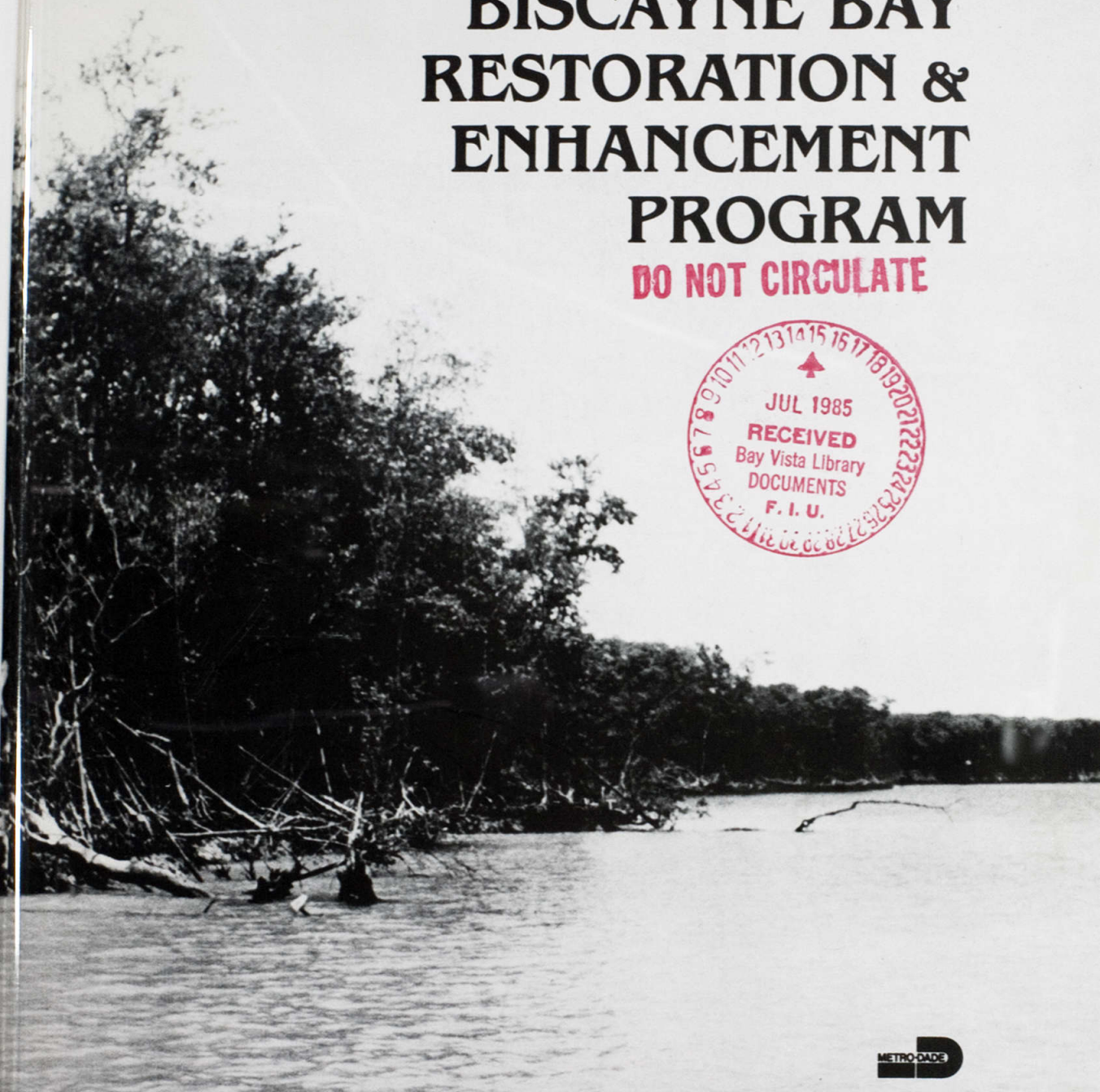
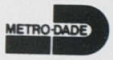
BISCAYNE BAY RESTORATION & ENHANCEMENT PROGRAM



METRO-DADE

DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT
909 S.E. 1st AVENUE
MIAMI, FLORIDA 33131



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INTRODUCTION

A. Bay History

Biscayne Bay, prior to the founding of the City of Miami in 1896, displayed the physical and hydrographic characteristics of a typical bar-built estuary. Physically, a bar-built estuary is a large, shallow partially enclosed body of water formed through the extensive development of sand bars or barrier islands parallel to the coast line. Hydrographically the region contains a volume of freshwater originating from upland sources (e.g. rivers,natural springs, etc.) which is mixed with seawater (Barnes, 1974).

Biscayne Bay was and still is partially enclosed by the barrier island known as Miami Beach. However, before urbanization, Ocean and Bay water exchange was limited to natural inlets (e.g. Norris Cut, Bear Cut, Safety Valve, Caesar's Creek, etc.) The main sources of freshwater "consisted of flow through natural drainage ways, overland flow and coastal underseepage from the Biscayne Aquifer" (Buchanan and Klein, 1976).

Prior to urbanization much of the immediate shoreline of Biscayne Bay was predominantly vegetated with mangroves (Harlem, 1979). Freshwater marshes existed landward of the saline mangrove environment (Teas, 1976; Harlem, 1979). The conditions of the

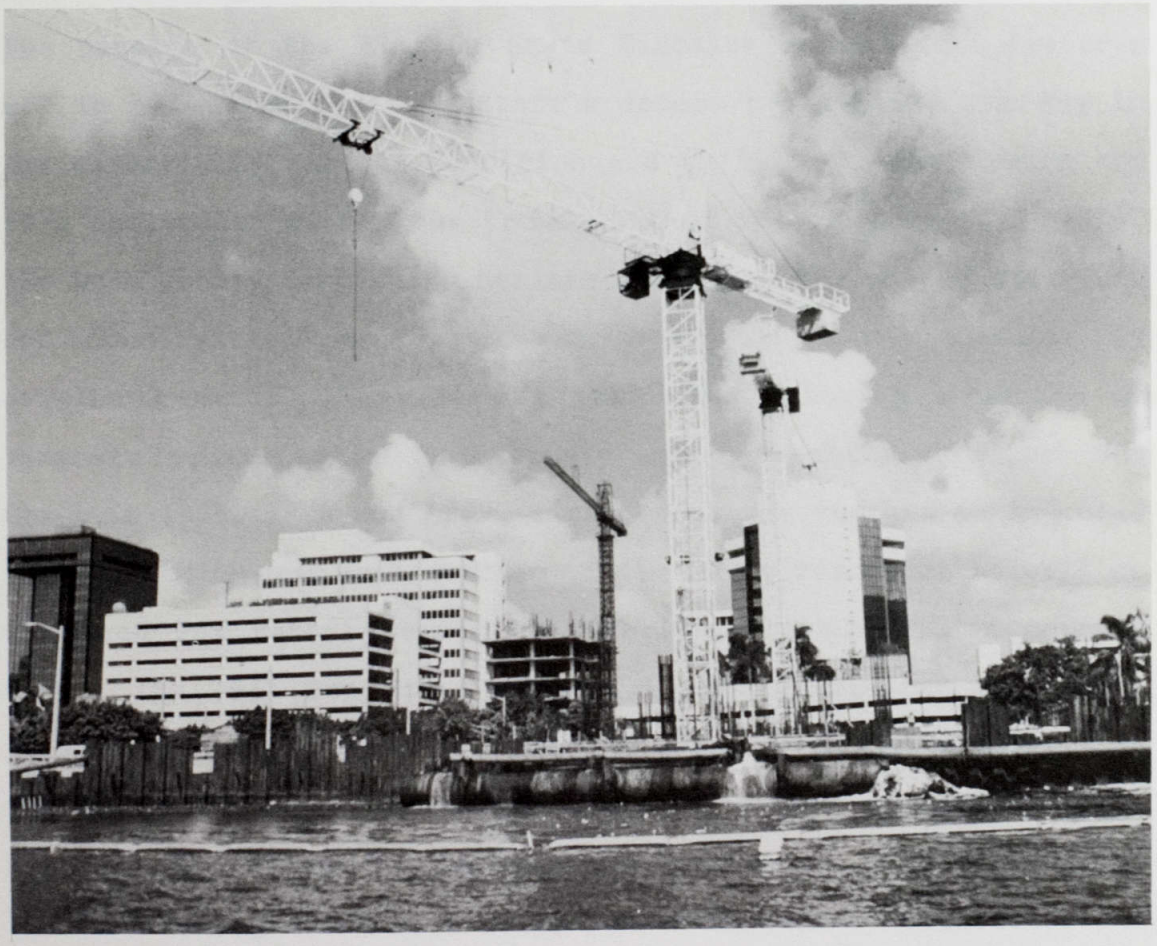
floral communities vegetating the Bay bottom prior to 1925 are not well known. It is reasonable to assume that Southern Bay was probably partially vegetated with seagrass beds and that some type of aquatic vegetation was present in Northern Bay. The mangrove, freshwater marsh and Bay bottom vegetation communities probably were, and with the exception of the freshwater marshes which have been diminished, probably still are the Bay's major sources of primary productivity. These floral communities either directly or indirectly supported the associated faunal communities in the Bay.

Mangrove shoreline. Photo: Ricky Schectman

Since the founding of the City of Miami, there have been extensive alterations in the natural, physical, hydrographical, and biological conditions of Biscayne Bay. Most of these alterations have occurredin Northern Biscayne Bay. Access, both physical and visual, has been restricted due to the construction of highrises, hotels, condominiums and the private ownership of bayfront land. The shoreline has been changed through the placement of fill and the construction of seawalls. This in turn has resulted in the loss of natural mangrove vegetated shorelines in Northern Bay. The amount of freshwater marshes has been reduced due to the inland intrusion of saline Bay water through mosquito control and agricultural drainage ditches (Teas, 1976).

Extensive urbanization and water management techniques have had the net effect of reducing the volume of freshwater discharging to the Bay. The dredging of Baker's Haulover and Government Cut has increased the volume of seawater entering into the Bay. This in turn has increased the average salinity in Northern Biscayne Bay. As a result, much of the bottom has become vegetated with seagrasses (Harlem, 1979). Subsequent dredging of large portions of the Bay bottom has reduced the quantity of these seagrass beds. North of Rickenbacker Causeway, the Bay has undergone a transition from a typical bar-built estuary to a saline lagoon (Biscayne Bay Management Plan, 1981).

Turbidity levels may have been elevated due to the resuspension of dredged bottom sediments and the eroding of shorelines. Water quality has been affected by the increased pollutant load caused by urbanization. Circulation has been altered through the construction of causeways and manmade islands. Additional alterations, such as the construction of the Port of Miami and the development of Miami Beach, have also contributed to the resultant changes in the Biscayne Bay ecosystem.



Construction along Bay shoreline. Note turbidity curtain in foreground to prevent excess sediment reaching the Bay from coastal construction activities.

Photo: Ricky Schectman

B. Program Background

The Bay's potential for biological viability and environmentally sound utilization decreased with its alteration. This resulted in a subsequent reduction in the aesthetic and recreational values of portions of the Bay ecosystem. As the general public became aware of this loss, local, state and federal agencies responded with a series of regulatory programs.

In 1968 the Biscayne National Monument was created. The monument was expanded into a national park in 1980, potentially preserving and protecting an area of Southern Bay from further degradation. The passage of the Florida State Biscayne Bay Aquatic Preserve Act in 1974 signified the State's intent to preserve the Bay in its essentially natural condition and to limit future dredge and fill activities within the boundaries of the preserve. In 1974, the Dade County Commission declared Biscayne Bay an "Aquatic Park and Conservation Area" and empowered the County Manager to develop a management plan for that area. During a series of symposia sponsored by Dade County and University of Miami Sea Grant in 1975, 1976 and 1977, a concensus was reached on the need for protection and preservation of the Bay's resources as well as the need for better regulation of coastal construction activities. The 1977 Sea Grant symposium also culminated in a concensus resolution stating "That a program to demonstrate the feasibility of enhancement procedures in selected areas of North Biscayne Bay should be implemented immediately." Additionally, the Florida Legislature in 1977, passed the Water Restoration and Preservation Act which authorized the State of Florida Department of Environmental Regulation to assist in the restoration of degraded water bodies.

As a result of many of these efforts, a need for a coordinated management plan setting guidelines for the preservation, protection, utilization, and enhancement of the entire bay was recognized. This resulted in the initiation of work on the Biscayne Bay Management Plan" in 1979 as well as the securement of Countywide Coastal Construction permitting jurisdiction by Dade County Environmental Resources Management in 1980. The Management Plan was adopted by the Dade County Commission on March 3, 1981 and serves the following purposes.

1. Defines the scope of concerns and programs that should be addressed within a comprehensive, coordinated approach to Bay Management.

2. Recommends programs and actions that should be undertaken during the next four years in order to move towards the comprehensive and coordinated management of Biscayne Bay.

3. Identifies a coordinating committee structure to oversee the scope and direction of recommended programs.

4. Identifies those agencies and community based groups that have responsibility for implementing certain management programs.

5. Identifies sources of funding or community based resources that can be utilized to achieve a coordinated approach to Bay Management.

The primary goal of the management plan is to provide a unified management system for the entire Bay that will, upon implementation, effectively maintain and enhance those physical, chemical, biological and aesthetic qualities that provide the basic character and values of this resource. The Biscayne Bay Management Committee serves as the overall coordinating structure which oversees the scope and direction of Bay Management programs. The Committee is composed of thirteen (13) members, of whom nine (9) are appointed by the Board of County Commissioners, as follows:

3 members of the Board of County Commissioners

2 members recommended for appointment by the Dade League of Cities

4 members from the Dade County Community appointed by the Dade County Manager

The remaining four members are:

District Engineer of the U.S. Army Corps of Engineers

Superintendent of the Biscayne National Park

Secretary of the Florida Department of Environmental Regulation

Executive Director of the Florida Department of Natural Resources

Members of the 1983 Bay Management Committee are identified on the inside cover of this document.

The Biscayne Bay Restoration and Enhancement Program is a major implementation tool of the Bay Management plan. It should be recognized that the Bay Restoration and Enhancement Program is a subset of the overall Bay Management effort. Therefore, the goal

and objectives of this program are a subset (i.e. the relevant portions) of the primary goal and program objectives of the Biscayne Bay Management Plan.

GOAL

It is the primary goal of the Biscayne Bay Restoration and Enhancement Program to maintain, restore, enhance or provide those physical, chemical, biological or aesthetic qualities of Biscayne Bay that provide the basic character and value of the resource.

In order to realize this goal the County shall work to achieve the following program objectives:

- Provide a wide array of water oriented opportunities at the water's edge, consistent with the primary goal;
- Enhance physical and visual access thereby increasing the potential for environmentally sound utilization and attractiveness of Biscayne Bay for the public at large;
- Identify and maintain, or enhance where necessary, those biological communities that are essential to the long-term viability of Biscayne Bay;
- Optimize the quality and quantity of marine life;
- Maintain, or enhance where necessary, water quality that permits safe water contact recreation and propagation of fish wildlife;
- Provide protection for endangered, threatened or rare species of plants and animals that exist within the waters of Biscayne Bay or the adjacent coastal wetlands;

- Seek funding for activities which are necessary to achieve the goal;
- Provide continuing monitoring of the Bay in order to assemble an adequate data base for Bay Management.

PROGRAM RATIONALE

Because development within portions of the Bay and its surrounding uplands has irreversibly altered some of the natural conditions of the Bay ecosystem (i.e. access, productivity, hydrography, biological viability, community structure, water quality, etc.), it is unrealistic to attempt to restore the Bay to its natural state. A more practical approach is to prevent further degradation and alteration of the Bay ecosystem and to restore the Bay's potential for maximum allowable utilization and productivity through the enhancement of many of the biotic and abiotic components of the existing system.

During the development of the Biscayne Bay Management Plan the following facts were recognized:

1. Many of the Bay's natural habitats have been either destroyed, altered, reduced or stressed.
2. There are no existing comprehensive baseline data on the various biotic and abiotic components of the Bay ecosystem.
3. Public awareness of the Bay ecosystem and its management is insufficient. This has resulted in misconceptions about and misuse of the Bay.
4. Existing public access to the Bay is limited and needs improvement.

The need for restoring and enhancing portions of the Bay became obvious. However, before large expenditures of time and public monies were to be committed to a Restoration and Enhancement Program, it was necessary to identify potential enhancement activities which could be used to restore and enhance Biscayne Bay.

Potential enhancement activities were identified in four main categories. Existing Bay habitats could be improved by implementing projects such as but not limited to riprap and artificial reef placement, seagrass and mangrove planting, shoreline stabilization, etc. A data base could be established through the initiation of studies on various ecosystem parameters such as but not limited to water chemistry, turbidity, benthic ecology and fisheries assessments. A public awareness program might include activities such as but not limited to media public service announcements, educational and informational projects, and civic participation programs. Public access to the Bay could be improved by the enhancement of existing parks, street ends, spoil islands and causeways, etc. As of 1983, over fifty street ends, 13 Bayside Parks, 11 spoil islands and 6 causeways have been identified as potential sites for both habitat and access enhancement activities.

Much of the information required to properly assess the potential areas and/or amount of enhancement necessary or allowable will be obtained through the Baseline Data Studies. For example, the number of locations, linear footage and type of shoreline stabilization required in the Bay, will be determined through the circulation, turbidity, benthic map and shoreline survey studies. It is also expected that additional enhancement activities may be developed through the monitoring of previous activities and the analysis of the baseline data or, if additional funds become available. For example, the modification of stormwater outfalls to the Bay is expected to cost approximately $50,000,000 and will be incorporated into the Program if these funds become available.

In order to meet the goals and objectives of the Bay Restoration and Enhancement Program, a long-term approach is imperative. It is expected that the Program will require at least a ten year implementation period. For this reason projected monetary apportionments for a ten year period have been estimated and are contained in Appendix A. As evidence of local support, the Dade County Commission declared the 1980's as "The Decade of Biscayne Bay" (Resolution No. R-1313-80) on October 7, 1980.

PROGRAM DEVELOPMENT

Partially as a result of the 1977 Seagrant Symposium resolution, the State of Florida legislature, in 1978, appropriated $125,000 to assist in the restoration of Biscayne Bay north of the Rickenbacker Causeway. In November of that year, a contract was signed with the Florida Department of Environmental Regulation and Dade County to initiate an intensive effort to identify enhancement activities and sites which could be completed within one year and to prepare a long-term "plan of action" for Bay restoration.

Under the direction of the County Manager's office, the Dade County Planning and Environmental Resources Management (DERM) Departments coordinated the enhancement activities with a Scientific/Technical Committee (Appendix B) to develop project and site selection criteria. Based upon these criteria and site analyses, a combination artificial reef and pier project on the south side of the 79th Street Causeway was selected as the first year enhancement activity. The project was officially dedicated in November of 1980.

Pelican Harbor artificial reef and fishing pier. Photo: Ricky Schectman

DERM and the Dade County Planning Department also began the task of selecting potential enhancement activities for 1980-81. The selection process involved a review and prioritization of potential enhancement projects by members of the Scientific-/Technical Committee and the staffs of DERM and Planning. After a ranking by the Scientific/Technical Committee was compared to a staff-prioritized list of enhancement projects, the following concensus prioritized list was obtained.

	Rank
Improve Public Awareness	1
Improve Access	2
Identify Areas that Need Stabilization or Wave Energy Abatement	3
Obtain Baseline Data on Fisheries and Fisheries Pathology	4
Monitor Existing Mitigation/Restoration Efforts	5
Develop Fisheries Management Program	6
Obtain Baseline Water Chemistry	6
Stabilize Shorelines	7
Map Benthic Communities	8
Riprap Public Areas	9
Identify Sources of Turbidity	10
Obtain Baseline Data on Water Epidemiology and Pathology	11
Plant Mangroves	12
Install Artificial Reefs	13
Plant Seagrass	14
Fill Deep Holes	15
Redistribute Circulation	16
Remove Fine Bottom Sediments	17

This list of prioritized projects was adopted by the Dade County Commission in December, 1979. It is the basis of contracts between the Florida Department of Environmental Regulation and DERM for the 1979-81 biennial appropriation of $950,000, the 1981-82 appropriation of $400,000 and the 1982-83 appropriation of $425,000.

This list should be viewed as a broad overview and many of the projects have a large degree of overlap. In fact, the data gathered in some of the projects are essential to the completion of others. It is also recognized that some projects may be altered, added or deleted as the information base becomes more complete.

The projects fall into four categories which comprise the four key elements of the Restoration and Enhancement Program. They are:

1. Develop a comprehensive data base.
2. Improve the public's awareness of Biscayne Bay.
3. Improve the habitat in Biscayne Bay.
4. Improve the public's visual and physical access to Biscayne Bay.

PROGRAM ELEMENTS, INTERRELATIONSHIPS AND RATIONALE

Owing to the large degree of interdependence among the four elements, selected projects in each category proceed concurrently. The projected monetary allotments for these projects are shown in Appendix A. As previously mentioned, the general public's overall awareness that the Bay has undergone alteration and degradation during the past 80 years has led to a series of regulation and preservation activities. The initiation and accomplishment of these activities has set the stage for the ensuing restoration and enhancement activities. Public forums will be held annually to inform the general public of the continuing progress of the Program as well as to solicit public input to the Program.

Public Awareness

While certain segments of the public are "aware" of Biscayne Bay, much of the public is generally uninformed or misinformed about the Bay despite its large physical prominence. Some members of the public believe that the Bay is no longer suitable for extensive human use. In fact, preliminary information indicates that large portions of the Bay are still biologically viable, visually and physically attractive, and suitable for water contact sports. Because of the general public's lack of awareness of these facts, the Bay's many potential economic and recreational benefits have not yet been fully realized. Therefore it is essential to make

the public more fully aware of the potential the Bay has to offer.

Since the Bay ecosystem has changed so dramatically over the past 80 years and since there are no existing data available to quantify the change or gauge improvements, it is necessary to collect baseline data on the Bay's various components. This information will be disseminated to the public so they will be factually informed of the benefits the Bay has to offer and how these benefits can be utilized without degrading the Bay system.

As the Restoration and Enhancement program progresses, Bay habitats will be enhanced or restored (eg. through artificial reefs, shoreline stabilization, fisheries management, etc). These activities, by improving the Bay's biological viability and water quality, will increase the Bay's potential economic and recreational benefits. It will therefore be necessary to inform the public of these results through a continuing awareness program, so they can directly benefit from the Bay Restoration Program.

The public awareness element of the program is also essential to educate the general public about the intricate and complex Bay ecosystem. By understanding the often times delicate interrelationships between the biotic and abiotic components of the ecosystem, as well as the problems confronting the Bay due to pollution and manmade stress, it is felt that the public will be able to utilize the Bay's potential benefits in a knowledgeable

manner which will not harm or disrupt the ecosystem. This type of information will also aid the public in understanding the reasoning and rationale involved in regulatory processes. In this respect the Bay Restoration and Enhancement Program offers the potential vehicle to improve public relations among regulatory agencies, the general public and developers.

Public Access

It is fully expected that once the public becomes more aware of the benefits the Bay has to offer, it's utilization will be increased. Due to past development practices, much of the Bay shoreline has been closed to the general public and existing public access to the Bay is limited. The current public access facilities are probably insufficient to provide the necessary access points to the Bay if the vast majority of the public wanted to utilize the Bay.

Since large public expenditures are involved in the Bay Restoration and Enhancement Program, it is important that the public-at-large benefit from an improved Bay. It therefore becomes imperative that access to the Bay be improved under this Program. Not only will access to current Bay users be improved, but even more importantly, access for the general public will be provided through the development of existing causeways, spoil islands, parks and street-ends. These types of enhancement activities will provide both functional, and aesthetically pleasing

locations and facilities on the Bayfront for the public's use. The public will be made aware of these facilities through the public awareness element of the program.

Wooden boardwalk winding through natural mangroves in North Bayshore Park.

Photo: Ricky Schectman

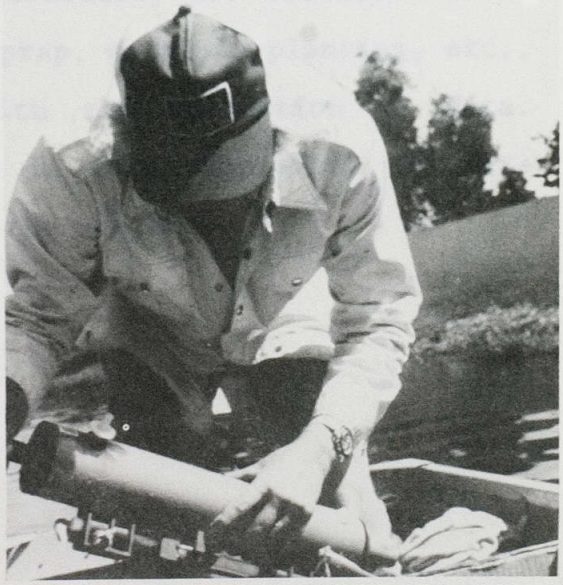
The location and type of public access facilities will be partially dependent on the existing need, space availability, and existing and projected usage. However, information obtained through the baseline data studies will also be used in determining facility type, size and location. Access facilities will be located where they will not only be easily available to the public but where increased public usage will not degrade the existing environment. Where water and/or faunal contact is imminent, the water and biological quality in the area of access facilities will be closely examined and analyzed to assure public safety.

Where possible, in-water enhancement activities will be located in the vicinity of public access facilities. This will be done when the in-water activity compliments the access facility. For example, artificial fishing reefs will be located, to the extent possible considering environmental conditions, near street end docks, existing parks, boardwalks, fishing piers, etc. However, certain in-water enhancement activities, such as seagrass planting, which may not be compatible with human utilization, will usually not be located in the immediate vicinity of public access facilities.

Baseline Data

Prior to 1981, the data base on the various components of the Bay ecosystem has been obtained from uncoordinated studies in limited geographical areas of the Bay or from investigations relating to particular interests of individual researchers. Therefore it is essential that a comprehensive data base concerning the major Bay ecosystem components be established. Results of previous studies will be incorporated into the data base wherever possible.

This data base will be used to quantify the existing state of the Bay ecosystem and to gauge improvements and/or changes in ecosystem components, resulting from Bay Restoration and Enhancement activities. The data base will also be a key element in determining the most cost effective types and location of public access and in-water enhancement projects.



DERM inspector collecting water samples for analysis.

Photo: Ben Mostkoff

Improving public awareness and supplying additional access and habitat improvements to the Bay must be tempered with environmental cognizance and sensitivity. Unregulated, these projects could lead to further degradation of the Bay ecosystem. Therefore, they must be monitored to ensure compatibility with the overall goals and objectives of the Bay Management Program. This will help to determine the most effective (both logistically and environmentally) ways to continue improving the Bay's potential for maximum allowable utilization and natural productivity.

Habitat Improvement

Ideally, a complete data base should be collected in order to determine the types of enhancement projects which are required. However, previous research and experience has shown that the technology already exists to complete selected in-water enhancement projects with a reasonable probability for success. Techniques such as the placement of riprap, mangrove planting, etc., can be initiated concurrently with the collection of data. Monitoring of these projects will in turn supplement the data base and determine the efficacy of the projects.

Mangrove planter constructed by a private developer. Photo: Ricky Schectman

Additional in-water enhancement projects, which will improve the Bay habitat, may also be developed through the collection of baseline data. The flexibility of the Restoration and Enhancement Program allows for the addition of these new developments in to the Restoration Plan.

As previously mentioned, the locations of in water enhancement projects will coincide with public access facilities wherever feasible. However, certain in water enhancement projects which would be degraded by human contact (such as seagrass replanting) will generally not be located near access facilities.

It is foreseen that the completion of in-water enhancement projects, when properly publicized through the public awareness program, will in turn directly affect the need for public access. In this respect the program is self-perpetuating. The collection and analysis of baseline data will be used to implement the existing management program and to develop new management techniques.

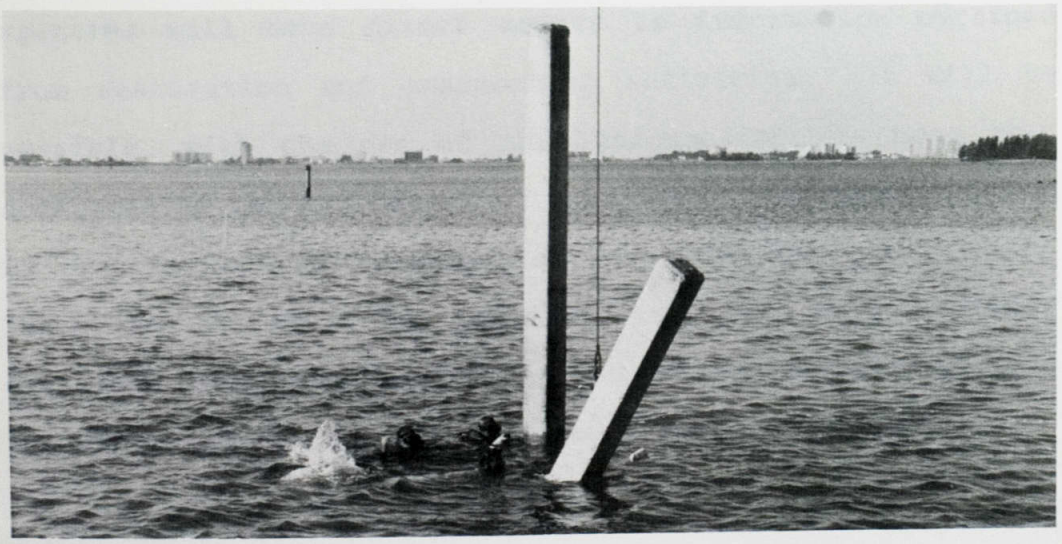
COMPLEMENTARY PROGRAMS

In addition to the projects previously described, other Bay related programs fall within the overall scope of the Bay Restoration and Enhancement Program, even though they may be funded from different sources. A short description of these complimentary programs and their relationship to Bay Restoration and Enhancement activities follows:

Port of Miami Mangrove and Seagrass Mitigation - Due to the expansion of the Port of Miami, 251 acres of bottom habitat (81 of which were vegetated with seagrasses) and approximately 3.8 acres of mangroves were destroyed. The resulting environmental damage is being mitigated through the implementation of seagrass and mangrove planting programs. Approximately 5.6 acres of mangroves will be planted. An initial planting of twenty-five acres of seagrasses south of Rickenbacker Causeway is being complimented by a test plot and monitoring program conducted in thirteen locations

throughout the Bay. The results of these programs will be used to determine feasibility and locations for planting the remaining 213 acres. In this respect the mitigation program will serve to improve Bay habitat. The program is being closely monitored and the results will be used as a basis for decision making in the Bay Restoration and Enhancement Program. In addition, two million dollars will be committed to a trust fund for future Bay restoration and enhancement activities to mitigate the long term impacts of operations at the Port of Miami.

Dade County Artificial Reef Program - Artificial reefs serve to increase the value of relatively unproductive habitats. As part of the Program, the feasibility of installing artificial reefs in the Bay is being studied. The location and value of Bay artificial reefs will be determined through information obtained during baseline studies undertaken through the Restoration and Enhancement Program.



DERM biologists constructing an artificial reef at North Bayshore Park.

Photo: Ben Mostkoff

As of 1983, a low profile, shallow water reef site at Pelican Harbor (south side of 79th Street Causeway) has been fully developed with concrete culverts and limerock rubble. A similar reef site is located at North Bayshore Park in the City of North Miami (south side of Broadway Causeway). A larger reef site, located in a dredge pit just north of the Julia Tuttle Causeway, will be continually developed over the entire span of the Program. Additional sites will be developed during the course of the program.

Dade County Urban Waterfront Project - The goal of this program is to optimize public access to the Bay through the development of policies, design guidelines and plans for portions of the Bay. This program will be used as a guide for the Public Access element of the Bay Restoration and Enhancement Program.

Local Permitting and Private Developers - Regulatory agencies will have direct access to information obtained from restoration and enhancement activities. It will be possible, with the use of this information, to more ably determine if the net effect of a private development project is beneficial or detrimental to the Bay eco-system. Therefore it will be possible to make more informed decisions concerning conditions and modifications to permits as well as mitigation for private development projects.

The same information will be made available to private developers. These developers can in turn design Bay enhancement projects into their development plans. Coordination between development and regulatory agencies can lead to the optimum allowable utilization of the Bay's potential resources as well as the improvement of those resources in the most cost-effective manner.

Local Government Developments - Local government programs involving developments in or near the Bay will be coordinated with activities within the overall BAy Restoration Plan. In this way, the optimum allowable utilization of the Bay can be realized by these governments.

Biscayne National Park -The boundaries of the Biscayne National Park encompass a large portion of South Biscayne Bay. It will therefore be essential to coordinate Bay Restoration and Enhancement activities with monitoring and preservation programs conducted by the National Park Service.

Sea Grant - The purpose of the National Sea Grant Program is to provide a means through which the development of marine resources, including their conservation, proper management, and social and economic utilization can be accelerated. The Program incorporates the "concept of advisory services through which scientific research results may be most directly applied to real problems" (U.S. Department of Commerce, 1972). Many of the Bay Restoration and Enhancement Program activities involve applied research

studies aimed at solving a "real problem". It is therefore expected that coordination of the Sea Grant Program with the Biscayne Bay Restoration and Enhancement Program will be beneficial in achieving the goals and objectives of both programs in the most cost-effective and expeditious manner.

Academic Institutions - In the past, Biscayne Bay has been the site of research activities originating in several academic institutions. In the future, it is hoped that academic research and the more applied activities of the Bay Restoration and Enhancement Program can be coordinated. Consequently all parties involved can obtain the maximum benefits from both projects through an exchange of data and information. Ancillary research projects, in connection with Bay enhancement activities (e.g. artificial reefs, seagrass replanting, etc.) will be encouraged.

Biscayne Bay Environmental Enhancement Trust Fund - On February 19, 1980, an ordinance (#80-9) was adopted by the Dade County Commission creating the Biscayne Bay Environmental Enhancement Trust Fund. This fund will consist of monies from enforcement and damage actions, mitigation assessments, donations, appropriations, grants and allocations. These monies will be used for the express purpose of financing Bay enhancement projects. As per section one (1) of the ordinance, the prioritized list of enhancement activities, excluding studies, described in this overview qualify for funding from this source.

PROGRAM IMPLEMENTATION

In order to achieve the goals and objectives of the Bay Restoration and Enhancement Program as well as to incorporate the concepts previously described in this overview, the following tasks have been initiated. A flow plan of the Biscayne Bay Restoration and Enhancement Program is shown in Appendix C. Enhancement activities will be approved by the County Commission prior to implementation.

Tasks:

1. Prepare scopes of work for each of the prioritized projects. These scopes of work will undergo an extensive review by DERM, members of the scientific/technical committee, the public, and the Florida Department of Environmental Regulation (DER).
2. Implement projects to be conducted by DERM. These projects are listed in Appendix D.
3. Request proposals and bids for the remaining projects outlined in the approved scopes of work.
4. Select contractors for construction activities (e.g. riprap placement, mangrove planting, dock construction, etc.).
5. Select consultants for remaining projects. Proposals will be reviewed by a Consultant Selection Committee. This committee will be comprised of representatives from the following organizations:
   a) DERM, Director
   b) Dade County Planning Department, Director
   c) Florida Department of Natural Resources, Director of Division of State Lands

d) Florida Department of Environmental Regulation, Contract Project Officer

e) Biscayne National Park, Superintendent

6. Form Biscayne Bay Restoration Working Team. This working team is comprised of the selected consultants, DERM staff, Planning Department staff, and representatives of Biscayne National Park, as well as the South Florida Water Management District. Members of the original Restoration Working Team are listed in Appendix E. The Restoration Working Team is the working unit responsible for achieving the overall goals and objectives of the Restoration Plan. Each member of the team has a particular area of expertise and is solely responsible for the progress and results of his/her individual project. However it is important to realize that the goals and objectives of each individual project are merely precursors to achieving the more holistic goals and objectives of the overall Restoration and Enhancement Program. The achievement of these overall goals and objectives is being reached through a synergistic approach. Therefore the working team initially met in 1981 to describe each of the individual projects to other team members and to assure that all projects were compatible. This ensured there would be no redundancy in data collection. The team now meets on a regular basis to ensure that the projects are remaining on course to achieve the goals of the overall Restoration and Enhancement Program.

The efforts of the working team are being coordinated by DERM.

7. Initiate work.
8. Monitor completed projects.
9. Prepare quarterly progress reports for each project. These reports shall be prepared by each individual consultant.
10. Prepare annual interim reports describing progress toward achieving the goals and objectives of the overall program. This report will be prepared by DERM. The efficacy of all projects will be evaluated and described. Recommendations for the addition and/or deletion of projects from the program will be made. Recommendations for reprioritizing the project list will also be made.
11. Review interim reports by the Restoration Team.
12. Submit interim reports to the Bay Management Committee and the Florida Department of Environmental Regulation.

Public funds for Biscayne Bay Restoration and Enhancement Program are limited. Therefore, in order to assure the greatest public benefit, it is of the utmost importance that there be a continual dissemination of information to the public. Additionally, in order to maximize the effectiveness of the program, it must be well coordinated with regulatory agencies, local and State governments, and academic institutions. Therefore, all information obtained, and progress achieved, will also be made available to the above named agencies, governments and

institutions. Public forums will be held annually to present the information obtained about the Bay during the previous year. They will also serve the purpose of updating the public on the progress of the entire program.

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	Total Program Cost	1978-79 Program Cost	1979-81 Program Cost	1981-82 Program Cost	1982-83 Program Cost	Future Years Request
Initial Restoration Plan	$37,919	$37,919				
Pelican Harbor-Bay Access and Habitat Improvement	87,081	87,081				
Prepare map of Bay Bottom Communities	26,803		20,948		5,855	
Survey and map Existing Shoreline	4,189		4,189			
Collect & Analyze Water Quality Samples (10 years)	525,002		61,865	15,534	73,004	374,599
Monitor Past Restoration Effort	6,107		6,107			
Circulation Modeling - N.B.B.	160,000		71,997	56,003		32,000
Bay sediments Chem Analysis	11,241				11,241	
Bay Bottom Community Monitoring (10 years)	485,000		51,780	33,421		399,799
Fisheries Assessment	940,000		238,689	185,663	7,026	508,622
Determine Sources of Turbidity	207,862		60,258	45,004		102,600
Survey of Mangrove Planting Sites	990		990			
Fisheries Pathology	75,000					75,000
Water Epidemology	87,823				87,823	
Public Park Access & Habitat Imp.	3,500,000		200,000		234,196	3,065,804
Biscayne Bay Artificial Reefs	100,000		5,625	4,375		90,000
Street End Access Improvements	1,000,000					1,000,000
Mangrove Planting	250,000			10,000		240,000
Rip-Rap Installation	5,000,000					5,000,000
Access Improvement Spoil Islands	2,500,000			50,000		2,450,000
Public Awareness Program	300,000		30,546		5,855	263,599
Subtotal 1978 - 1979 Program		125,000				
Subtotal 1979 - 198			752,994			
Subtotal 1981 - 1982				400,000		
Subtotal 1982 - 1983					425,000	
Grand Total	$15,305,017	$125,000	$950,000 *	$400,000	$425,000	$13,602,023

* Includes $197,006 appropriated from the Pollution Recovery Trust Fund, which are unavailable to the County.

APPENDIX B

Biscayne Bay Scientific/Technical Committee

Colonel James B. Adams, Jacksonville District Corps of Engineers

Commander D. Addison, Coast Guard Boating Safety Division

Ms. Sandy Barrett, South Florida Regional Planning Council

Mr. Bill Bird, Dade County Parks and Recreation Department

Ms. Sidney Brinson, Florida Department of Environmental Regulation

Dr. Iver Brooks, Rosenstiel School of Marine and Atmospheric Sciences

Mr. Fred Calder, Florida DER, Office of Coastal Management

Dr. James Carpenter, Rosenstiel School fo Marine and Atmospheric Sciences

Mr. Joe Carroll, U.S. Fish and Wildlife Service.

Dr. Donald deSylva, Rosenstiel School of Marine and Atmospheric Sciences

Dr. Ron Gaby, Connell, Metcalf and Eddy

Mr. Aaron Heiger, United States Geological Survey

Mr. Stanley Hemphill, Dade County Park and Recreation Department

Dr. T. Lee, Rosenstiel School of Marine and Atmospheric Sciences

Mr. Charles Littlejohn, Florida Department of Environmental Regulation

Mr. Carmen Lunetta, Dade County SeaPort Department

Dr. Donald S. Marszalek, Rosenstiel School of Marine Atmospheric Sciences

Mr. John Michel, Greenleaf/Telesca

Lieutenant J.G. Parker, United States Coast Guard

Mr. Robert Perkins, Dade County Park and Recreation Department

Ms. Andrea Petrovits, Florida Department of Transportation

Mr. William Powell, Dade County Public Works Department

Mr. Mark Proctor, State Department of Natural Resources

Mr. Don Pybas, Florida Sea Grant

Mr. Lee Rawlinson, Dade County Developmental Impact Committee

Mr. Peter Rhodes, South Florida Water Management District

Dr. M. Roessler, Tropical BioIndustries Development Company.

Mr. James Sanders, Biscayne National Park

Mr. Burt Saunders, Office of the County Attorney

Captain Saunderson, Florida Department of Natural Resources
Marine Patrol

Mr. Allan Sosnow, Florida Department of Transportation

Mr. Richard Stone, National Mrine Fisheries Service, Office
of Marine Recreatioanl Fisheries

Ms. Linda Sumarlidason, Florida DNR, Division of State Lands

Dr. D. Tabb, Tropical BioIndustries Development Comapny

Dr. Howard Teas, University of Miami

Dr. Anitra Thorhaug, Applied Marine Ecological Services

Mr. Jim Tilmant, Biscayne National Park

Dr. Lanny Udey, University of Miami School of Medicine

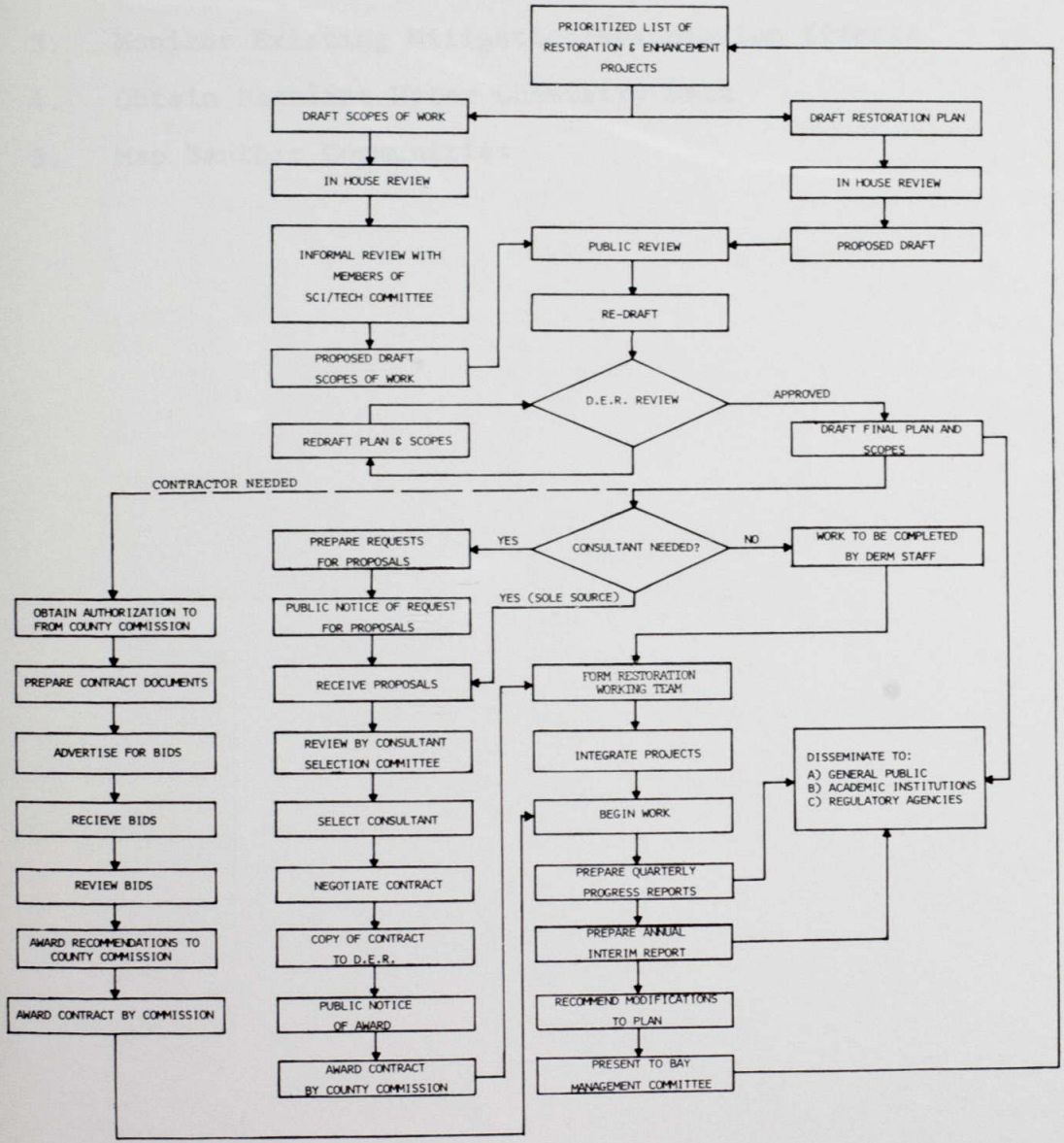
Mr. Joel van Arman, South Florida Water Management District

Dr. J. van de Kreeke, Rosenstiel School of Marine and Atmospheric
Sciences

Dr. Harold Wanless, Rosenstiel School of Marine and Atmospheric
Sciences

APPENDIX C

BISCAYNE BAY RESTORATION
& ENHANCEMENT PROGRAM
FLOW DIAGRAM



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BISCAYNE BAY RESTORATION
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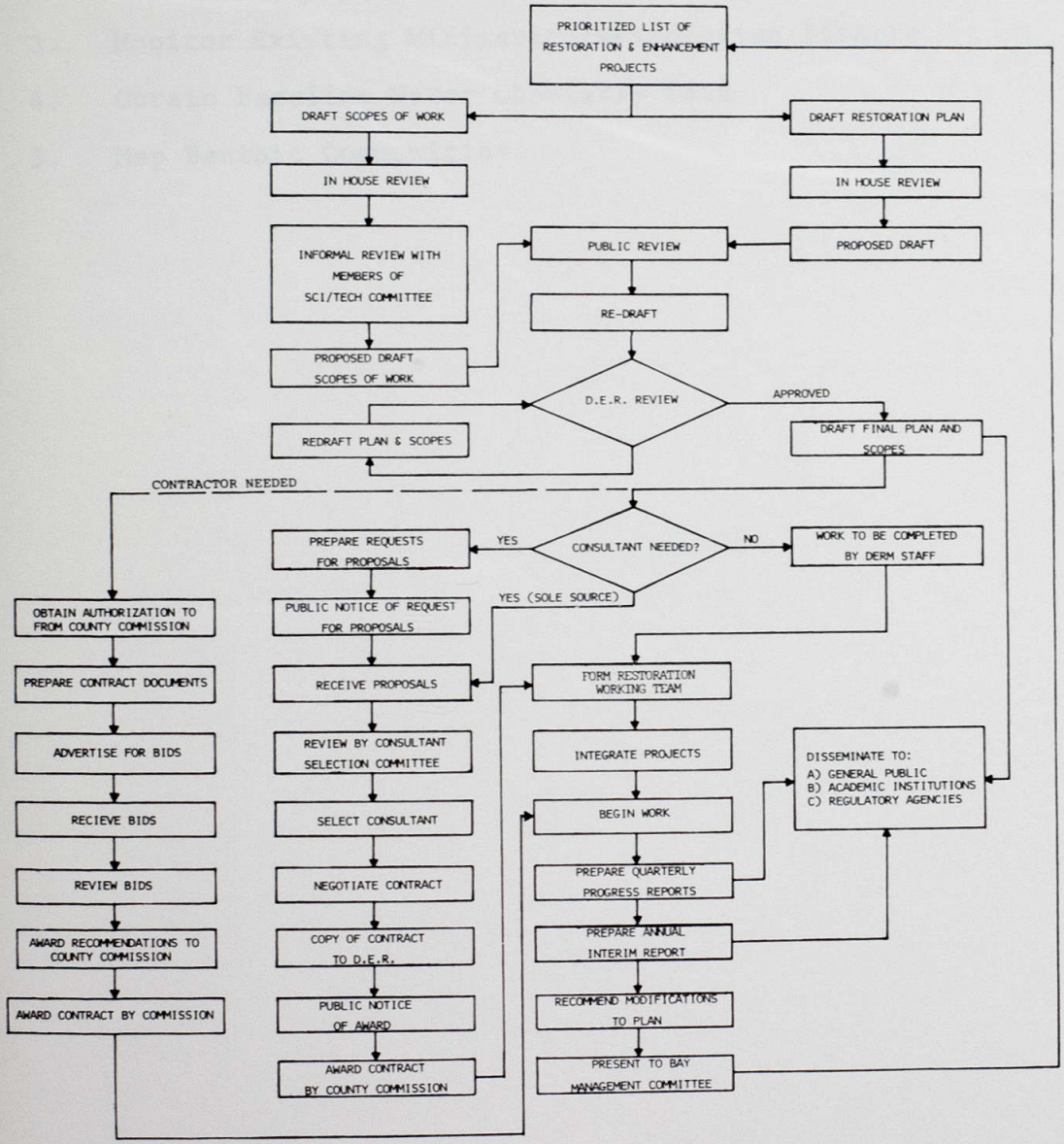

APPENDIX D

Projects to be Conducted by DERM

1. Public Awareness
2. Identify Areas that Need Stabilization or Wave Energy Abatement
3. Monitor Existing Mitigation/Restoration Efforts
4. Obtain Baseline Water Chemistry Data
5. Map Benthic Communities

APPENDIX E

Biscayne Bay Restoration Working Team

Mr. S. Berkeley, Rosenstiel School of Marine and Atmospheric Sciences, Fisheries Consultant

Mr. M. Brown, RSMAS, Marine Hydrocarbons Consultant to Florida DNR

Dr. E. Corcoran, RSMAS, Marine Hydrocarbons Consultant to Florida DNR

Ms. L. Dye, Biscayne National Park

Dr. P. Mc Laughlin, Florida International University, Benthic Ecology Consultant

Dr. P. Schroeder, Biosystems Research, Inc., Benthic Ecology Consultant

Mr. J. van Arman, South Florida Water Management District

Dr. J. van de Kreeke, RSMAS, Circulation Consultant

Dr. J. Wang, RSMAS, Circulation Consultant

Dr. H. Wanless, RSMAS, Marine Sediments Consultant

DERM Staff

Planning Department Staff

CONTRIBUTORS

Anthony J. Clemente, Director, DERM
Edward A. Swakon, Water Management Division Chief, DERM
Robert Holm, Ph. D.
David Ettman, Biologist, DERM
Robert Karafel, Biologist, DERM
Jean Evoy, Principal Planner, Planning Department
Ricky Schechtman, Senior Planner, Planning Department

PRINCIPAL AUTHOR

William L. Einziger, Biologist, DERM