waters, such as quality, quantity, living resources, and aesthetics, or human or natural use thereof. Impacts can be both positive and negative.

Direct indicates a casual relationship, denoting that the impact on coastal water derives as a consequence from the action or use.

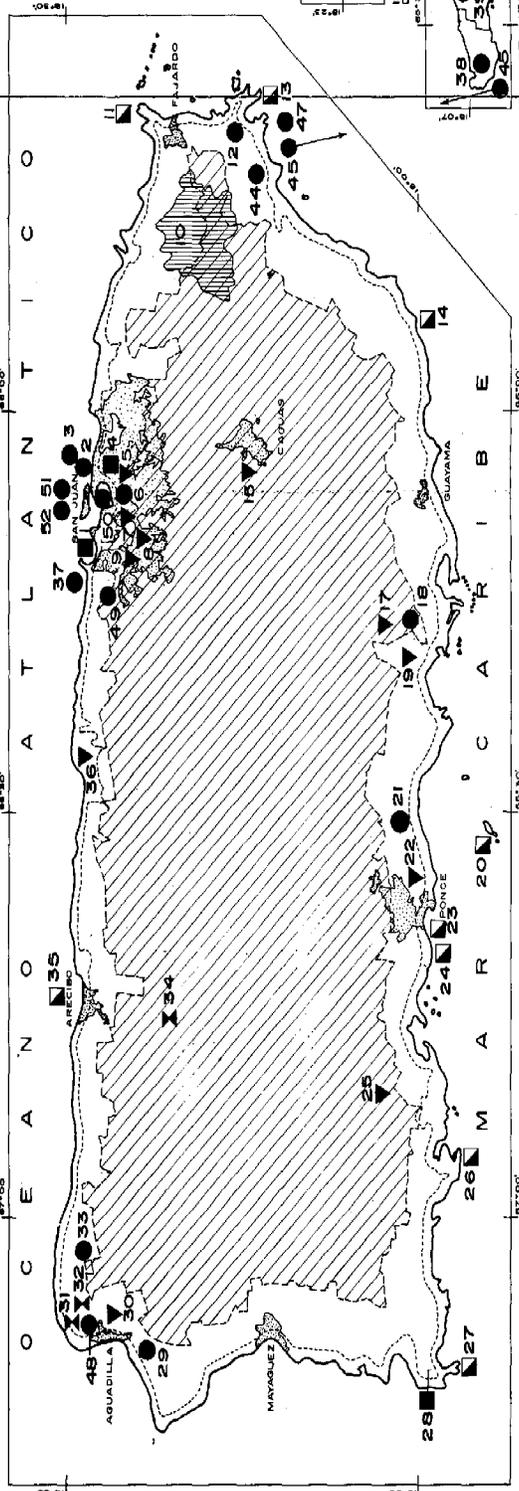
Significant impacts are those which: Affect the characteristics of the coastal, marine and estuarine ecosystems; affect other uses of coastal waters; affect the interests of the public; are inevitable or serve short-term objectives to the disadvantage of long-term objectives.

- 1 - SAN JUAN NATIONAL HISTORIC SITE
- 2 - FORMER 10TH NAVAL DISTRICT
- 3 - FORMER NAVAL STATION & ISLA GRANDE AIRPORT
- 4 - GOVERNMENT SERVICE ADMINISTRATION
- 5 - ARMY RESERVE TRAINING CENTER
- 6 - CATANO FUEL STORAGE FACILITY
- 7 - FORT BUCHANAN
- 8 - ARMY RESERVE TRAINING CENTER
- 9 - PR NATIONAL CEMENTERY
- 10 - LUQUILLO EXPERIMENTAL FOREST
- 11 - CAPE SAN JUAN LIGHT HOUSE RES.
- 12 - ROOSEVELT ROADS NAVAL STATION
- 13 - CABRA DE TIERRA LIGHTHOUSE
- 14 - PUNTA TUNA LIGHTHOUSE
- 15 - ARMY RESERVE TRAINING AREA
- 16 - PUNTA FIGURA LIGHTHOUSE
- 17 - SALINAS TRAINING AREA
- 18 - SALINAS RECEIVER SITE
- 19 - ARMY RESERVE TRAINING CENTER
- 20 - CAJA DE MUERTOS LIGHTHOUSE
- 21 - FORT ALLEN
- 22 - ARMY RESERVE TRAINING CENTER
- 23 - PUNTA CARENERO LIGHTHOUSE
- 24 - PUNTA CUCHARA LIGHTHOUSE
- 25 - ARMY RESERVE TRAINING CENTER
- 26 - PUNTA BREA LIGHTHOUSE
- 27 - CABO ROJO LIGHTHOUSE
- 28 - DEPT. OF INTERIOR - FISH & WILDLIFE
- 29 - U.S. NAVAL RADIO STATION-AGUADA
- 30 - ARMY RESERVE TRAINING CENTER
- 31 - RAMEY AIR FORCE BASE & SATELLITES
- 32 - RAMEY AIR FORCE BASE AMMUNITION BASE
- 33 - U.S. NAVAL RADIO STATION - ISABELA
- 34 - ARECIBO IONOSPHERIC OBSERVATORY
- 35 - ARECIBO LIGHTHOUSE
- 36 - CAMP TORTUGUERO
- 37 - SECURITY GROUP ACTIVITY SABANA SECA
- 38 - FORMER NAVAL STATION ROOS. WEST ANNEX
- 39 - MONTE SANTO
- 40 - MANUEVER AREA (EAST - VIEQUES)
- 41 - MANUEVER AREA - CULEBRA
- 42 - U.S. COAST GUARD LIGHTHOUSE RESERVE
- 43 - RUNWAY
- 44 - WATER LINE EASEMENT
- 45 - COMMUNICATION CABLE (ROOSEVELT ROADS VIEQUES)
- 46 - VIEQUES RESTRICTED (R 7104.207 615) WARNING (W426 B/C/S) SURFACE RANGER 204.234 J/AND
- 47 - EXPLOSIVE ANCHORAGE (110.24) AREAS
- 48 - ROOSEVELT ROADS SURFACE RESTRICTED (207.615)
- 49 - AGUADILLA COMPONENT OF SABANA SECA SECONDARY GROUP ACTIVITY
- 50 - SABANA SECA RESTRICTED AREA
- 51 - DRY DOCK & SHIP REPAIR FACILITY
- 52 - FERNANDEZ JUNCO'S HOUSING AREA
- 53 - STOR 7 1/2 NAVAL RESERVATION

- U.S. NAVY
- ▼ U.S. ARMY
- ⊗ U.S. AIR FORCE
- ◻ DEPT. OF TRANSPORTATION
- ▨ DEPT. OF AGRICULTURE
- DEPT. OF THE INTERIOR

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA - - - - - APPROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO - - - - - STUDY AREA INLAND BOUNDARY

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:
 COMANDO EN JEFE FUERZAS ARMADAS
 JUNTA DE PLANEACION

TERRENOS FEDERALES EXCLUIDOS
 EXCLUDED FEDERAL LANDS

By applying these definitions, the following uses have been determined to be subject to management:

- a) All uses of coastal waters and submerged lands;
- b) All uses of the zona maritimo-terrestre (the publicly-owned "maritime zone" along the shorefront);
- c) All uses within areas which will be designated as Natural Reserves;
- d) The following major uses: Land subdivisions, urbanizations, industrial projects, commercial centers, hotels, "villa turisticas," and "trailer camps." (See discussion in Chapter 4.)

Permitted uses of water will be determined in each instance by review of development proposals in light of the policies set forth in the Islandwide Land Use Plan, including the new policies established by the PRCMP, the policies and standards of the Environmental Quality Board, and any plan and policies adopted by DNR. Most development of water areas requires a permit from the Army Corps of Engineers; the Department can prevent the granting of a Corps permit by denying an endorsement.

In addition, both Commonwealth and Federal law require the preparation of environmental impact statements before taking any action that would significantly affect the environment.

(3) AREAS OF PARTICULAR CONCERN

The Management Program must include an inventory and designation of Areas of Particular Concern within the coastal zone. (Section 305(b)(3))

Areas of Particular Concern (APC's) are designated in Chapter 4, and are shown on Map 29. These designations include a description of the nature of the concern and how the Management Program addresses and resolves the concern. Guidelines regarding priorities of uses in these areas, including lowest priorities, are found below. (For convenience of the general public in reviewing this document, APC's are called "Special Planning Areas" in the text.) These designations are based upon:

- a) A review of natural and man-made coastal zone resources. An inventory of such resources appears on Maps 30-37.
- b) Consideration of the following factors contained in 15 CFR 923.21(d):

- (i) Areas of unique, scarce, fragile or vulnerable natural habitat, unique or fragile figuration (for example, Niagara Falls), historical significance, cultural value or scenic importance (including resources on or determined to be eligible for the National Register of Historic Places),
- (ii) Areas of high natural productivity or essential habitat for living resources, including fish, wildlife and endangered species and the various tropic levels in the food web critical to their well-being,
- (iii) Areas of substantial recreational value and/or opportunity,
- (iv) Areas where developments and facilities are dependent upon the utilization of, or access to, coastal waters,
- (v) Areas of unique hydrologic, geologic or topographic significance for industrial or commercial development or for dredge spoil disposal,
- (vi) Areas of urban concentration where shoreline utilization and water uses are highly competitive,
- (vii) Areas of significant hazard, if developed, due to storms, slides, floods, erosion, settlement, and salt water intrusion,
- (viii) Areas needed to protect, maintain or replenish coastal lands or resources including flood plains, aquifers and their recharge areas, estuaries, sand dunes, coral and other reefs, beaches, offshore sand deposits, and mangrove stands.

Of the areas deemed significant upon consideration of the above inventory and factors, several are recommended in Chapter 4 for future designation as Areas for Preservation or Restoration (APR's). (For convenience of the general public in reviewing this document, APR's are called "Natural Reserves" in the text.)

APC's in Puerto Rico contain a resource feature that both (1) has outstanding value when judged by the criteria set forth above, and (2) has potential for more than one use or may be sought by potentially incompatible users. Thus, APC's represent areas of significant conflict, present or potential, over future use. Although all of Puerto Rico is subject to direct planning and control by the Commonwealth government, the presence of significant conflicts makes these Areas of Particular Concern to the Commonwealth and will be subject to more intensive planning and management once the Program is approved.

(4) MEANS OF EXERTING COMMONWEALTH CONTROL

The Management Program must include an identification of the means by which the state proposes to exert control over land and water uses, including a listing of relevant constitutional provisions, laws, regulations, and judicial decisions. (Section 305(b)(4))

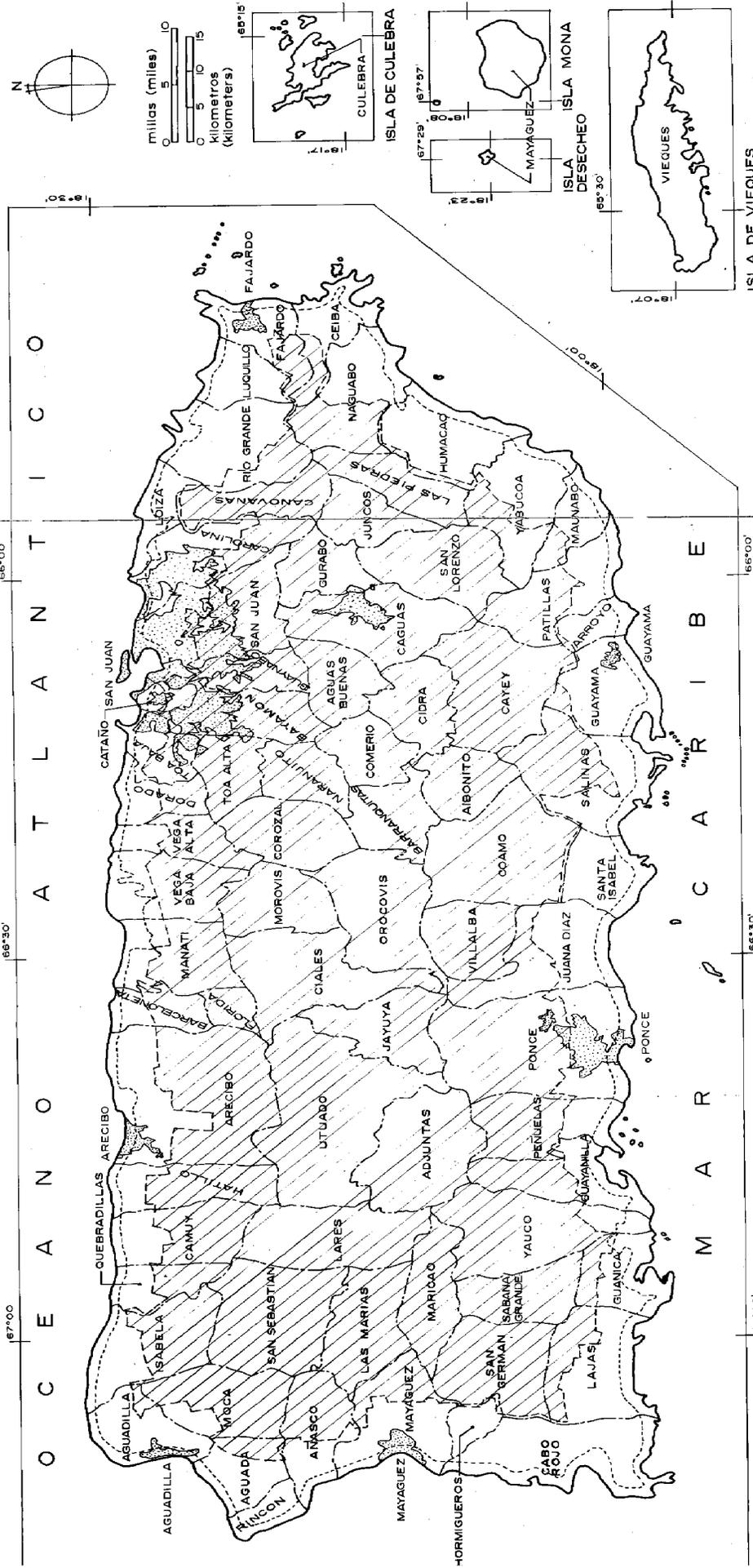
Chapter 4 contains a description of the powers and programs of the Puerto Rico Planning Board, the Regulations and Permits Administration, the Environmental Quality Board, and the Department of Natural Resources (DNR). Special reference is made to the following statutes and regulations:

Statutes:

- a) Puerto Rico Planning Board. Organic Act, Law No. 75 of June 24, 1975.
- b) Regulations and Permits Administration. Regulations and Permits Administration Organic Act, Law No.76 of June 24, 1975, and the following acts to which it refers:

Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

TE TERRESTRE APROXIMADO DE LA ZONA COSTANERA ----- APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO ----- STUDY AREA INLAND BOUNDARY



A DE PUERTO RICO
 NTE DE INFORMACION/SOURCE:
 ARTAMENTO DE TRANSPORTACION Y OBRAS PUBLICAS
 A DE SERVICIOS TECNICOS.
 VICIOS DE MAPAS TOPOGRAFICOS Y FOTOGRAMETRIA.
 IDO LIBRE ASOCIADO DE PUERTO RICO.

28
 LIMITES MUNICIPALES
 MUNICIPAL BOUNDARIES

A.R.P. — A.P.R.

- 1- PANTANO PUENTE DE LA CONSTITUCION
- 2- BOSQUE DE PIÑONES
- 3- BOSQUE PTEROCARPUS EN TORRECILLA ALTA
- 4- DESEMBOCADURA DEL RIO ESPIRITU SANTO
- 5- CABO SAN JUAN - EL FARO
- 6- ARRECIFE LA CORDILLERA
- 7- BOSQUE ESTATAL DE CEIBA
- 8- PANTANO DE HUMACAO Y BOSQUE PTEROCARPUS

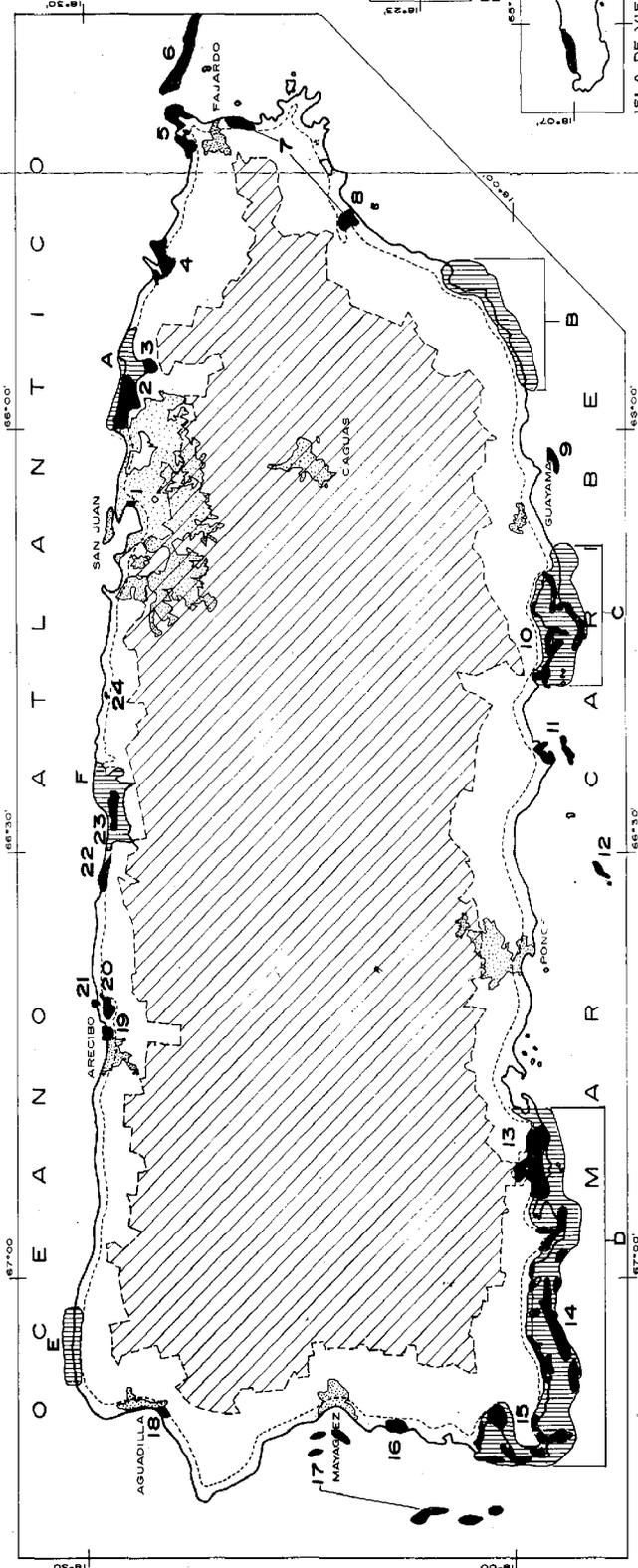
- 9 - ARRECIFES DE GUAYAMA
- 10 - BAHIA DE JOBOS Y MAR NEGRO
- 11 - PUNTA PETRONA
- 12 - CAJA DE MUERTOS
- 13 - BOSQUE DE GUANICA
- 14 - LA PARGUERA
- 15 - BOQUERON
- 16 - LAGUNA JOYUDA
- 17 - ARRECIFE TOURMALINE

- 18 - CIENAGA ESPINAR
- 19 - FARO DE ARECIBO Y FORTIN VICTOR ROJAS
- 20 - CAÑO TIBURONES
- 21 - CUEVA DEL INDI
- 22 - HACIENDA LA ESPERANZA
- 23 - LAGUNA TORTUGUERO
- 24 - BOSQUE PTEROCARPUS EN DORADO
- 25 - ISLA DE LA MONA
- 26 - BAHIAS FOSFORESCENTES DE VIEQUES

- A.I.S. — A.P.C.**
- A - BOCA DE CANGREJOS
 - B - AREA DE PANDURA
 - C - AREA DE GUARDARRAYA
 - D - AREA DE LA BAHIA DE JOBOS
 - E - AREA DEL SUROESTE
 - F - AREA DE ISABELA
 - G - AREA DE LAGUNA TORTUGUERO
 - H - VIEQUES
- TODOS LOS MANGLARES

AREAS DE INTERES SINGULAR  **AREAS OF PARTICULAR CONCERN**
AREAS DE PRESERVACION Y RESTAURACION  **AREAS FOR PRESERVATION AND RESTORATION**

LIMITE TERRESTRE APROXIMADO DE LA ZONA COSTANERA APROXIMATE COASTAL ZONE INLAND BOUNDARY
 LIMITE TERRESTRE DEL AREA DE ESTUDIO STUDY AREA INLAND BOUNDARY
 Financial assistance provided in part by Coastal Zone Management Act of 1972, administered by Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.



ISLA DE PUERTO RICO
 FUENTE DE INFORMACION/SOURCE:
 DEPARTAMENTO DE RECURSOS NATURALES
 Y JUNTA DE PLANIFICACION.

AREAS DE INTERES SINGULAR Y AREAS DE PRESERVACION Y RESTAURACION
AREAS OF PARTICULAR CONCERN AND AREAS FOR PRESERVATION AND RESTORATION

- Airport Zone Act, Act No. 92 of June 16, 1953
 - Act No. 374 of May 14, 1949 (Amended) (historic and tourist zones)
 - Act No. 89 of June 21, 1955 (Institute of Puerto Rican Culture)
 - Act No. 3 of March 2, 1951 (buildings of historic value)
 - Act No. 3 of September 27, 1961 (Control of buildings in floodable areas)
 - Act No. 168 of May 4, 1949 (Puerto Rico building regulations)
 - Act No. 135 of June 15, 1967 (certification of plans and specifications)
 - Act No. 25 of June 8, 1962 (neighborhood facilities for urban development)
 - Act No. 427 of May 13, 1951 (sign control)
 - Act No 104 of June 25, 1958 (Horizontal Property Act)
- c) Environmental Quality Board. Public Environmental Policy Act, Law No 9 of June 18, 1970.
- d) Department of Natural Resources. Department of Natural Resources Organic Act, Law No. 23 of June 20, 1972, and the following acts to which it refers:
- Hunting Law, Law No. 374 of May 11, 1950
 - Fishing Law, Law No. 83 of May 13, 1936
 - Forestry Law, Law No. 22 of November 22, 1917
 - Law No. 19 of May 28, 1925 (forest planting)
 - Law No. 38 of April 25, 1930 (forest reserves)
 - Law No. 39 of April 13, 1946 (land acquisition)
 - Law No. 149 of May 9, 1945 (nurseries)
 - Mining Law, Law No. 6 of October 6, 1954
 - Watershed Law, Law No. 4 of April 20, 1967
 - Flooding (acquisition of property), Law No. 28 of May 14, 1964
- Other statutes:
- a) Law No. 144 of June 3, 1976 (extraction of materials from the earth's crust)
 - b) Law for the Conservation and Development of Culebra, Act No. 66 of June 22, 1975
 - c) Law No. 70 of May 30, 1976 (wildlife)
 - d) Law No. 132 of July 1975 (squatters)
 - e) Law No. 211 of March 26, 1946 (soil conservation districts)
 - f) Law No. 21 September 4, 1969 (litter)
 - g) Law of Ports for the Island of Puerto Rico, May 3, 1886

- h) Law of Piers and Ports of 1968
- i) Civil Code of Puerto Rico, 31 LPRA, art. 254
- j) Law No. 38 of September 27, 1949 (beach concessions)
- k) Law No. 128 of June 29, 1977 (energy office)
- l) Fisheries Act, Act No. 83 of May 13, 1936
- m) Law No. 136 of June 3, 1976 (new water law)
- n) Penal Code of Puerto Rico, Law No. 115 of July 22, 1974 (squatters)

Regulations:

- a) Planning Board
 - Reg. No. 3, The Subdivision Regulation
 - Reg. No. 4, The Zoning Regulation
 - Reg. No. 7, The Building Regulation
 - Reg. No. 9, The Neighborhood Facilities Regulation
 - Reg. No. 11, The Simple Subdivision Regulation
 - Reg. No. 12, Regulation for the Certification of Construction Projects
 - Reg. No. 13, The Floodable Areas Regulation
- b) Department of Natural Resources
 - Regulation to Govern the Extraction of materials from the Earth's Crust
 - Hunting Regulation
 - Fishing Regulation
- c) Environmental Quality Board
 - Regulation for the Control of Solid Waste
 - Water Quality Standards Regulation (Amended)
 - Regulation for the Control of Atmospheric Pollution (Amended)

(5) USE PRIORITIES IN PARTICULAR AREAS

The Management Program must include "broad guidelines on priorities of uses in particular areas, including specifically those uses of lowest priority." (Section 305(b)(5))

The priorities set forth below establish the broad guidelines for all APC's, which include (1) all mangrove wetlands and, (2) seven areas specified in Chapter 4.

For mangrove wetlands, use priorities are derived from the policy established in Chapter 3, section on Mangrove Wetlands. These priorities are as follows:

- a) (Highest priority). Uses specified in the mangrove wetlands policy as being permitted in Natural Reserves (APR's) (e.g., burying cable or pipelines),
- b) Uses specified in the mangrove wetland policy as being permitted in other mangrove wetlands (e.g., nature study, aquaculture, or similar resource-dependent activity).
- c) (Lowest priority). All other uses.

For other APC's, the Program provides for detailed planning, regulation, and enforcement, so that natural systems will be protected insofar as practicable in each case, consistent with achievement of needed economic development. In some cases, development disruptive of natural systems may be unavoidable. Such development will be permitted, however, only after full consideration of location and design alternatives that would cause less disruption of natural systems. (The Commonwealth's EIS requirements, already described, assure this evaluation.) As a result of this policy, the priorities of uses for APC's (other than mangrove wetlands) are as follows:

- a) (Highest priority). Uses that maintain the integrity of estuaries and coastal waters.
- b) Coastal-dependent uses that cannot readily be redesigned or relocated to cause less impact on natural systems. (See Chapter 3, section on Coastal-Dependent Industry.)
- c) Uses strongly benefited by coastal location (including (1) industries such as power plants that need cooling waters or which use large quantities of imported products; and, (2) industries that serve or are supplied by water-related industries and therefore seek locations near them) and which cannot readily be redesigned or relocated to cause less impact on natural systems. (See Chapter 3, section on Coastal-Dependent Industry.)
- d) Non-dependent, non-related uses that retain flexibility of future use and do not prematurely or inalterably commit shorelands to more intensive uses. (See Chapter 2, policy on protecting future options; Chapter 3, section on Coastal-Dependent Industry.)
- e) (Lowest priority). Non-dependent, non-related uses that cause a permanent or long-term change in the features of coastal shorelands or coastal waters.

(b) ORGANIZATIONAL STRUCTURE

The program must include a description of the organizational structure proposed to implement the program, including the responsibilities and interrelationships of local, areawide, state, regional, and interstate agencies in the management process. (Section 305(b)(6))

In his covering letter* which accompanies the Program document, the Governor has designated the Department of Natural Resources as the lead agency for administering the Coastal Management Program. This decision reflects the two emphases of the Program as described in Chapter 4: a) Guiding Development on Public and Private Property; and b) Active Management of Coastal Resources.

- a) Guiding Development on Public and Private Property. Responsibility for development guidance functions, which are of a policy-making, planning, and regulatory nature, is concentrated in the Puerto Rico Planning Board (PRPB). The issuance of permits pursuant to PRPB regulations, as well as some other largely ministerial duties, are the responsibility of the Regulations and Permits Administration (RPA). Additional policies and regulations have been established by the Environmental Quality Board (EQB) and the Department of Natural Resources (DNR). All four agencies are described in Chapter 4.

The responsibilities of PRPB, which is administratively attached to the Office of the Governor, are extremely broad. The Board is responsible for the full range of public objectives, for considering the full range of methods available to achieve them, and for the entire area of the Commonwealth. Guiding development in the coastal zone is thus only one of many "sectors" for which the Board has planning responsibility.

The development guidance emphasis of the Program, as explained in Chapter 4, is not one of establishing a new development guidance process at the Commonwealth level, since such a process has been operative for many years. Rather, the Program emphasis is on refining the existing process -- by fine tuning regulations, for example, and by making more site-specific decisions before development proposals are submitted -- so that the process may respond more sensitively to the problems and opportunities of the immediate littoral area.

The signed cover letter will be included in the final PRCM.

Although many of the needed refinements must ultimately be accepted or rejected by PRPB, the breadth of PRPB's duties dictates that the Board not be responsible for initiating them and pressing for their adoption and implementation. Other agencies, with narrower ranges of responsibilities, are better able to focus on the needs of individual sectors such as this. In the case of coastal management, principal sectorial responsibility is assigned to the Department of Natural Resources. (The Planning Board Organic Law (Section 13 (3)) obligates the Board to assist agencies in preparing and implementing their functional and sectorial plans and programs.)

- b) Active Management of Coastal Resources. With particular emphasis on public lands and waters, active management of coastal resources is the second emphasis of the Puerto Rico Coastal Management Program. This emphasis includes measures to protect and maintain coastal resources (e.g., regulating resource extraction, franchising, surveillance, enforcement). It also includes measures to enhance public use and enjoyment of the resources (e.g., property acquisition, beach cleaning, provision of recreational facilities). The established responsibilities of the Department of Natural Resources, explained in Chapter 4, make it the appropriate agency to be responsible for this aspect of the program as well.

Linkages among the four principal agencies responsible for implementation of the Program are of critical importance. These are described in Chapter 4.

REQUIREMENTS OF SECTION 306(c) OF THE CZMA

(1) ADOPTION, PARTICIPATION, FEDERAL POLICY

The state must have developed and adopted a management program for its coastal zone in accordance with rules and regulations promulgated by the Secretary, after notice, and with the opportunity of full participation by relevant Federal agencies, state agencies, local governments, regional organizations, port authorities, and other interested parties, public and private, which is adequate to carry out the purposes of this title and is consistent with the policy declared in Section 303 of this Title. (Section 306(c)(1))

(a) Public participation

A description of public participation activities, including public information, informal reviews of preliminary drafts, and public hearings, is presented in Appendix E.

(b) Federal participation

Descriptions of Federal agencies affecting the coast can be found in Appendix A. Federal agency comments and the Coastal Zone Project staff's responses may be found in Appendix D. Federal agency participation in formulation of the Program is comprised of four elements:

1. Consultation arising out of meetings on the Culebra Segment. Late in 1975, representatives of 10 Federal agencies met at the Federal Regional Council offices in New York to discuss the Culebra Segment of the Puerto Rico Coastal Management Program and to identify subject Areas of Particular Concern. Several of the agencies participated in discussions at the meeting about their coastal zone management concerns, activities, programs, problems, and expectations. Although the questions and most comments focused on the Culebra Segment, several suggested expectations of the Puerto Rico program generally.
2. Informal consultation during document preparation. During staff work on preparation of this Program document, Federal agencies were extensively consulted both to obtain information on their present and future programs and to obtain suggestions on ways in which the Program could best be related to them. These consultations were handled principally by telephone or in person with agencies having representatives in Puerto Rico.
3. Meetings to review draft document. A meeting was held on August 16, 1977, at the Federal Regional Council offices in New York to facilitate contributions by Federal agencies to revision of a preliminary draft of this document. A total of 12 agencies participated in this meeting. A list of these agencies and their concerns, together with copies of written comments received and the Department's responses, is contained in Appendix D. All expressed agency views were considered in preparing later drafts of this document.
4. Additional agency consultations to review draft document. In addition to the New York meeting, individual consultations were held with several Federal officials who were unable to attend those meetings or who wished to explore subjects raised there in greater depth. All expressed agency views were considered in preparing later drafts of this Program document.

(c) Commonwealth agency consultation

Descriptions of Commonwealth agencies affecting the coast can be found in Appendix A. Commonwealth agency comments and the Coastal Zone Project staff's responses can be found in Appendix D. Commonwealth agencies have participated in preparing the Program in several ways:

1. Informal consultations were held with a number of agencies during the planning phase of this program, both to obtain information and to determine how the Program might best respond to the needs of these agencies.
2. Prior to the adoption of the Objectives and Policies element of the Planning Board's Islandwide Land Use Plan, personnel of the Planning Board reviewed preliminary drafts with the heads of Commonwealth agencies or their representatives. These meetings were held during 1976.
3. A series of meetings, with technical personnel of agencies principally affected, was held during the summer of 1977 to review a preliminary draft of this Program document. All expressed agency views were considered in preparing later drafts of this Program document.

(d) Local governments

The coastal zone includes portions of 43 municipalities, although none of these has authority to control land use. All the municipalities were given an opportunity to participate in the development of the Program:

A preliminary draft of the Program document was sent to the mayors of all coastal municipalities, with requests for comments (or for opportunities to meet with them in person to discuss the Program). All expressed views were considered in preparing later drafts of this Program document.

(e) Regional organizations

There do not appear to be any regional organizations within the Commonwealth's coastal zone.

(f) Port Authorities

The Puerto Rico Ports Authority is linked to the Commonwealth Department of Transportation and Public Works. Participation by the authority is included above in the discussion of participation by Commonwealth agencies.

(g) Consistency with Federal policy in Section 303 of the CZMA

Through its policies and implementing authorities, the Program is intended to be consistent with and to enhance the national policies of Section 303 of the CZMA by

- providing for the preservation, protection, development, and where possible, the restoration or enhancement, of the resources of the coastal zone,
- developing and implementing a management program designed to achieve use of coastal land and water resources with full consideration having been given to ecological, cultural, historic, aesthetic and economic development values,
- providing a means (through the Federal consistency procedures) for continued cooperation and participation of Federal agencies in the administration of the Program,
- encouraging the participation of the public, Federal, Commonwealth, and local governments in the development of the Program, and
- encouraging cooperation through the continued implementation of and adherence to this Management Program of various Commonwealth agencies, particularly regarding environmental problems.

(2) COORDINATION WITH LOCAL, AREAWIDE, INTERSTATE PLANS AND GOVERNMENTS

(a) Local, areawide, interstate plans

The state must have "coordinated its program with local, areawide, and interstate plans applicable to areas within the coastal zone existing on January 1 of the year in which the state's Management Program is submitted to the Secretary, which plans have been developed by a local government, an areawide agency designated pursuant to regulations established under Section 204 of the Demonstration Cities and Metropolitan Development Act of 1966, a regional agency or an interstate agency;" (Section 306(c)(2)(A))

This requirement is inapplicable, since no local, areawide, regional, or interstate agency has developed any plan applicable within the coastal zone.

- (b) Effective mechanism for continuing coordination. The state must have "established a mechanism for continuing consultation and coordination between the management agency ... and with local governments, interstate agencies, regional agencies, and areawide agencies within the coastal zone to assure the full participation of such local governments and agencies in carrying out the purposes of this title...." Special provision is made for any management program decision that would conflict with local zoning. (Section 306(c)(2)(B))

The statutory provision relating to conflicts between the management program and local zoning ordinances is not applicable, since there are no local zoning ordinances in Puerto Rico. As already noted, the coastal zone includes portions of

43 municipalities. One interstate agency may be affected: The Caribbean Fishery Management Council, which has management responsibility in Puerto Rico and the U.S. Virgin Islands, under the Fisheries Conservation and Management Act.

A preliminary draft of this Program document was sent to each of these entities. All expressed views were considered in preparing later drafts of this Program document. For the future, the Commonwealth will continue to consult with these entities, using a mutually acceptable procedure, to obtain their participation and assistance and to assure continuing coordination between their programs and the Coastal Management Program.

For the future, the organizational structure includes formal mechanisms for public involvement, such as:

- Public information programs of the Commonwealth agencies,
- Public hearings required by Commonwealth law before adoption of plans and regulations, and
- The presence of private citizen members of the Environmental Quality Board.

These mechanisms are regarded as supplements to the most important mechanism: The political process, through which private citizens influence agency actions by expressing their interest to the Governor and their legislators.

No formal new mechanisms for updating are believed to be necessary, since all Commonwealth programs must be updated in response to changing conditions. Accordingly, program updates/revisions (as necessary) will be a regular part of Planning Board and Department of Natural Resources activities.

(3) PUBLIC HEARINGS

The state must have held public hearings in the development of the management program. (Sec. 306(c)(3)) Section 311 requires that public hearings be announced at least 30 days in advance and that all documents and other agency materials must be made available at the time of the announcement.

After a draft of this document had been made available to serve as a basis for hearings, the required hearings were held in San Juan, Ponce, and Mayaguez on January 24, 26, and 31 of this year. Public notice of the hearings was given on December 21, 1977 by publication in three newspapers. Copies of a draft of this document were made available to the general public at the time of the public notice, by placing copies at the library

of the Planning Board and the Coastal Zone Project Office in DNR. Summaries of the hearings are included in Appendix E.

(4) REVIEW AND APPROVAL BY GOVERNOR

The management program and any changes thereto must have been reviewed and approved by the Governor. (Sec. 306(c)(4)).

The Governor's approval is contained in his covering letter*, which accompanies this program document.

(5) DESIGNATION OF SINGLE AGENCY

The Governor must have designated a single agency to receive and administer the grants for implementing the management program (sec. 306(c)(5)).

In his covering letter*, which accompanies this document, the Governor has certified that the Department of Natural Resources is the single designated agency to receive and administer grants for implementing the coastal management program, and furthermore, that the Department of Natural Resources is designated as the lead agency for implementation of the coastal management program.

Among the statutory powers of the Department, conferred by Article 5 of its Organic Act, are powers to advise the Governor, the Legislative Assembly, and other governmental bodies concerning the implementation of public policy governing natural resources; to make contracts and agreements with Federal, state, and Commonwealth agencies in order to achieve the objectives of the Department and its programs; and to accept funds from such agencies.

These powers, explicitly or by implication, include the capabilities required by OCZM to accept and administer grant funds; to monitor and evaluate management of Puerto Rico's coastal resources and to make periodic reports thereon to OCZM, the Governor, and the legislature; and to request approval from OCZM for changes to the management program if and when such become necessary.

(6) ORGANIZATION FOR IMPLEMENTATION

The state must be organized to implement the management program. (Sec. 306(c)(6)).

Commonwealth organization for implementation of the Program has been described in Chapter 4.

*The signed letter will be included in the final PRCMP.

(7) AUTHORITY FOR IMPLEMENTATION

The state must have authority to implement the program, including the authority required under subsection 306(d) of the CZMA. (Sec. 306(c)(7)).

The authorities of the PRPB, RPA, EQB, and DNR to administer land and water regulations and guide development are described in Chapter 4. Authorities to acquire land are set forth below in the discussion of section 306(d).

(8) CONSIDERATION OF THE NATIONAL INTEREST

In order to meet the requirements of subsection 306(c)(8) of the Act states must:

- (1) Describe which national interest in the planning for and siting of facilities... were considered during program development and the sources relied upon for such consideration;
- (2) Indicate how and where the consideration of those national interests is reflected in the substance of the management program including, where appropriate, indication of when and where national interests in identified facilities may compete or conflict with other national interests in coastal resources conservation...;
- (3) Describe a process for continued consideration of identified national interests.. during program implementation... including a clear detailed description of administrative procedures and decision points where such interests can be considered.

(a) Identification and Consideration of National Interest in the Commonwealth Coastal Area

One of the Commonwealth's (DNR) principal sources of information for identifying and incorporating consideration of the national interest in the planning for and siting of facilities into the development process and various policies set forth in this document, has been through comments and policy statements of affected Federal agencies (see Appendix D), Federal legislation and Presidential Executive Orders have also been consulted in defining the national interests.

(b) National Interests Considered

National Defense

The Department of Defense and the Army, Navy and the Air Force were contacted the period of program development. The following are major objectives of National defense:

- o to ensure sovereignty of the nation and protect its citizens from physical harm or expropriation, and
- o to establish and maintain the facilities necessary to carry out the first objectives

The Commonwealth recognizes the importance of national defense facilities. The Naval presence in the Commonwealth remains significant in terms of facilities and area. While the management program excludes Federally owned and leased land from the coastal zone, it anticipates that the defense agencies will conform to the PRCMP to the maximum extent practicable and that Federal consistency mediation procedures will be used as necessary.

Specifically, the following policies found in Chapter 3 indicate how and where on the management program the national interest in defense facilities are considered;

- . Special protection of mangrove wetlands
- . Criteria for diking, filling, dredging and deposit of dredged sediments.

Energy Production and Transmission

The following agencies were contacted and/or have sent comments during the period of program development: Department of Energy, Corps of Engineers, and the Department of Interior (BLM and USGS). Furthermore, the National Energy Plan objectives were examined. The following are the major objectives for energy:

1. To reduce dependency on foreign oil and vulnerability to supply interruptions, and
2. To have renewable and essentially inexhaustable sources of energy to sustain economic growth.

National interest in energy production is being considered in the development of the required energy facilities siting planning process (which will not be completed until September 30, 1978). The Islandwide Land Use policies in Chapter 2 include specific infrastructure policies concerning energy facilities (Public Policy 16). A discussion of the need to reserve coastal-dependent sites including those for energy facilities is included in the section on Coastal-Dependent Industry, and coastal waters in Chapter 3. Furthermore, Utilities Conservation Action Now Plan was examined and many of the conservation measures and alternative renewable sources were discussed.

Transportation

The following agencies were contacted and/or commented on the management program: Department of Transportation (Coast Guard), Federal Aviation Administration and the Corps of Engineers. Also the National Transportation Needs Study for Puerto Rico and the Coast Duties (14 U.S.C. 2). The following are the major objectives for transportation:

- o to develop a balanced transportation system
- o to provide safe, efficient, and convenient access via one or more modes of transportation for the movement of people, goods and services, to, from and through the coastal area.

National interest in transportation facilities is recognized in the objectives and policies quoted in Chapter 2, including the following objective:

To use the programming and construction of infrastructure as a tool, which, when linked to land use planning, serves to direct and promote the comprehensive development of the country.

Furthermore, the importance of transportation facilities is reflected in the dredge and fill criteria found in Chapter 3.

Recreation

The following agencies were contacted and/or commented on the management program during its development: NPS, BOR, and FWS. Also the National Historic Preservation Act and Puerto Rico's SCORP were examined. The following are the major objectives for recreation:

- o Recreation should be considered as an equal among competing users of the coastal area
- o To provide high quality recreational opportunities to all people of the U.S. while protecting the coastal environment
- o To protect existing recreation areas from adverse contiguous uses
- o To accelerate the identification of no-cost transfer of surplus and underutilized Federal property

National interest in recreation was described and considered in Chapter 3 in the following following section: Reefs, mangroves, dunes, beaches, coastal forests, cultural and historical sites and recreation. The policies and objectives found in Chapter 2 represent further consideration (esp. 3.00, 14.00, 17.04, 18.00).

(c) Continued Consideration

All affected Commonwealth agencies will consider the national interest in making permit decisions and approval of plans for or in the coastal zone. These decision points where the national interests can be considered are detailed in Subsection I.1, the development control process for the Regulations and Permits Administration and the Planning Board. Furthermore, Federal agencies will be consulted during the development of management plans for APC's and natural reserves, special planning areas, and new management measure proposed for development during implementation (see Table 3-2) through draft reviews, bilateral meetings/contact and other mutually agreed procedures.

(9) AREAS FOR PRESERVATION OR RESTORATION

The management program must make provision for procedures whereby specific areas may be designated for the purpose of preserving or restoring them for their conservation, recreational, ecological, or aesthetic values. (Sec. 305(c)(9)).

Areas for preservation or restoration (APR's) are recommended for future designation in Chapter 4, are shown on Map 29, and are described in Appendix C. In all cases, the objective of designation is to preserve important natural features and values. (For the convenience of the general public in reviewing this document, APR's are called "Natural Reserves" in the text.) As indicated in Chapter 4, formal designation of APR's is to be done by statute (as already proposed, for example, by pending legislation for Mona and Monito Islands), or administratively by the Planning Board.

REQUIREMENTS OF SECTION 306(d) of the CZMA

AUTHORITY FOR MANAGEMENT

The state must have authority for the management of the coastal zone in accordance with the Management Program. Such authority must include power

- (1) "to administer land and water use regulations, control development in order to ensure compliance with the management program and to resolve conflicts among competing uses,

- (2) to acquire fee-simple and less than fee-simple interests in lands, waters and other property through condemnation or other means when necessary to achieve conformance with the Management Program." (Section 306(d))

Statutory power to adopt and administer land and water use regulations, and to control development, is conferred by the statutes described in Chapter 4.

The power to resolve conflicts among competing uses is inherent in the planning and regulatory powers conferred by the Planning Board Organic Act. As described in Chapter 4, the Governor is explicitly empowered to resolve conflicts between the Planning Board and EQB.

The Department of Natural Resources has power to acquire property, by condemnation or otherwise, pursuant to the General Expropriation Law of Puerto Rico, 23 L.P.R.A., Sections 2910-13. In addition, the Puerto Rico Land Administration, which often acquires land needed by other public agencies, has broad power to acquire land or interests therein, by expropriation or otherwise. (Puerto Rico Land Administration Act, 23 L.P.R.A., Sections 311-30)

REQUIREMENTS OF SECTION 306(e) OF THE CZMA

(1) TECHNIQUES FOR CONTROLLING LAND AND WATER USES

The Management Program must provide "for any one or a combination of the following general techniques for control of land and water uses within the coastal zone:... (b) Direct state land and water use planning and regulation..." (Section 306(e)(1))

The Commonwealth uses the method listed in Section 306(e)(1)(B) of the CZMA: Direct Commonwealth land and water use planning and regulation.

(2) ASSURING LOCAL REGULATIONS NOT UNREASONABLY RESTRICTIVE

The Management Program must provide "for a method of assuring that local land and water use regulations within the coastal zone do not unreasonably restrict or exclude land and water uses of regional benefit." Section 306(e)(2))

There are no local regulations of land or water uses anywhere in Puerto Rico, nor is there enabling legislation for adoption of such regulations. (The Planning Board Organic Law, Article 24, does authorize the Board to delegate some regulator powers, including the amendment of zoning maps, to local planning commissions. No such delegation has occurred, however. In any event, the statute also requires the Board to establish guidelines sufficient to assure that any delegated powers are exercised consistently with policies and regulations of the Board.)

REQUIREMENTS OF SECTION 306(h) OF THE CZMA

SEGMENTATION

If a state Coastal Zone Management Program is adopted in segments, the state must adequately provide for the ultimate coordination of the various segments of the Management Program into a single program. (Section 306(h))

The Culebra Segment of the Puerto Rico Coastal Management Program was adopted prior to the remainder of the Program so that early attention could be devoted to the urgent coastal zone management needs of Culebra Island and its surrounding keys and waters. The Culebra Segment was approved by NOAA in early 1977.

Following approval of the full Puerto Rico Coastal Management Program, as described in this Program document, Puerto Rico will conduct a single unified Coastal Zone Management Program; the Culebra Program, as described in the Culebra Segment document, is incorporated in full into the Program. The management measures described in this Program document apply to Culebra as well as to the rest of Puerto Rico's coastal zone. In addition, Culebra is subject to special provisions (notably to the Law for the Conservation and Development of Culebra and to the Culebra Conservation and Development Authority). These provisions, as described in the Culebra Segment document, respond to the special problems of Culebra. The Culebra provisions are supplementary to the measures applicable throughout Puerto Rico's coastal zone, as described in this Program document, and are believed to be fully consistent with those measures.

REQUIREMENTS OF SECTION 307 (c) and (d) OF THE CZMA

FEDERAL CONSISTENCY

In addition to general requirements for cooperation that the CZMA places on all Federal government agencies (e.g., Section 303(c)), specific requirements address the consistency of Federal activities, development projects, licenses and permits, and financial assistance with the Coastal Program. (Section 307 (c)(1,2,3) and (d))

(a) Standards for Determining Consistency

In determining whether Federal activities, development projects, licenses and permits, and financial assistance are consistent with the Puerto Rico Coastal Management Program, the following shall be applied:

1. The objectives and policies element of the Islandwide Land Use Plan adopted by the Puerto Rico Planning Board on June 8, 1977. (Set forth in Chapter 2 of this Program document.)

2. The following additional policies and criteria:
 - Policy on special protection for mangrove wetlands (Chapter 3, section on Mangrover Wetlands),
 - Policy on appropriate access to Federal beaches hereafter declared surplus (Chapter 3, section on Beaches, part A),
 - Policy on public access to beaches (Chapter 3, section on Beaches, part B),
 - Criteria for diking, filling, dredging, and deposit of dredged sediments (Chapter 3, section on Coastal Waters, part D), and
 - Policy on sites for coastal-dependent development (Chapter 3, section on Coastal-Dependent Industry).
3. The water quality standards adopted by the Puerto Rico Environmental Quality Board (Chapter 3, section on Coastal Waters, part A);
4. Any additional policies, regulations, and plans, including plans for Special Planning Areas and Natural Reserves, that are incorporated into the Program in the future.

(b) Commonwealth Agency Responsible for Consistency Review

The Planning Board is the agency to which consistency certifications and determinations are to be submitted. This section designates, for each type of Federal action, the Commonwealth agency (the Planning Board or the Department of Natural Resources) which will be responsible for making the consistency review.

Federal agencies administering authority within the Puerto Rico coastal zone boundary are required to minister said authority in conformance with Section 307 of the CZMA and NOAA implementing regulations.

(c) Federal Activities and Development Projects (Section 307(c)(1) and (2))

Section 307(c)(1) and (2) of the CZMA require that Federal activity, including development projects significantly affecting the coastal zone "shall be conducted in a manner which is, to the maximum extent practicable, consistent with approved state management programs."

In the case of excluded Federal lands, activities on these lands that have an impact on the coastal zone beyond the boundaries of the Federal properties will be subject to this provision, as will activities beyond the boundary of the coastal zone that significantly affect the coast. Federal agencies themselves determine whether or not an activity or project will significantly affect the coastal zone and whether or not it is consistent, to the maximum extent practicable, with the Coastal Management Program. The Federal agency must, however, notify Puerto Rico of its proposed action and its consistency determination.

Certain categories of Federal action can generally be acknowledged as not affecting the coastal zone. These include:

- Radio transmission and maintenance of navigation aids placed or authorized by the U.S. Coast Guard; and
- Any action for which the agencies' environmental impact procedures, established pursuant to the National Environmental Policy Act of 1969, do not require issuance of an Environmental Impact Statement or negative declaration.

Other activities and projects generally can be considered as significantly affecting the coastal zone. These activities include:

- Federal agencies applying for licenses and permits,
- Development projects in the coastal zone,
- Land acquisition in the coastal zone,
- Road construction in the coastal watershed,
- Waste discharge in the coastal watershed,
- Activities affecting or altering surface runoff quality or quantity in the coastal watershed, and
- Dredge, fill, development, construction, or waste discharge in coastal waters.

To save time and funds, and to avoid conflicts involving substantial commitments of resources, consistency should be assessed at the earliest possible time. Preferably, this should occur as an integral part of the earliest planning and budgetary decisions.

The Puerto Rico Planning Board is the single Commonwealth agency responsible for reviewing Federal agency determinations that their projects and activities are (or are not) consistent with the PRCMP. The Board's A-95 project notification process will be used (and, as necessary, extended) to provide specific opportunity for review of consistency determinations. If a Federal consistency determination is under review, an item will be added to the A-95 notification requesting reviewing agencies to comment whether the project or activity is consistent with the Coastal Management Program. The Department of Natural Resource's Coastal Management Unit will be among the recipients of A-95 notifications in such cases.

(d) Federal Licenses and Permits (Section 307(c)(3)(A & B))

Section 307 (c)(3) of the CZMA provides that any applicant for a Federal license or permit to conduct an activity significantly affecting land or water uses in the coastal zone, must certify that the proposed activity complies with, and will be conducted in a manner consistent with, the Commonwealth's Coastal Management Program. At the same time, the applicant must supply a copy of such certification to the Commonwealth, along with all necessary information and data. The Commonwealth will then review the application, and at the earliest possible time, but within 6 months, notify the Federal agency of its concurrence or objection. The CZMA requires that: "No license or permit shall be granted by the Federal agency until the state or its designated agency has concurred with the applicant's certification or until, by the state's failure to act (within 6 months) the concurrence is conclusively presumed..."

Table B-1 lists the kinds of Federal licenses and permits which may significantly affect the coastal zone, which the Commonwealth wishes to review for consistency with the Coastal Management Program. Such review is desired only for those licenses and permits that authorize activities within the boundaries of the coastal zone. If it is found that the issuance of other kinds of Federal permits and licenses causes significant effects on coastal land and water uses, the list will be expanded through appropriate OCZM procedures for changes to the PRCMP.

Table B-1 designates the single Commonwealth agency (the Planning Board in some cases, the Department of Natural Resources in others) that is responsible for consistency review of each listed type of Federal license and permit. If the same Commonwealth agency is responsible both for consistency review and for review under another Federal or Commonwealth law or regulation, the two types of review will be combined. In all cases, the review process will include notifications of the type required for A-95 clearance. Reviewing agencies will be requested to comment whether the license or permit is consistent with the Coastal Management Program. The Department of Natural Resource's Coastal Management Unit will be among the recipients of notifications.

(e) Federal Assistance (Section 307(d))

Section 307 (d) of the CZMA establishes consistency requirements for Federal financial assistance to the Commonwealth and to local governments. Federal assistance includes any grant, loan, contract, subsidy, guarantee, insurance, or other form of financial aid. If any such aid "affects the coastal zone," it must be consistent with the Coastal Management Program.

The Puerto Rico Planning Board is the single Commonwealth agency responsible for determining that Federal assistance significantly affecting the coastal zone is consistent with the Coastal Management Program. The Board's A-95 notification process will be used to review financial aid applications to assure consistency with the Coastal Management

Program. In cases in which Federal assistance may affect the coastal zone, an item will be added to the A-95 notification, requesting reviewing agencies to comment whether the assistance is consistent with the Coastal Management Program. The Department of Natural Resource's Coastal Management Unit will be among the recipients of A-95 notifications in such cases.

TABLE B-1

FEDERAL LICENSES AND PERMITS WHICH MUST BE CERTIFIED FOR
CONSISTENCY WITH THE PUERTO RICO COASTAL MANAGEMENT PROGRAM

<u>Type of Federal license or permit</u>	<u>Commonwealth agency responsible for consistency review</u>
Department of Defense - U.S. Army Corp of Engineers:	
- Permits and licenses required under Sections 9 and 10 of the River and Harbor Act of 1899.....	DNR
- Permits and licenses required under Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (Ocean Dumping).....	DNR
- Permits and licenses required under Section 404 of the Federal Water Pollution Control Act of 1972 and amendments.....	DNR
Nuclear Regulatory Commission:	
- Permits and licenses required for siting and operation of nuclear power plants.....	Planning Board
Department of Interior - Bureau of Land Management:	
- Permits for pipeline rights-of-way.....	DNR
Department of Transportation - U.S. Coast Guard:	
- Permits for construction of bridges under 33 USC 401, 4591-507, and 525-534.....	Planning Board
- Permits for deep-water ports (33 CFR 158 et seq.).....	Planning Board
Department of Engery:	
- Permits for construction and operation of facilities needed to import or export natural gas.....	Planning Board
Department of Interior - U.S. Geological Survey (Section 307(c)(3)(B)):	
- OCS plans that describe in detail Federal license and permit activities (Review pursuant to Section 307(c)(3)(B) of the CZMA.....	DNR

(f) Processing of Comments on Consistency

Puerto Rico will rely upon the public notice provided by the Federal agency reviewing the applications for the Federal license or permit. If such notice does not satisfy the minimum requirements of OCZM regulations adopted pursuant to Section 307(c)(3), the Commonwealth agency will give additional required notice. The Commonwealth agency will consult with affected Federal agencies to determine whether the Federal notices comply with OCZM regulations.

The Commonwealth agency will review all comments received within the specified time limit. In addition, the Commonwealth agency will make its own initial determination of consistency. If any comments are received suggesting that the action is not consistent, or if the Commonwealth agency itself makes an initial determination that the action is not consistent, the responsible agency will attempt, through negotiation, to modify the project or take other appropriate steps to achieve consistency. If the conflict cannot be resolved to the mutual satisfaction of all reviewers, the responsible agency will review all comments and make a determination of consistency or lack of consistency on behalf of the Commonwealth.

REQUIREMENTS OF SECTION 307(f) OF THE CZMA

AIR AND WATER POLLUTION CONTROL REQUIREMENTS

The Management Program must "incorporate" requirements established by, or pursuant to, the Federal Water Pollution Control Act, as amended, and the Clean Air Act, as amended (Section 307(h)).

The policies and requirements of the Federal Water Pollution Control Act and the Clean Air Act are the minimum water and air pollution control requirements applicable to the Puerto Rico Coastal Management Program and are incorporated by reference.

The Management Program has been developed in consultation with the Environmental Quality Board, which is the Commonwealth agency responsible for pollution control. Continuing close cooperation with the Environmental Quality Board is planned and anticipated.

APPENDIX C

**DESCRIPTIONS OF SPECIAL PLANNING AREAS
AND NATURAL RESERVES**

Appendix C

DESCRIPTION OF SPECIAL PLANNING AREAS AND NATURAL RESERVES*

Chapter 4 recommends several portions of the coast for future designation as Natural Reserves and designates a few, larger areas as Special Planning Areas. (See Map 29.) This appendix briefly describes these areas.

NATURAL RESERVES

1. Constitution Bridge Mudflats Reserve (Ownership: Commonwealth)

These mudflats, adjacent to the Constitution Bridge in San Juan Bay, are one of the best areas in all Puerto Rico for shorebirds, gulls and terns. Per acre, it supports the greatest diversity and concentration of birds anywhere on the islands.

The mudflats are used as nesting areas by the Brown Pelican (Pelacanus occidentalis) which is on the Federal endangered list. The largest roost of Louisiana Herons (Hydranassa tricolor) known in Puerto Rico and the second largest roost of Snowy Egrets (Egretta thula) are found next to Constitution Bridge. In addition, a rookery of about 1,000 Cattle Egrets (Bubulcus ibis) is established in the area.

Raising of the flat by as much as several feet in some places as a result of man-made land fills has led to the destruction of a large part of the area previously inhabited by waterbirds and the invasion of the site by mangroves. Mangroves are occupying the elevated southern flats at such a rate that they threaten to completely eliminate this area as a significant waterfowl habitat.

2. Pinones Forest Reserve (Ownership: Commonwealth)

The Pinones State Forest includes Pinones Lagoon as well as adjacent mangroves. Total area of the Forest is 1,608 acres. It is of great ecological importance and a nesting area for many species of birds on the Federal and Commonwealth endangered list including: the Osprey (Pandion haliaetus) and the Brown Pelican (Pelacanus occidentalis).

*For convenience of the general public in reviewing this document, the terms "Special Planning Areas" and "Natural Reserves" are used in place of the terms "Areas of Particular Concern" and "Areas for Preservation and Restoration" used in Federal regulations.

Carmelita Island within the Pinones Lagoon holds the largest population of Snowy Egrets (Egretta thula) known in Puerto Rico.

The bioluminescent Pinones Lagoon is one of the few places having environmental conditions which support large populations of bioluminescent dinoflagellates. Because of the rarity of these bioluminescent organisms the area is of particular importance to marine biologists. The area's proximity to metropolitan San Juan makes tourist and other visitor excursions relatively convenient.

At Punta Vacia Talega, ancient barrier dunes dating back to Pleistocene glaciation, together with the rugged coastline and high elevation, provide distinct geological values to an area already rich in unique habitats. The beaches and dunes, the forest, and the ocean comprise an integral ecological system.

The area's recreational potential is also noteworthy. There are approximately 5,200 lineal feet of good beaches, ideal for swimming, snorkeling, shell collecting, hiking, picnicking, fishing, motor boating, and water skiing.

3. Torrezilla Alta Pterocarpus Forest Reserve (Ownership: private)

This Pterocarpus forest is one of six to be found in the entire coastal study area. The endangered West Indian Tree Duck (Dendrocygna arborea) is found here in significant numbers. Adjacent hills are reported to be major feeding areas for the threatened White Crowned Pigeon (Columba leucocephala). Other rare waterfowl have also been observed in the forest area.

4. Rio Espiritu Santo Reserve (Ownership: Commonwealth and private)

This large complex consists of mangroves, fresh water swamp (ownership: private) and Pterocarpus forest (ownership: private) in the Rio Espiritu Santo area.

The mangroves, some 1,007 cuerdas in extent, are of prime ecological value for the preservation of wildlife. The system as a whole supports rare and endangered species of wildlife, including the nearly extinct Puerto Rican Parrot. Until recently, Ensenada Comezon between Punta Picua and Punta Miquillo was among Puerto Rico's finest natural areas. In the last few years, developments have destroyed several parts of the system. Nevertheless, it remains one of the Island's prime wildlife areas. The Ensenada Comezon is known to support the threatened White-Crowned Pigeon (Columba Leucocephala), the endangered West Indian Tree Duck (Dendrocygna arborea), and the nearly extinct Puerto Rican Parrot (Amazona vittata).

5. El Faro Reserve (Ownership: Conservation Trust and other private)

El Faro, a headland in the northeastern part of the Island, embraces varied topographical features such as hills, valleys, cliffs and beaches, as well as inland lagoons, mangrove forests, and coral reefs. Laguna Grande, the largest lagoon, is bioluminescent. The area provides habitat to a wide range of birds, marine organisms and plants. The lagoons are spawning grounds of fish and crustaceans.

As land's end, this sizable open space in the path of growing urban expansion, has been mentioned as an ideal site for a research center. It is an area of extraordinary beauty with a great range of living organisms, where one can still observe ecological process, unaltered by human activities. Scientists who have studied the area are of the opinion that it should be preserved forever in its natural state.

At present, the Conservation Trust owns the 444 cuerdas tract of land comprising El Faro.

Access to the site is restricted.

6. La Cordillera Reef Reserve (Ownership: Commonwealth and private)

La Cordillera is a chain of small islands off the coast of Fajardo. The whole area is rich in cays and coral reefs in good condition. Reefs near Icacos Islands, Palominito Cay, and Diablo Cay exhibit a great diversity of coral species.

The chain of islands supports several thousand nesting seabirds. Among these are approximately 1,000-2,000 Brown Noddies (Anous stolidus); 1,000-2,000 Bridled Terns (Sterna anaethetus), approximately 500 Sooty Terns (Sterna fuscata), one of Puerto Rico's only colonies of Roseate Terns (Sterna dougalii), several hundred Brown Boobies (Sula leucogaster) and a few Laughing Gulls (Larus atricilla). Most of the islands of the Fajardo Cordillera have little or no potential human use and are a primary area for Puerto Rico's wildlife. Together with their adjacent reefs, they should be managed as a wildlife sanctuary, with limited recreational uses, such as picnicking, and snorkeling, using an underwater trail through the reefs.

7. Ceiba State Forest Reserve (Ownership: Commonwealth)

The Ceiba State Forest consists of about 363 acres in two areas: 271 acres of mangrove in Fajardo (Santa Rita) and 92 acres in Naguabo (Hacienda La Esperanza). Salt flats support a great variety of wildlife including shorebirds, fish and crustaceans.

Among the animals dependent on this mangrove system and adjacent coastal waters is the endangered Manatee or Sea Cow (Trichechus manatus). In addition to the Manatee, the mangrove ponds support the largest population in Puerto Rico of the White-cheeked Pintail (Anas bahamensis), an endangered duck. Similarly, the endangered White-crowned Pigeon (Columba leucocephala) and Yellow-shouldered Black bird (Agelaius xanthomus) have breeding colonies within the mangrove. Large numbers of the rare Whimbrel (Numenius phaeopus) are found only on the nearby mudflats of the Roosevelt Roads base.

8. Humacao Swamp and Pterocarpus Forest Reserve (Ownership: private)

The Humacao Swamp, though little studied, is one of the least disturbed fresh water areas, making it one of Puerto Rico's prime wildlife habitats.

Heavily forested, it contains the most extensive remaining tract of the rare Pterocarpus officinalis. The area also supports great numbers of egrets, herons, and waterfowl, including the West Indian Tree duck, which is on the Commonwealth endangered species list.

9. Guayama Reef Reserve (Ownership: Commonwealth)

Staghorn coral reefs and soft coral reefs, from 50 to 84% living, are found near the coast of the municipality of Arroyo. Between the coast, near Punta Figuras, and the Guayama Reef Reserve there is an abundance of Thalassia. The water is normally clear and good for the practice of aquatic sports, especially diving. Although these reefs are believed to be in good condition, they have not been fully explored. Fuller exploration should be assigned high priority.

10. Jobos Bay and Mar Negro Reserve (Ownership: Commonwealth and private)

A large petrochemical development encircles the second largest mangrove swamp on the Island. Commonwealth owned mangrove swamps constitute a large part of this estuary. The entire area is being considered for industrial expansion. Offshore cays are important as habitats for bird and marine species. Coral reefs, in excellent state, abound offshore.

11. Punta Petrona Reserve (Ownership: Commonwealth)

This area consists of mangrove areas and cays--all portions of the Aguirre State Forest.

The Punta Petrona mangroves are extensive and undisturbed, full of channels and ponds, and support a diverse fauna. Although not extensively studied, their undisturbed character and long distance from human settlements suggest that they are a prime wildlife area.

The Caracoles Cays are a group of beautiful, uninhabited mangrove islets supporting dove and herons.

12. Caja de Muertos Reserve (Ownership: Commonwealth)

This area is comprised of Caja de Muertos Islands (Ownership: Commonwealth, but leased to a private party) and nearby Berberia Cay (ownership: Commonwealth).

Caja de Muertos is notable for sea turtles, great numbers of which are reported on its beaches. The island has an abundant and unique herpetofauna of great scientific interest.

Berberia Cay is characterized by its completely undisturbed vegetation which not only provides an important nesting area for pigeons and doves, but also makes it practically impossible to survey.

13. Guanica Forest Reserve (Ownership: Commonwealth and private)

This area comprises the Guanica State Forest and adjoining cays and reefs (ownership: Commonwealth) as well as the adjoining Bahia de la Ballena area (ownership: private), which is bordered by the Forest and the sea.

The adjoining reefs and mangroves, most of them in good condition, are abundant with marine life. Special care, however, is needed to protect these important resources from pollutants of nearby industrial complexes.

The Forest--classified as a sub-tropical dry forest--is the habitat for approximately half of all the species of land birds in Puerto Rico. The Puerto Rico Whip-poor-will breeds only in this forest and has been placed on the endangered species list. Seven vegetation associations

are recognized, which include more than 700 plant species of which 246 are trees or large shrubs. This diversity is comparable to no other area of equal size in Puerto Rico. Of the 48 rare or endangered species in Puerto Rico, 16 are found only within the boundaries of this forest.

14. La Parguera Reserve (Ownership: Commonwealth)

This area comprises three bays (La Parguera Bay, Monsio Jose Bay, and Montalva Bay), their bordering mangroves, and nearby cays and reefs. (Ownership: Commonwealth, except those mangrove areas owned by the Conservation Trust. Parts of the mangroves are included in the Boqueron State Forest.)

The bioluminescence of La Parguera and Monsio Jose Bays have made the La Parguera area one of Puerto Rico's most important and best known natural areas. This habitat supports the Yellow-shouldered Blackbird, (*Agelaius xanthomus*), a species that is endemic to Puerto Rico and on the Federal endangered species list. The cays of La Parguera also support large numbers of herons, pelicans and terns. The Manatee (*Trichechus manatus*), an endangered species, is also found there.

Montalva Bay with its cays, reefs, and mangrove system supports a great variety of marine life. The area is highly suitable for the pursuit of recreational, ecological and scientific studies.

15. Boqueron Reserve (Ownership: Commonwealth and Conservation Trust)

This area comprises the Boqueron State Forest (except those parts included in the La Parguera APR) and the Commonwealth-owned Boqueron Bird Refuge and the Conservation Trust-owned property at Guaniquilla. (The Cabo Rojo Lighthouse would also be included if it were not located on excluded Federal land.)

The Boqueron State Forest, distinguished by the salt ponds near the lighthouse, is the best area in Puerto Rico for shorebirds. The site supports a small breeding population of Snowy Plovers as well as large numbers of herons, pelicans, and the Yellow-tailed Tropicbird.

The Boqueron Bird Refuge is one of the finest areas for herons. It supports other species including the Black-crowned Night-heron (Nyctanassa violacea), which is on the Commonwealth endangered species list, and the Brown Pelican (Pelacanus occidentalis), which is on the Federal list. More than 100 bird species have been recorded in the refuge.

The channels and mangrove complex located within the forest are important not only because they provide wildlife benefits, including fish, waterfowl, and bioluminescent organisms, but also because it has great undeveloped recreational potential. The complex provides rich protected substrate, a habitat for a large variety of organisms, which, in turn serve as the food base for marine fauna. Some fish of commercial importance are found among the mangrove roots, while others spend part of their life cycle there breeding and spawning. The mangroves also provide nesting grounds for both native and migratory birds.

Punta Guaniquilla at Cabo Rojo is the promontory which defines the northern limits of the Bahía de Boqueron. The property has a variety of natural characteristics, a mangrove fringe, and two lagoons, rolling hills coming down to the sea and natural caves in a dense forest.

One of the lagoons has a unique rock formation. The other lagoon, surrounded by a mangrove fringe, is known to be a habitat for the endangered Antilles tree duck. This area was initially acquired by a petroleum firm for industrial purposes and was thus under development pressure.

The Conservation Trust has subsequently acquired it to protect these important natural features. The area consists of around 400 cuerdas.

16. Laguna Joyuda Mangroves Reserve (Ownership: Commonwealth)

Laguna Joyuda, with some 75 acres of bordering mangroves, is a brackish lagoon and, as such is of ecological importance. It is one of the few areas where a mixture of herons, sea swallows, and coastal aquatic birds tend to congregate. This same area is also well known for great barracuda, snook, haddock, jewfish, shapper, ladyfish, and tarpon. Forage and bait fish, such as mojarra, mullet, and anchovy are abundant, and small marine fish.

17. Tourmalines Reefs Reserve (Ownership: Commonwealth)

These reefs have been included for their magnificent state and their marine life. Though information on coral reefs is very scarce, increased rates of sedimentation and waste discharge have killed some nearshore reefs and degraded many others.

18. Espinar Swamp Reserve (Ownership: Private)

This is a small swamp in Aguadilla. This freshwater swamp has been reputed to support the endangered species West Indian Tree Duck (Dendrocygna Arborea).

19. Arecibo Lighthouse Reserve (Ownership: U.S. Federal Department of Transportation)
Preservation of this important lighthouse is desirable, although it is located on excluded Federal land.*

20. Cano Tiburones Reserve (Ownership: Commonwealth and private)
Although much of this freshwater swamp was partially drained in earlier decades to create agricultural land, it remains important because the large natural supply of freshwater offers great potential as an outstanding habitat for waterfowl and aquatic freshwater birds.

21. Cueva de Indio Reserve (Ownership: Private)
This cave, in the Barrio Islote de Arecibo, is of particular archeological importance.

22. Hacienda la Esperanza Reserve (Ownership: Conservation Trust)
La Esperanza contains an exceptional seascape of coves and cemented dunes and a vast alluvial plain with rich agricultural soils. It includes the estuarine zone of the Manati River and haystack hills characteristic of the karst region.

La Esperanza is also of great historic value, being the site of one of the oldest and most important sugar mills on the Island. It has been included in the National Register of Historic Places of the National Park Service. The property includes 2,265.75 cuerdas.

23. Laguna Tortuguero Reserve (Ownership: Commonwealth)
Tortuguero Lagoon is the only natural fresh water lake in the Island. It serves as habitat for many endangered species and endemic species of plant and animal life. A moritorium on new development has already been proposed by the Puerto Rico Planning Board. However, many pharmaceutical industries are being constructed or projected around the lagoon area. The large input of water needed by these industries poses a threat to the natural systems of the lagoon.

24. Dorado Pterocarpus Forest Reserve (Ownership: Private)
This forest is classified as a sub-tropical humid coastal forest. Though the size of the Pterocarpus forest in Dorado is smaller than the Pterocarpus forest in Humacao, it is in good condition and constitutes, jointly with the other forests, an important habitat for wildlife.

*Other lighthouses on excluded Federal lands, such as the Aguadilla and Cabo Rojo lighthouses should also be preserved.

25. Mona and Monito Islands Reserve (Ownership: Commonwealth)

The fauna of Mona Island is the most unique of any of the islands of Puerto Rico. Seven species of amphibians and reptiles are found nowhere else in the world except on Mona. Among these are the famous Mona Island Ground Iguana (Cyclura stejnegeri) a relic of the past, the Mona Blind Snake (Typhlops monensis), and the Mona Boa (Epicrates monensis).

The island is also important as a nesting area of various sea turtles. Mona is believed to support one of the largest known nesting aggregations of the endangered Hawksbill Sea Turtle (Eret-mochelys imbricata) known anywhere in the world. It is also known to support a relic breeding population of the Green Sea Turtle (Chelonia mydas). The Green Sea Turtles on Mona appear to have been isolated from other breeding colonies in the Caribbean for so long as to have developed some characteristics distinct from those of other islands.

The rest of this unique fauna includes a tree frog and several lizards. The avifauna of Mona Island is also noteworthy. The cliffs around the island sustain the largest population of breeding White-tailed Tropicbirds (Phaethn lepturus), in Puerto Rico. A large colony of approximately 500 pairs of Red-footed Boobies (Sula Sula), also nests here. A subspecies of the Yellow-shouldered Blackbird (Agelaius xanthomus), is endemic to Mona and now may be in danger of extinction, if the recently established Glossy Cowbird (Molothrus bonariensis) parasitizes its nests. Mona used to be the nesting ground of many thousands of White-crowned Pigeons (Columba leucicephala), a threatened species, and could probably be so again if hunting is carefully controlled. There is no question that Mona Island is one of Puerto Rico's prime wildlife areas.

Monito is presently the outstanding seabird nesting area in Puerto Rico. This is the only locality where the Magnificent Frigatebirds (Fregata Magnificens), and Masked Booby (Sula dactylatra) are known to breed in Puerto Rico. There are 200 nesting pairs of the former and 50 pairs of the latter. Fifty pairs of Blue-faced Boobies (Sula dactylatra) make up the largest breeding colony of this species anywhere in the United States territory.

In addition to the above mentioned species, the island is virtually covered with nests of Red-footed Boobies (Sula Sula), Brown Boobies (Sula leucogaster), and Sooty Terns (Sterna fuscata).

There are also a few nests of Laughing Gulls (Larus atricilla) and Brown Noddies (Anous stolidus) nests on the cliff ledges.

26. Vieques Bioluminescent Bay Reserve (Ownership: Commonwealth and Federal)

This area consists of several bioluminescent bays and a salt pond, and is rated as a wildlife habitat of exceptional value. Federally-owned portions of the proposed reserve are appropriate for preservation, although they are located on excluded Federal lands.

The phenomenon of bioluminescence has been observed in Puerto Mosquito, Tapon Bay, Puerto Ferro, and Puerta del Manglar, but the time-period of bioluminescence has not yet been studied in detail. In addition, Mosquito Bay and Ferro Bay are important areas for waterfowl including the endangered White-cheeked Pintail (Anas bahamensis), several species of doves and pigeons including White-crowned Pigeon (Columba inornata). The endangered Manatee (Trichechus manatus) has also been reported from within a mangrove channel in Mosquito Bay. The very rare Key West Quail Dove (Geotrygon chrysis), has been reported in the arid scrub of the Ferro Peninsula.

The large salt pond at the head of Tapon Bay is a good locality for waterfowl, pigeons, doves, and shorebirds including the endangered White-cheeked Pintail (Anas bahamensis), and threatened White-crowned Pigeon (Columba leucocephala).

SPECIAL PLANNING AREAS

Criteria for selection of Special Planning Areas included: (1) size and quality of existing natural systems, (2) intensity of developmental pressures, (3) economic importance and (4) consensus among government, industry, and environmental groups. The list from which Special Planning Areas were selected was based on a thorough inventory in which every site and/or project was mapped using the following categories: Archeologic and/or cultural value, natural areas, recreation, development with direct access needs to the coast, sites with unique geographical value for development, hazard areas and significant man-made features.

Upon applying these criteria the following areas have been designated as Special Planning Areas:

- A. Boca de Cangrejos Special Planning Area
- B. Pandura-Guardarraya Special Planning Area
- C. Jobos Bay Special Planning Area
- D. Southwest Special Planning Area

- E. Isabela Dunes Special Planning Area
- F. Laguna Tortuguero Special Planning Area
- G. Vieques Special Planning Area

In addition, all mangrove wetlands are Special Planning Areas.

A. Boca de Cangrejos

Location: Loiza Municipality

Area: 7,176 cuerdas

Ownership: Private and Commonwealth

This Special Planning Area (SPA), famous for its natural beauty and located immediately east of metropolitan San Juan, extends from Punta Cangrejos to the Loiza River. This area contains an aquarium, several squatter developments and recreation attractions. It is subject to increasing development pressures.

Among the natural features which should receive important protection consideration are mangrove forests, lagoons, fresh water swamps and beaches. The mangrove forest comprises 3,136 cuerdas and is the largest in Puerto Rico. The Pinones Forest, managed by the DNR, lies within this mangrove forest; the remainder of the mangrove forest is privately owned. Most of the mangrove forest is the black-white type, with a fringe of red mangrove protecting it on the ocean side.

Two large lagoons - Pinones and Torrecilla - are located within the mangrove forest. These lagoons support 30 known species of fish, bioluminescent dinoflagellates, and some 46 species of birds, many not found outside the forest.

South of the mangrove forest is a freshwater swamp -- "El Pajonal" -- which supports two bird species found on the Federal list of endangered species. Also within this swamp are some isolated groves of pure *Pteracarpus* forest.

One of the longest stretches of undeveloped beach in Puerto Rico protects the mangrove forest from frequent flooding. The beaches, including partially remaining dunes, have suffered erosion in places, both from natural causes and man-induced by sand extraction. Offshore from the beaches lie extensive coral reefs, portions of which were previously known as the "submarine garden of Boca de Cangrejos."

Other significant natural features within the area include Punta Vacia Talega, an exposed cemented barrier dune, and "mogates" or "haystack hills" in the limestone area south of the mangrove forest.

Culturally and historically important human habitats are also found within this area. The Pinones-Torrecilla area is home to several families whose ancestors originally settled the area. Nearby Loiza Aldea is an historically important town because of its old church, and culturally important because of the annual "fiestas de Loiza Aldea." Also, east of Punta Vacia Talega is a "conchero", the remains of an Indian settlement, relatively unknown but considered by some to be of great archeological importance.

PRIDCO has on several occasions proposed more intensive development of this area, primarily for tourism. In addition, the Planning Board has proposed the development of a new community in this area, and a private firm has proposed the development of a tourist-residential community. Environmentalists have urged the conservation of this area. The proposed development has therefore become a major issue.

Among the development issues facing this area is the need to balance growth potential from expanding tourist-residential facilities and other urban activities proposed by the government and private enterprise against the protection of remaining natural areas. Expanding recreational use of the limited natural resources poses another important development issue.

The presence of highly competitive uses having great economic, ecological, tourist-recreational, educational and scenic value underline the importance of identifying this as a Special Planning Area.

B. Pandura-Guardarraya

Location: Municipalities of Yabucoa and Maunabo

Area: 12,960 cuerdas (8,837 cuerdas of land; 4,123 cuerdas of water)

Ownership: Private

This Special Planning Area (SPA) located on the southeast coast of Puerto Rico stretches from the Yabucoa Valley in the north to the Guardarraya Range in the south. The area is known primarily for a scenic seascape provided by mountain ranges and rolling hills coming down to the sea in addition to pocket beaches. Sparsely settled, the area contains several

shoreline settlements and faces growing industrial and residential pressure. The need to balance future residential and industrial development with a spectacular coastline is clearly evident.

The shoreline is irregular. It is punctuated by several rock promontories such as Punta Guayanes to the north, Punta Yeguas and Punta Toro in the center and Punta Toro to the south. The river mouths of the Guayanes and Maunabo Rivers in addition to several beach systems are additional natural features. The Yabucoa Valley remains rural in character notwithstanding that it is the site of a major oil refinery. The area has natural features well worth protecting.

Towards this end, the Conservation Trust has recently acquired a 300-cuerda tract of land at Punta Yeguas which was previously exposed to the pressure of industrial and residential development.

The endemic tree frog (Eleutherodactylus cooki) is confined to boulder piles within the Pandura Mountain Range. Portions of this range, where the frog is common and where development is impractical, should be set aside for the protection of the frog.

Outstanding scenic qualities and attractive beaches in this area make it one of Puerto Rico's best conservation opportunities. At the same time, the location of a major oil refinery strongly suggests the possibility of other industrial development taking place. Problems of litter have generally gone unchecked.

An SPA study for this area is therefore required to resolve the priorities between recreation, residential, and industrial uses and to establish conservation measures for the scenic landscape.

C. Jobos Bay

Location: Guayama and Salinas Municipalities

Area: 17,164 cuerdas (6,579 cuerdas of land; 10,585 cuerdas of water)

Ownership: Commonwealth and Private

This Special Planning Area (SPA), located on the south coast of Puerto Rico, stretches from Municipal Road 7710 in the Municipality of Guayama to Playa de Salinas near Punta Salinas in the Municipality of Salinas. The area is primarily rural in character and includes several important natural features in addition to small settlements. There is consequently the need

to balance the continuing growth of the area with adequate protection of some of the most important natural resources in Puerto Rico.

Among the most important natural resources of this area are forests, mangroves, cays and bodies of water. Two of the four portions making up the Aguirre State Forest are located here and consist of mangroves and tidal flats. Although many of the mangroves bordering Jobos Bay were removed to make way for a large industrial plant, valuable portions remain. The mangrove forests support at least 60 species of birds, three of which are endemic to Puerto Rico. Some fish of commercial value are found among the mangrove roots, while others spend part of their life cycle there breeding and spawning.

Although the mangrove forest of Aguirre is not in pristine condition, the entire coastal zone is considered one of the most productive areas for sport and commercial fisheries on the south coast.

Jobos is a prime area supporting the Manatee, an endangered species on the Federal list. The relatively undisturbed mangrove system of Mar Negro, with its extensive system of channels, salt ponds, and islets, is of great importance as a wildlife habitat, particularly for the endangered Manatee. The Caribe and de Barca Cays, located southwest of Punta Pozuelo at the mouth of Jobos Bay, support important egret rookeries.

Boating and picnicking are frequent recreational uses in this area, despite the lack of public facilities. Week-end and recreational use is heaviest during the summer months, although there are no records of visitors to the area.

This area is the site of a major industrial complex, and the Economic Development Administration has proposed continuing industrial development of the Jobos Bay Area. The area is attractive for industrial development primarily because of natural ports and flat topography. In addition, the Water Resources Authority power plant complex is located in the area together with an outfall for discharging cooling waters. There is therefore need to provide an SPA Plan for this area which balances industrial and residential development with that of natural resource protection.

D. Southwest

Location: Municipalities of Guayanilla, Yáuco, Guanica, Lajas and Cabo Rojo

Area: 67,385 cuerdas (27,998 of land; 39,387 cuerdas of water)

Ownership: Private and Commonwealth

This Special Planning Area (SPA) extends from Punta Ventana and Guanica Forest in the Municipality of Guayanilla to Punta Guaniquilla in the Municipality of Cabo Rojo. This vast area is known for its industrial development and significant natural features. The area attracts many visitors. Consequently, there is a clear need to resolve the issues of industrial and residential, tourist and recreational pursuits with that of the effective management of natural resources.

The area has been divided into three sub-areas:

1. Guanica
2. La Parguera and Montalva Bays
3. Boqueron

1. Guanica. This sub-area stretches from Punta Ventana to Punta Montalva including Guanica Bay, the Guanica Dry Forest, and a small industrial complex. Guanica Bay, now seriously polluted, needs to be protected. In recent years two of the three pollution-causing industries have closed down, and a local group interested in clearing up the Bay has been formed. The Bay has also been proposed as a ship building area.

The Dry Forest is divided into two separate segments, in part by Guanica Bay. The Forest is a unique natural resource which is well documented in other places*.

The Guanica subarea also has historic and cultural value in that it includes the landing site of the American Troops in 1898 and the Guanica Lighthouse. Cana Gorda Public Beach, as well as other beaches such as that at Ballena Bay, Cerro Capron, provide an opportunity for recreational activities.

2. La Parguera and Montalva Bays. This sub-area extends from Punta Montalva to Punta Molina and includes La Parguera and Montalva Bays. This sub-area is rich in natural features, including mangroves, cays and reefs that display exuberant marine life such as the light-emitting dinoflagellates found in La Parguera and Monsio Jose Bays.

Recently the Conservation Trust acquired approximately 350 cuerdas of land surrounding La Parguera Bay in an effort to protect the "atmosphere" of the area from further environmental deterioration.

*See Chapter 3 of the PRCMP (Section on Coastal Forests) and the Master Plan for the Commonwealth Forests of Puerto Rico.

Competing uses here include commercial and vacation-residential uses. Illegally constructed houses along the shoreline at Parguera present a difficult problem to resolve and are a source of pollution because of the lack of sewage treatment facilities.

Magueyes Island is the site of the Graduate School of Marine Sciences of the University of Puerto Rico which uses the wide spectrum of marine and coastal ecosystems in the sub-area to carry out academic and scientific activities.

3. Boqueron. This sub-area extends from Punta Molino to Punta Guaniquilla. The area is known for its natural resources which attract increasing numbers of visitors. At the same time, its potential as an industrial area is demonstrated by proposals for development by PRIDCO.

Some of the natural resources for preservation, recreation and tourism are: (a) Rincon Lagoon, a large salt water body--surrounded by mangroves; (b) the Commonwealth-owned Boqueron Forest, a unique ecosystem comprising water, land mangrove and fish and wildlife in danger of environmental deterioration as a result of increased use by visitors; (c) the heavily-used beaches at El Combate, Pajaros, and Boqueron; and (d) coral reefs at Bajo Enmedio and offshore sand deposits at Salinas; (e) significant natural features such as points (Cabo Rojo, Punta Jaguey, Punta Aguila, Punta Moja Casabe and Punta Melones in addition to Punta Guaniquilla, bays (Sucia, Salinas and Boqueron Bays), and salt flats.

The salt flats are the source of moderately important salt industry, PRIDCO development proposals for port complexes indicate a growing potential as an industrial area. In addition, there have been recent efforts at aquaculture in Cabo Rojo.

There is clear need for the preparation of a plan for this SPA which will help to resolve the present and potential land use conflicts.

E. Isabela Dunes

Location: Municipality of Isabela

Area: 5,034 cuerdas (3,368 cuerdas of land; 1,666 cuerdas of water)

Ownership: Private

This Special Planning Area (SPA) extends from Bajura, midway between the town of Isabela and the settlement of Jobos, to Punta Agujereada north of Borinquen Airport (formerly Ramey Air

Force Base). The natural beauty of the area has always attracted visitors and has resulted in the nearby development of vacation homes and tourist facilities. At the same time, extraction of sand for construction purposes has seriously damaged the beach system along this part of the coast which, in turn, has resulted in flooding and irreparable damage to the flora in the area. More detailed study is required in order to resolve these conflicting issues as soon as possible.

The Jacinto Dunes are considered to be the most important dune formation worthy of strong conservation efforts. Covering an area of approximately 215 cuerdas, this formation is the result of wind action and erosion taking place over hundreds of years. Vegetation not only stabilizes the dunes but also helps them continue to grow. The dune system supports wildlife, safeguards adjacent lands from erosion by the sea, and protects wildlife and settlements from heavy winds and flooding.

The issue is particularly critical because sand is a vital part of the construction industry. Extensive extraction of sand for construction threatens the very existence of the dune system.

There is therefore an urgent need to provide an SPA Plan for this area which balances development considerations with that of natural resource management.

F. Laguna Tortuguero

Location: Municipalities of Vega Baja and Manati

Area: 8,750 cuerdas including the Laguna

Ownership: Private and Commonwealth

In recent years, Laguna Tortuguero -- an important natural resource -- has been subject to developmental pressures. This has led to a proposed moratorium on new development by the Planning Board in order that the balanced management of the area occurs.

As a natural resource, the Lagoon is unique for several reasons. First, it is the largest body of fresh water located so close to the ocean. Second, the area -- lagoon, swampy area, and beach -- supports several types of fauna. The lagoon supports three endangered species:

(1) Least Grebe (Podiceps dominicus), (2) Ruddy Duck (Oxyura jamaicensis), and (3) Purple Gallinule (Porphyryula martinica). A swampy area in the south central portion of the Lagoon area supports the wintering population of the Sora (Porzana carolina), a rare immigrant Rail confined to fresh water swamps in Puerto Rico. The beach north of the Lagoon is believed to support sea turtles (e.g. the endangered Hawksbill Turtle (Eretmochelys imbricata)). Third, for its size, the lagoon supports the most diverse flora anywhere in Puerto Rico, including at least four species endemic to the locality. The most important factor in the maintenance of the natural state of the ecosystem of the Lagoons and nearby swamps is the provision of fresh water to those systems.

Several studies describe and identify the area as an important natural resource in danger of possible irreparable damage: 1) Ecological Study of the Tortuguero Lagoon by the Water Research Institute, University of Puerto Rico in Mayaguez; 2) Ecological Study of the Tortuguero Lagoon by Gustavo Candelas; 3) Study on the Flora and Fauna of the Tortuguero Lagoon by Carlos a Rios; and 4) Protection of the Tortuguero Lagoon by the New Puerto Rico workshop.

The proposals for development of the area include industrial, residential and recreational uses. The proposed DuPont factory, when completed, will occupy 180 acres to the southwest of the Lagoon and the industrial wastes could adversely affect the Lagoon if adequate systems for disposal and treatment are not provided. Two proposed residential projects to the south and east of the Lagoon respectively could directly affect the quality of the Lagoon. Recreational uses based on environmental considerations have been proposed by the Department of Natural Resources.

Recently, the Governor appointed a special committee to review the status of the Laguna Tortuguero, thereby demonstrating the importance of resolving the issues concerning the lagoon. It follows that a plan of this SPA would be especially appropriate.

G. Vieques

Location: Approximately 9 miles southeast of Puerto Rico

Area: 51.7 square miles. The island is 18 miles long by 3½ miles wide.

Ownership: Commonwealth, Federal, and Private

There are no permanent fresh water streams on Vieques Island, and precipitation is minimal.

Almost 3/4 of the island belongs to the Navy (approximately 26,156 of the 33,000 cuerdas). These portions of the island constitute excluded Federal land. Other lands include 1,900 cuerdas belonging to the Commonwealth Land Authority for agricultural uses; 1,200 cuerdas reserved by Fomento for future industrial uses, 700 cuerdas belonging to the Social Programs Administration; 2,500 cuerdas in private lands for farming purposes, and 600 cuerdas for urban uses.

Vegetation in Vieques is similar to that of the semi-arid region of southwest Puerto Rico. The coast is fringed by mangrove wetlands and bays that exhibit the phenomenon of bioluminescence, such as Puerto Mosquito, Bahía Tapon, Puerto Ferro, and Puerto del Manglar. Many coral reefs are found in Vieques, and the broad insular shelf provides favorable conditions for proliferation of marine life. The most important natural areas in Vieques include its beaches, like Sun Bay, which has complete facilities; and mangrove systems like the ones in Laguna Kiana, Ensenda Honda, Bahía Tapon, Bahía Mosquito, Playa Grande, Bahía Ferro and Bahía Chiva, all of which are of great importance for Puerto Rico's wildlife.

The most important coral reefs bordering the coastal waters near Vieques are Ensenada, Cana Honda, Punta Vaca, Isabel Segunda, Caballo Blanco, Mosquito and Corona. These corals are of varied shapes and colors, and several species of fish are associated with them.

The eastern part of the island, within the Navy Base, exhibits numerous swamps and the adjacent hills of Mt. Pirata, as well as Kiani Lagoon, all of them natural areas of importance to Puerto Rico's wildlife, especially to endangered species such as the White-crowned pigeon (Columba leucocephala).

The Vieques population, approximately 8,500 inhabitants, depends mainly on agriculture, fishing, and a modest tourist industry for subsistence. Water scarcity as well as the small amount of available land, have limited opportunities for industrial development in Vieques.

An SPA plan is needed to facilitate the development of the non-Federal portions of the island, consistent with protection of natural resources.

APPENDIX D&F

THESE APPENDICES MAY BE FOUND IN
VOLUME NUMBER II

**COASTAL ZONE
INFORMATION CENTER**

