NATIONAL MARINE SANCTUARY SITE EVALUATIONS

Recommendations and Final Reports

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prepared by
CHELSEA INTERNATIONAL CORPORATION
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for

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Office of Ocean and Coastal Resource Management
Sanctuary Programs Division

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This project was truly a joint effort of Chelsea International Corporation staff, our scientific consultants and the Research Planning Institute technical staff. Special thanks are in order for their dedicated efforts.

In addition to the 30 Resource Evaluation scientists, the Project Team was composed of the following individuals. Each demonstrated special talents and expertise in completing his or her responsibilities which are also presented below.

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I. SUMMARY REPORT FOR THE NATIONAL MARINE SANCTUARY SITE EVALUATION PROGRAM

SUMMARY REPORT FOR THE NATIONAL MARINE SANCTUARY PROGRAM

Concerned about mounting use and pressures on the marine environment, Congress enacted legislation in the 1970s to manage and protect our offshore areas. One such Congressional response -- the Marine Protection, Research Sanctuaries Act of 1972 -- provides a comprehensive and balanced approach for the preservation and multiple use of selected marine areas. Title III of the Act authorizes the Secretary of Commerce to designate areas of ocean and the Great Lakes waters as marine sanctuaries to preserve or restore them "for their Conservation, recreational, ecological, or esthetic values." The National Oceanic and Atmospheric Administration (NOAA) administers Title III through its Office of Ocean Coastal Resource Management, Sanctuary Programs Office (SPO).

Formation of the National Marine Sanctuaries Program resulted from this 1972 Congressional initiative. Focusing on comprehensive management and protection of diverse marine areas, the National Marine Sanctuaries Program identifies marine and Great Lakes sites of long-term resource benefit and public enjoyment. The program, not strictly regulatory in nature, represents a management tool for national marine resource development, conservation, and use. Simply stated, the program provides a balance among multiple uses of designated marine and Great Lakes areas.

Under Title 15 of the Code of Federal Regulations, Part 922 -- Marine Sanctuaries, until the September 7, 1982 publication of proposed revised rules, any person could recommend a site for consideration as a possible marine sanctuary. Those regulations set forth procedures and criteria to review sanctuary candidates for possible placement on a List of Recommended Areas (LRA). Once determined by NOAA, the LRA was published in the Federal Register with no additional public input required. As a result of this process, NOAA received an extraordinary range of site nominations, which varied substantially in size and technical supporting data. The nomination process became unwieldy; occasionally sites were nominated to prevent certain uses from occurring in a particular area. This led to Congressional and public concern over the nomination process.

In February 1982, the Chelsea International Corporation of Washington, D.C., was awarded a contract to recommend marine areas for possible placement on a Site Evaluation List (SEL). The Program Development Plan (PDP) designed by NOAA for marine sanctuaries specified that sites had to be selected and evaluated not only on their scientific and resource merits but also on their human use and management values. The objective of NOAA's

contract with Chelsea was to provide NOAA with sufficient information to replace the LRAs through a new site nomination procedure that focused on the area's natural resources. In this procedure, sites would be identified by a scientific evaluation process and would be presented to the public for comment before nomination to NOAA for inclusion on its new Site Evaluation List. This process was embodied in the September 7, 1982, NOAA proposed rule.

THE DESIGNATION PROCESS

The designation process, from site identification to final approval to actual designation, is long and involved. Consequently, the Secretary of Commerce has designated only six areas since passage of the Act in 1972.

The site designation process outlined by NOAA is as follows:

1. Sites are identified by the regional resource teams,

2. Regional resource teams apply site identification criteria to each site within that region.

3. The initial list of site descriptions are approved by the regional resource team and are mailed to previously identified individuals and organizations, nationally and within the region.

4. Public comment and additional nominations are received.

5. Each regional resource team recommends no more than five sites to NOAA following the close of the public comment period.

6. NOAA selects sites for placement on the SEL, which is then published in the Federal Register for comment; NOAA prepares a written analysis of how each site meets the resource evaluation criteria for future reference.

7. NOAA selects a candidate site from the SEL; in compliance with the National Environmental Policy Act, an environmental analysis is made.

8. A notice of intent to prepare a draft environmental impact statement (DEIS) is published in the Federal Register.

9. A draft site management plan describing objectives and possible regulatory actions for the area is prepared.

10. One or more regional meetings are held to solicit government and public comment on the selected site and its proposed management plan. Appropriate revisions are then completed and reviewed with interested parties, and any additional meetings are held with relevant Federal agencies.

11. A public hearing is held on the DEIS and draft management plan no less than 30 days after notice in the Federal Register; written comments are accepted for 45 days after date of notice.

12. A final environmental impact statement (FEIS) is prepared and distributed for final comment.

13. Final consultation occurs with Federal agencies and state officials.

14. The Secretary of Commerce, upon approval of the President, designates the area as a National Marine Sanctuary.

15. The designation is effective unless the Governor of a State with waters lying within the boundary of the site objects to its designation, or both Houses of Congress adopt a concurrent resolution of disapproval within 60 days of continuous Congressional session.

SCIENTIFIC RESOURCE EVALUATION TEAMS

As contracted, Chelsea International was responsible for completing the resource evaluation efforts and for drafting the recommendations to NOAA of areas worthy of sanctuary designation. To carry out this charge, Chelsea established teams of nationally recognized marine scientists for eight regions whose boundaries approximate those of the Regional Fishery Management Councils specified in the Magnuson Fishery Conservation and Management Act of 1976. For the SEL process, the boundary between the North and South Atlantic regions was Cape Hatteras, North Carolina; the boundary between the South Atlantic and Gulf of Mexico regions was U.S. Route 1 in the Florida Keys.

The scientific resource evaluation teams were comprised of the following scientists:

Caribbean Region

Dr. Manuel Hernandez-Avila
Team Leader
Chairman, Department of Marine Sciences
University of Puerto Rico
Mayaguez, Puerto Rico
(Physical Oceanography)

Dr. John Ogden
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Fairleigh Dickinson University
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(Marine Biology)

Eastern Pacific Region

Dr. Paul Rudy, Team Leader
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Corvallis, Oregon
(Marine Biology)

Dr. P. Dee Boersma
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University of Washington
Seattle, Washington
(Zoology)

Dr. Joel W. Hedgpeth
Marine Biologist
Oregon State University (retired)
Santa Rosa, California
(Biological Oceanography)

Dr. June Lindstedt-Siva
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(Marine Biology)

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Great Lakes Region

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(Geology)

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Gulf of Mexico Region

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Dr. H. Perry Jeffries
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Graduate School of Oceanography
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South Atlantic Region

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(Marine Geology)

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Director, Belle Baruch
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(Marine Biology)

Dr. Dirk Frankenberg
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University of North Carolina
Chapel Hill, North Carolina
(Marine Biology)

Dr. Harold Wanless
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(Marine Geology)

Western Pacific Region

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The teams, comprised of independent scientists with knowledge of the values and uses of coastal waters within their region, were charged to:

- Identify and recommend areas within their region, based on NOAA's scientific selection criteria, for consideration as potential sanctuary sites.

- Acquaint State and local governmental entities and regional interest groups with the site selection process.

- Recommend no more than five sites in the region to NOAA following the public comment period.

To support these teams, Chelsea and the technical staff of the Research Planning Institute, Inc. (RPI) coordinated the program and complemented the efforts of the teams. Chelsea's Project Manager and two Program Managers were in frequent contact with the team leaders, NOAA officials, and others concerned. One Program Manager was responsible for the North Atlantic, South Atlantic, Gulf, and Caribbean teams; the other Program Manager coordinated efforts with the Alaska, Great Lakes, East Pacific, and West Pacific teams. Chelsea and RPI support included meeting organization, distribution of materials, and technical expertise for drafting of site descriptions and reports.

RESOURCE EVALUATION CRITERIA

As specified by NOAA's Program Development Plan (PDP), the teams used NOAA's scientific criteria in their evaluations and deliberations. The criteria, which address characteristics of particular significance to the National Marine Sanctuaries Program, are grouped in the following four categories with accompanying subheadings:

Natural Resource Values

Regional representation
Subregional representation
Community representation
Biological productivity
Biotic character/species representation
Species maintenance
Ecosystem structure/ habitat features

Human Use Values

Fishery resources of recreational importance
Fishery resources of commercial importance
Ecological/esthetic resources of importance for recreational activities other than fishing
Research opportunity
Interpretive opportunity
Historical, archaeological, or paleontological importance

Potential Activity Impacts

Activities that may arise in a specific area, including:

Vessel traffic
Aircraft overflights
Commercial or recreational fishing
Other recreational sports
Waste disposal
Research
Dredging
Anchoring
Salvage operations
Oil and gas activities

Management Concerns

Relationship to other programs
Management of a conservation unit
Surveillance and enforcement
Economic considerations
Accessibility

After determining which criteria were met, the teams tabulated their results using a Site Evaluation Matrix. A low, moderate, high, or unknown value was given to each individual criterion met. Those sites which consistently received low values were given a "low priority" assessment and eliminated; those which consistently received high values were given a "high priority" assessment and recommended for further consideration. Appendix A provides the guidelines used in the priority value rating.

SITE NOMINATION PROCESS

The site nomination process began in March 1982 with two team leader orientation meetings in Washington, D.C. NOAA's Sanctuary Program Office (SPO) extensively briefed Chelsea staff and the team leaders on program status, desired goals, and the site evaluation criteria. Chelsea was asked to present NOAA with a revised plan on an accelerated schedule instead of the 15-month plan called for in the initial Request for Proposal. The accelerated plan required two meetings in each region -- the first to identify sites meeting the necessary criteria and the second to select and recommend final sites for NOAA following the public comment period.

To facilitate the delivery of recommendations to NOAA in the requested 12 months, meeting schedules were rigid. The regional resource evaluation teams were provided NOAA's PDP and criteria and briefed on the planned process by the Team Leader. The team members were asked to nominate areas for possible consideration at the first regional meeting. These nominations were to be based on personal knowledge, research, and contacts with colleagues familiar with the resources of the region. Members were encouraged to discuss candidate sites with others interested or knowledgeable of the area. Detailed documentation of the resources and values of a nominated area was mandated for the meeting.

First Regional Team Meetings

Chelsea arranged two-day meetings for team members to discuss potential sites. No limitation was placed on the number of areas for suggestion, but each team had to consider the sites within the region that were on the LRA and each member was aware of the charge for final recommendation of <u>five</u> sites to NOAA for inclusion on its SEL.

One team meeting per week was held from April 15, 1982, to June 9, 1982. At these first meetings, discussion centered on site description, resource evaluation, the reason for sanctuary nomination, and other pertinent information. Following each regional team meeting, the RPI technical staff prepared detailed site descriptions, which presented the technical merits of each site, identified resource or management issues, and provided a list of references

Public Participation Process

Of critical concern to NOAA and the team members was public participation and comment in the sanctuary nomination process. The public was encouraged to comment on the candidate sites identified by the teams that met NOAA's scientific criteria.

This public participation was particularly important to the success of the program because of certain constraints:

- o The large geographical area covered by each of the eight regions.
- o The small number of team members for each region.
- o The lack of adequate resources to hold multiple public hearings in each region.

Throughout the site identification and evaluation process, continual contact with individuals, groups (public and commercial), government agencies potentially interested in marine sanctuaries was made. Media and telephone interviews were conducted with interest groups, such as fishermen's associations, oil and gas associations, and government officials. Moreover, significant outreach activities were made in areas where confusion or controversy surfaced over individual sites or the process involved.

The packages of material provided for review and comment were carefully structured to provide as much information as possible and to ensure comparable comments among the various regions. The packages contained a brief description of the marine sanctuary program; a request for comments on any or all of the sites; and details on the manner in which additional areas could be recommended for consideration.

Mailing lists were solicited from myriad sources -- State coastal zone offices, State Governors, environmental groups, industry, Leagues of Women Voters, Chambers of Commerce, State agencies, and others. NOAA's Administrator wrote to the Governor of each coastal State requesting a liaison to coordinate responses from State and local governmental units. The regional mailing lists were then sent for review to team members, State liaisons, State coastal zone representatives, and NOAA personnel.

About 30 days after each initial team meeting, the regional site descriptions were sent to each name on the respective mailing lists and to 82 national organizations and agencies. A deadline of 45 days was set for comment, with 30 days provided for submission of new nominations. More than 3,600 site description packages were distributed, and over 1,000 responses and 27 site nominations were received and sent to the team members. (See Table 1.) Chelsea then prepared a matrix of responses for each site which was provided to the regional team members along with copies of all comments and nominations.

Team members gave serious consideration to the public comments and recommendations received in their evaluation of potential

marine sanctuaries. Each team read the comments, talked to interested individuals, groups, or officials, and developed a priority listing based on the sites previously identified and those identified public.

Second Regional Team Meetings

Beginning in September 1982 and ending in October 1982, the second team meetings followed the public comment and site nomination period. These meetings focused on ranking sites for submission of the final five to NOAA.

A problem arose -- five teams (Great Lakes, Gulf of Mexico, North Atlantic, South Atlantic, and West Pacific) had received nominations from the public which they believed worthy of full consideration for nomination. In each case, the public nominator provided comprehensive scientific and resource information, and, in some cases, presented data not previously available to the team members. Although each of these five teams took a slightly different approach in the final selection, each conducted additional discussions and evaluations of the sites considered worthy of additional consideration. In those regions where the final list of five recommended sites included one of these public-recommended nominees, NOAA agreed to another round of comment on the new site descriptions. The revised packages were sent to individuals on the original mailing list of each of the five regions with a response request within 30 days. Because of particular circumstances in the North Atlantic region, a third mailing was conducted, which is described in the chapter on the North Atlantic region.

Following this second round of public comment and evaluation, the regional resource evaluation teams made their final selection of 33 sites to recommend to NOAA for inclusion on its SEL.

It must be noted that NOAA asked Chelsea to terminate its efforts in the Alaska region on November 2, 1982. During the public comment period for Alaska, numerous concerns arose about the concept of a sanctuary, possible restrictions, the size and number of sites, and the perceived lack of public participation raised by Alaskan fishermen and public officials. Although Chelsea attempted to address these concerns through extensive outreach efforts, communication difficulties, timing, and Alaskan Congressional requests halted the process. Therefore, the final list or recommendations does not contain sites within the boundaries of the Alaskan region.

Final regional reports reflect member sensitivity to the conflicting interests of such a process and to the public perceptions of such deliberations. Boundaries were particularly controversial, and several teams stressed the need for NOAA,

state and local officials, and private interests to evaluate the boundary question once the sites reached active candidate status. Teams also highlighted management issues and possible recommendations.

Team Recommendations

The regional resource evaluation teams recommended the following sites to NOAA for inclusion on its SEL:

RECOMMENDED AREAS

Caribbean Region

Cordillera Reefs, Puerto Rico
East End, St. Croix, U.S. Virgin Islands
Southeastern St. Thomas, Virgin Islands

East Pacific Region

Washington State Nearshore
Cortez & Tanner Banks, off California
Morro Bay, California
Heceta-Stonewall Banks, Off Oregon
Western Washington Outer Coast

Great Lakes Region

Western Lake Erie Islands & Sandusky Bay, Ohio
Green Bay (Lake Michigan), Wisconsin
Lake Superior (including Apostle Islands & Isle Royal) Michigan and Wisconsin
Cape Vincent (Lake Ontario), New York
Thunder Bay (Lake Huron), Michigan

Gulf of Mexico Region

Big Bend Seagrass Beds, off Florida
Florida Middle Ground, off Florida
Shoalwater Bay - Chandeleur Sound, Louisiana
Flower Garden Banks, off Texas
Baffin Bay, Texas

North Atlantic Region

Virginia - Maryland Nearshore Waters & Barrier Island Bays
Narragansett Bay & Block Island Sound, Rhode Island
Nantucket Shelf, Massachusetts
Stellwagen Banks, Massachusetts
Frenchmen's Bay/Mid-coastal Maine

South Atlantic Region

Ten Fathom Ledge - Big Rock, North Carolina
White Oak River System, North Carolina
Santee Delta, South Carolina
Port Royal Sound, South Carolina
Florida Shelf Coral gounds

West Pacific Region

Northern Mariana Islands
Cocos Lagoon, Guam
Papaloloa Point (Ofu Island), American Samoa
Southern Mariana Islands
Facpi Point, Guam.

THE REPORT

The following chapters contain the individual regional reports which discuss site identification, evaluation, and the recommendation process for the region. Issues addressed by the team are presented as well as methods and reasons for site selections. A final site description and map for each recommended area also is included.

TABLE I

PUBLIC PARTICIPATION MAILING SCHEDULE

Region	First Mailing	45-Day Comment Deadline	75-Day Nomination Deadline	Second Mailing	30-Day Comment Deadline	Third Mailing
Alaska	18 sites 8/18/82	10/1/82	11/1/82			
Caribbean	6 sites 8/3/82	9/20/82	10/18/82			
East Pacific	9 sites 7/12/82	8/27/82	9/27/82			
Great Lakes	10 sites 7/26/82	9/10/82	10/11/82	1 site 12/6/82	1/10/83	
Gulf of Mexico	7 sites 6/14/82	7/29/82	8/24/82	1 site 10/19/82	11/22/82	
North Atlantic	5 sites 6/28/82	8/13/82	9/13/82	4 sites 10/18/82	11/22/82	2 sites 12/14/82-3/17/83
South Atlantic	4 sites 7/6/82	8/20/82	9/20/82	3 sites 10/20/82	11/22/82	
West Pacific	7 sites 7/19/82	9/3/82	10/4/82	2 sites 12/7/82	1/10/83	
TOTAL SITES	66			11		2

II. REGIONAL REPORTS

CARIBBEAN REGION

MARINE SANCTUARY SITE EVALUATION LIST
CARIBBEAN REGION

MANAGEMENT OVERVIEW

1. Resource Evaluation Team

The Caribbean resource evaluation team consisted of two marine scientists from the region. Dr. Manuel Hernandez-Avila, a physical oceanographer and Chairman of the Department of Marine Sciences, University of Puerto Rico, was the team leader. Dr. John Ogden, a marine biologist and Director of the West Indies Laboratory, Fairleigh Dickenson University, St. Croix, USVI, was the other team member. Both Dr. Hernandez-Avila and Dr. Ogden made numerous contacts with local government officials, marine scientists, and fishing interests during the site evaluation process. The two team members met privately on two occasions during the site evaluation process.

2. Site Evaluation and Public Participation Process

The team had two scheduled meetings, on June 1-2, 1982, on St. Thomas, USVI, and on November 2, 1982, at the West Indies Lab on St. Croix. Steve Covell of Research Planning Institute (RPI), Columbia, SC, and Dr. Mattson were present at those two meetings. Family health problems required Dr. Hernandez to telephone his recommendations to Dr. Ogden and Dr. Mattson for the second meeting. Drs. William McLean and Laverne Ragster of the College of the Virgin Islands, St. Thomas, attended the first team meeting and presented information on three potential Marine Sanctuary sites around St. Thomas. Wayne Savage of Chelsea also attended the first meeting. William Tobias, USVI Division of Fish and Wildlife (St. Croix), Alan Putney of the Eastern Caribbean Natural Areas Project, and Ms. Liz Wilson of St. Croix were present at the second meeting.

At the first team meeting, the team considered nine potential Sanctuary sites in Puerto Rico and the U.S. Virgin Islands, including the sites that were on NOAA's List of Recommended Areas (44 Fed. Reg. 62552, Oct. 31, 1979). They agreed to solicit public comments on six of the nine sites, based upon site descriptions to be prepared by RPI. Those sites were:

C-1. Cordillera Reefs, PR. This site includes 62 sq mi of ocean surrounding a chain of islands at the northeastern tip of Puerto Rico.

C-2. Southeastern St. Thomas, USVI. This 12.3 sq mi site was an active candidate for Marine Sanctuary designation until NOAA withdrew it on March 10, 1982. It is a heavily used area with several marinas, excellent diving spots, and a severely polluted mangrove lagoon.

C-3. East End St. Croix, USVI. This 54 sq mi site encompasses the well-known Buck Island National Monument, the fishing areas to the east of St. Croix in both Territorial and Federal waters, and the southeastern coastal waters of St. Croix.

C-4. Salt River Submarine Canyon, St. Croix, USVI. This tiny (3 sq mi) site is on the north side of St. Croix, and is the site of the West Indies Lab "Hydrolab" project.

C-5. Saba Island/Perseverence Bay, St. Thomas, USVI. This 5.5 sq mi site begins at the end of the runway at St. Thomas' airport, and stretches out and around Saba Island. It also fronts on the campus of the College of the Virgin Islands, located just west of the airport.

C-6. Vieques Island, PR. This site, located south of the central portion of Vieques Island, includes two bioluminescent bays on the island. Access to the 18.5 sq mi site is severely restricted because of the U.S. Navy's activities on and around Vieques.

Descriptions of these six potential Marine Sanctuary sites were mailed to 60 groups and individuals in Puerto Rico and the U.S. Virgin Islands, and 82 national organizations and Federal agencies. Chelsea received only nine (9) responsive replies to this mailing by the 45-day public comment deadline of September 20, 1982. The opportunity to submit public nominations for sites not proposed by the team ended on October 18, 1982, with no nominations submitted. With the exception of local support for the two Puerto Rico sites by the Puerto Rico Planning Board and for all six sites by the Caribbean Fishery Management Council, all of the substantive comments came either from Federal agencies (EPA, NOAA, U.S. Navy, and the Fish & Wildlife Service, or from one environmental group (Defenders of Wildlife). The U.S. Navy strongly opposed the Vieques site because of the potential interference with its activities there. The team also considered the blanket opposition of the National Ocean Industries Association and Chevron USA in their final analysis.

3. Recommendations

3.1. Fishing Interests

One of the user groups that did not respond to the request for public comment was the commercial fishermen of Puerto Rico and the Virgin Islands. In the team members' views, this is the area in which most future conflicts with the Marine Sanctuary program will lie. The Caribbean Fisheries Management Council wrote a supportive letter acknowledging that Dr. Hernandez had discussed the sites with them. The National Marine Fisheries Service of

NOAA raised a caution flag with respect to any restrictions on commercial and recreational fishermen.

The East End St. Croix site extends eastward to an important local fishing area, Lang Bank. The Territory currently has laws on the books that control some fishing activities in that area, but the team perceived that enforcement of Territorial fishing laws is extremely lax. Thus even the adoption of local fishing laws and regulations could antagonize fishing interests, if one were also proposing to enforce those laws.

3.2. Site Selection

The Caribbean resource evaluation team recommends the following three sites for placement on the Marine Sanctuary Site Evaluation List. Without prioritizing them, the sites are:

1. Cordillera Reefs, PR
2. Southeastern St. Thomas, USVI
3. East End St. Croix, USVI

As part of its final regional report, the team has approved a set of brief site descriptions, including maps which show the boundaries of the proposed sanctuaries. This portion of the report contains highlights of the team's rationale for choosing each of the three sites, as well as comments on management issues that came to the team's attention during the site evaluation process.

In anticipation of questions regarding the team's rationale for not recommending the other sites, the team states that these three are the best sites. The other three sites that were circulated for public comment probably meet the Marine Sanctuary criteria, but they simply are not as good as the final three. The three sites that were discussed at the first team meeting, but not circulated for public comment, were not considered to meet Marine Sanctuary criteria.

3.2.1. Cordillera Reefs, PR

This site is a heavily-used recreation area off the northeast coast of Puerto Rico. It is less than three miles from the major city of Fajardo, and is easily accessible by power and sailboats alike. The area has been designated by the Puerto Rico Planning Board as a "Natural Reserve." It was removed from NOAA's List of Recommended Areas, for Marine Sanctuary consideration, on July 13, 1981, after substantial local opposition developed in response to a NOAA proposal to include the waters around Culebra and Culebrita Islands. This proposal by the Caribbean resource evaluation team does not include Culebra and Culebrita, although the Fish and Wildlife Service expressed their concern at the

omission of the "spectacular" Culebrita Reef. The team does not believe that Culebra or Culebrita could be successfully brought into the sanctuary program.

If the present Active Candidates in Puerto Rico, La Paguera and Mona/Monita Islands, are designated as Marine Sanctuaries in the near future, the Cordillera Reefs proposal should probably be set aside until the program has thoroughly evaluated the St. Croix and St. Thomas sites.

3.2.2. Southeastern St. Thomas, USVI

No commenter specifically opposed the Southeastern St. Thomas site, and some were surprised to learn that it had regressed from Active Candidate status. This site epitomizes the inappropriate use of the word "sanctuary" in this program. Much of the program's opposition, in St. Thomas as well as nationwide, comes from public perception of "sanctuary." The word is particularly inapt in this site, which might properly be called a "marine management" area. The area encompassed by the team's proposal (12.3 sq mi) contains thousands of sailboats, at least a dozen heavily-used diving spots, and the sewage effluent outfall of the main city on St. Thomas, Charlotte Amalie. The team is concerned that some local and Federal officials expect to accomplish things by Sanctuary designation that they have not been able to do by way of other statutes, even though they have ample authority under those statutes.

A slightly smaller version of this proposal was almost designated a Marine Sanctuary in 1981, but an intramural battle between Territorial Government agencies stalled the process so long that NOAA decided to drop the site and see if it came up again as part of this site evaluation process. The team learned of the local opposition to designation of this site during their visit to St. Thomas. Some of this opposition, they believe, was due to the way in which NOAA published "draft" regulations in the Sanctuary DEIS without first working with the many user groups to determine what would work and what would not.

For example the draft regulations in the DEIS would have forbidden anchoring on coral, with a civil penalty of up to $50,000 per infraction. Local scuba trip operators felt directly threatened by this rule, particularly where there were dive spots in which there were no non-coral anchorages. The DEIS referred to permanent moorings for such areas, but gave no hints as to who would put them in, how they would be paid for, and who would control access to them if there were fewer moorings than users. A public meeting with this interest group, such as was done with the Gray's Reef Sanctuary, might resolve most of these issues.

3.2.3. East End St. Croix, USVI

This 54 sq mi proposal covers an area of ocean that is one-half as large as the entire island of St. Croix, and it will be perceived as very large. Most of the adjoining land is in Federal or local parkland, or agricultural or residential use, and the nearshore area is not likely to be controversial. It is in the management of resources on Lang Bank that fishing interests will have to be carefully considered. The team increased the size of their original proposal by extending the southwestern boundary westward to include Great Pond Bay.

This proposal surrounds the popular diving areas of Buck Island National Monument, as well as Green Cay National Wildlife Refuge. The East End is an area of high diversity, including coral reefs and seagrass beds, as well as high biological productivity. It is clearly one of the best spots in the U.S. Caribbean for Marine Sanctuary status. A total of six comments were received on this site, three in support and none opposing.

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Cordillera Reefs, Puerto Rico

B. LOCATION: (CARIBBEAN REGION)

1. LATITUDE/LONGITUDE: 18°22' N, 65°32' N

2. DESCRIPTION: The site covers approximately 62 mi^2 (160 km^2) around the Cordillera Islands, totally lying within the waters of the northeast coastal sector of the Commonwealth of Puerto Rico (see map). The urban industrial center of Fajardo with its commercial port and marina is less than 3 mi (4.8 km) from the area. Extensive, well-developed coral reef communities occupy the Cordillera Reefs and attract numerous recreationists. Divers are also attracted by several shipwrecks in the area. These waters are affected by severe storms and water spouts. Also, the region is seismically active and tsunami waves historically have impacted the area.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The site contains extensive, well-developed coral formations and associated fish and shellfish resources.

2. The endangered hawksbill turtle and manatee utilize the area.

3. The area receives a high degree of recreational use which has resulted in the depletion of some species.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The large coral reef communities are the outstanding biological feature of this area. The area is inhabited by spiny lobster, octopus, queen conches, helmet shells, and fish including rays, barracuda, grouper, squirrelfish, snapper, grunts, goatfish, jawfish, butterflyfish, angelfish, damselfish, wrasse, trunkfish, doctorfish, and parrotfish.

The endangered manatee (Trichechus manatus) and hawksbill turtle (Eretmochelys imbricata) utilize the area.

Sooty terns, brown boobies, laughing gulls, bridled terns, and noddy terns are among the seabirds likely to be found in this area.

2. HUMAN USES

The Cordillera Reef system is one of the most visited, marine recreational areas in Puerto Rico. Thousands of boaters, swimmers, skin divers, underwater photographers, and fishermen use its waters every month. Spearfishing for sport has depleted some of the large reef fish around Icacos and Palominitos, and scuba divers remove shellfish and coral, but the reefs are still diverse with respect to coral and fish species. Exceptionally clear waters, calm seas during most of the year, and easy accessibility from Fajardo make this area both extraordinarily attractive and susceptible to damage without proper management safeguards.

The Reefs have been designated as a Natural Reserve by the Puerto Rico Planning Board.

The area was formerly used as a military ordnance testing ground.

III. PRINCIPAL REFERENCE MATERIAL

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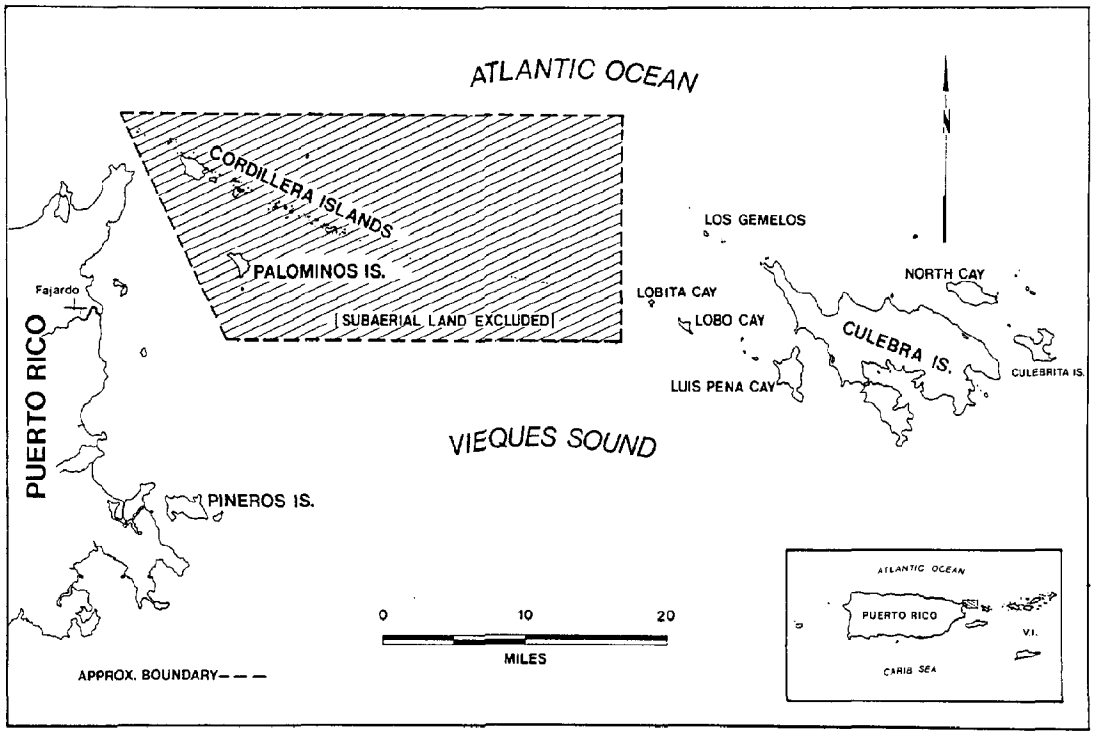
CORDILLERA REEFS, PUERTO RICO



LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION (C-2)

I. SITE LOCATION AND NAME:

A. SITE NAME: Southeastern St. Thomas, U.S. Virgin Islands

B. LOCATION: (CARIBBEAN REGION)

1. LATITUDE/LONGITUDE: 64°48.5' W to 64°54.1' W,
18°16.5' N to 18°19.6' N

2. DESCRIPTION: The site consists of 12.3 mi^2 (32 km^2) of Virgin Islands' territorial waters immediately southeast of St. Thomas, including the entire mangrove lagoon, Jersey and Cowpet Bays, and the waters surrounding Great and Little St. James, Dog, Buck, and Capella Islands. This area encompasses diverse tropical marine ecosystems including numerous habitat types and a wide variety of marine species. Extensive marine development has already occurred in the Benner Bay area. The site is dominated by areas of fine-grained sand with transitional marine meadows of algae and turtle grass. Fifteen different biotic associations of calcareous algal plains and zones of rock and rubble and open ocean waters, as well as a series of shallow fore reefs, deep reefs, and back reefs, occur within the area.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The diverse marine communities situated southeast of St. Thomas form a highly productive and ecologically significant ecosystem whose preservation and management are important to scientific research and to man's understanding of the delicate interrelationship existing between marine species, particularly in regard to the local commercial fishery resources.

2. The area's spectacular beauty and biotic diversity sustain important recreational boating, diving, and tourism which are crucial to the economy of the Virgin Islands.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Mangrove Lagoon, which includes Bovoni Cay, Cas Cay, and Patricia Cay, is the most extensive red mangrove system remaining in the Virgin Islands. The area is a major nursery for several species of reef fish and the spiny lobster (Panulirus argus). The endangered brown pelican, the threatened green sea turtle, olive ridley turtle, loggerhead turtle, and the "endangered" hawksbill and leatherback sea

turtles have been sighted within the area. Numerous birds including ospreys and cattle egrets roost, feed, and nest in and around the mangroves. Some rare reptiles, such as the local snake (Alsophis) and the ground lizard, also find protection within these mangrove cays. Mangroves are additionally important as sediment traps, breaking storm waves, and dampening tidal currents. Mangrove roots play an important role in mineral recycling necessary for maintaining the productivity exhibited by the mangrove community.

The site also contains large expanses of turtle grass flats which are habitats for many species of (juvenile) molluscs, fish (e.g., labinids, wrasses, and latjanids), and spiny lobsters. The area between Patricia and Cas Cays contains a back-reef community of Porites. Coral reefs contain hard corals (e.g., Sidastrea, Acropora, Diploria, Millipora, and Reontastrea) in association with soft corals (e.g., Pterogonia, Psecidopterogoria, Eunicia, and Plexamella, and sponges.

The ocean areas are pristine and contain coral reefs and fine-grained sand areas dominated by the alga Halimeda, marine meadows of Thalassia and Syringodium, calcareous algal plains, and zones of rock and rubble where over 300 species of fish have been observed. The areas of low relief are frequented by a variety of crustaceans and include a recently discovered portunid crab resource exhibiting the potential for commercial exploitation and development. Molluscs, including three species of conch, and a diversity of fish species dominated by porgies, pat snappers, and small grunts also inhabit this area.

The algal plain covers most of the sea floor deeper than 50 ft (15.2 m). The most obvious components are manatee grass (Halophila), green algae (e.g., Caulerpa, Halimeda, Udotera, Valonia, and Penialus), and brown algae (e.g., Lobophora, Dictyota, and Sargassum). The faunal component is dominated by sponges (of which there is a large and colorful variety), fighting conches, carrier shells, hermit crabs, and burrowing polychaete worms.

More than 495 species of flora and fauna have been identified in the area. More than 76 species of green, brown, and red algae; 46 species of molluscs; 15 species of sponges; 58 species of echinoderms, cnidarians, annelids, and crustaceans; 243 species of fish; 2 "endangered" and 3 "threatened" species of marine turtles; 100 species of shorebirds; and the endangered humpback whale live, feed, spawn, breed, and/or nest within these waters southeast of St. Thomas, U.S.V.I.

2. HUMAN USES

St. Thomas's economy is based on tourism, and most tourist attractions are water-related. The waters of the site are the locus for as much as 20 percent of all Virgin Islands boating activities, including considerable use of the area for both

private (recreational) and commercial snorkel and scuba diving tours. Damage to coral crests by anchors and debilitation of sea turtles or migrating humpback whales by power boats traversing the area is of some concern. The resources are such that the area provides spectacular coral reef diving experiences, particularly popular at the coral cave formations at Cow and Calf Rocks and the coral reefs at Buck Island, Capella Island, and Nazareth Bay. The most notable diving attraction is the Royal Mail Steamship H.M.S. WYE, which sank on the south shore of Buck Island. Other wrecks include a World War I freighter located in the West Bay of Buck Island, an unidentified wreck at Whelk Rocks, and a Caribbean trading schooner.

The area is also important to local commercial fishermen. Landings average 1.7 million pounds of fish and 122,000 pounds of lobster. This fishery is a small-scale artisanal fishery using West Indian fish traps and boats that are generally less than 25 ft (8 m) in length.

Of the more than 700 cruise ships which visit St. Thomas annually, only about 1 percent (7-10 smaller vessels) enter or leave through the passage between Buck Island/ Capella Island and St. Thomas. The primary commercial vessel users are small, interisland cargo vessels, passenger-carrying ferry boats, barges, and houseboats. Dredge and fill operations in the proposed sanctuary area have been allowed in the past.

The rich variety of marine resources found within these waters, their importance to the overall resource base of the Virgin Islands, and their close proximity to land have helped to establish this area as an important center for marine research. The first survey of the shoreline and water depths was performed in 1851. Offshore reefs were charted in 1924, and scientific research interests increased in the late 1960s when several environmental impact studies were conducted to assess the impacts of a proposed jet port in Mangrove Lagoon. Since then, the Government of the Virgin Islands has sponsored a number of studies of the dynamics of the Mangrove Lagoon ecosystem, fisheries, lobsters, wildlife, and the flora and fauna of offshore islands and cays.

In addition, a number of research stations have been established along the perimeter of the site. Dr. John Lilly conducted his first experiments in dolphin communication at a specially constructed laboratory at Nazareth Bay. This laboratory was later used for research on sharks and turtles by staff members of the Caribbean Research Institute (CRI). CRI also established a small field-station laboratory at Benner Bay, from which was conducted research on the Mangrove Lagoon, fisheries, lobsters, and ciguatera. Currently, five research projects are being conducted in the area.

The area is also subject to moderate stresses resulting from rapid and unplanned shoreline development and consequent domestic sewage intrusion into the ecosystem since 1960. Resort and residential development is centered at Nazareth Bay by Cabrite Point. Commercial docks are concentrated east of the Mangrove Lagoon area near Benner Bay. Mangrove Lagoon receives leachate and eroded sediments from the adjacent Bovoni Landfall. Both point and nonpoint source pollutants from future coastal development threaten the proposed marine sanctuary.

III. PRINCIPAL REFERENCE MATERIAL

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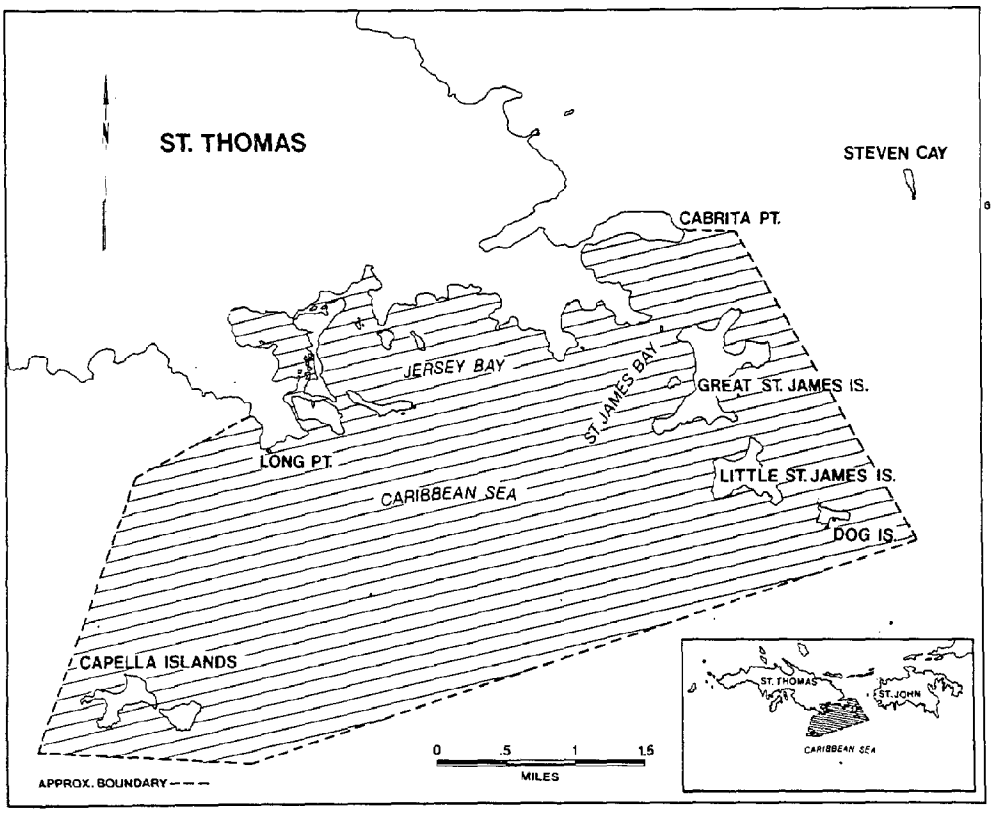
Office of Coastal Zone Management, 1981, Draft environmental impact statement: proposed St. Thomas National Marine Sanctuary: NOAA/CZM, Wash., D.C.



LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: East End St. Croix, U.S. Virgin Islands

B. LOCATION: (CARIBBEAN REGION)

1. LATITUDE/LONGITUDE: 17°45' N, 64°33' W

2. DESCRIPTION: The site covers approximately 54 mi^2 (137 km^2) of territorial and Federal waters adjacent to the east end of St. Croix, including the waters around Green Cay U.S. National Wildlife Refuge, and Buck Island Reef National Monument, and the area around Lang Bank out to the 60 ft (18 m) depth contour (see map). The mainland shore consists largely of segments of sandy beach interspersed between low and steep rocky shore. Volcanically-derived Cretaceous siltstone and sandstone basement rock is thought to underlie much of the proposed site. Coral reef formations are distributed throughout the area with numerous reefs fringing the shore. Grazing sea urchins and parrotfish ingest pieces of coral and excrete calcareous sand, and bands of sand lie between the patch reefs. Water turbulence and water clarity play major roles in determining biological zonation in this area.

The water salinity in the proposed site is nearly always above 34 ppt. Offshore sea surface temperatures range from 25°C (77°F) in February to 28°C (82°F) in July; nearshore sea surface temperatures range from 23°C (73°F) to 30°C (86°F). Spring tides [1 ft (30 cm)] within the site are primarily diurnal. Neap tides are irregular and semidiurnal with a usual range up to 6 in (15 cm). The majority of deep-water waves approaching this site are driven by the consistent northeast trade winds. These waves are mostly 1-3 ft (0.3-1 m) high, although they may occasionally attain heights of 12 ft (3.6 m). Waves up to 12 ft (3.6 m) high at the shore may also result from tropical storms or hurricanes passing to the south during the late summer and fall, or from long-period winter waves from the north which steepen as they approach shore.

This region experiences shallow-focus seismic activity, and tsunami waves have been noted historically along these shores.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. A rich diversity of tropical marine organisms depend upon the maintained integrity of the site.

2. Lang Bank has been identified as a Critical Area of high biological productivity.

3. The area is an important field research site for scientific investigation of tropical marine habitats and offers great potential as an interpretive center.

4. This area supports a small artisanal fishery.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The site is inhabited by a rich diversity of marine organisms. Coral formations composed of live, dead, and dying staghorn, elkhorn, finger, brain, and boulder corals provide habitats for numerous other marine species, including encrusting coralline algae. Submerged meadows of manatee, turtle, and shoal seagrasses are found in the shallow lagoon areas in association with patch reefs. Diverse species of hard corals, gorgonians, sponges, molluscs, crustaceans, and other benthic and pelagic marine organisms inhabit the area. Long-spined black sea urchins take daytime refuge on patch reefs and graze upon the algal mats and surrounding seagrass beds at night. Schools of grunts and copper sweepers leave the protection of the reefs at night using well-defined routes to reach seagrass-bed feeding grounds. Juveniles of some surgeonfish and parrotfish as well as the spiny lobster live in seagrass beds until adulthood, at which time they migrate onto the reefs. Dozens of fish species occur in the area including infrequently observed eels, brotulids, apogonids, serranoids, blennies, and scorpaenids which are camouflaged or hide in the recesses of coral reefs.

Sea birds utilizing this area include brown boobies, frigate birds, laughing gulls, terns, bluefaced boobies, tropic birds, and the endangered brown pelican.

Both Buck Island and Green Cay Beach are important nesting sites for the endangered hawksbill sea turtle and possibly the threatened green sea turtle. Endangered leatherback sea turtles nest at several locations on St. Croix and would be at least incidentally encountered within the proposed sanctuary site.

2. HUMAN USES

Artisanal fishermen harvest conch, whelk, and spiny lobster from these waters; however, as occurs throughout Caribbean waters, ciguatera fish poisoning poses a problem for finfish harvesting.

The West Indies Lab of Fairleigh Dickinson University is located at Tague Bay, and it is an important facility for research and education concerning tropical marine science.

Buck Island Reef National Monument (operated by the National Park Service) and Green Cay National Wildlife Refuge (operated by U.S. Fish and Wildlife Service) adjoin the site. Cramer Park is a local park on the east end of Tague Bay. The waters around Buck Island are noted as a graveyard for sunken ships and attract large numbers of recreational divers each year. The Lang Bank has been designated as a Critical Area of high biological productivity in the Virgin Islands Coastal Zone Management Program.

III. PRINCIPAL REFERENCE MATERIAL

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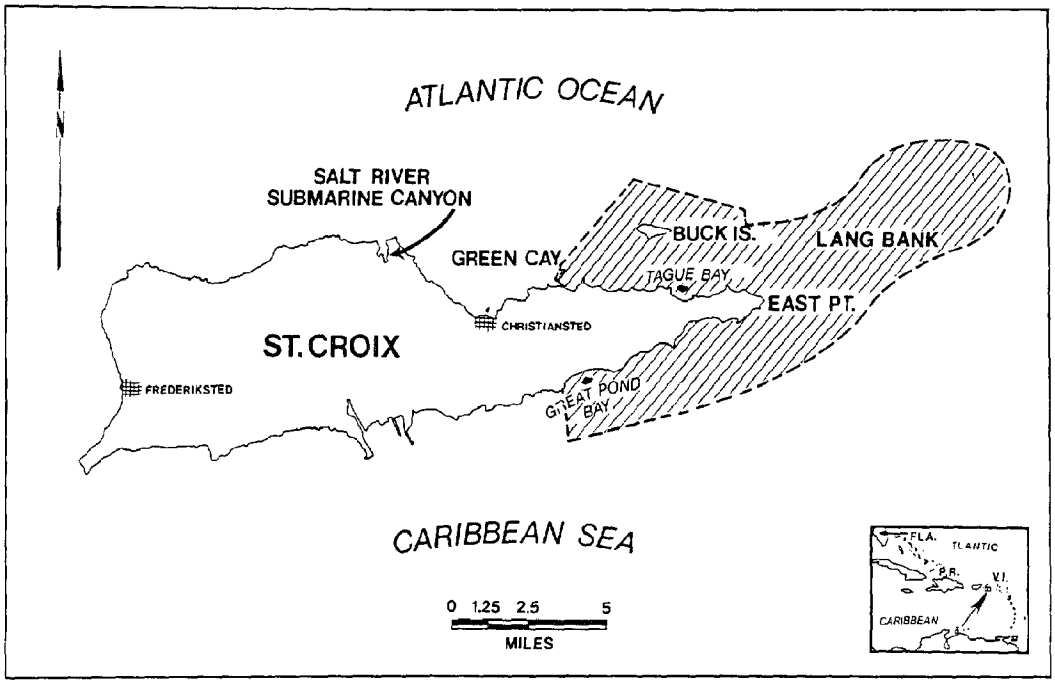

LOCATION MAP

EAST PACIFIC REGION

MARINE SANCTUARY SITE EVALUATION LIST
EASTERN PACIFIC REGION

MANAGEMENT OVERVIEW

1. Resource Evaluation Team

The Eastern Pacific resources evaluation team was comprised of five marine scientists from the region. The team leader was Dr. Paul Rudy, Director, Institute of Marine Biology, University of Oregon. The other team members were Dr. Dee Boersma, Director, Institute of Environmental Studies, University of Washington; Dr. Joel W. Hedgpeth, Marine Biologist, Santa Rosa, CA; Dr. June Lindsedt-Siva, Environmental Scientist, Atlantic Richfield Company, Los Angeles, CA; and Dr. Elizabeth Venrick, Scripps Institution of Oceanography, La Jolla, CA.

2. Site Evaluation and Public Participation Process

The team held their first meeting in San Francisco, California on April 22-23, 1982. Prior to this meeting the team members had made numerous contacts with their colleagues in academic institutions, state and local governments, Federal agencies, environmental groups, and fishing and oil and gas interests to solicit views on potential Marine Sanctuary sites. At the initial meeting, the team discussed each section of the coastal waters of the Pacific Coast of the United States to identify potential Marine Sanctuary sites. They also reviewed all Eastern Pacific sites that were contained in NOAA's List of Recommended Areas (44 Fed. Reg. 62552, Oct. 31, 1979). During the first meeting, using the criteria contained in the Sanctuary Program PDP, the team identified nine preliminary Marine Sanctuary candidates:

EP-1. Washington State Nearshore. This is a group of three distinct areas in Puget Sound, entirely in State water, encompassing about 430 sq mi.

EP-2. Western Washington Outer Coast. This rocky coastline area extends 90 miles south from the northwestern tip. Entirely in State waters, it is an important habitat for fish, raptors and marine mammals.

EP-3. Willapa Bay, WA. This complex bay/estuarine ecosystem encompasses approximately 100 sq mi of State water in the southwest corner to the Columbia River.

EP-4. Heceta-Stonewall Banks, off OR. This is a hard bottom bank area, about 400 sq mi, lying off midcoastal Oregon near Newport. Entirely in Federal water, the area supports important fishery resources.

EP-5. Trinidad Head Area, CA. This is a small (4.5 sq mi) stretch of shallow, gently sloping coast south of the California-Oregon border. Characterized by high rocky scarps and sandy pocket beaches, it is entirely in State water.

EP-6. Morro Bay, CA. This 2,000 acre embayment, south of the City of Morro Bay, supports three habitats - coastal salt marsh, tidal mud flats and deepwater channels. It lies within State jurisdiction.

EP-7. Santa Barbara Basin, CA. This site includes 260 sq mi of flat bottomed anoxic submarine basin entirely in Federal water. Its bottom sedimentary deposits makes it valuable for geological research.

EP-8. San Nicolas and San Clemente Islands, CA. This site consists of two discrete areas surrounding two islands used by the military. Offshore from Santa Catalina Island, the site contains important marine mammal habitat.

EP-9. Cortes and Tanner Banks, off CA. This site is comprised of two rocky bottom areas, approximately 9,000 acres, west of San Diego. Located in Federal water, these banks are a major sport and commercial fishing area.

Following the meeting, descriptions and maps of each of these candidate sites were mailed to 290 groups and individuals in Washington, Oregon and California and to 82 national organizations and Federal agencies. Chelsea received 141 responses by the end of the 45-day public comment period (August 27, 1982). In addition, two sites were nominated by the public prior to the September 27, 1982, nomination deadline. These sites were the Tacoma Narrows, WA, submitted by Ms. Nancy N. Kroening of Seattle, WA, and Cape Arago, OR, nominated by the Oregon Shores Conservation Coalition, Rockaway, OR.

The team held their second meeting in Half Moon Bay, California on Oct. 23, 1982. During this meeting they reexamined their nine original choices in light of the comments had received during the public participation process, and they considered the two public nominations. The meeting began with the team recommending to NOAA that Mugu Lagoon, CA be considered as an Estuarine Sanctuary site. They then discussed the two sites that had been nominated during the public participation process. They decided not to give further consideration to Tacoma Narrows because the habitat and natural resources it contained were represented in areas within the Washington Nearshore Site already selected as a candidate. The team suggested, however, that should the Washington Nearshore Site survive the site selection process and achieve active candidate status, the group determining the boundaries might wish to reconsider the Tacoma Narrows.

Next the team reviewed the Cape Arago, OR nomination. Cape Arago is a rocky, sedimentary headland dotted with caves and surge channels located next to Coos Bay. It was agreed that this nomination had considerable merit and should be evaluated with the nine other sites during the meeting.

3. Recommendations

The Eastern Pacific team, using the criteria outlined in the NOAA PDP, recommends the following five sites in order of priority for placement on the Marine Sanctuary Site Evaluation List.

1. Washington Nearshore, WA
2. Tanner-Cortes Banks, off CA
3. Morro Bay, CA
4. Heceta-Stonewall Banks, off OR
5. Washington Outer Coast, WA

At the time of the second team meeting there was uncertainty whether the State of Washington would support the two sites within their waters. Consequently, the team recommended that Trinidad Head and Cape Arago, then sixth and seventh respectively, be added to the list if the two Washington sites were dropped. As explained below, the State of Washington subsequently decided to remain neutral on both Washington sites and Trinidad Head and Cape Arago did not make the final list.

As part of its final regional report, the team approved a set of brief site descriptions, including maps which defined recommended boundaries for the proposed sanctuaries. The team believes, however, that those boundaries should be considered tentative, and when a proposed site is elevated to active candidate status, the issue of the final boundaries should be reopened.

This portion of the final regional report contains highlights of the team's rationale for selecting each of the five sites, a summary of public comments received and management issues that came to the team's attention. The team believes these sites represent an excellent cross-section of the marine ecosystems of the Pacific Coast of the United States.

3.1 Washington Nearshore, WA

Initially discussion covered all the waters in Puget Sound and the San Juan Islands, however because such a site would have exceeded the size limitations recommended by NOAA, the team decided to select certain areas that would represent each of the more unique, major habitats within the Puget Sound - San Juan Islands system. As conceived during the first site selection meeting in San Francisco, this potential site included three areas:

Area A - The San Juan Islands - Skagit Bay complex but not including the Estuarine Sanctuary in Padilla Bay.

Area B - The coastal waters adjacent to Dungeness Spit, within Sequim Bay, and adjacent to Indian Island, including the waters surrounding Protection Island.

Area C - The waters of the Nisqually Delta and the shallow waters surrounding Anderson, McNeil and Gertrude Islands.

During the public comment period 37 comments were received on this site, 30 in favor and 4 opposed. There was also a petition signed by 291 local people strongly supporting the site. Governmental comments were divided with 4 in support, 3 in opposition, and 3 taking no position. The Jefferson County Planning Department, Port of Port Townsend, Bureau of Indian Affairs (Olympic Penninsula Agency) and the Point No Point Treaty Council supported the proposal, while the Washington Department of Fisheries and the U.S. Navy opposed, both on the grounds that existing regulations were adequate. Fourteen environmental groups expressed support with none opposed. The Defenders of Wildlife, while tentatively supporting the San Juan Islands complex, expressed concern that the areas were all within State waters and already well protected by the State.

This site came first in the team's rankings, but because of possible State opposition it was questionable whether it would be accepted by NOAA. To clarify the State's position, explain the Marine Sanctuary program, and evaluate public support for these sites, Wayne Savage of Chelsea and Dallas Miner of the Marine Sanctuary Program Office spent a week in the area in December, 1982. At the invitation of the Washington Department of Ecology, they held a series of meetings with local officials and interested groups and individuals. Following those meetings the State agreed to withdraw its opposition if certain areas within the proposed site were eliminated. These areas were:

1. The harbor and port/industrial area of Anacortes;
2. Sequim Bay and those areas generally easterly of Protection Island; and
3. The waters surrounding Anderson Island.

The team agreed to the recommendations. However, when this site achieves active candidate status, the team recommends that the boundary issue be reopened. At that time NOAA, State and local officials and local individuals and organizations will be in a better position to define final sanctuary boundaries.

3.2. Tanner-Cortes Banks, California

The proposed sanctuary consists of two neighboring rocky bottom sites, some 112 mi west of San Diego, California and is all in Federal waters. The area is one of the most important commercial fisheries within the southern California Bight and contains rare and select lifeforms.

This site, which the team ranked second, received 12 comments; 10 in support of the nomination, and none opposed. There were no comments dealing solely with this site, all were part of multiple site responses.

The Marin County Planning Department supported the proposal, commenting on the unusual underwater plateaus found in the area. Environmental support came from the Sierra Club (Loma Prieta Chapter), Sport Fishing Institute, American Cetacean Society, Defenders of Wildlife, and the Whale Center. The U.S. Minerals Management Service took no position, but called attention to the active oil leases in the general vicinity of the site, though not within the proposed boundaries. The paucity of public comment was no doubt due to the fact the site is entirely within Federal waters and over 100 miles west of the California coastline. It was ranked high due to its Federal status and its exceptional species classification and population dynamics research opportunities.

3.3. Morro Bay, California

The proposed 2,000 acre site is located south of the city of Morro Bay. The embankment contains coastal salt marsh, tidal mud flats and deep-water channel habitats. The area, all within State waters, is one of the largest bay wildlife habitats on the California coast.

The Morro Bay site received by far the most public comments, 44% of the total received, with 117 letters in support and only 4 in opposition. 102 of the supporting comments came from individuals who live in the area. Additional support came from the Morro Bay City Council, which voted unanimously to support the proposal. Environmental groups in general were enthusiastic with 11 in favor of the nomination. . Only the California Waterfowl Association and the Defenders of Wildlife opposed, the former because they feared all waterfowl hunting would be terminated if the area were designated and the latter because some of the area is already a State park. (According to Park Authorities, almost the entire spit and a small area south of Morro Bay are within the State Park, however only about 1/6 of the water area of the Bay is within the park boundaries.) The Sport Fishing Institute named it their top priority site in the Eastern Pacific region. The site elicited little comment from the oil and gas industry.

Many of the public comments expressed concern that none of the local, State, or Federal government agencies with jurisdiction over parts of the area had been willing to accept authority for the waters of the bay. As one writer stated, "much of the land surrounding Morro Bay is incorporated, and when decisions need to be made concerning the area and the bay itself, a 'pass the buck' attitude reigns supreme." Most of the commenters believed that a coordinated management plan was needed and that the sanctuary status could provide the mechanism..

A major issue for the site involves waterfowl hunting. The proposed site contains one of the two black brant hunting areas in the State, and as the population has grown, so has the pressure to eliminate hunting. This issue must be dealt with directly in any future efforts to achieve sanctuary status.

3.4. Heceta-Stonewall Banks, Oregon

The proposed site, approximately 400 square miles in area, is a hard-bottom bank entirely within Federal waters. The area is an important commercial and sport fishing area due to upwelling.

This site received relatively little public comment, a total of 13 letters (5% of the total), 9 supporting and 3 opposing. The proposed area is all in Federal waters and, like the Tanner-Cortes site, this probably explains the lack of public interest. The Oregon Shores Conservation Coalition was supportive, citing the highly productive fisheries of this area. The northwest office of the Friends of Earth supported it as an important research area. The Whale Center recommended that the boundaries be extended shoreward to the mean high water line to include whale migration routes. The Defenders of Wildlife were not supportive even though the site is totaly in Federal waters, citing their opinion that a site should not be designated on the solely because of its valuable fishery resources. Exxon USA also opposed the nomination.

Prior to the initial nomination of the site, Dr. Rudy discussed it with Oregon State Land Conservation Development Commission (LCDC) authorities. The LCDC people subsequently met with the Oregon Department of Fish and Wildlife to determine their position. While the area is outside State jurisdiction, representatives of the above organizations saw a Heceta-Stonewall Banks Marine Sanctuary as fitting into their overall coastal zone management program.

While there was little public comment from fishing interests, the team believes that a potential problem could arise between commercial and sports fishermen and that a management plan associated with Marine Sanctuary status would prevent conflicts between these groups.

The team also expressed their belief that the Pacific Fishery Management Council should play an important role in any future sanctuary management plan. Though the Council manages fisheries on a species by species basis, rather than an area basis, the creation of a Marine Sanctuary on the Banks could serve as a research and testing ground for innovative fisheries management policies.

3.5 Washington Outer Coast

The proposed site extends from just north of Tattoos Island on the northwestern tip of Washington State to Point Grenville, about 90 mi to the south. The site lies completely within Washington State waters and is a unique breeding and feeding ground for migratory marine birds, mammals, and fish.

The Washington Outer Coast Marine Sanctuary Site, ranked fifth by the team, drew 8% of the public responses or 23 letters. Eighteen were in support and two opposed. There was only one comment dealing solely with this area, all others were part of multiple site responses.

The Washington Department of Fisheries opposed, while a wildlife biologist with the Washington Department of Game expressed support for the nomination, noting the important harbor seal habitat. Environmental organization support was unanimous, with 11 comments. Supporters included the Island Action Coalition, Olympic Peninsula Audubon Society, Olympic Park Associates, Friends of the Earth, Northwest Office, and the Mountaineers. The Makah Tribal Council disputed the team's recommended boundary (which extended to the high tide mark) stating that tribal territory, by treaty, extended to the mean low tide mark. They also expressed concern about preserving their offshore fishing rights. Following discussions with Chelsea project staff, the tribal attorney indicated that if their rights were adequately protected, they saw benefits associated with sanctuary status. The Makah tribe was the only Indian group that commented directly on this proposal. When this site achieves active candidate status the other tribes inhabiting the coast should be involved in the site designation process. The Whale Center and Pacific Sea Bird Group recommended that the boundaries be extended 25 miles offshore to include Humpback Whale migration routes. The Defenders of Wildlife also expressed concern that the area was entirely within State waters. It was the consensus of the team, however, that when this site achieves active candidate status, the issue of boundaries should also be reconsidered.

Compared with the Washington Nearshore site, this area aroused relatively little public or governmental comment or controversy. The team believes, however, it is one of the most scenic, wild and rugged sections of the Pacific coastline and consequently is an ideal candidate for Marine Sanctuary status.

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME

A. SITE NAME: Washington State Nearshore Marine Sanctuary

B. LOCATION: (EASTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE: Three primary areas encompassed within:
East of 123°12' W; West of 122°12'W;
South of 48°45' N; North of 47°05' N

2. DESCRIPTION: The proposed Washington State Nearshore Marine Sanctuary includes a series of habitats representing the extraordinary diversity of marine communities found within the Puget Sound ecosystem. The sites included within the proposed marine sanctuary are some of the most biologically productive areas within U.S. coastal waters and represent a diverse and structurally complex intertidal zone. Food webs are complex and interactions between species are important in structuring the communities. The proposed sanctuary would include roughly 370 mi^2 (950 km^2) within the coastal waters of the State of Washington, divided among three geographically distinct locations within Puget Sound (see maps):

Area A. - The San Juan Islands-Skagit Bay Complex, the northernmost division of the proposed sanctuary, is located at the junction of the Strait of Juan de Fuca and the Strait of Georgia and encompasses approximately 325 mi^2 (840 km^2). It is representative of rocky-shore, deep-water, and shallow-embayment habitats. The proposed site would not overlap the Estuarine Sanctuary located in Padilla Bay and would not include the harbor and port/industrial area of Anacortes.

Area B. - This middle area includes coastal waters adjacent to Dungeness Spit, extending eastward to Protection Island. It would not include the waters of Sequim Bay. This division represents estuarine habitats important internationally as nursery, breeding, and feeding grounds for an enormous number of ecologically and commercially important marine species. The approximate area of the site is 45 mi^2 (114 km^2).

Area C. - The southernmost division of the proposed sanctuary lies 70 miles (155 km) to the south of Port Townsend and includes the estuarine waters of the Nisqually Delta and the shallow waters surrounding McNeil and Gertrude Islands. The waters around Anderson Island are not included. This division is similar to Area B in that it also represents an extremely important nursery, breeding, and feeding ground. Approximately 10 mi^2 (25 km^2) of area is included in this site.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The area supports an unusually diverse array of marine habitats within a relatively small area.

2. The area is critical to the maintenance of a large number of ecologically and commercially important fish, shellfish, bird, and marine mammal species.

3. Because of the unique association of marine organisms indigenous to the area, the facilities of the Friday Harbor Marine Research Laboratory (on San Juan Island), and the commitment to research and resource protection fostered by the State of Washington and several Federal agencies, the area provides exceptional opportunities for marine research and resource management programs.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Area A (San Juan Islands-Skagit Bay Complex)

The San Juan Islands, a relatively pristine area, may be characterized as a rocky-shore environment, but the islands also exhibit mud- and sand-flat, sheltered-bay, and marsh habitats. Biotic zonation patterns typical of rocky-shore habitats are clearly evident as the 12 ft (3.7 m) tidal range exposes a rich diversity of marine flora and macroinvertebrate fauna. Rockweed and a variety of smaller green, red, and brown macroalgae form the basis of the nearshore food web, which supports vast populations of isopods, amphipods, hermit crabs, shrimp, barnacles, sponges, anemones, starfish, sea urchins, chitons, abalone, scallops, octopus, and other marine organisms associated with rocky shore habitats. Subtidally, rockfish, lingcod, cabezon, sculpins, Pacific herring, and salmon abound in large numbers. The submerged rocky platforms below the islands drop off rather abruptly into deep channels. The deeper waters serve as an important habitat for gray whales (federally-listed as an "endangered" species), killer whales, pilot whales, minke whales, harbor and dall porpoises, harbor seals, stellar sea lions, and elephant seals. Harbor seals utilize offshore rocks and reefs for haul-out (resting) and pupping sites. The largest single component (1000+ animals) of Puget Sound's harbor seal population resides in this area. The waters around the San Juan Islands represent an important breeding ground for river otters. Bird nesting and feeding sites are interspersed throughout the San Juan Island complex, which supports the highest known concentration of nesting oystercatchers in the United States. Bald eagles, Federally listed as a "threatened" species, are

commonly observed in the area and depend upon the marine environment for much of their food.

Skagit Bay is situated just east of the San Juan Islands and contains one of the largest and least disturbed stands of eelgrass remaining on the West Coast of the United States. Skagit Bay is internationally important to migratory birds of the Pacific Flyway which feed in the Bay before making their nonstop flight to their Alaskan breeding grounds. The Bay delta is a critical fall and spring migration feeding area for dabbling ducks (e.g., mallards, pintail, widgeon, and green-winged teal). It is a prime wintering area for snow geese. Thousands of waterfowl and shorebirds, representing 165 species, colonize these bays. The area is home to 50,000 ducks, 20,000 black brant (one-half of all the brant of the Pacific Flyway), oystercatchers, trumpeter swans, auklets, cormorants, pigeon guillemots, glaucous-winged gulls, puffins, osprey, peregrine falcons, golden eagles, bald eagles, great blue heron, and green heron. The organically-rich and productive mud flats of Skagit Bay represent an extremely important feeding and spawning ground for herring, flatfish, baitfish, and juvenile salmonids. In addition to being commercially valuable, these fish species are important to raptorial birds and marine mammals (e.g., whales, porpoises, seals, sea lions, and river otters) that live and feed within the San Juan Islands-Skagit Bay complex.

Area B (Dungeness Bay-Sequim Bay-Protection Island-Indian Island Complex)

Dungeness Spit is a relatively high-energy, unstable, mixed sand and gravel spit, behind which is supported uncommonly rich, nearshore, marine macroinvertebrate fauna (115 species). These serve as prey for 70 species of demersal and neritic fishes and marine mammals. Herring, smelt, walleye, pollock, and perch comprise 92 percent of all year-round fish species spawning and feeding in these waters. Feeding salmon populations migrate through the Dungeness Bay area during the summer months. Dungeness crab are abundant and harvested commercially. The area is an important pupping ground for harbor seals.

Protection Island National Wildlife Refuge is refuge to the greatest number of nesting sea birds anywhere on Puget Sound. More than 40,000 birds (representing 170 species) breed and nest on the island; it is the last remaining nesting site on Puget Sound for the tufted puffin and burrowing auklet. Protection Island has the largest colony of rhinoceros auklets in the continental United States. Bald eagles nest on Protection Island, and young eaglets have been successfully reared on the island for a number of years. The east end of the island is a major haul-out and pupping area for a colony of more than 200 harbor seals, a species designated as

"protected" by the State of Washington. Pup production on Protection Island rates it as one of the top three sites in northern Puget Sound. The birds of Protection Island feed on organisms nurtured in the biologically productive muds of Sequim Bay.

Area C (Nisqually Delta-McNeil Island-Gertrude Island Complex)

The Nisqually estuary is the last unspoiled major estuary in Washington State. It is an extremely important nursery ground for salmonids, other finfish, and shellfish, and is an important feeding area for waterfowl and migratory birds of the Pacific Flyway. The area's 18-ft tidal extremes provide extensive littoral zones, yet there are many ecotones of different types. Food webs are intricate, unusual, and varied.

The harbor seal is the most abundant marine mammal found in Puget Sound. Nisqually Delta and Gertrude Island are important breeding grounds, although since the 1940s, the Nisqually population has been reduced because of several factors including extensive bounty hunting, the impacts of industrial pollutants discharged into the nearby waters, and continuing encroachment by Man. The Nisqually is a biologically rich, deltaic mud flat supporting large numbers of waterfowl including whistling swans, western Canada geese, black brant, mallard, pintail, and the American widgeon. The waters provide an abundance of food for these species which consume aquatic vegetation and shellfish. Much of the delta is part of Nisqually National Wildlife Refuge.

The waters north of the Nisqually Delta, especially those surrounding McNeil and Gertrude Islands, are critical habitats for the birds of the Pacific Flyway and resident species. More than 10,000 waterfowl (representing 100 species) winter in these waters. The bald eagle maintains active nest sites on Gertrude Island. Still Harbor, on Gertrude Island, is the most significant harbor seal pupping and haul-out site in southern Puget Sound. Over 70 great blue heron nests are located on McNeil Island. Other birds nesting on the island include hawks, kestrels, owls, pigeon guillemots, and many passerine species. Brant feed on the eelgrass along the beaches, and over 10,000 American widgeon feed annually in the fields.

2. HUMAN USES

The area is predominantly utilized for aquatic recreation and commercial fishing. Residents and visitors enjoy boating, fishing, clamming, crabbing, duck hunting, birdwatching, swimming, diving, and beachcombing activities because of the area's exceptional biotic richness and beauty.

Since 1904, the San Juan Islands have served as an area of intense scientific research. Recognizing the unique character of the archipelago, the University of Washington established a marine biology research center at Friday Harbor on San Juan Island. The laboratory is open to the public during the summer months, and its museum and educational programs add to the area's value as a unique educational resource. The deep channels, shallow bays, lagoons, and marshes provide a diversity of habitats containing organisms used for biomedical experimentation in fields such as developmental biology, neurobiology, and muscle physiology. Rocky-shore habitats have proved to be valuable field sites for ecological studies. The Audubon Society operates an educational Nature Center at Nisqually Reach. Western Washington State University maintains a biological research station in Anacortes. Battelle Northwest operates a major marine laboratory in Sequim Bay.

Fine-grained sand and mud habitats, with their characteristically high densities of infaunal species, have facilitated field experiments on interactions between species that help to elucidate many important aspects of population dynamics. Populations of nearshore fishes and of bottom-dwelling invertebrates have been altered in some areas within Puget Sound. A program of continuing research is needed to study the effects of fishing, competition between predators, and of alteration of resources on species and species interactions, in an effort to provide relevant data needed to improve management decisions for this and other coastal regions.

Fossil Bay, off Sucia Island in the San Juan Archipelago, and Protection Island National Wildlife Refuge are important sites for fossil hunters. The shoreline along Fossil Bay is rich in fossilized clams, snails, and ammonites 75 million years old. Protection Island is an established archaeological site where prehistoric mastadon/mammoth and human bones have been unearthed. Mastodon tusks have also been found in the banks of Sequim Bay. More than 30 relic hearths have been found buried beneath the beach on Indian Island, near an old Indian village believed to be about 500 years old. Nearby, at the Manis Mastodon Site in Sequim, a spear point lies buried in a mastodon rib dated at 9500 years old. Further west, at the mouth of the Hoko River, over 5500 artifacts have been found dating back to between 2500 and 2800 years ago. With fluctuations in sea level ranging in the hundreds of feet during recent geologic time, it is reasonable to expect that additional historic treasures might be found in these offshore waters.

The area is utilized by commercial aquaculturists and managed by the Washington Department of Fisheries. The San Juan Islands-Skagit Bay Complex supports floating-pen fish culture and raft-and-longline cultures of oysters, scallops, and mussels. Very high potential for future aquaculture of seaweed, abalone, and rock scallop exists in the San Juan Islands. The protected bays and relatively clear water make this a prime

area for aquaculture. In addition, the area receives considerable protection as a result of the State law controlling the taking of marine organisms (Shoreline Management Act) and of the large number of islands cooperatively managed by the State of Washington and the U.S. Fish and Wildlife Service. Dungeness Bay and Sequim Bay contain the State's largest geoduck beds (20 million pounds) and important lease areas for oyster culture. Dungeness Spit is managed as a National Wildlife Refuge. The Dawley property in southeastern Sequim Bay is managed by the U.S. Fish and Wildlife Service and will eventually be used as an educational center. Protection Island is federally managed as a bird sanctuary. The Nisqually Delta-McNeil Island area is a vital part of the State's Fisheries Management Program for geoducks. Some 12 million pounds of prime-quality geoducks are contained in this area. In addition, the Federal government manages the Nisqually National Wildlife Refuge as a "research natural area." Protection of the McNeil Island (Gertrude Island) seal population is afforded by maintenance of McNeil Island as a Federal prison restricting public use, and other Federal laws protecting marine mammals.

The area is also subject to increasing industrial and port development pressures. The Puget Sound system, in general, is used extensively for commercial fishing and other marine transportation activities. Anacortes, Port Angeles, Seattle, Olympia, Port Townsend, and Bellingham are major port cities situated adjacent to the proposed Marine Sanctuary site. Weyerhauser Paper Corporation proposes to expand its dock facilities at Dupont, Washington. Scott Paper Company operates a log rafting and storage facility at Similk Bay and uses other facilities near the community of LaConner located adjacent to Skagit Bay.

The U.S. Bureau of Mines reports that there are numerous mineral deposits within or near the boundaries of the site. Within the San Juan Islands-Skagit Bay complex, there are 61 mineral deposits. Many of these deposits have produced in the past. Most are of stone material, including sand and gravel, limestone, and sandstone. Others were developed for olivine, chromite, and coal. Three productive sand and gravel deposits occur near shore at the Dungeness Spit-Sequim Bay site. In addition, productive sand and gravel deposits occur on McNeil Island and in the Nisqually Delta area. Diatomite deposits also occur on Anderson Island.

The proposed Marine Sanctuary site is situated within Northwestern Indian Treaty Areas and encompasses the fishing grounds customarily used by Indian tribes living within the Puget Sound area. The Point No Point Treaty Council, an intergovernmental fisheries management agency of the Indian signatories, is responsible for managing a major portion of the anadromous fisheries in the Strait of Juan de Fuca and Hood Canal. The Council also manages certain rights to shellfish

and bottom-fish resources within the Dungeness-Sequim Bay area.

The U.S. Army Corps of Engineers, Seattle District, maintains navigational channels at Anacortes Harbor and Oak Bay Waterway. The marina at Friday Harbor on San Juan Island is planned for expansion. The Port Authority of Port Angeles maintains a boat launch within the proposed site. The channel leading to the launch facility requires annual dredging and spoil disposal.

The U.S. Department of the Navy conducts operations vital to the nation's defense in close proximity to or within portions of the proposed site. These include restricted areas in Admiralty Inlet and Bay and Carr Inlet and restricted airspace over waters near parts of Whidbey Island.

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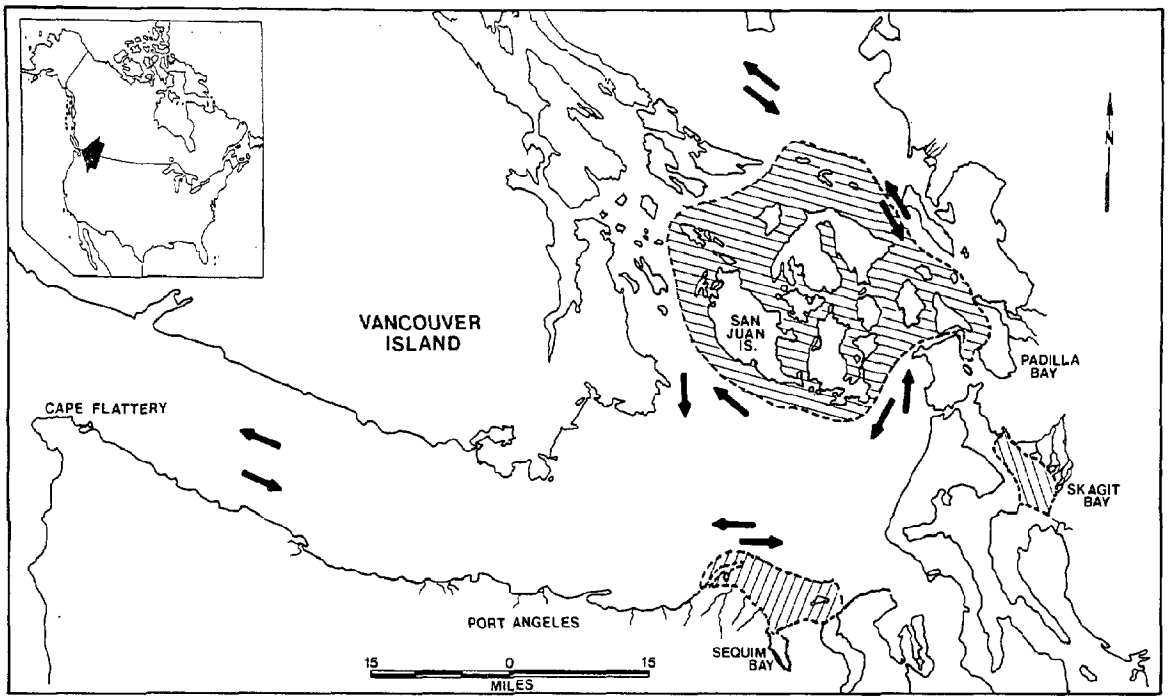

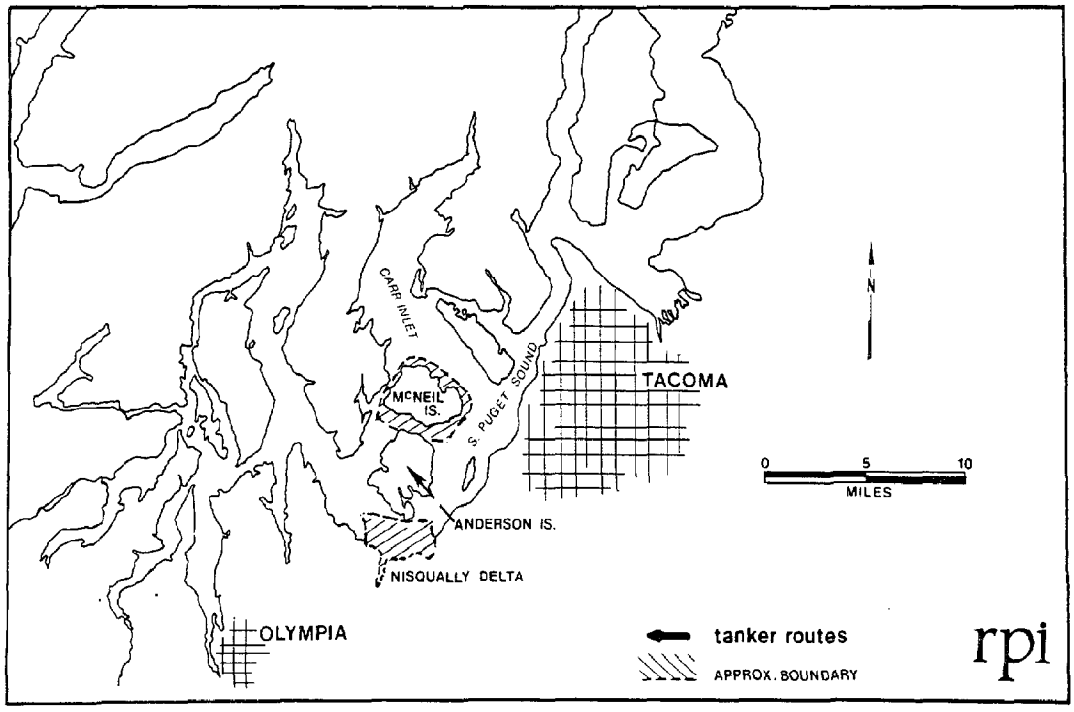

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME

A. SITE NAME: Cortes and Tanner Banks off California

B. LOCATION: (EASTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE: Cortes Bank 32°30' N, 119°20' W
Tanner Bank 32°42' N, 119°10' W

2. DESCRIPTION: The proposed marine sanctuary consists of two neighboring rocky-bottom, terraced ledges situated in Federal waters 112 mi (180 km) west of San Diego, California. The composite area of these two sites is approximately 14 mi^2 (36 km^2) extending down to the 200 ft (60 m) depth contour. This area is characterized by high wave energy and is subject to the full force of open-ocean storm waves which attain heights of 33 ft (11 m). The location of the banks in relation to oceanic currents generates a mixture of both nearshore and offshore organisms. The underwater visibility is normally in excess of 60 ft (20 m).

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. This area is one of the most important offshore commercial fisheries within the southern California Bight.

2. This area contains accessible, rare, relict lifeforms and newly-discovered species which have been the subject of scientific investigations. This area is important for maintenance and continued survival of those species.

3. Exceptional research opportunities are provided in the areas of classification, population dynamics, and species interactions.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The Southern California Bight represents one of the world's most productive ecosystems, exhibiting the richest diversity of marine flora and fauna in northern temperate waters. The Bight supports 33 species of marine mammals, 80 species of marine birds, and 485 species of California's 562 species of marine fish. The Banks serve as an important refuge for many such species disappearing from more heavily impacted nearshore areas.

Although species typically found nearer to the mainland also occur here, this area is unique due to the unusual relative abundances of the species. Dense stands of southern sea palm

(Eisenia arborea) and smaller brown and red algae occur in shallow communities. Numerous kinds of bottom-dwelling macroinvertebrates inhabit this area including anemones, barnacles, hydroids, pelecypods, sponges, spiny lobsters, crabs, sea urchins, abalones, tunicates, sea stars (sometimes extremely abundant locally), and bryozoans.

Tanner Bank contains unusually high concentrations of the chestnut cowrie and the California sheepshead, and is the last area in California with a significant-sized population of giant seabass. Cortes Bank is a haven for large numbers of abalone and lobsters.

The Banks are a major, year-round foraging ground for several species of marine mammals, including whale species, which are Federally listed as "endangered"), and migrant and wintering seabirds. Sea lions are observed in the area feeding on fish, despite the fact that the nearest sea lion haulout area is located a considerable distance away from the Banks.

The Banks support one of the major commercial fisheries for jack mackerel, anchovies, and other species. Demersal fish living in this area include rockfish, sheepshead, rock wrasse, blackeye goby, ocean whitefish, and numerous others. Open-ocean fish found here include yellowtail, California flyingfish, the blue and thresher sharks, and billfish. Gulls, terns, shearwaters, and storm petrels are some of the seabirds noted in this area.

Many new species of marine invertebrates have been identified from these waters. Specimens of a group of mollusks (Monoplacophora) which were thought to have been extinct since Paleozoic time have been recovered from the Banks. Other unique species found here include Dimya sp. (only found on Tanner Bank), lampshells, pogonophorans, vestimentiferans (large, gutless worms), and purple coral (Allopora californica).

2. HUMAN USES

The Banks are a major sport and high-yield commercial fishing resource of the southern California region.

Researchers use the site for collecting and studying many newly-discovered and rare marine organisms.

The clear visibility and shallowness of the water help facilitate specimen collections by scientific and recreational scuba divers, but strong currents and rough weather make diving difficult.

The U.S. Department of the Navy conducts activities within portions of the proposed site which are essential to the national defense. These areas are restricted and fall under the jurisdiction and management of the Navy. The restricted areas

include Cortes Bank Carrier Operations Area, San Clemente and Western San Clemente Operations Areas, and Warning Areas 60, 289, 291.

There are no active oil-and-gas leases contained within the boundaries of the proposed marine sanctuary. However, there are active leases in the general vicinity of the site, and the entire area has a potential for containing hydrocarbon resources.

III. PRINCIPAL REFERENCE MATERIAL

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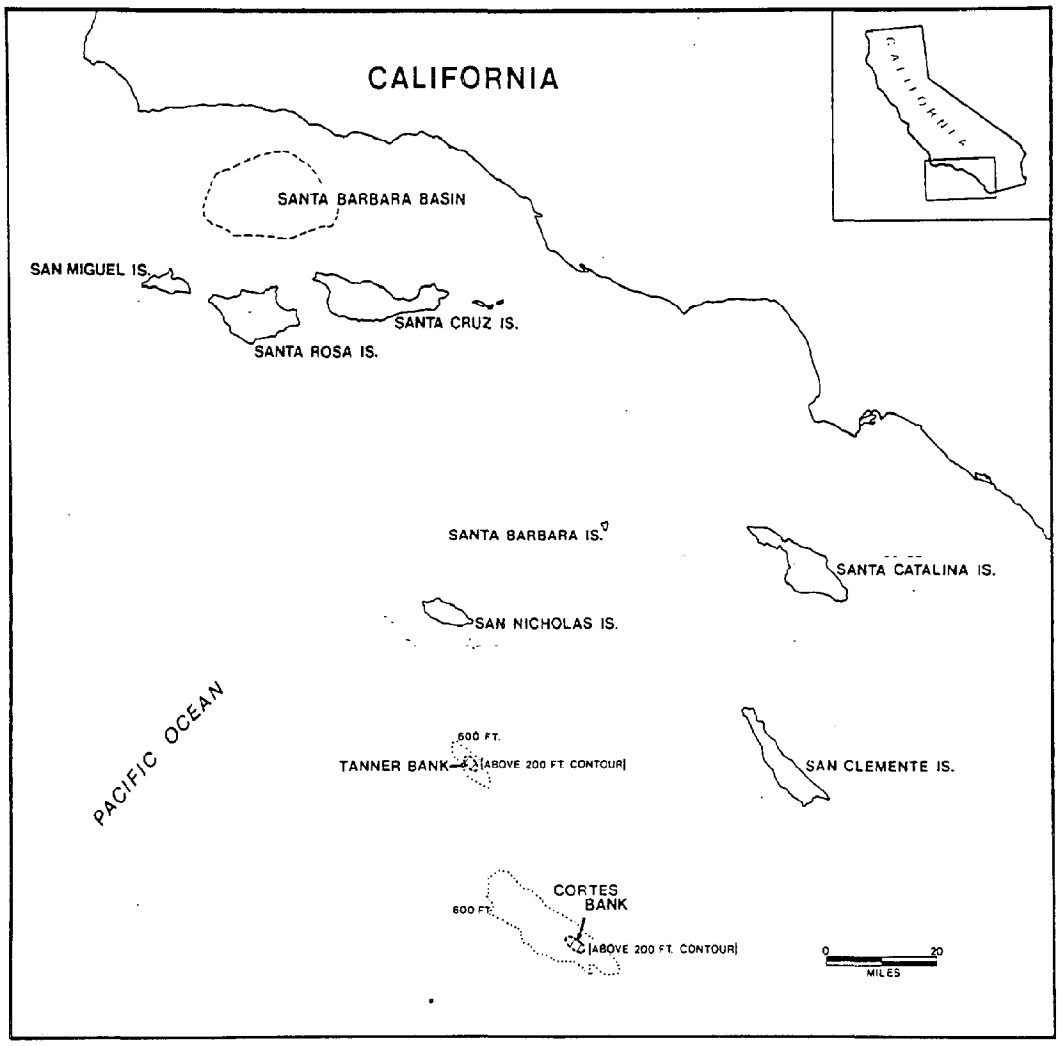

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Morro Bay, California

B. LOCATION: (EASTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE: 120°50' W, 35°20' N

2. DESCRIPTION: Situated in a scenic, environmentally sensitive area between two major metropolitan centers (west of a burgeoning agri-urban area and south of the city of Morro Bay in San Luis Obispo County) this 3.1 mi^2 (8.1 km^2) estuarine embayment supports three habitats: coastal salt marsh, tidal mud flats, and deep-water channels. Morro Bay, entirely within California State waters, is a heavily used fishing port. It represents the largest and most pristine bay/marsh, wildlife habitat on California's southern coast. At low tide, 2.2 mi^2 (5.7 km^2) of mud flats are exposed, providing a vast feeding ground for over 250 species of birds and access to an extensive clam shellfishery resource.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The area is biologically significant as a rich feeding ground for resident and migratory birds of the Pacific Flyway.

2. The area is rich in biological productivity and is already utilized by research scientists associated with California Polytechnical Institute, San Luis Obisbo State, and Santa Barbara College. Scientists as far away as the University of California at Los Angeles and the University of Southern California also use the area for marine science classes. The area provides an exceptional opportunity for marine research, educational program development, and recreational resource management.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The salt marsh and adjacent habitats of Morro Bay are relatively undisturbed and provide an extensive feeding area for 225 species of shorebirds and waterfowl. This is an important nesting area for egrets, herons, and the endangered American peregrine falcon.

Eelgrass (Zostera marina) and various algae are found in the open-water marine zone, with some algae in the lower tidal

flats. Some 32 species of algae have been identified in the vicinity. The upper edges of the extensive tidal mud flats are generally devoid of vegetation, but are rich in invertebrates.

Morro Bay is one of the more important migratory coastal stops on the Pacific Flyway. Upwards of 25,000 individual waterfowl have been counted on a peak day. Among the more exotic species that feed along the mud flats are the whistling swan, snow goose, snowy plover, and the elegant tern. Black brant are attracted by the eelgrass and are, at times, very abundant. The rare black rail has been observed in the Bay; however, the endangered California clapper rail, which formerly bred here, has not been observed recently.

A total of 66 species of fish have been collected in the Bay. Of the saltwater species, three (northern anchovy, shiner perch, and black perch) comprise 50 percent of the total individuals collected. At least 15 species appear to breed in the Bay.

Four species of marine mammals have been sighted: the stellar sea lion, the California sea lion, the harbor seal (which occasionally pups in the Bay), and the sea otter.

Some 120 species of invertebrates have been recorded in the Bay, including 19 species of clams (the Washington, the gaper, and the geoduck are the most common), 34 species of polychaete worms, and 20 species of amphipod crustaceans.

2. HUMAN USE VALUE

The Bay area is administered as a State Park. More than 700,000 persons visit the Park annually. These and other visitors to the area make extensive use of recreational boating, hunting, and sportfishing opportunities. The northern part of the Bay is protected by the bird sanctuary ordinance of the City of Morro Bay. The use of motor vehicles on the beach is permitted; in addition, the use of firearms on the Bay is permitted seven days a week for more than four months of the year. South of the Morro Bay city limits is a live-aboard boat anchorage. Other portions of the Bay, outside of the Morro Bay city limits, are within county limits and fall under the jurisdiction of the San Luis Obispo County Service Area No. 9 Board of Supervisors.

The surrounding lands adjacent to the Bay are largely undeveloped. That portion of the Bay south of the westerly extension of Santa Ysabel Street in Baywood Park is privately owned. A marina has been proposed for development along the Bay's southern margin.

There is a commercial oyster farm in addition to a very large recreational clam and ghost shrimp shellfishery within the proposed Marine Sanctuary site.

The Museum of Natural History at White Point is an important educational resource, documenting, preserving, interpreting the wildlife, ecology, and Indian history of the Bay. University scientists and students, members of the National Audubon Society and the Sierra Club, and young school children use the Bay extensively for field trips and as a study area for research.

The U.S. Army Corps of Engineers maintains navigational projects (dredge and fill operations) within the proposed area. The port is used extensively by the commercial fishing fleet, sportfishing boats, large yachts, and U.S. Coast Guard cutters.

The U.S. Department of the Interior, Bureau of Mines, reports that 13 mineral deposits lie along the periphery of the proposed site. Six of these deposits are developed for chromite, three for stone, and four for sand and gravel.

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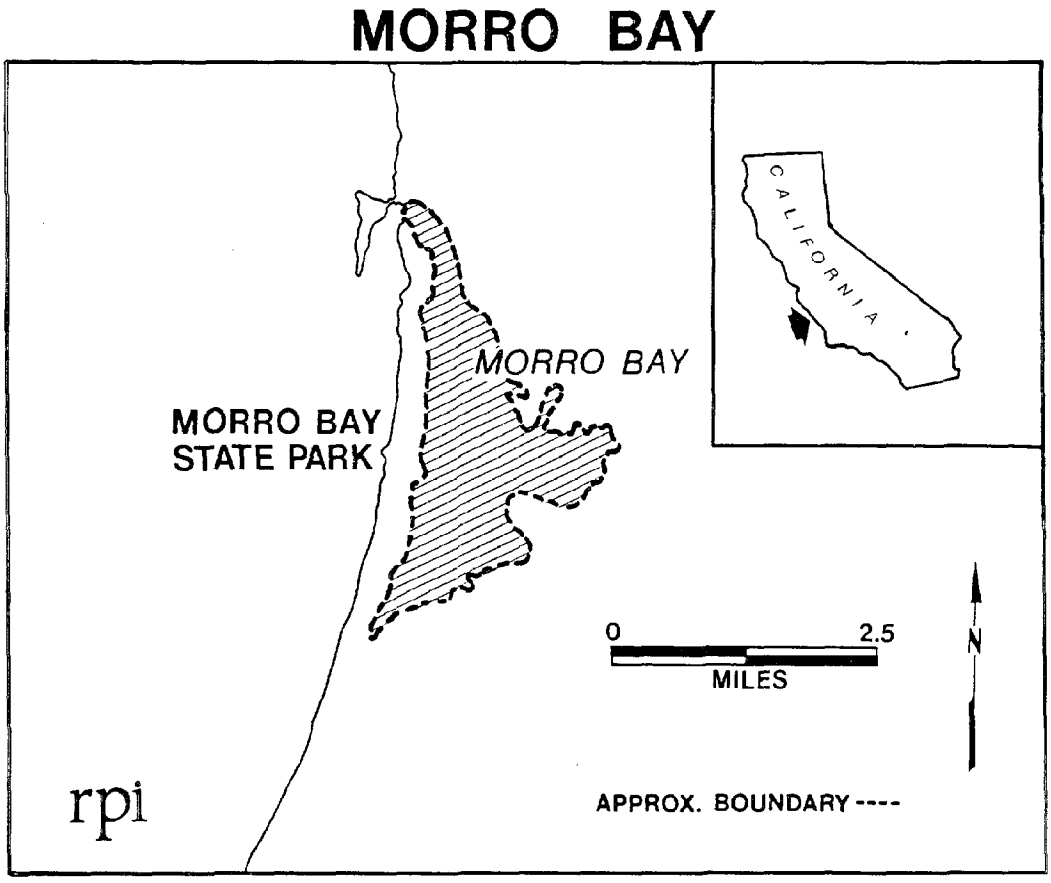

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME

A. SITE NAME: Heceta-Stonewall Banks, Oregon

B. LOCATION: (EASTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE: 44°30'N, 124°25' W

2. DESCRIPTION: The proposed site is a hard-bottom bank extending offshore from the vicinity of Newport to south of Florence. It encompasses an area of approximately 400 mi^2 (1,000 km^2) entirely within Federal waters. The outer boundary of the site lies along the 330 ft (100 m) depth contour. The surface waters of this area exhibit high biological productivity, especially during the summer when northerly winds drive surface water offshore and nutrient-rich water upwells into the area. Bottom topography also causes turbulence bringing nutrient-rich waters to the surface. The Columbia River influences the area, especially during the summer, by adding nutrients which increase biological productivity.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The proposed area is highly productive and supports important commercial fisheries (which includes harvesting by foreign fleets).

2. The area has been, and remains, an important research site for nearby academic institutions. Oregon State University at Corvalis and its marine institute at Yaquina Bay study physical oceanography and marine food web interactions.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The highly productive waters at this site provide a large food supply to fish populations. Abundant zooplankton thrive upon the phytoplankton blooms and, in turn, are eaten by other marine animals. Migrating whales and commercially important rockfish feed upon the euphausid shrimp, small fish, squid, and various zooplankton that inhabit this area. Fish caught in this area include: various rockfish, hake, lingcod, ocean perch, flounder, sole, halibut, mackerel, salmon, sablefish, skate, sculpin, and ratfish.

Unfortunately, detailed information is lacking concerning the bottom-dwelling organisms, primarily because of the difficulty in obtaining biological samples from the hard, rocky bottom.

The seabird fauna of the Heceta-Stonewall Banks are also poorly known, but preliminary data indicate that relatively high numbers of birds occur in the area.

2. HUMAN USES

Vessels from the United States and foreign fleets fish in the general vicinity of the Heceta-Stonewall Banks. Large quantities of coho and Chinook salmon, black cod, Pacific Ocean perch, Dover sole, Petrale sole, Pacific whiting, rockfish, sablefish, and tanner crab are harvested nearby annually. These activities are managed by the Pacific Fishery Management Council.

Close to educational and research facilities at Newport (Oregon State University Marine Science Center--a Sea Grant institution), Heceta-Stonewall Banks is an outstanding area for the study of Pacific Ocean fisheries and provides exceptional opportunities for morphological and biological investigations of bottom-dwelling organisms inhabiting hard-rock ocean bottoms. The physical oceanography and food-web dynamics of this are have been the subject of several scientific studies.

Whale-watching is a popular sport in the area. Boats leave from the port of Newport.

The U.S. Department of the Navy conducts operations within a portion of the proposed site (Warning Area 570 off Newport) that area essential to the national defense. Access into this are is restricted, and management of the natural resources of this area falls under the jurisdiction of the U.S. Department of the Navy.

III. PRINCIPAL REFERENCE MATERIAL

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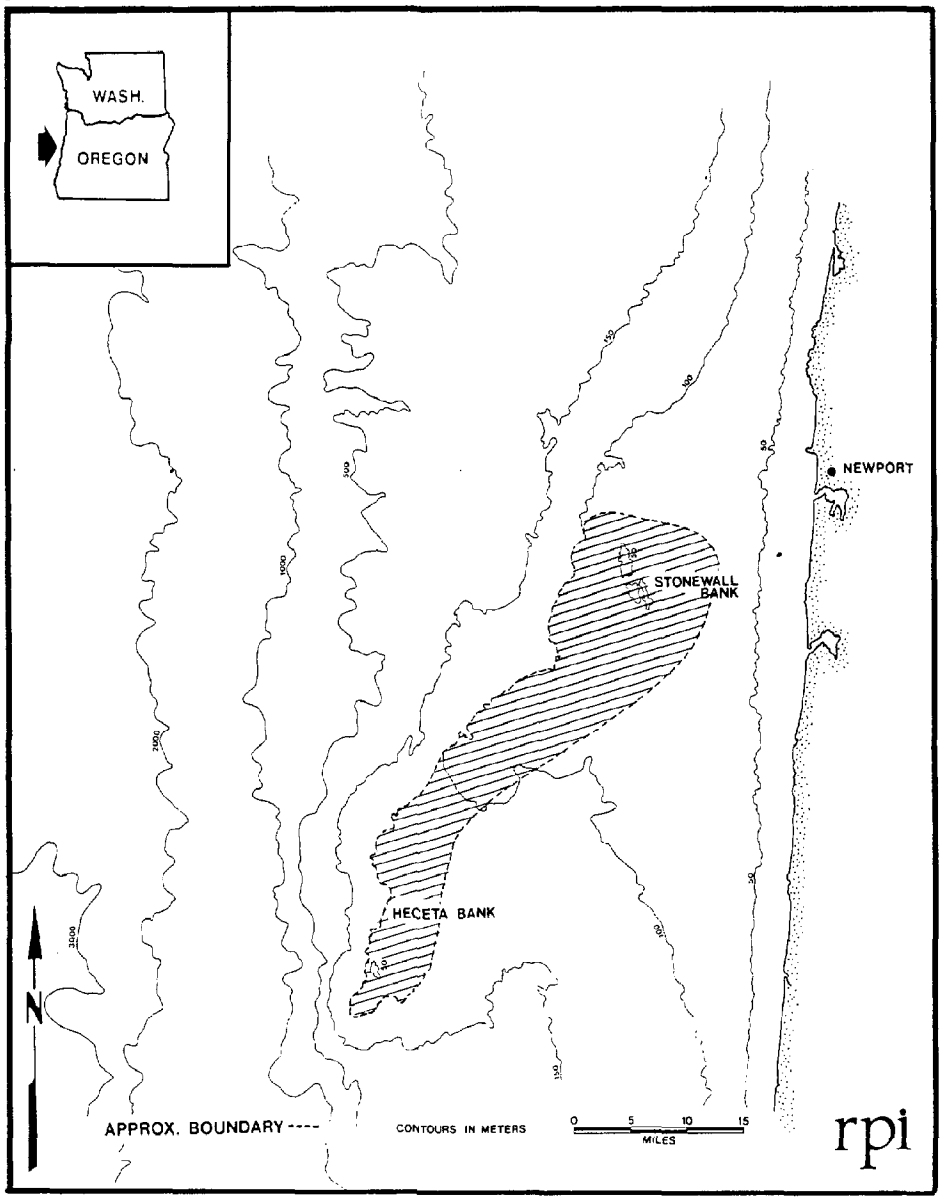
HECETA-STONEWALL BANK



LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Western Washington Outer Coast

B. LOCATION: (EASTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE: The proposed sanctuary lies within: East of 124°42' W; West of 124°25' W; South of 48°25' N; North of 47°15' N .

2. DESCRIPTION: The proposed marine sanctuary would extend from Duntz Rock (north of Tatoosh Island on the northwestern tip of Washington State), 90 mi (145 km) southward along the coast to Point Grenville encompassing an area of approximately 225 mi^2 (576 km^2; see map). The site lies totally within Washington State's jurisdiction, though it lies adjacent to Federal and Indian lands. The inshore boundary would extend to mean high water adjacent to State- or Federally-owned lands, and to mean low water where such boundary is continguous to the Makah or Quinault Reservations. The offshore boundary is contiguous with the boundary established for the area's Washington Islands National Wildlife Refuge, 2-3 mi (3.2-4.8 km) offshore. The area is representative of high wave-energy, rocky-shore ecosystems, but is unique as a breeding and feeding ground for migratory marine birds, mammals, and fish. The area includes offshore kelp beds, numerous pocket beaches of fine- or coarse-grained sands, and richly productive estuarine systems. Isolated by mountainous terrain and a wide corridor of Federally-protected or Indian-owned lands, this portion of Washington's coast remains scenically beautiful, ecologically diverse, biologically productive, and relatively free from developmental pressures.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The area is highly productive and representative of pristine coastal environments.

2. The area is of special significance as a habitat important to the continued survival of several ecologically and commercially important species of fish, raptors, and marine mammals.

3. The diversity and richness of marine organisms, and the contributions made by those organisms to the life histories of species migrating through the area suggests that the marine sanctuary designation would provide exceptional opportunities for scientific research in the areas of species interactions, population dynamics, and physiological ecology.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The spectacular rocky coastline of the proposed site serves as a major habitat to the birds of the Pacific Flyway. The 200,000 waterfowl (representing 15 species of birds) that migrate through or make their permanent residence along Washington's Northwest Coast depend on the marine algal communities, eelgrass beds, and infaunal and epibenthic invertebrate species living below mean high water. More than 100 species of marine invertebrates and 61 species of red, brown, and green algae comprise the food web that supports Pacific herring, salmon, lingcod, sole, rockfish; 80 other species of fish, harbor seals, stellar sea lions, and sea otters; gray whales; and thousands of aquatic birds and raptors.

Tatoosh Island, Destruction Rock, Quillayute Needles, and Point Grenville are vitally important bird nesting and breeding grounds. The area represents the primary U.S. nesting area and highest continental U.S. density of the bald eagle, a species Federally-listed as "threatened." Cassin's auklets, rhinoceros auklets, black oystercatchers, glaucous-winged gulls, pigeon guillemots, sooty shearwaters, three species of cormorants, common murres, forked-tail storm petrels, Leach's petrels, tufted puffins, peregrine falcons, and osprey nest and breed on these offshore islands.

The large bird population is indicative of the area's enormous biological productivity. Eelgrass forms the basis of the food web of these Pacific Northwest coastal waters. It serves directly as a food source for migrating and resident birds, and it provides substrate and sustenance for the more than 300 marine species living below high tide.

The proposed site is also very important in supporting several species of marine mammals. Tatoosh Island is a significant habitat for northern and California sea lions. Four hundred to five hundred individuals use the island as a haul-out area. The rocky islands of Quillayute Needles are also important haul-out areas for these species. Destruction Island is notable as Washington's primary habitat for harbor seals. In total, nearly 20 percent of Washington's harbor seal population resides within the proposed sanctuary. Point Grenville, the sanctuary's southernmost boundary, is an important sea otter habitat. The southern sea otter is a "threatened" species. In 1969, 59 sea otters were released at Point Grenville. The current population numbers about 40 individuals, but has extended as far north along the coast as Ozette. It is anticipated that this sea otter population will continue to expand under proper management. Grey whales (Federally-listed as an "endangered" species) migrate through this area in large numbers.

Bottom-dwelling fish (i.e., salmon, pacific herring) and shellfish (i.e., oysters, Dungeness crab) form an important part of

the ecosystem. They serve as food for marine mammals and birds, as well as being commercially and recreationally important.

2. HUMAN USE VALUE

The area is primarily used recreationally and by commercial fishermen. Wilderness camping is permitted along the shoreline of the Olympic National Park which borders the proposed site on the east. Olympic National Park was recently dedicated as a World Heritage Site and as a Biosphere Reserve. In his dedication address, Dr. Michael Batisse of UNESCO noted that his United Nations Committee also considered the area below mean high water and offshore areas of the Guillayute Needles and Flattery Rocks to have the qualifications for World Heritage Site status. Accordingly, the U.S. Fish and Wildlife Service and the Washington State Parks Commission has authorized the National Park Service to apply for World Heritage Site designation of these areas. The offshore rock islands within the proposed site are within the Washington Wildlife Refuge which is a part of the National Wilderness Preservation System as authorized by Congress. The magnificent biota of Duntz and Duncan Rocks offer exceptional recreational and educational opportunities for scuba divers and marine biologists.

The Makah Tribal Council has designated its coastal area (at the northern extreme of the proposed site) as a Wilderness Area under the laws of the Makah Tribe. The Quinault Indian Reservation has shown interest in maintaining the high quality of its beaches. The reservation boundaries extend to mean low tide. The right of the Makah to take up to 50 percent of the harvestable anadromous fish that pass through the tribe's usual and accustomed fishing grounds has been affirmed and reaffirmed by the courts. These fishing grounds extend from the Strait of Juan de Fuca out into the Pacific Ocean to an area known as Swiftsure and then south along the Pacific coast to an area intermediate to Ozette Village and the Quileute Reservation, as well as the rivers along the Pacific shore. The Makah Indian Tribe also maintains a Fishery Management Department. The Department is given the responsibility to propagate, enhance, and protect the tribe's fishery resources, which inhabit the waters of the proposed Marine Sanctuary.

An equally important value is its potential contribution to the field of scientific research. The complex assemblage of marine-related organisms representing various trophic levels, and the interrelationships among those organisms needs to be examined in greater detail if resource management is to be effective. The community structure of the proposed site affords scientists and resource managers the opportunities needed to investigate species interactions, population dynamics, trophic requirements, and other significant questions. In fact, the area already contributes to the goals of scientific research.

For the past 15 years, researchers at the University of Washington have utilized the area as a field research site gathering baseline data. Several archaeological sites, adjacent to Lake Ozette and near the old Indian Village, add historical significance to the area.

The U.S. Department of the Interior, Pacific Southwest Region, indicates that there are numerous deposits of gold placers, coal, gemstones, and sand and gravel extending from Tatoosh Island to Point Grenville. There are 16 deposits that have been identified; most are past-productive gold placer deposits.

The proposed site encompasses areas under the jurisdiction of the U.S. Department of the Navy. The Navy conducts operations essential to the support of national defense and therefore restricts access to certain sites within the proposed sanctuary including Queets (Sea Lion Rock), Washington Coastal Warning Area, Submarine Test and Trial Areas 3 and 4, and Cape Flattery Warning Area.

The U.S. Army Corps of Engineers, Seattle District, maintains navigation (dredge and spoil disposal) projects in the Quillayute River adjacent to the waters of the propose Marine Sanctuary in the area near La Push.

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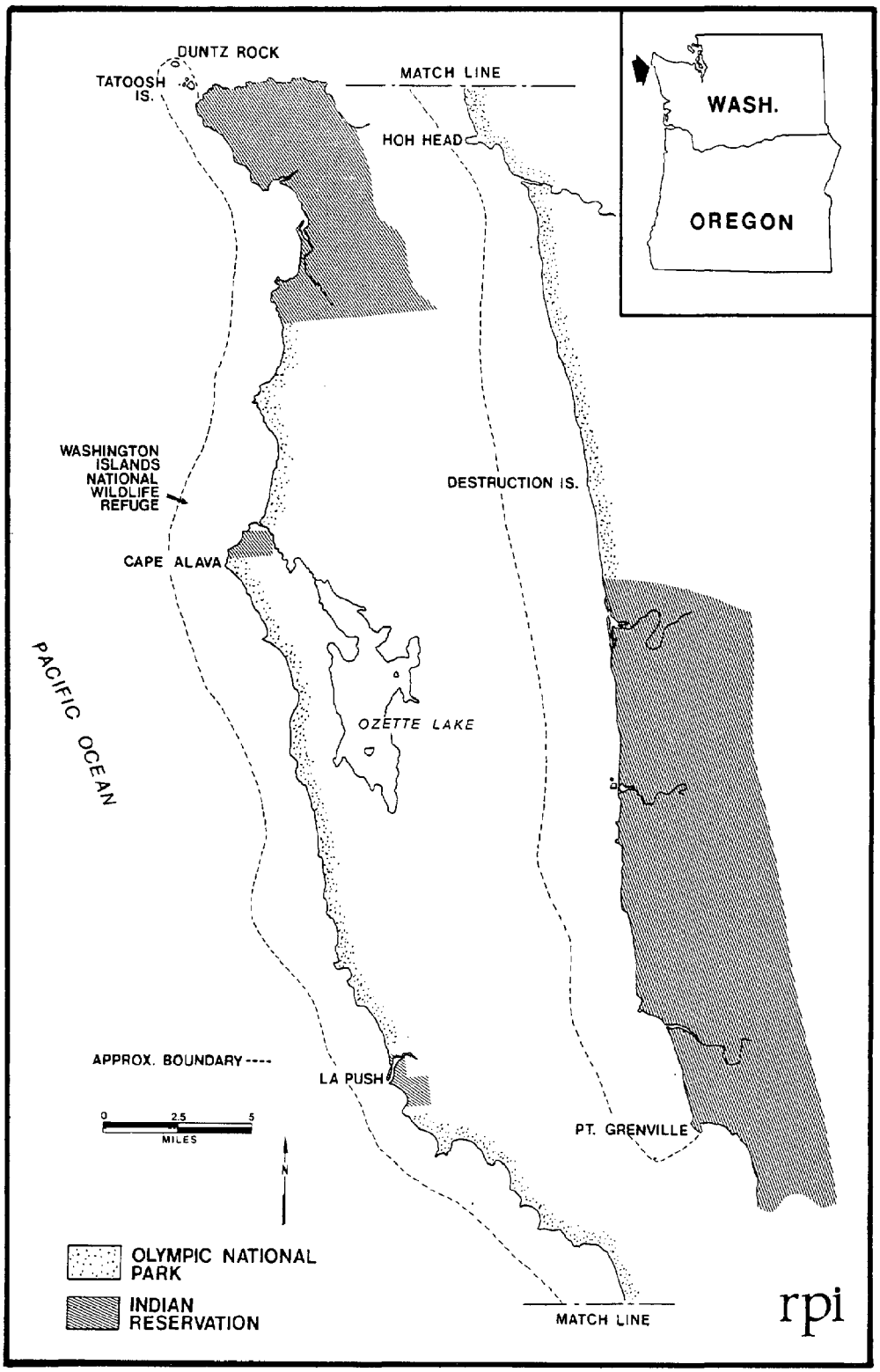
WASHINGTON OUTER COAST



LOCATION MAP

GREAT LAKES REGION

MARINE SANCTUARY SITE EVALUATION LIST
GREAT LAKES REGION

MANAGEMENT OVERVIEW

1. Resource Evaluation Team

The Great Lakes resource evaluation team was comprised of three marine scientists from the region. The team leader was Dr. A. M. Beeton, Director, Great Lakes and Marine Water Center, University of Michigan. The other team members were Dr. Charles E. Herdendorf, Director, Ohio State University Sea Grant Program and Dr. H. J. Harris, Coordinator of the Green Bay Project for the University of Wisconsin Sea Grant Program.

2. Site Evaluation and Public Participation Process

The team held its first meeting in Ann Arbor, Michigan, on May 18-19, 1982. Prior to this meeting the team members had made numerous contacts with their associates in academic institutions, state and local governments, Federal agencies, environmental groups, and fishing and other commercial interests to solicit their ideas for potential candidate sites. At the initial meeting, the team made a systematic survey of the coastline of each of the Great Lakes and evaluated each potential site using the criteria set forth in the NOAA Program Development Plan. This survey included those Great Lakes sites that were on NOAA's existing List of Recommended Areas (44 Fed. Reg. 62552, Oct. 31, 1979).

During the first meeting the team selected ten potential Marine Sanctuary sites from the 24 considered in the survey. They were:

GL-1. Cape Vincent (Lake Ontario), NY. This site, at the gateway of the St. Lawrence Seaway, is approximately 320 sq mi. It contains biologically rich and diverse habitat critical to many important fish species.

GL-2. Long Point-Erie Morain (Lake Erie), PA. The only nondepositional sandy bottom in Lake Erie, this 290 sq mi area is geologically unique. It borders Presque Isle State Park.

GL-3. Western Lake Erie Islands, including Sandusky Bay, OH. North of Sandusky, this site encompasses 440 sq mi of heavily used recreational area. The waters around the numerous islands in the site are relatively uncontaminated, supporting many species of fish and underwater plants.

GL-4. Maumee Bay (Lake Erie), MI and OH. This site of approximately 50 sq mi lies in Ohio and Michigan state waters at the mouth of the Maumee River.

GL-5. St. Clair River Delta, MI. This is a classic bird-foot delta extending into northern Lake St. Clair, encompassing about 70 sq mi. It is the only natural delta in the Great Lakes.

GL-6. Thunder Bay (Lake Huron), MI. This site contains about 400 sq mi of varied lake bottom infested with submerged reefs, shoals and wrecked ships.

GL-7. Straits of Mackinac, MI. These straits link Lakes Michigan and Huron. Lying between Michigan's upper and lower peninsulas, this 250 sq mi site contains steeply sloping channels, shoals, shallow reefs and shipwrecks.

GL-8. Green Bay (Lake Michigan), WI. This site covers 1000 sq mi of Michigan and Wisconsin waters in two units. The upper region is unpolluted and supports a fishery resource; the lower is a warm water estuarine.

GL-9. Southern Lake Michigan Reefs, MI. This site of three separate areas, totalling only a few square miles, consists of three reefs and the waters over them between Milwaukee and Muskegon.

GL-10. Apostle Islands (Lake Superior), WI. The initial site, approximately 375 sq mi in Wisconsin waters, provides exceptional research opportunities and excellent recreation. The amended site (renamed Lake Superior) encompasses two subunits totalling 1,031 sq mi; the additional 656 sq mi surrounding Isle Royal National Park was added to the original proposal during the team deliberations at the second meeting.

Descriptions and maps of each of these ten sites were prepared by the Research Planning Institute. After being approved by the team, the descriptions were mailed to 220 groups and individuals in all the states bordering the Great Lakes and to 82 national organizations and Federal agencies.

Chelsea received 72 responses by the end of the 45-day public comment period (September 10, 1982). In addition, two sites were nominated by the public by the October 11, 1982, nomination deadline. One was the Rock Islands Lighthouse and Submerged 19th Century Sailing Schooner site in the Thousand Islands region of the St. Lawrence River, New York. It was nominated by the Save the River Organization of Clayton, New York. The other was a Mid-Lake Superior site nominated by the Michigan Technological University, Houghton, Michigan.

The team held their second meeting at the Ohio State University Sea Grant facilities on South Bass Island, Ohio, on October 29, 1982. During this meeting, the team reexamined their original ten potential candidates in light of the comments received during the public participation process and considered the two additional public nominations.

As their first order of business, the team discussed the criteria and grading system they would use to reduce the list of ten candidates to the final five sites that they would recommend to NOAA. They decided to evaluate each site in terms of both its natural resource value and its human use value on a scale of high (3 points), medium (2 points) and low (1 point). Each team member would rank each potential site and the sum of their individual scores would indicate the joint team ranking.

The team then discussed the question of whether non-pristine sites should be considered because of their restorative potential. This issue arose during the public comment period when the team received a number of letters critical of some of the preliminary candidate sites (i.e., Green Bay and Maumee Bay). The critics believed that because these areas had already been degraded by man's activities, they were no longer in a pristine state which the commenters considered a requisite for Marine Sanctuary status. After extended discussion, the team agreed unanimously that they should continue to consider sites that may be degraded now, but have potential for restoration or rehabilitation. They based this decision on the language of the Marine Protection, Research and Sanctuaries Act of 1972, which states that sites can be designated "for the purpose of preserving or restoring their conservation, recreational, ecological or esthetic values."

The team next examined the two new nominations that had been submitted during the public participation process. They concluded that, due to its limited area, the waters around the Rock Island Lighthouse did not merit being considered as a separate Marine Sanctuary site, but that the boundaries of the Cape Vincent, Lake Ontario, candidate site should be slightly expanded to include this wreck. They also decided that the Mid-Lake Superior nomination was worthy of being considered as a separate site in their final deliberations.

3. Site Selection Recommendations

The Great Lakes team recommends, in order of priority, the following five sites for placement on the Marine Sanctuary Site Evaluation List:

1. Western Lake Erie Islands-including Sandusky Bay, OH (Lake Erie)
2. Green Bay, WI (Lake Michigan)
3. Lake Superior Marine Sanctuary, WI and MI (Lake Superior - modified Apostle Islands.)
4. Cape Vincent, NY (Lake Ontario)
5. Thunder Bay, MI (Lake Huron)

Using the criteria and scoring system described above, the team's evaluation concluded with two sites tied for first place with 18 points each, the Lake Superior Island site, expanded to include Isle Royale, third with 17 votes, and the other two sites tied with 16 votes each.

As part of the final regional report, the team has approved a set of brief descriptions of each site, including a map showing the recommended boundaries. The team believes, however, that these boundaries should be considered tentative and that when a site on this list achieves active candidate status, the issue of its exact boundaries should be reopened. The balance of this part of the final regional report discusses the evaluation team's rationale for choosing each site, a summary of public comments received, and specific issues that arose during the site selection process.

3.1. Western Lake Erie Islands - including Sandusky Bay (Lake Erie)

The site encompasses approximately 440 sq mi of Sandusky Bay, open Lake Erie waters, lake and bay bed and wetlands, all within state jurisdiction. The site is a popular vacation and recreation area due to its beautiful scenery and diverse aquatic wildlife.

This proposed site received 24 written comments during the first public response period, representing 12% of the total received. Seventeen were in favor and three opposed. All environmental groups were in support as were the majority of governmental agencies. Governmental support came from the Toledo Metropolitan Area Council of Governments, Ohio EPA, Ohio Biological Survey, National Park Service and the USEPA Environmental Research Laboratory in Duluth.

The Ohio Department of Natural Resources opposed the nomination in its present form, but stated they were open to further evaluation of the site if it were amended to eliminate Sandusky Bay and with assurance that the state would retain access to its mineral resources in the area. They also expressed concern that less restrictive public use guidelines of a Marine Sanctuary might undermine the tight restrictions placed on the public use of the Old Woman Creek National Estuarine Sanctuary already

located in their state. They suggested limiting the Sanctuary area to a subset of the archipelago such as the waters and reefs adjacent to West Sister Island. The U.S. Army Corps of Engineers expressed concern that the designation could restrict current uses. Atlantic Richfield opposition was the only comment from the petroleum industry.

The team ranked the site high for both its natural resource and human use value. In discussing the Ohio DNR's concern over Sandusky Bay, the team believes it should be included because it is an even more productive fishery than the Islands region. Furthermore, they recognized that Sandusky Bay has already experienced a certain amount of degradation and that the prominence associated with sanctuary status should enhance efforts to restore the area. Concerning the oil and gas issue, it was noted that the Ohio DNR has recommended that gas development not proceed in the western basin of Lake Erie. Consequently, conferring sanctuary status on the area would have no effect on gas development because such development has already been prohibited.

3.2 Green Bay, Wisconsin (Lake Michigan)

The site covers an area of approximately 1,000 sq mi of Wisconsin State waters in Green Bay and part of Lake Michigan. Twenty-nine comments were received on this site; 17 in support and 9 opposed. There was almost unanimous support from environmental groups while the oil and gas industry opposed the nomination. The City of Green Bay, the Brown County Planning Commission, the Green Bay Economic Development Authority, the Bay-Lake Regional Planning Commission and the USEPA Environmental Research Laboratory in Duluth supported the nomination. At the state level, however, there were conflicting positions with the Wisconsin Department of Natural Resources (DNR) in support and the Wisconsin Coastal Management Council (WCMC) opposed. The WCMC oppostition was based on concern that the proposed marine sanctuary would not improve the state's management capabilities, and on the lack of interest in the project from the State of Michigan. They stated, however, that if the sanctuary included both the Wisconsin and Michigan portions of the Bay and a joint interstate baywide management effort could be developed, they would support further study of the site. In subsequent telephone conversations with NOAA and Chelsea personnel, they agreed not to oppose placing the site on the team's final list of five sites and to withhold final judgement until such time as the site achieves active candidate status.

Much of the public comment criticized the proposed boundaries of the site which included both the lower and upper bay, but only on the Wisconsin side. Some commenters questioned why the proposed site split the Bay down the middle and did not include the

Michigan western shore. Others stated that due to the degraded condition of the lower Bay it did not merit sanctuary status. The team discussed these boundary issues and decided that both the upper and lower parts of the Bay should be included because the cold water fishery in the northern end grades into a warm water fishery in the southern end and both regimes need to be included. It was also felt that the southern end showed great potential for rehabilitation and sanctuary status could provide national attention and consequently enhance the effective antipollution program now underway. The team discussed the issue of including waters on the Michigan side of the Bay and decided to keep the proposed boundaries as they were in order to stay within NOAA's size limitations. However agreeing with the Wisconsin Coastal Management Council suggestion, they recommended that if the proposed Green Bay site becomes an active candidate, inclusion of Michigan State waters be considered.

3.3. Lake Superior, Wisconsin and Michigan

The site is composed of two important subunits and encompasses a total of 1031 sq mi of Wisconsin and Michigan State waters in Lake Superior. The western unit, 375 sq mi, lies adjacent to Apostle Islands National Lakeshore which extends 1/4 mile into Lake Superior. The eastern unit consists of 656 sq mi of Michigan State waters surrounding Isle Royale National Park out to a depth of 600 ft .

The proposed Lake Superior Marine Sanctuary site began with the team's initial proposal for a site that included only the waters surrounding the Apostle Islands. During the public comment period, 16 responses were received on this site with most in favor. The Wisconsin Department of Natural Resources gave support, but warned that the sanctuary designation should not jeopardize negotiations with local Indian tribes on fishing rights. The WCMC was initially opposed, stating their belief that an additional management jurisdiction was not needed. They later agreed not to oppose putting the site on the SEL list.

Additional support came from the Ohio Department of Natural Resources, the USEPA Environmental Research Laboratory in Duluth, the Defenders of Wildlife, and the Great Lakes Camp and Trail Association. The Lake Carriers Association expressed concern that the area boundaries contained domestic and international shipping lanes.

The team thinks this site has exceptional merit and uniqueness in that it contains the only large grouping of islands in Lake Superior, the largest freshwater lake in the world. Also, the islands are already a part of the National Park System and sanctuary status would protect the surrounding waters. The National Park Service Regional Office in Omaha, and park

personnel on the Apostle Islands, were very supportive of this proposal and provided ideas and information in developing the site description.

The team next discussed the Mid-Lake Superior site nominated by the Michigan Technological University. It was decided that, because of its pristine nature and unique deep water habitat, not found in the other areas of the Great Lakes, this area merited further consideration. After considerable discussion, it was decided to reduce the size of this proposed sanctuary to include the deeper waters around Isle Royale and combine it with the proposed Apostle Islands site. Since this added significantly to the area of the original Apostle Island nomination, it was decided that a site description and map of the new area, now designated the proposed Lake Superior Marine Sanctuary, be sent out for public review. Chelsea received 16 comments, all generally favorable except the Michigan Department of Natural Resources. They later agreed to modify their position and adopt a wait-and-see attitude.

3.4. Cape Vincent, New York

Cape Vincent is located in the northeastern corner of Lake Ontario at the gateway to New York State's Thousand Islands resort area and the St. Lawrence Seaway. The proposed site includes an area of about 320 sq mi, extending from Carleton Island north of Cape Vincent to Stony Point Light and out to the Canadian border. All of the proposed site is within the jursidiction of New York State.

Sixteen comments were received concerning this site, ten in support and four opposed. Governmental support was strong with the New York Department of State, the Governor's official point of contact for the SEL process; the St. Lawrence - Eastern Ontario Commission; the Ohio Department of National Resources and the USEPA Environmental Resource Laboratory in Duluth approving the recommendation. The National Park Service suggested an expansion of the proposed boundaries. The St. Lawrence Seaway Development Corporation expressed concern due to the busy navigation channel within the site and the Lake Carriers Association recommended that the boundary be redrawn to exclude the St. Lawrence River. There were no comments from the fishing or oil and gas industries directly related to this proposal. The Defenders of Wildlife believed the area was presently well-managed by state authorities and that the team had not made a good case for the area being designated a marine sanctuary.

The team ranked the site fourth on their list and extended its boundaries slightly to adopt the recommendations made by the Save the River organization to include the submerged sailing schooner off Rock Island Lighthouse and the National Park Service suggestion that the boundaries be extended to include the area around Grindstone Island.

In summary, the team believes that because of its great scenic beauty, accessibility and abundance of fish and wildlife, the site would afford excellent opportunities for fisheries research, recreational enjoyment and educational experiences.

3.5. Thunder Bay, Michigan

The proposed Thunder Bay site includes Thunder Bay and vicinity (up to Middle Island). The site has an area of approximately 400 sq mi and is entirely within State of Michigan waters.

The proposal to make Thunder Bay a Marine Sanctuary generated more local support than any other site in the Great Lakes region. The original proposal was drawn up by the local planning commission and sent to the team prior to their first meeting. The team decided that it merited public review and 36 letters were received during the comment period. Thirty of those comments were in support and four opposed.

Both local and national environmental groups supported the recommendation, as did 16 other individuals or groups. The Defenders of Wildlife qualified their support due to limited knowledge of the area stating they did not believe it should be a prime candidate. However, there was strong state and local governmental support from the Alpena City Council, Alpena County Planning Commission, Thunder Bay River Watershed Council, Northeast Michigan Council of Governments, Michigan Department of Natural Resources and the Michigan State Travel Bureau. Congressman Bill Davis also expressed his support, as did the Alpena Chamber of Commerce. Only the U.S. Army Corps of Engineers was opposed. The team was impressed by the amount of enthusiastic local support for the proposal and believed sanctuary status would help preserve the numerous shipwrecks in the area from treasure hunters.

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Western Lake Erie Islands including Sandusky Bay, Ohio (Lake Erie)

B. LOCATION: (GREAT LAKES REGION)

1. LATITUDE/LONGITUDE: 41°30' N, 82°40' W

2. DESCRIPTION: The site encompasses approximately 440 mi^2 (1140 km^2) of Sandusky Bay, open Lake Erie waters, lake and bay bed, and wetlands, all within Ohio State jurisdiction (see map). Lake Erie and Sandusky Bay water surface level is approximately 571 ft (174 m) above mean sea level. The associated wetlands exist primarily between the 571 (174 m) and 575 ft (175 m) elevation contours. The bedrock of this area is mostly limestone and dolomite with shale occurring on some mainland locations. This region has been subjected to massive continental glaciation during Pleistocene times. Unsorted glacial deposits as well as sediments from ancient glacial lakes cover much of the bedrock. Solution of the carbonate bedrock by dissolved weak acids has produced numerous sinkholes and caves.

The shores along the site are composites of high rocky and glacial till bluffs, and discontinuous sand and gravel and cobble beaches, as well as segments of marshlands. The Muddy Creek Bay wetland on the western end of Sandusky Bay is the most extensive wetland in Ohio along the Lake Erie coast. Small sand and gravel pocket beaches occur on Middle and South Bass Islands. Kelley's Island, the largest island within the U.S. portion of Lake Erie, contains the largest sand deposit of the Ohio Islands. An extensive sand deposit also exists at the East Harbor area. Wave and current action is sometimes energetic around the islands and forms pebble bars which jut from some island shores.

Around the rock rubble and erosional remnants of dolomite and limestone which form islands and shoals, the bottom of Lake Erie is relatively level. The deepest reported sounding is 62 ft (19.5 m), just south of Starve Island; however, depths generally do not exceed 45 ft (14 m). Sand, clay, gravel, and rock bottoms are reported within the area. In Lake Erie, soft mud is the most common bottom type in the vicinity of the islands. Sediment loading of Sandusky Bay is predominantly clay and silt from the Sandusky River. The average depth of Sandusky Bay is approximately 5 ft (1.5 m). The entire area is experiencing relative subsidence with respect to eastern Lake Erie at a rate of approximately 6 in (15 cm) per century.

Slow erosion of the island and mainland shores due to scouring by waves and nearshore currents is accelerated during periods of high lake level. Spring and fall storms and expansion of freezing water within rock joints contribute to shoreline recession. The tidal range is only 0.1 ft (0.03 m); however, seiches (atmospherically induced displacements of the lake surface) may attain maximum amplitudes of up to 6 ft (2 m) although they are usually less than 2 ft (0.6 m). The computed maximum wave height in the site's open waters is approximately 12.5 ft (3.8 m). These large waves break in shallow depths while reformed waves of up to approximately 3.5 ft (1.1 m) break against the shore. Northeast storms produce flooding of the low-lying eastern shores of several islands.

The climate is classified as temperate humid-continental. Weather patterns are complex and rapidly changing. The lake is usually ice covered from late December until late February. Fog occurs frequently. Prevailing southwest winds drive a lake surface gyre clockwise around the islands and at depth a counterclockwise current circulates. These water currents transport cleaner, cooler water from the central Lake Erie basin into the vicinity of the islands. Water clarity is typically greatest at Kelley's and North Bass Islands where visibility may be up to 10 ft (3 m). The Lake Erie waters have a low level of heavy metal and pesticide contamination, but high phosphorous concentrations produce eutrophic conditions throughout much of the area. Dense mats of the freshwater plant Cladophora attach to shallow, rocky island areas. At Kelley's Island, during periods of low water, decomposing plants make the public beach periodically unfit for bathers. Summer thermal stratification of the water inhibits mixing and produces short periods of low oxygen concentrations in the bottom waters. The shallow Johnson Island area has the poorest water quality due to its proximity to large communities. Effluents from sewage disposal plants and industrial waste treatment centers, and seepage from domestic septic systems enters this area.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The site is a very popular vacation/recreation area for many urban dwellers in this region.

2. Diverse aquatic wildlife and animals, including rare and endangered species, inhabit the site. Ninety-five species of fish have been observed in the area.

3. The waters around the islands are relatively uncontaminated by pesticides and heavy metals, but are characterized as eutrophic.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Lake Erie is the smallest and shallowest of the five Great Lakes, but it is biologically the most diverse and productive because of its southernmost position, availability of nutrients, and diversity of habitats. The greatest diversity of habitats and species is found among the Western Lake Erie Islands. The area is also the most important breeding area for fish, waterfowl, and shorebirds lakewide.

The rich fish life and plant life are the food base of this area, supporting nesting and migrating birds, shorebirds, waterfowl, and passerine (perching) birds. Mallards, black ducks, and blue-winged teals breed in the marsh areas. The endangered bald eagle and a variety of hawks, owls, herons, and egrets nest in this area. Dense concentrations of great blue herons, great egrets, and black-crowned night herons nest within the West Sister Island U.S. National Wildlife Refuge. Cormorants, gulls, and various waterfowl breed on other islands. The common egret, least bittern, hooded merganser, king rail, and common tern are also found within the proposed site.

Ninety-five species of fish have been reported from this area. The area's dominant fish species which breed within these waters are: perch, bass, channel catfish, alewife, gizzard shad, carp, goldfish, freshwater drum, and emerald shiner. The eutrophic Sandusky Bay is the habitat for a large carp population. Northern pike and muskellunge were once common in Sandusky Bay, but their numbers have declined possibly due to drainage of marshes and damming of tributaries. Muskellunge is an endangered species in Ohio. Other fish which spawn in the area include lake sturgeon, longnose gar, lake herring, lake whitefish, rainbow smelt, central mudminnow, northern pike, muskellunge, quillback, northern hog sucker, sunfish, bullhead, crappie, sauger, and walleye. The Sandusky Bay area provides an exceptional freshwater fishing area with over three million walleye caught per year. It is the major white bass commercial fishery in the nation.

The bottom-dwelling community is composed primarily of widespread and abundant chironomids and oligochaetes which are major food items for fish. Also distributed on the bottom are polychaete worms, caddisflies, coelenterates, flatworms, molluscs, amphipods, isopods, and other crustaceans. Two dozen species of freshwater mussel have been found on various substrates within the site. Large gelatinous bryozoan colonies occur at certain times and may wash onto the shore. Cladophora and Bangia plants attach to the rocky, shallow substrate around the islands and thrive on the high phosphorous concentrations in the water.

The zooplankton community is primarily copepods, but cladocerans and diverse rotifers are abundant, and ostracods are present.

Diatoms are overwhelmingly the greatest component of the phytoplankton. Diatom blooms occur in the spring and fall, and during winter the phytoplankton are nearly all diatoms. Green and blue-green phytoplankton species also are present and reach bloom proportions in the summer.

Wetlands vegetation includes coontail, duckweeds, water-milfoil, water-smartweed, American lotus, white waterlily, spatterdock, bullhead lily, pond weed, and water-stargrass. Dredging, landfill, motorboating, dumping of wastes and domestic sewage, runoff from agricultural lands, and fluctuations in water levels have been cited as causes for declines in populations of floating vegetation and marsh grass.

Salamanders, frogs, toads, newts, and turtles are common along the shores. A rare population of triploid salamanders (Ambystoma texanum) lives on North Bass Island. Green Island is the only known habitat for the snail Anguispira kochi strontiana. Mudpuppys, which burrow into muddy sediments, are fairly common in open-water areas. Muskrats and raccoons inhabit and feed around the site.

2. HUMAN USES

This site is unique because it contains the only islands in Lake Erie. Because of their close proximity to four major urban centers (Cleveland, Detroit, Lorain/Elyria, and Toledo) with a total population of approximately seven million people, recreational activities are diverse and well developed in the area. These activities include fishing, camping, day-hiking, picnicking, powerboating, waterskiing, sailing, swimming, and sightseeing. In the fall, hunting for waterfowl and pheasant is a popular pastime. In winter, the area is used largely by day visitors for ice fishing, skating, ice boating, sledding, and, less commonly, snowmobiling. Regularly scheduled ferry service from the first week in April through the third week in November provides access to some of the islands and delivers bulk freight. Water taxi service is commercially available among the islands. Commercial airplanes regularly fly to North, Middle, and South Bass Islands and to Kelley's Island in order to transport mail. Flights to Rattlesnake Island are available by reservation. The population of the islands adjacent to the site fluctuates greatly with the seasons. Most island housing consists of one or two family units, primarily summer cottages. Historically, the area's economy has been based upon quarrying limestone, lumbering, commercial fishing, and peach growing. The present-day local economy experiences a surge from May through September, a direct result of the amusement, recreation, and retail trade associated with the resort and vacation activities occurring here. Commercial

fishing has declined and most fishing is now recreational. Popular sport fish are perch, walleye, and bass. Party boats from Port Clinton and Sandusky fish over reef areas. Island vineyards locally sell their wines and attract tourists. Since four major urban areas are located within a 50-mile radius of the site, dredging, landfill, motorboating, domestic sewage and waste dumping, and agricultural runoff activities continue to impact on the system's resources.

Kelley's Island is the location of a state park and the sandy beach on its north shore is a popular bathing area, as are other sandy beaches of the site. Fossil collecting is an activity in the old limestone quarries of Kelley's Island. East Harbor State Park is a large and very popular state park on the mainland adjacent to the area. Several youth groups maintain camp facilities in the immediate vicinity.

The site encompasses all channels to the heavily industrialized, commercial ports of Sandusky, Marblehead, and Port Clinton. Vessel traffic to or from Toledo or Monroe could also pass through the western boundaries of the site. Over seven million tons of coal, limestone, and other commodities move through Sandusky and Marblehead.

Active marinas operate within the area. Five thousand powerboats are moored at the West Harbor/Catawba Island marinas in the summer season, mostly for fishing. The Gem Beach Channel is extremely congested during the summer because it is the only channel into the West Harbor area from the lake. Major sailing regattas are held annually at the islands. Some other area attractions are the Johnson Island Civil War prison site and Perry's Victory and International Peace Memorial at Put-In-Bay on South Bass Island commemorating the Battle of Lake Erie in the War of 1812 and the lasting peace between Canada and the United States.

Archaeological artifacts discovered in this vicinity indicate human settlement occurred as early as 3000 B.C. Evidence of Indian civilizations is found in this vicinity and Inscription Rock on Kelley's Island has been deciphered as the story of the Erie tribe.

A restricted military test-firing range is situated along the site's western boundary.

Educational and scientific opportunities within the site are greatly enhanced by the presence of Ohio State University's F. T. Stone Laboratory (the oldest freshwater biological research station in the United States) on South Bass Island and by the presence of a number of wildlife refuges, nature preserves, and parks within or bordering the site. These include Magee Marsh State Reservation, Crane Creek State Park, Ottawa National Wildlife Refuge, Old Woman Creek National Estuarine Sanctuary, and West Sister Island National

Wildlife Refuge which, in 1975, was designated as a wilderness area. Public access is allowed only by special permit in order to protect the great blue and black-crowned night herons which nest there. The Ohio Division of Wildlife conducts tours of their fish hatchery on South Bass Island. Audubon groups from Michigan visit the area each spring to view the abundant and varied bird species. Sandusky Bay borders the Muddy Creek Bay wetland, the most extensive wetland on the Lake Erie shore in Ohio. These adjunct sites have a long track record of providing excellent educational and research programs and facilities relating to the natural resources of the lake and its coastal region. The entire site was also included within the Institute of Ecology-National Science Foundation system of Experimental Ecological Reserves in 1981. Such reserves were set aside for the purpose of providing representative terrestrial and aquatic sites for manipulative ecological research. All such reserves have a long, continuous history of research and good potential for long-term future integrity and comprehensive management.

Research has been conducted within the site by investigators from many institutions including Heidelberg College, Bowling Green State University, Ohio State University, Ohio Environmental Protection Agency, Ohio Department of Natural Resources, U.S. Geological Survey, and many others. The environmental impact study for a proposed, but never built, power plant within Sandusky Bay also represents an extensive data base.

The Western Lake Erie Islands are located in an area that is on a trend with the Lima/Indiana oil field, and a small oil field is present on Pelee Island across the Canadian border. Therefore, it is believed that the area may contain petroleum resources.

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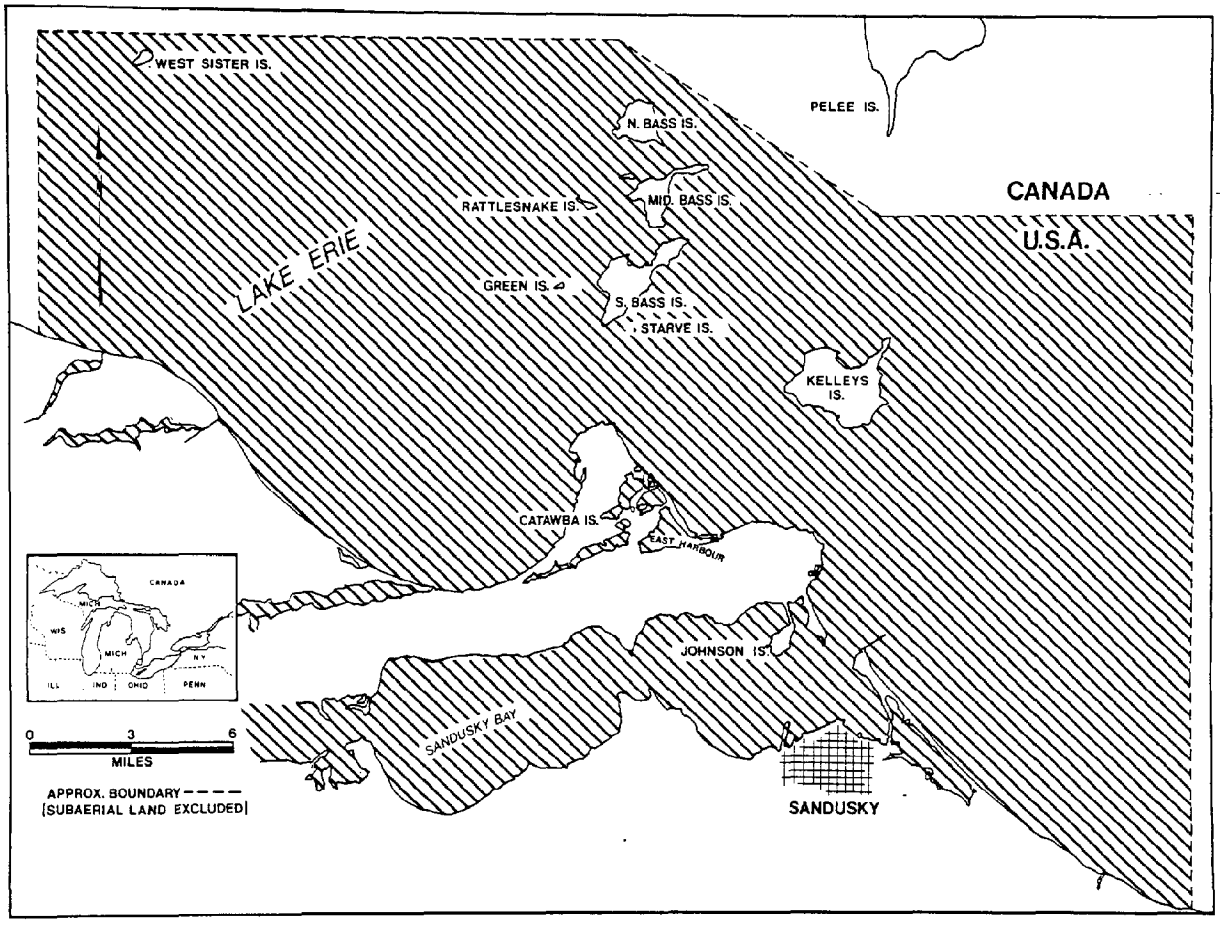

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Green Bay (Lake Michigan), Wisconsin

B. LOCATION: (GREAT LAKES REGION)

1. LATITUDE/LONGITUDE: 44°45' N, 87°45' W

2. DESCRIPTION: The site covers an area of approximately 1,000 mi^2 (2,570 km^2) of Wisconsin waters in Green Bay and part of Lake Michigan. The site consists of upper and lower units. The upper region is unpolluted and supports an existing (and potentially greater) fishery and important nursery and spawning grounds. Sturgeon Bay is estuarine and contains warm water. The mean depth of Green Bay is approximately 52 ft (15.8 m). Green Bay is connected to Lake Michigan through naturally occurring passes at the north of the Bay and through the Sturgeon Bay ship canal traversing the Door Peninsula. Numerous tributaries flow into Green Bay including 14 rivers. The Fox-Wolf river system transports the largest amount of river water into the Bay at an estimated mean flow rate of 118 m^3/sec (31,000 gal/sec). The Fox-Wolf river system also transports a large quantity of suspended and dissolved contaminants including effluents from numerous pulp and paper mills located in the very heavily industrialized Fox River Valley. Lower Green Bay is extremely polluted and highly eutrophic, although a concerted local, State, and Federal effort is continuing to improve water quality. Phosphorus enters the Bay from significant nonpoint as well as point sources. The flushing rate of the lower Bay has been estimated at between 29 and 160 days.

The area's bedrock is primarily limestone, dolomite, and shale shaped by the succession of Pleistocene glaciations which covered this region. Green Bay water surface levels have been much lower than present and relict beach forms are found submerged in the Bay. The Bay substrate materials include mud, sandy mud, sand, clay, and rock. High sedimentation rates occur in the southern and eastern portions of the Bay where polluted muds include industrial and municipal wastes. A few rocky patches occur along the northeast portion of the Bay. Sand, copper, and manganese are major mineral resources in the area, but they are not mined in Green Bay.

Bay surface level has varied substantially during recent history impacting wetlands particularly along the low-lying western bay shore. The proposed site adjoins a major portion of Wisconsin's Great Lake wetlands. Seiches (i.e., atmospherically driven displacements of the bay surface) cause reverse flow in the tributaries which connect to the Bay. The Bay

surface is commonly covered during December through April by ice which becomes as much as four feet thick.

More than 200 shipwrecks lie in the waters surrounding the Door Peninsula. The area supports a substantial sport diving industry.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The site and adjacent areas are heavily used for recreation, lake front development, industrial purposes, and fishing.

2. The site yields the largest fish harvest in the Lake Michigan region, even though past alteration of the habitat has changed the composition of the fish population.

3. Measures to improve water quality of the south end of Green Bay are having beneficial results. Stresses to the Green Bay ecosystem include nutrient loading, suspended solids and sediments, toxic substances, and fishing activities. Exceptional research opportunities and ongoing activities are directed toward rehabilitation methodologies.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Over 37 species of fish spawn in the area. Salmon and lake trout are stocked by both State and Federal programs. Unfortunately, a drastic depletion of certain fish populations has occurred during recent times. Cisco are greatly reduced in number and lake sturgeon, which were once common, are now endangered. Introduction of exotic species, such as German carp, alewife, ocean smelt, and sea lamprey, have markedly affected fish species composition in the area. Large numbers of carp increase turbidity, disrupt macrophyte communities, and thereby interfere with successful reproduction of other species. Yellow perch are intolerant of low oxygen concentrations which carp and catfish can tolerate. Improvements in lower Bay water quality have reduced occurrences of severe anoxic conditions and has benefited the area's fishery. In fact, a substantial portion of the lake's perch harvest occurs in Green Bay. Lower Green Bay is a major perch spawning area.

Bottom-dwelling tubificid worms and midge larvae, generally recognized as indicators of poor environmental quality, are abundant near the middle and southern portions of the Bay. The pollution-intolerant "shrimp" Pontoporeia affinis inhabits the northern Bay bottom. Other bay-bottom dwellers include oligochaetes, amphipods, isopods, leeches, molluscs, and

mayfly nymphs. Phytoplankton during the winter and early spring are predominantly diatoms. Green and blue-green algae reach maximum population size during late summer. Copepods, cladocerans, and rotifers are common types of zooplankton.

Diverse species of waterfowl and shorebirds nest on the islands and wetlands, including several types of gulls, terns, herons, and egrets, as well as the sandhill crane and double-breasted cormorant. Among the other bird species that utilize the area are Canada goose, red-breasted merganser, black ducks, gadwalls, mallards, American widgeon, wood duck, blue-wing teal, green-wing teal, bufflehead, shoveler, coot, gallinule, American bittern, least bittern, Virginia rail, sora rail, semipalmated sandpiper, dunlin, sanderling, semipalmated plover, black-bellied plover, killdeer, and goldeneye. The Bay serves as a major stopover point for migratory waterfowl. Quantities of diving ducks up to 20,000 are not uncommon in the area. Recent high water levels, however, have reduced available wetlands and waterfowl populations which, in turn, have caused the decline in waterfowl hunting.

2. HUMAN USES

The site is used extensively for commercial fishing, marine transportation, mining, and recreation. Extensive landfill of coastal marsh for agriculture and urbanization has permanently altered wildlife habitats around the area. The sportfishery of the Bay has declined, and health warnings are issued concerning contamination of fish in certain locations. Despite water quality problems, the Bay yields the largest commercial fish harvest in the Lake Michigan region. Most of the commercial catch consists of perch caught in gill nets. The northern portion of Green Bay is the location of most recreational and commercial fishing. Whitefish, lake trout, Coho salmon, and king salmon are popular sport fish in the north along with walleye and smallmouth bass which are fished from rocky beaches. Public access to the lower Bay is limited.

Although recreation is a multimillion-dollar business in Green Bay, the Bay is not extensively used by recreational boaters, partly due to the scarcity of boat launching sites and facilities. The eastern Bay is primarily a tourist/vacation area, and Door County has a long history as a resort community. Trapping for muskrat and mink occurs along the western bay shore. Duck hunting is a recreational pastime in the Bay area. County and State wildlife refuges adjoin the site, including Wisconsin's Long Tail Point Migratory Waterfowl Refuge.

The Bay, its adjacent wetlands, and rugged shorelines are used as field stations by graduate and professional researchers at the University of Wisconsin-Green Bay.

Fisheries in the area are managed by regulations concerning closed seasons, size limits, closed areas, gear restrictions, and quotas. Carp adversely influence perch reproduction by disturbing vegetation used for perch spawning sites; however, carp are not harvested due to high concentrations of PCBs (poly-chlorinated biphenyls).

Waste treatment facilities at the lower part of the Bay since about 1970 have been improving Bay water quality.

The City of Green Bay and Brown County have development plans for maintaining and enlarging the harbor at Green Bay.

Navigation channels in the Bay are maintained by dredging. Spoil disposal practices are scrutinized by agencies of both States and the Federal government. Continued maintenance dredging requires identification of suitable spoil sites. Development in and near State waters is controlled by the Department of Natural Resources' Water Regulation Program, Brown County's Shoreland Management Program, and the U.S. Army Corps of Engineers' Section 10 and Section 404 programs.

Research and development dollars are continually being channeled into the lower Bay through the Wisconsin Department of Natural Resources, University of Wisconsin-Sea Grant, University of Wisconsin-Green Bay, and Wisconsin Coastal Zone Management Programs. Other agencies studying the Bay include the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and the Great Lakes Fishery Commission. The Bay-Lake Regional Planning Commission serves as coordinator of Green Bay data for the Future of the Bay Steering Committee in hopes of developing a comprehensive management plan.

The Green Bay area contains important resources of historical and educational significance. These include lighthouses and Indian pictographs.

Two islands adjacent to the proposed site are owned and managed by the Michigan Nature Association. These are Gull and Little Gull Islands (known as the "Wilderness Islands") between Poverty and St. Martin Islands.

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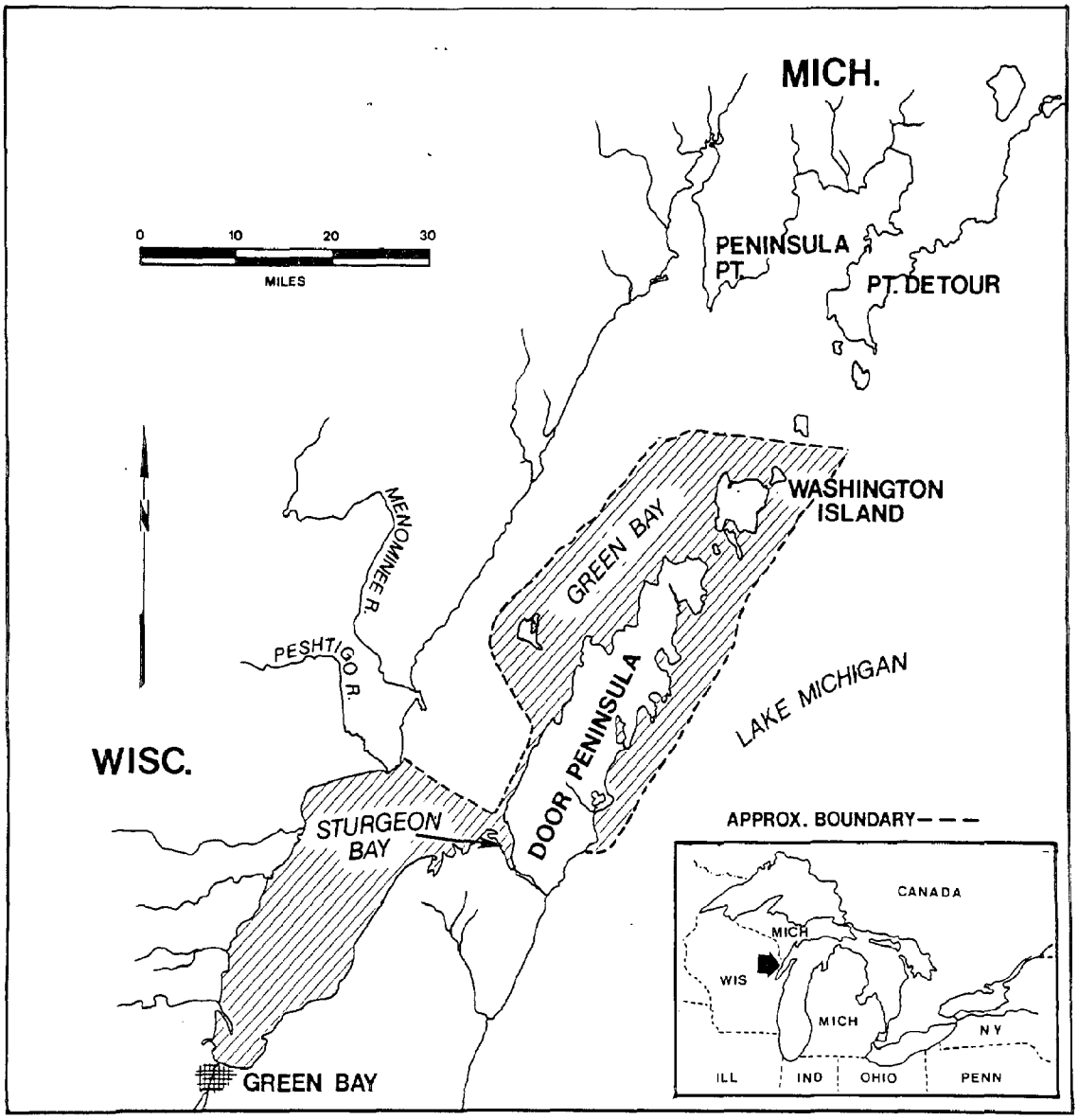

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Lake Superior, Wisconsin and Michigan

B. LOCATION: (GREAT LAKES REGION)

1. LATITUDE/LONGITUDE: 47°00' N by 90°45' W;
48°02' N by 88°45' W

2. DESCRIPTION: The candidate site, composed of two important subunits, encompasses a total of 1031 mi^2 (2670 km^2) of Wisconsin and Michigan waters situated in the western half of Lake Superior. One unit, roughly 375 mi^2 (970 km^2), lies adjacent to the federally owned Apostle Islands National Lakeshore. The boundaries of this federal park extend $\frac{1}{4}$ mile (0.4 km) into Lake Superior. The proposed site would include submerged areas beyond this boundary owned by the State of Wisconsin. The Apostle Islands section represents a glaciolacustrine habitat characterized by a steeply sloping lake bed composed predominantly of sand mixed with silt and clay. The depth of the lake bottom in this area ranges from 31-373 ft (9.5-114 m).

The second unit consists of 656 mi^2 (1700 km^2) of Michigan State waters and submerged lands surrounding Isle Royale National Park to a depth of 600 ft (183 m). Eastward of Blake Point, the site boundary extends offshore Isle Royale a maximum distance of approximately 11.5 mi (18.5 km). The lake bed is composed of glacial tills. The bedrock in this area is composed of glacially-scoured, Precambrian metamorphic and igneous rock. The area contains unique deposits of copper, iron, silver, and greenstone. Due to the oligotrophic nature of Lake Superior, and the rocky character of its basin, recent sedimentation in the area has been minimal.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The site described provides an unusual opportunity for scientific research on a large, oligotrophic, freshwater system, and its diverse, associated animal and plant species.

2. The deepwater areas near Isle Royale are considered important to the life histories of several commercial, sport, and ecologically valued species of fish. Several rare and endangered species of fish-eating birds are also known to breed, feed, and migrate through this area.

3. Recreational and commercial boating are important in both subunits on Lake Superior. Recreational boaters search for fishing hot spots, scenic pleasures, and diving opportunities on the numerous historical ship and seaplane wrecks.

4. Although Lake Superior is generally characterized as remote and vast, with few direct human influences, acid rain precipitation and contamination by heavy metals and PCBs are now recognized as serious problems. Lake Superior is currently being considered as a future water supply for the far west and as a disposal site for nuclear and thermal wastes.

5. Many geologic formations are unique to this section of Lake Superior. Glacial striations are a common sight on nearshore bedrock. Greenstone is abundant near Isle Royale, and copper and silver veins, common on surrounding land masses, may be observed by divers in the area.

6. The Isle Royale subunit offers recreational users and scientists access to a deepwater environment immediately proximate to shore support facilities. The precipitous slopes of bottom contours near Isle Royale provide an opportunity for research and exploration unparalleled in the Great Lakes.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The waters surrounding the Apostle Islands and Isle Royale represent an important habitat, feeding, and breeding ground for commercially and recreationally important fish and wildlife. Twenty-one species of fish are known to spawn in these waters. The adult slimy sculpin, white sucker, chubs, and rainbow smelt prefer shallow waters less than 15 ft (5 m) deep; the ninespine stickleback nests only in shallow waters on rocky-sand substrates. More than 40 species of fish live or migrate through the area, and include recreationally popular and abundant species such as lake, brown, rainbow, and splake trout, and coho and chinook salmon. Two unusual forms of lake trout (the Sicowet and the "humper") have been found to inhabit the deeper waters of the candidate site. The pygmy whitefish is known to occur only in Lake Superior. However, the ecology of these species is only poorly understood. The deeper waters of this region may also hold the remains of such coregonid populations as the shortnose cisco, once found throughout the Great Lakes system. The natural fish stocks in Lake Superior have also been influenced by the introduction or accidental invasion of many exotic fish species including pink salmon, rainbow smelt, and sea lamprey.

The waters in and around the islands in this region are used extensively as breeding, nursery, and feeding areas for more than 43 species of birds and ducks, including such fish-eating birds as the common loon, bald eagle, osprey, mergansers,

and endangered double-crested cormorants which are undergoing a population explosion. Several of these species are rare, and populations are carefully monitored by environmental groups. Mallards, green-winged teal, blue-winged teal, bufflehead, common loon, red-breasted merganser, horned grebe, belted kingfisher, great blue heron, American coot, herring gull, ring-billed gull, American widgeon, and scaups comprise the dominant species. The candidate area is also within the migratory routes of several other waterfowl and large predatory birds such as hawks.

Since Lake Superior is relatively unproductive and recent sediments compose a small percentage of the substrate, the Isle Royale subunit has a low abundance and species diversity of benthic and planktonic fauna. The most abundant invertebrates include Pontoporeia, Mysis, and various species of calanoid copepods. Floral communities are largely planktonic and are unique and diverse. Approximately 285 species of planktonic algae are known from Lake Superior and over 300 species of benthic algae were collected from a single rock at Superior Shoal, east of Isle Royale. Nearshore populations of invertebrates in the Apostle Islands subunit may number as high as 700 organisms per square meter, dominated by insect larvae. Pelecypods, isopods and amphipod crustaceans, oligochaete worms, leeches, and flatworms are also present in low-moderate abundance.

2. HUMAN USES

In no other place in the Great Lakes are there vestiges of geologic evolution as in Lake Superior. Due to its large, unperturbed nature, Lake Superior remains much as it was following glacial retreat thousands of years ago. Historical perspectives can be developed by observing the history, geology, ecology, and biota of Lake Superior.

Lake Superior is of unique value to the scientific community. The Isle Royale subunit contains some of the deepest, cleanest, and least perturbed water of Lake Superior. Systems such as this are uncommon in the Great Lakes and rare worldwide; the area described is unique in its relatively low productivity, deepwater flora and fauna, and ice and wave formations.

Maintained as a national lakeshore and park, respectively, the Apostle Islands and Isle Royale are primarily used for recreational boating, fishing, hiking, and camping. The Apostle Islands area also serves as a fishing ground for the native Indians. More than 88,000 individuals visit these areas each year, transported by ferry boats and seaplanes.

The proposed site includes one of the highest concentrations of shipwrecks in Lake Superior. The wrecks include yachts, freighters, passenger steamers, fishing boats, seaplanes, and

jettisoned cargo. Recreational boaters come from Minnesota, Michigan, Wisconsin, and Canada.

The Apostle Islands subunit is heavily fished by both commercial and sport fishermen. Rainbow smelt have also been an important commercial fish species. In total, more than 21 licensed commercial fishermen and several native Americans commercially operate within the Apostle Islands subunit.

Management of the natural resources associated with the Apostle Islands National Lakeshore and the Isle Royale National Park is currently carried out within a coordinated network involving the Wisconsin, Michigan, and Minnesota Departments of Natural Resources, the U.S. Fish and Wildlife Service, the National Park Service, the Red Cliff Tribal Council, the Great Lakes Fishery Commission (an interstate-international organization), the International Joint Commission, the Army Corps of Engineers, the U.S. Environmental Protection Agency, and other federal, state, and provincial agencies.

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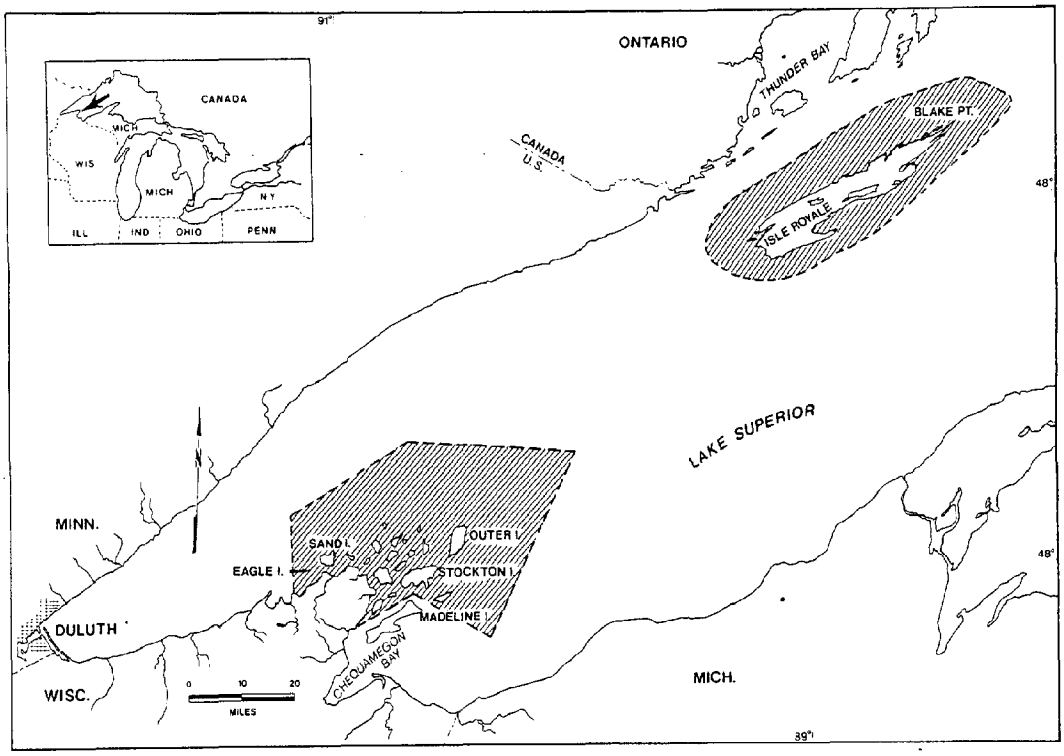

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Cape Vincent (Lake Ontario), New York

B. LOCATION: (GREAT LAKES REGION)

1. LATITUDE/LONGITUDE: 44°04' N by 76°25' W

2. DESCRIPTION: Cape Vincent, situated in the northeastern corner of Lake Ontario, is at the gateway to New York State's Thousand Islands resort area and the St. Lawrence Seaway. The lake bed is composed of fine- to very fine-grained calcareous deposits underlain by glacially scoured bedrock. Water depths range from 85 ft (26 m) to more than 161 ft (51 m) in some channels. Cape Vincent represents an area of approximately 320 mi^2 (830 km^2). The site extends from Grindstone Island north of Cape Vincent down to Stony Point Light and out to the Canadian boundary. It also includes the submerged sailing schooner off Rock Island Lighthouse. This site lies wholly within the jurisdiction of New York State.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The Cape Vincent area includes some of the most biologically rich and diverse habitats within the Great Lakes region, and represents an environment critical to the life histories of many commercially and recreationally important fisheries of the Great Lakes.

2. Because of its scenic beauty, accessibility, and abundance of fish and wildlife, the area under consideration affords excellent opportunities for fisheries research, recreational enjoyment, and educational experiences based on the indigenous natural resources.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Cape Vincent (and its environs) is an area of unparalleled scenic beauty and natural diversity. Wilson's Bay and Mud Bay (northeast of Grenadier Island) represent major fish spawning habitats for 27 species of finfish. Alewives and rainbow smelt (important food fish for Lake Ontario's rapidly growing Pacific salmon fishery), as well as northern pike, bullhead, yellow perch, smallmouth bass, brown trout, and rainbow trout spawn in these bays.

Grenadier Island, Little Galloo Island, and Gull Island are important resting, feeding, and nesting habitats for more than 75,000 breeding pairs of birds, representing 69 species of migrating and indigenous waterfowl. Loons, grebes, petrels, ring-billed gulls, white pelicans, double-crested cormorants, great blue herons, cattle egrets, bitterns, glossy ibises, whistler and mute swans, geese, ducks, teals, widgeons, terns, and sandpipers feed and nest within the boundaries of the area. Endangered species such as peregrine falcons and bald eagles may also migrate through the area.

Bottom communities, critical links in the detritus-based food chain in the Cape Vincent area, exhibit the greatest diversity within Lake Ontario. Population estimates range from 1600 organism/m^2 during summer months to 2400 organisms/m^2 during the spring. Crustaceans, molluscs, chironomids (fly larvae), as well as flatworms and other freshwater worms, account for 97 percent of all organisms identified.

2. HUMAN USES

The Cape Vincent area is primarily used for recreational fishing and duck hunting. Coho, Atlantic, and chinook salmon, brown trout, rainbow trout, and lake trout are the most popular gamefish. The islands northeast of Cape Vincent are popular summer resorts and attract numerous recreational boaters during summer months.

The New York State Department of Environmental Conservation (DEC) operates a fisheries station at Cape Vincent and a salmonid fish hatchery further south in Mexico Bay. More than 9,000,000 salmonid fry have been introduced into Lake Ontario under DEC's fish management programs. DEC continues to monitor gamefish and foodfish population dynamics within Lake Ontario. The area also supports a small commercial American eel fishery.

The New York State Chapter of The Nature Conservancy owns marsh land adjacent to the site, and hopes to acquire property within Wilson's Bay, situated within the boundaries suggested for this area.

The site includes the western portion of the St. Lawrence River and the vessel traffic lanes to Rochester and Oswego. All traffic entering or leaving the Great Lakes must pass through a portion of the proposed site. The St. Lawrence Seaway Development Corporation, a government-owned enterprise, regulates vessel traffic and performs other safety-related marine activities in the seaway.

Henderson Bay, within the proposed site, may be the repose of shipwrecks and, therefore, represents an area of cultural and historical significance.

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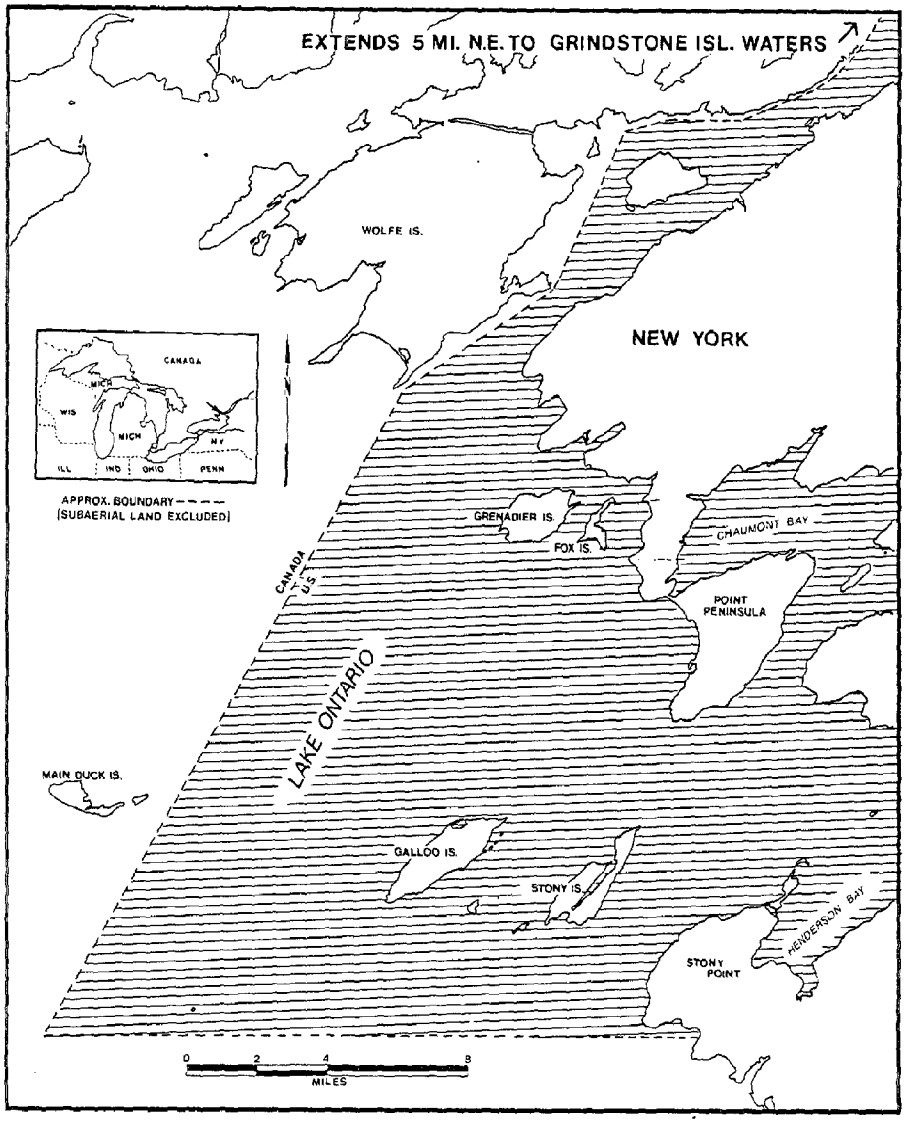

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Thunder Bay (Lake Huron), Michigan

B. LOCATION: (GREAT LAKES REGION)

1. LATITUDE/LONGITUDE: 45°00' N, 83°20' W

2. DESCRIPTION: The proposed Thunder Bay site includes Thunder Bay and vicinity (up to Middle Island) extending out to 83° W. Depths extend to over 300 ft (91 m) along the northeast section of the site. Altogether, the site has an area of approximately 400 mi^2 (1035 km^2) and is entirely within State of Michigan waters.

The lake bed geology in this area is interesting and varied, consisting of glacially deposited boulders and cobbles covered by gravel and coarse-grained sand. The lake bottom is a steeply sloping series of narrow platforms undulating within and around the Bay and Michigan Islands, dropping from 30 to 300 ft (9-91 m) within 10 mi (16 km) from shore. The area is infested with submerged reefs, shoals, and wrecked ships. The Misery Bay Sinkhole [75 ft (23 m) deep, 300 ft (91 m) diameter] is an interesting formation formed by the collapse of a cavern within the limestone shelf that runs through Alpena County. West of Middle Island's lighthouse are limestone formations and sink holes resembling underground rooms submerged in 40-70 feet of water. One-quarter mile north of Rockport are offshore, underwater springs. A 45 ft (13.7 m) submerged limestone wall running along the southeastern edge of Thunder Bay Island is another interesting geological feature of the lake bed in the Thunder Bay area.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The underwater limestone sinkhole, the large concentration of historical shipwrecks, and the proximity of idyllic Michigan Islands National Wildlife Refuge establish this area as a particularly valuable historical, educational, and recreational resource.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The highly sculptured limestone bedrock, the undulatory pattern of the submerged terraces and scarps, and the extreme gradations in sediment size composition create a variety of

biological niches in the Thunder Bay area. Water quality in the Bay is excellent, and the shoreline is rich in diverse flora. The marsh vegetation along the edges of the Michigan Islands provides a habitat and breeding area for black ducks, black terns, rails, and coots, all of which nest in protected back-bay areas. Nesting well above the marsh areas, on rocky substrate which is not flooded within a given nesting season, are thousands of colonial nesting birds such as ring-billed gulls, double-breasted cormorants, common terns, herring gulls, and yellow-headed blackbirds, one of the few populations of this species in the eastern United States. Thunder Bay Island alone hosts 11,000 breeding pairs of ring-billed gulls. A reasonable estimate of the bay area's gull and tern populations (1980-1982) would be approximately 52,000 breeding pairs.

Scarecrow Island, part of the Michigan Islands National Wildlife Refuge, has the greatest variety of nesting birds in the National Wildlife Refuge. The gravel shoreline is heavily used by herring and ring-billed gulls, while many waterfowl (including mallard, black gadwall, blue-winged teal, dabbling ducks, the diving red-breasted merganser, great blue herons and cormorants) are observed nesting along the shores and within the bays. The American osprey and the American bald eagle, designated by the Federal government and by the State of Michigan as "threatened," have also been observed within the area as well as the rare sandhill crane. Numerous other duck species casually feed on various food sources located offshore Scarecrow Island. These species include American merganser, golden-eye bufflehead, and Canada geese. Further offshore, in the heart of the bay, many diving duck species (e.g., scoters, old squaws, American mergansers, red-breasted mergansers, and common golden-eye) can be observed. Green-winged teal, blue-winged teal, and many other dabbling duck species use the areas around the edge of the bay for feeding, resting, and nesting.

Three heron species (e.g., great blue heron, black-crowned night heron, and green heron) have nested continuously on Scarecrow Island for many years. Recently, some of the great blue herons have been displaced by double-crested cormorants (a "threatened" bird species as listed by the State of Michigan), and in 1981, at least 39 active nests were present in trees. In addition to osprey and bald eagles cormorants and the Michigan-listed "endangered" common tern use Scarecrow Island regularly for nesting and roost sites. Thunder Bay is also important as a resting area for migratory shorebirds. Typically, in the last week of May and throughout August and September during migration to and from the Arctic, very large flocks of migratory shorebirds (especially sandpipers and plovers) move through the bay.

Thunder Bay is an important stopover for dunlins, sanderlings, ternstones, the peep sandpipers, and golden and black-

bellied plovers; unusual species as the stilt sandpiper and Phalaropes may also appear. In addition, at the northern end of Thunder Bay in the low sand dunes and windswept sandy shore is one of the last known nesting locations of piping plovers, an endangered species in Michigan which is now down to less than 20 nesting pairs. Numerous other islands support bird species nesting in the bay. The relatively high productivity of the waters in the bay, its semiestuarine character, and its position phytogeographically in the Great Lakes system mark Thunder Bay as an area where many stressed, rare species are able to reproduce successfully and consistently.

The various geological sites, including the Misery Bay Sinkhole (sometimes referred to as El Cajon Bay Sinkhole) and the Thunder Bay Island Rock Wall, as well as the numerous shipwreck sites, serve as a habitat for 20 species of gamefish. Alewives, carp, black bass, smallmouth bass, catfish, brown trout, steelhead, splake, northern pike, and yellow perch can be observed within and around these sites. There have been several unconfirmed sightings of white cave fish at the bottom of the El Cajon Bay Sinkhole. Chinook salmon, rainbow trout, brown trout, splake, and steelhead are annually planted by the Michigan Department of Natural Resources in the inland rivers that feed Thunder Bay, thereby establishing this area as a valuable resource to the fishing industry and sportsmen alike.

2. HUMAN USES

Situated in an area of medium population density, the area is primarily used for recreational boating, diving, and nature appreciation. Three interesting underwater geological sites (Rock Wall, Misery Bay Sinkhole, and the North Point Reef forming the northern boundary of Thunder Bay) and 83 identified shipwrecks attract large numbers of gamefish, anglers, and recreational divers to the area, where the exceptional clarity of the water enhances the diving experience. The shipwrecks include wood-hulled schooners, steamers, barges, Great Lakes tugboats, a steel-hulled steamer, and an ocean-going freighter. The area also supports a shipwreck salvage industry that has reduced the recreational value of some of the wreck sites. Much of the area is not easily accessible, though some is visited by the more serious naturalists and birdwatchers.

The islands in this system are owned by a wide variety of individuals and government agencies including the State of Michigan, the Bureau of Land Management, the U.S. Coast Guard, the U.S. Department of Interior, the U.S. Fish and Wildlife Service, and the Michigan Natural Association. The State of Michigan owns the waters, lake bed, islands, and the shore adjacent to Thunder Bay. The area is presently included in Michigan's Underwater Preserve System administered by the Michigan Department of Natural Resources in cooperation with

the Department of State (Division of History). The area is one of only two such preserves along the 3200 miles of Michigan Great Lakes shoreline. The Underwater Preserve System seeks to prevent damage to sunken ships due to improper salvage practices.

Within this site, five islands are nature preserves. Two islands are managed (primarily to protect migratory and nesting birds) as part of the Michigan Islands National Wildlife Refuge; three are owned by the Michigan Nature Association. Ten other islands in the area are managed by the Bureau of Land Management. The area provides potential for educational and ecological research opportunities. The U.S. Army Corps of Engineers, North Central Division, is responsible for maintaining deepwater channels leading to Alpena and Black River Harbors. These areas are considered, by the Corps, to be intensively-used commercial and industrial sites.

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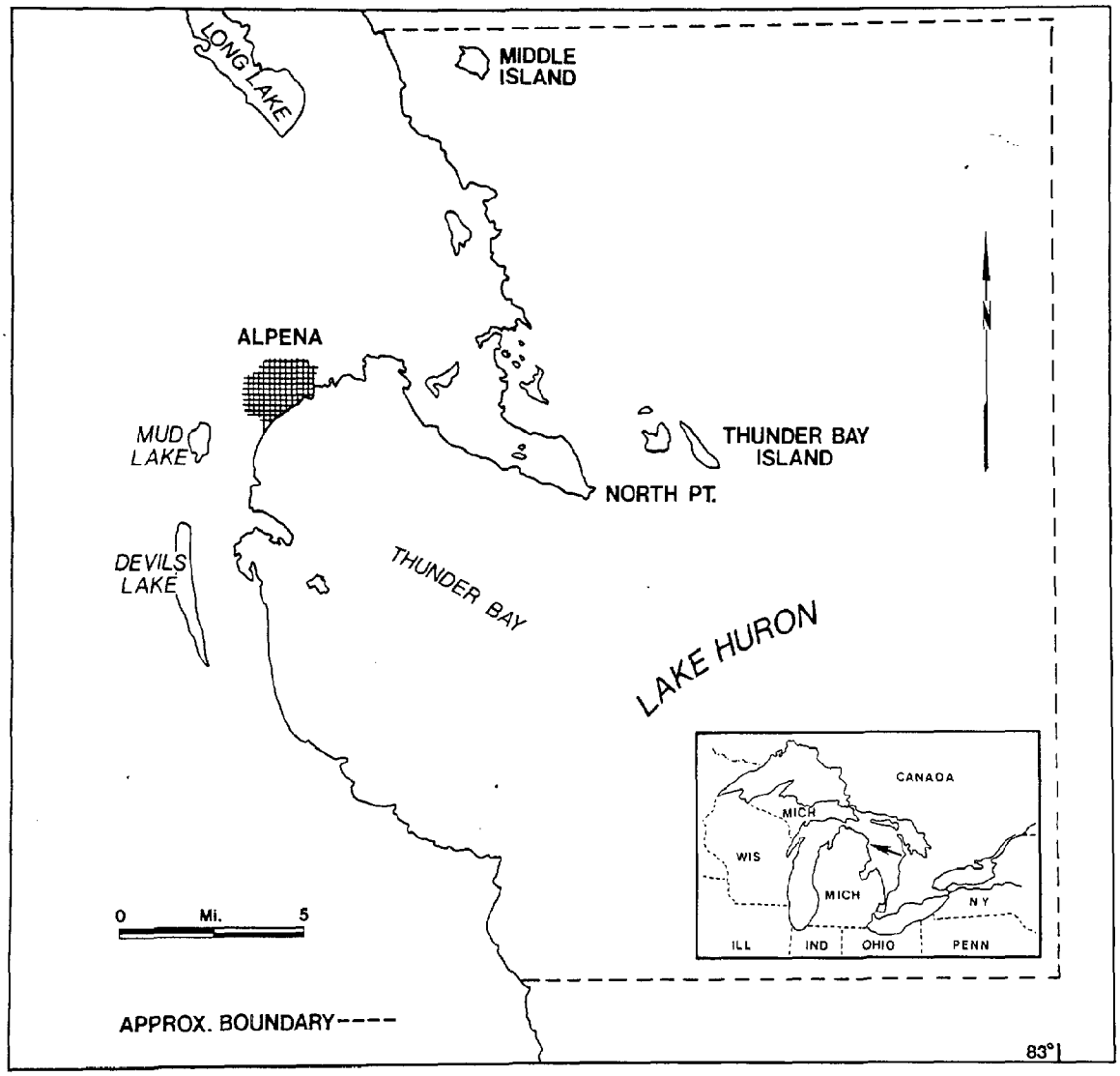

LOCATION MAP

GULF OF MEXICO REGION

MARINE SANCTUARY SITE EVALUATION LIST
GULF OF MEXICO REGION

MANAGEMENT OVERVIEW

1. Resource Evaluation Team

The Gulf of Mexico resource evaluation team was comprised of four marine scientists from the region. Three of the team members are biologists; the fourth is a coastal geologist. The team leader was Dr. Thomas Bright of the Texas A & M University Department of Oceanography. The other team members were Dr. James P. Ray of Shell Oil Company (Houston, TX), Dr. David A. Gettleson of Continental Shelf Associates, Inc. (Tequesta, FL), and Dr. William G. McIntire, who retired in 1978 from the post of Associate Dean, Center for Wetland Resources, Louisiana State University (Baton Rouge, LA). The team members made numerous contacts with individuals in academic institutions, state and local governments, Federal agencies, environmental groups, fishing and oil and gas interests.

2. Site Evaluation and Public Participation Process

The team first met on April 14-15, 1982, in New Orleans. At that meeting, the team considered 17 possible Marine Sanctuary sites in the Gulf of Mexico, including the six Gulf sites that were on NOAA's List of Recommended Areas (44 Fed. Reg. 62552, Oct. 31, 1979). At the first meeting the team identified seven areas they considered "potential" Marine Sanctuary sites. After descriptions of these sites had been approved by the team, they were mailed to 268 groups and individuals in the states of Texas, Louisiana, Mississippi, Alabama, and Florida, and to 82 national organizations and Federal agencies. Those seven sites were:

GC-1. Northern Harbor Island, TX. This site incorporates about 8.3 sq mi of shallow seagrass beds and marsh/mangroves adjacent to northern Harbor Island northwest of Port Aransas. It is entirely within state waters.

GC-2. South Bay, TX. A pristine shallow embayment at the south end of Laguna Madre near Padre Island in state waters, this site contains large seagrass beds.

GC-3. Seven and One-half Fathom Reef, TX. This is a 1,150x165 foot reef off Padre Island, rising about 18 feet from the surrounding bottom. In state water, it is one of the most accessible reefs in Texas.

GC-4. Flower Garden Banks, off TX. Located some 100 miles offshore in Federal water, these are the most northern coral

reefs in western Gulf of Mexico. Banks consist of east and west sections approximately 16 miles apart.

GC-5. Shoalwater Bay - Chandeleur Sound, LA. The proposed site, approximately 80 sq mi entirely in state water, lies off Louisiana's east coast. It contains highly productive pristine seagrass beds and mangroves.

GC-6. Big Bend Seagrass Beds, FL. These extensive shallow water seagrass beds, in both state and Federal waters, extend up to 22 miles off the mid-Florida west coast. Two alternatives were proposed for this site, both incorporating West Indian manatee habitat.

GC-7. Florida Middle Ground. This site of about 460 sq mi lies in Federal water northwest of St. Petersburg. An extremely high biologically productive area, its hard bottom contains numerous steep limestone escarpments.

Chelsea received 70 responses by the end of a 45-day public comment period (July 29, 1982). Two additional sites were nominated by the public by August 24, 1982, the nomination deadline. Those sites were Baffin Bay, Texas, and the strip of Florida Bay between Everglades National Park and the northwestern shore of the Florida Keys.

The team met for the second time on September 16, 1982, in Tampa, FL, at which time they considered the public comments and the two nominations. The team members had received numerous informal responses to their initial seven proposals, as well as to sites that the team had not proposed. At the second meeting, the team concluded that the Baffin Bay proposal met the Marine Sanctuary criteria, while the Florida Bay proposal did not. A site description of the Baffin Bay proposal was mailed out to the same groups and individuals who had received the first mailing. A 30-day comment period on the Baffin Bay proposal expired on November 22, 1982, and 32 written responses were received by then. After the end of the public comment period on Baffin Bay, the team was polled by telephone to finalize their choice of five sites to recommend to NOAA.

3. Recommendations

3.1. State-Federal relationships

The eight Gulf of Mexico sites for which public comment was solicited are dominated by state water sites, with only two, Flower Garden Banks and the Florida Middle Ground, in Federal waters. Of the nine other sites discussed by the team, but not considered as possible recommendations to NOAA, only two, the DeSoto Canyon area off the Florida Panhandle, and a deep coral

area west of the Dry Tortugas, lie beyond state jurisdiction. Because of the predominance of state water sites in their deliberations, the Gulf team was concerned about the interactions between state and Federal regulatory regimes. Commercial fishing, and sport fishing and hunting are activities which are primarily regulated by state governments, and the resource evaluation team was of the opinion that these activities should not be interfered with by the Federal government after sanctuary designation.

There are problems, however, even in state waters where the states should be able to exercise control. For example, in Baffin Bay, TX, the illegal poaching of wildlife - particularly the taking of deer by hunters in boats - is a problem that appears to need additional governmental attention. The Chandeleur Sound - Shoalwater Bay site is entirely in state waters, and under control of the local (parish) government as well. Yet the substantial distance from the mainland to the Chandeleur site impedes local efforts to manage the area. In both of these areas Marine Sanctuary designation and the resources associated with sanctuary management could enhance the enforcement of existing state laws and regulations.

The State of Florida, which already has two Marine and two Estuarine Sanctuaries, sees the potential designation of the Big Bend Seagrass Beds in a light which is quite different from Texas and Louisiana. Florida natural resource managers, and even the Governor of Florida, actively support the Seagrass Bed designation because of, rather than in spite of, the accompanying "federalization" of the site. They see "national" sanctuary designation as an asset in controlling the ultimate development of Florida's west coast. There is no doubt that the Big Bend grass beds are vitally important to the maintenance of offshore fisheries; the area is also a critical habitat for the endangered West Indian manatee. The state's objectives in having part of the seagrass beds designated as a sanctuary are to preserve the offshore fisheries, as well as protect the manatee.

3.2. Site Selection

NOAA directed each team to select no more than five sites per region, and the Gulf of Mexico resource evaluation team recommends the following five sites for placement on the Marine Sanctuary Site Evaluation List. Without intending to prioritize them, the sites are:

1. Big Bend Seagrass Beds, FL
2. Florida Middle Ground
3. Shoalwater Bay - Chandeleur Sound, LA
4. Flower Garden Banks
5. Baffin Bay, TX

As part of the final regional report, the team has approved a set of short descriptions of each site, including a map showing the recommended boundaries of a Marine Sanctuary (except in the case of the Big Bend site). The balance of this part of the report contains highlights of the evaluation team's rationale for choosing each site, and some comments regarding specific management issues that came to light during the site evaluation process.

3.2.1. Big Bend Seagrass Beds, FL

This was the site that drew the most public response on the first round; 38 of the original 70 comments were concerned with the Big Bend proposal. Of those comments, 30 were in favor of placing the site on the SEL and 7 were opposed. Opposition came from commercial fishermen (4 opposed; none in favor), the oil and gas industry (2 opposed, 1 in favor, 1 neutral), and one governmental organization (12 in favor, 1 opposed). The lone opposing view from government organizations came from the Gulf of Mexico Fishery Management Council, which also expressed opposition to Shoalwater Bay - Chandeleur Sound and the Florida Middle Ground. The resource evaluation team disagreed with the presumptions made by the Fisheries Management Council; i.e., that the "Coral Reef Fisheries Management Plan" provided adequate protection for the Florida Middle Ground, and that the two state water sites (Big Bend and Chandeleur) were "not presently threatened" and therefore should not be considered as potential sanctuaries. "Present threat" is but one of many considerations that the team used in considering the merits of a potential sanctuary site, and the absence of an imminent threat does not necessarily disqualify a site from sanctuary designation.

The team had more difficulties with the size and boundaries of the Big Bend site than it had with any of the other four recommendations. The resource evaluation team is of the opinion that a Big Bend Marine Sanctuary, if one is designated, should not be larger than 100 square miles. However, information available to the team indicated that the seagrass beds cover about 1,160 sq mi of the seabed off Florida's west coast. In the request for public comment, the team suggested two alternative boundaries. Alternative I (400 sq mi) ran from the mouth of the St. Marks River at the north, to Live Oak Point, a 10-mile wide, 40-mile long area. Alternative II (1015 sq mi) ran from south of the Crystal River to the mouth of the St. Marks River, an 145-mile long, 7-mile wide strip. In both cases, the offshore boundary was at approximately the 33ft depth contour.

A number of commenters strongly favored the larger proposal (Alternative II) and even an expansion of those boundaries farther south, to encompass the mouth of the Crystal River.

Defenders of Wildlife made this suggestion as a means of protecting the habitat of the endangered West Indian manatee. The manatee utilizes both the Suwanee River (within Alternative II) and the Crystal River during the winter. Defenders of Wildlife also noted that the Big Bend sites were within the ranges of the endangered green sea turtle and the threatened loggerhead turtle.

The U.S. EPA, Region IV (Atlanta), supported the designation of both alternatives, in order to prevent overfishing of breeding stocks of both recreational and commercial fisheries. The Governor of Florida, Hon. Bob Graham, supported a modification of Alternative II; a six-mile wide strip from Cedar Key to the north of the St. Marks River (420 sq mi). He noted that these boundaries would provide three access points, at St. Marks National Wildlife Refuge (NWR), Suwanee River NWR, and Cedar Key NWR, and that any of these three land sites could be the location of the Sanctuary's management facilities. The U.S. Fish and Wildlife Service (F&WS) gave its strong support to Alternative II and pointed out that the area is also the feeding area for eight pairs of bald eagle, and is the wintering area for the largest concentration of redhead ducks in the southeast United States. The F&WS stressed the importance of the area as habitat for the West Indian manatee, the brown pelican, the Ridley, green, leatherback and the loggerhead turtle and the American alligator. One F&WS commenter recommended that the Alternative II boundaries be extended south to include the areas off the Crystal, Homosassa, and Chassahowitzka Rivers, because of their importance as manatee habitat.

The Marine Mammal Commission recommended expansion of the boundaries of Alternative II south to the Chassahowitzka NWR, to include most of the summer migratory habitat of the northwest Florida manatee population. The manatee issue is a difficult one, as the team's primary reason for proposing the Big Bend seagrass area was its high productivity of sport and commercial fisheries. To combine that reason for nomination with the manatee issue may result in a sanctuary proposal far larger than the resource evaluation team considered acceptable. The manatee is listed as "depleted" under the Marine Mammal Protection Act and "endangered" under the Endangered Species Act. It is Florida's State Marine Mammal and is afforded special protection under state law. Because of the manatee's sensitivity to cold water, the state has designated 12 warm-water manatee refuges throughout Florida, including the headwaters of the Crystal River the northernmost winter habitat.

Because of the two rationales for designating portions of the Big Bend Seagrass Beds, the resource evaluation team could not reach a decision on recommended boundaries. The team recommends that an area of the seagrass beds, not greater than 100 square miles

in extent, which also accommodates significant portions of the manatees' critical habitat, be considered in the event that this site becomes an "active candidate" for sanctuary designation.

3.2.2. Florida Middle Ground

This is an area located about 95 miles off the northwest coast of Florida. Although the team circulated a 460 sq mi proposal for public comment, they believe that a Marine Sanctuary at the Middle Ground should be no larger than 100 sq mi. The accompanying map shows the entire 460 sq mi area, as there does not appear to be sufficient information available to select the "best" 100 sq mi. The Middle Ground is probably the most productive coral and algal reef area in the northern Gulf of Mexico. Depths range from 24 to 42 m, with high relief on the order of 10 to 15 m. The regional Fisheries Management Council has proposed the entire 460 sq mi area as a "Habitat Area of Particular Concern," and the team understands that some form of special protection is afforded by the Department of the Interior. There are about 60 potential oil and gas lease tracts located within the HAPC boundaries.

Public comment consisted of 13 favorable, 6 neutral, and 5 opposing responses. The Tampa Port Authority and the Florida League of Women Voters were among the supporters; opposition came from commercial fishing and oil and gas interests. The distance from shore is probably the dominant factor in the limited public support for the site. The resource evaluation team, however, believes that the unique resources of the Middle Ground qualify it as one of the five best sites in the Gulf of Mexico.

3.2.3. Shoalwater Bay - Chandeleur Sound, LA

This site, landward of the Chandeleur Islands portion of the Breton National Wildlife Refuge, received the strongest level of local support of any site considered by the resource evaluation team. The St. Bernard Parish Police Jury unanimously nominated the site for consideration as a Marine Sanctuary on June 1, 1982. The Parish Coastal Zone Advisory Committee expressed their support in the form of a Resolution on May 24, 1982. The St. Bernard Parish Planning Commission added its voice in support of the proposal on July 9, 1982. Both Louisiana Senators, Russell Long and J. Bennett Johnston, expressed strong support, and the Governor of Louisiana, Hon. David Treen, supported placement of the site on the SEL in his letter of October 8, 1982. Congressman Robert Livingston, whose district includes St. Bernard Parish, also supported placing the site on the SEL as a potential Marine Sanctuary. Mayor of New Orleans, Ernest Moriel, also expressed his support.

The principal opponent of the Chandeleur site was Ted Ford, Assistant Secretary, Louisiana Department of Wildlife and Fisheries. Mr. Ford was joined in his opposition by Jack Brawner, Southeast Regional Director of the National Marine Fisheries Service. Mr. Brawner said: "We concur that this site requires management, but recommend it not be further considered as a National Marine Sanctuary at the present time since the area is adequately managed by the Parish and State." His statement contradicts those from the parish, where the paucity of management was a major reason for their strong support of the proposal. The commercial fishing industry took the position of blanket opposition to any Marine Sanctuary site in the Gulf of Mexico, and their position was given appropriate consideration by the Resource Evaluation Team.

Additional substantive comments were received in supportive letters from the U.S. Fish and Wildlife Service and the Center for Wetland Resources of Louisiana State University. The Fish and Wildlife Service "wholeheartedly" supported the Chandeleur proposal, and recommended that its boundaries be expanded to include the entire Chandeleur Island chain, from Chandeleur Light at the north to Palos Island at the south. They also proposed that the sanctuary be extended seaward one mile on the Gulf side of the Chandeleur Islands, as this area is extensively utilized by nesting terns, skimmers, and gulls as a feeding area, and is being used by the brown pelican colony on North Island. The F&WS support is particularly noteworthy in light of the fact that the Chandeleur Islands are already part of a National Wildlife Refuge, and in fact are designated as wilderness area.

One significant point made both by the LSU Center and Mr. Cy Rhodes of Long Beach, MS, is that the Chandeleur Islands are migrating westward at a rate of up to 5 meters/year, and the Islands are gradually disappearing due to erosion. One of the parish's objectives, as it was expressed to the team, is to employ beach stabilization techniques on islands other than the Chandeleurs. Within the wilderness-designated islands, no such efforts are allowed.

There is a strong interest within the St. Bernard Parish government in managing a Chandeleur Sound Marine Sanctuary if it were designated. The Parish Planning Commission suggested setting aside part of a three-story school building, now dedicated to their Coastal Zone Management Program as a "coastal complex," as offices and an interpretive center for the proposed sanctuary.

One objection to the Shoalwater Bay - Chandeleur Sound proposal was that it would interfere with, or even exclude, menhaden fishing. W. Borden Wallace of Wallace Menhaden Products, of Metairie, LA, stated that his fishermen occasionally set their

nets within the proposed boundaries for the site. Depths within the proposed area are as great as 23 feet, but are generally in the 6 to 10 foot range. Menhaden boats can operate in such shallow waters, according to Mr. Wallace. Edward Swindell of Zapata Haynie Corporation (Houston) echoed Mr. Wallace's concern with regard to the menhaden fishery. As it appears that there is at least an occasional menhaden fishery in the area, this is an issue that should be raised in any future proposal to move forward on sanctuary status for this site.

3.2.4. Flower Garden Banks

This site, approximately 100 miles off the Texas coast, was the focus of one of the Marine Sanctuary program's greatest controversies. The Flower Garden Banks were withdrawn from "active candidate" status by NOAA while this site evaluation process was taking place. The team's initial proposal for the site drew 30 comments, 22 of which were in favor of placing the site on the SEL. The only opposing views were those of commercial fishermen (4 responses) and 2 of 6 oil and gas industry respondents. The credibility of the fishermen was undermined by their blanket opposition to all proposed Marine Sanctuary sites in the Gulf of Mexico.

During the team's discussions, the Flower Garden Banks were held in unanimous high regard as an ecologically important site. What concerned the resource evaluation team was the question of what sanctuary status could do, if anything, for the site. The team concluded that the only potential action that would benefit the Flower Gardens would be to ban anchoring on the corals in the site. There was considerable concern over the capability of an agency of the United States unilaterally to forbid anchoring at a location over 100 miles offshore. At one time during the team's deliberations, it appeared that the Gulf of Mexico Fisheries Management Council was going to adopt anchoring regulations as part of its Coral Reef Fisheries Management Plan. Such regulations, even if promulgated, would have no application to oil field service vessels or to oil tankers, both of which are known occasionally to anchor on the Flower Gardens. Information available to the resource evaluation team during its final deliberations indicated that the proposed anchoring restrictions were being withdrawn from the Coral Reef Management Plan. Later communications from the Council indicated that the anchoring restrictions had indeed been withdrawn.

The team's proposed boundaries for the Flower Gardens site correspond to the Department of the Interior's "no activity" zone, and encompass an area of 44 sq mi. The team does not believe that a larger "buffer zone" is necessary to protect the reefs.

Although the Flower Gardens site was actively considered by NOAA from 1977 to 1982 as a Marine Sanctuary candidate, its inaccessibility is a major factor working against sanctuary status. Neither Texas nor Louisiana state agencies expressed any interest in managing such a sanctuary; its distance from shore would make enforcement and monitoring a costly enterprise. At one time, there were commercial dive shop operators who offered trips to the Flower Gardens. The team was informed that all of these ventures have since been terminated, and that there are currently no such trips available. This diminution in public attention caused the team to give little weight to the public enjoyment aspects of a Flower Gardens Marine Sanctuary. The resource evaluation team devoted a substantial portion of its time to discussing the pros and cons of Marine Sanctuary status for the Flower Gardens, and concluded that there was only one reason for such a designation - to prevent anchoring on the coral reefs of the Flower Garden Banks. If anchoring can be prevented by some other avenue, perhaps through the Intergovernmental Maritime Organization, then that approach to protecting this resource may be the preferred one.

3.2.5. Baffin Bay, TX

This is the only site recommended by the Gulf of Mexico resource evaluation team that was not included in the team's first round of proposals. It is, however, a site for which strong local support was voiced; much stronger than the support for the three Texas sites that were eliminated during the team's final deliberations. No "official" state response to the Baffin Bay proposal was received, but the nomination proposal itself came from the Texas Coastal and Marine Council, with additional nominating letters from the Lower Nueces River Water Supply District and the Port of Corpus Christi.

Numerous contacts were made between team members Bright and Ray, NOAA Sanctuary Program Office personnel, and representatives of the major landowner adjacent to Baffin Bay (the King Ranch). Even though John Cypher of the King Ranch wrote urging that the sanctuary program hold off on Baffin Bay for about five years, the team was of the opinion that the site should go on the SEL now. The two reasons given by Mr. Cypher for postponing action on Baffin Bay should be mentioned here. The first of these is that the sanctuary might "take" dry land (above the high tide line) although no such authority exists in the present Federal statute. The second is that the program needs five years to "mature," and gain experience managing sanctuaries that lie next to private lands. Cypher does not see a "threat" to Baffin Bay, so he believes there is plenty of time to wait. The Gulf of Mexico resource evaluation team believes that a current "threat" is not a necessary precondition for sanctuary designation, but is only one of many factors to be considered in evaluating a

potential site. Baffin Bay is being recommended to NOAA for placement on the SEL because of its unique biological and paleontological characteristics, not because the team believes that it is currently threatened by any particular activity.

Thirty-six comments were received on this area; 13 in favor, 14 opposed and 9 neutral. Opposition to the Baffin Bay proposal came primarily from a few commercial fishermen in the area, who expressed their concern that their livelihood would be threatened by sanctuary designation. Since the entire area recommended by the team is in state waters, it is unlikely that Marine Sanctuary status would do anything to the commercial fishermen that the state does not already do, or that the state would oppose. A number of commenters mentioned that Baffin Bay is not significantly threatened by man's activities, primarily because most of its shoreline is in private ownership. This was one feature that made the site preferable to Harbor Island, which is completely surrounded by development. Very little potential exists for development of the land around Baffin Bay, at least for the forseeable future. Since the Marine Sanctuary program has no statutory authority to control land use, or even to acquire land, the Baffin Bay situation is superior to Harbor Island.

Two other issues surfaced in the Baffin Bay deliberations; oil and gas activities and illegal hunting and fishing (poaching). As the waters are entirely under state control, and the Governor of Texas would have an absolute veto over any aspect of a designation that he disagreed with, it is inconceivable that Marine Sanctuary status would carry with it Federal preemption of state oil and gas regulation. There is some limited oil and gas activity in parts of Baffin Bay now, and that activity would continue after designation unless the State of Texas desired to stop it. Poaching, both of fish and of deer (hunters shooting from boats), was raised several times as one problem that might be alleviated if Baffin Bay became a sanctuary.

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME

A. SITE NAME: Big Bend Seagrass Beds, Florida

B. LOCATION: (GULF COAST REGION)

1. LATITUDE/LONGITUDE: Southeast along Florida's west coast from 30°05' N to 29°10' N
84°20' W 83°00' W

2. DESCRIPTION: The Big Bend area of Florida may be defined as a huge, open-water estuary. This site is composed of extensive, shallow-water seagrass beds extending up to 22 mi (35 km) offshore in the "big bend" region of Florida. These beds constitute a vastly productive habitat supporting a rich diversity of marine organisms. The geological structure of the area is characterized by a thin veneer of quartz sand and organic debris overlying the limestone plateau of the Ocala-Middle Ground Arch. Occasional limestone outcrops protrude through this veneer to provide hard substrate. The most distinctive topographic feature of this area is the Cedar Keys where there are beautiful sand beaches. Offshore from the beaches are seagrass (e.g., Thalassia testudinum, Syringodium filiforme, Halodule wrightii) tidal flats. The islands are composed of beach sand. The gradually sloping karst features of this area, the large expanse of undeveloped shoreline, and lack of intracoastal boat traffic are critical factors in maintaining the quality and stability of these seagrass beds. Within the 1,160 mi^2 (3,000 km^2) of productive sea bottom in this area, two alternative sites (see map) are proposed:

Alternative I runs from the mouth of the St. Marks River to Live Oak Point encompassing a zone some 10 mi (16 km) wide and 40 mi (47 km) long for a total of 400 mi^2 (1,036 km^2).

Alternative II extends from south of the Crystal River to the mouth of the St. Marks River as a band approximately 145 mi (232 km) long and 7 mi (11 km) wide for a total of approximately 1,015 mi^2 (2,252 km^2).

Within these two alternatives, the Site Evaluation Committee recommends that an appropriate area of 100 mi^3 (256 km^3) be selected.

The inshore boundary of both areas is the intertidal zone, characterized by no wave energy and gently sloping, sandy to sandy-mud beaches fringed by oyster reefs. The offshore boundary roughly follows the 33 ft (10 m) depth contour. The boundaries of the proposed site encompass both State and Federal waters.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The area under consideration is significant in relation to its level of primary and secondary productivity.

2. The area under consideration is of special interest because it supports a biological assemblage unique to its biogeographic region and subregion.

3. The area under consideration is important to life history activities of indigenous marine organisms.

4. The area under consideration contains fish and shellfish species and fishery habitats which are important to the recreational and commercial fishing industries, and for which consideration and management is in the public interest.

5. The area under consideration provides exceptional opportunities for research in marine science and resource management.

6. The area under consideration provides an excellent potential opportunity to interpret the meanings and special relationships of marine resources.

7. The area under consideration is threatened by a gradual deterioration of the water quality as a result of agricultural activities, coastal community development, increased channel dredging activities, and municipal and industrial waste disposal practices which alter water chemistry, water flow patterns, and nutritional characteristics of ambient water.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Florida's Gulf coast seagrass beds constitute a uniquely productive ecosystem and a nursery ground for juvenile and developing fish of the eastern Gulf of Mexico fisheries. They represent the largest seagrass beds in the Gulf of Mexico. Seagrasses are extremely sensitive to increases in turbidity; the Big Bend Seagrass Beds are perhaps the most vulnerable to water-quality alterations generated within the adjacent river drainage systems. The seagrass community greatly increases the surface area available for plants and animals and provides a suitable substrate for many organisms that would not be able to colonize bare sand. In this way, the seagrass beds sustain the growth and proliferation of vast numbers of marine macroinvertebrates, sponges and algae which interact in a delicately balanced food web that supports several commercially important species such as oysters, scallops, blue crab, stone crab, shrimp, red drum, spotted sea trout, and mullet.

In addition to supporting a rich diversity of food organisms for commercially important indigenous and migratory species of finfish, detrital material derived from the seagrass beds may also provide an important source of nutrition supporting the adjacent oyster reef communities.

The area from the Suwannee River to Chassahowitzka Bay is an important habitat for the rare and nearly extinct West Indian Manatee (Trichechus manatus). It is listed as "depleted" under the Marine Mammal Protection Act. Approximately 120 manatees regularly use the headwaters of the Crystal and Homosassa Rivers as winter warm-water refuges. During the summer, from March to October, the animals disperse along the coast from the Chassahowitzka River north to the Suwannee River. Over 50 animals use the mouth of the Suwannee River and fewer use the Chassahowitzka, Homosassa, Crystal, and Withlacoochee Rivers. The seagrass beds around these rivers are an important food resource for the manatees, and the sheltered creeks and bayous are important calving areas. According to studies performed by the U.S. Fish and Wildlife Service, this is the only manatee population in Florida which has shown a net increase in numbers over the last few years. The proposed site represents the northernmost range of the West Indian Manatee. The inshore waters of the Big Bend Seagrass Beds area are frequented by bottlenose dolphins.

All four genera of thecophoran sea turtles (i.e., Ridley, leatherback, green, and loggerhead) are in some degree associated with these seagrass flats--thus the name "turtle grass" for Thalassia, one of the principal species in the habitat. The Big Bend Seagrass Beds have historically been the principal migratory stopover station and feeding ground of both the very highly endangered Kemp's ridley turtle (a species on the very brink of extinction) and the green turtle (Federally listed as "endangered" in this portion of its range). The loggerhead is Federally listed as "threatened."

The American alligator (Alligator mississippiensis) has been observed in the general vicinity of the proposed site. Alligator populations in southern portions of the proposed Sanctuary appear to be increasing, although the species is still (Federally) considered "threatened" in Florida.

At least eight pairs of American bald eagles (Haliaetus leucocephalus) winter and breed in the general area, which represents the northernmost concentration of active nests on the Florida Gulf coast. The bald eagle is Federally listed as an "endangered" species.

More than 75 species of spectacular wading birds and other waterfowl utilize the area extensively during fall and winter. Species include gadwalls, pintails, American widgeons,

northern shovelers, mallards, blue-winged teals, ring-necked ducks, and lesser scaups. This area is host to the largest Florida concentration of wintering redhead ducks. Seasonal or year-round residents within the St. Marks and Cedar Keys National Wildlife Refuge complex generally include ospreys, Canadian geese, egrets, herons, white ibises, and endangered brown pelicans. Cedar Keys, in particular, is noted as one of the largest nesting colonies in the South.

Cedar Keys is the northernmost range of red, white, and black mangroves in Florida. The extensive seagrass community plays a vital role in maintaining a balanced ecosystem among all types of marine life which depend upon the waters of the Gulf of Mexico for their survival.

Adjacent uplands are owned primarily by paper company/silvaculture interests and the U.S. Fish and Wildlife Service. Much of the paper company land is leased to the State for wildlife management, especially the northern portion. Most of the area is considered "pristine" except for the Fenholloway River which drains effluent from a paper mill. This effluent has influenced the health of seagrasses near the mouth of that river. Water quality in the Fenholloway River has improved greatly during recent years.

The U.S. Department of the Interior, Bureau of Mines, reports that undeveloped deposits of limestone and peat occur nearshore at many locations along the Big Bend, and there exists a potential for heavy mineral deposits. Though efforts by the mining industry to control pollution have been highly successful, a small amount of pollution is sometimes uncontrollable.

Those areas in Federal waters which lie in the Outer Continental Shelf (OCS) are being considered for leasing as part of the proposed OCS oil and gas Lease Sale No. 79. The magnitude of resource potential is unquantified at this time. If development occurs, it is likely that portions of the site may be needed as OCS oil and gas pipeline corridors. Portions of the general area, however, have been designated as "no activity zones" by the Bureau of Land Management.

2. HUMAN USE VALUE

The Big Bend coast currently supports recreational and commercial fishery activities which are vitally important to the economy of the Big Bend area. Though population densities along the coast remain low, the growth of communities along the rivers has been accompanied by a tremendous growth in sportfishing. In recent years, competition between commercial and sportfishing has accelerated, and problems have arisen between various commercial fishing interests. Competition for the oyster crop has developed as Apalachicola Bay shellfishermen migrate down the Big Bend coast when the Bay is closed because of degraded water quality. The St. Marks, Suwannee

River, and Cedar Key National Wildlife Refuges, bordering Alternative II, provide access to this area through pristine corridors that enhance the value of the proposed site as a region of high interpretive value for school children, graduate students, naturalists, and professional research scientists. In addition, the Cedar Keys (forming the southernmost boundary of Alternative II) have long been utilized as a field research site by environmental scientists at the University of Florida (Gainesville), which operates the Florida Marine Laboratory at Seashore Key. The St. Marks, Econfina, and Fenholloway estuaries have similarly been utilized by research scientists associated with Florida State University (FSU) in Tallahassee and its Ball Marine Laboratory. Each year several hundred students from Florida, Georgia, North Carolina, West Virginia, Pennsylvania, New York, Ohio, Michigan, Wisconsin, and South Dakota visit the area for study. Various Audubon, Sierra Club, and museum nature study groups have directed outings to the area. Graduate student and faculty research programs have involved the natural history, behavior, physiology, reproductive biology, taxonomy, and ecology of the flora and fauna, as well as community-level studies.

The proposed marine sanctuary would provide an excellent research opportunity because of the existing natural resource data base and its proximity to laboratory facilities, and because the commitment to marine ecological research is well established in the area. The FSU Ball Marine Laboratory, as well as its adjoining estuarine and coastal marine regions, has been designated an Experimental Ecological Reserve by the Institute of Ecology under a study sponsored by the National Science Foundation. However, many of the ecological relationships unique to seagrass communities have not been sufficiently explored or mapped. Seagrasses are highly sensitive to environmental perturbations. Studies are needed to determine the loss of seagrasses attributable to industrial waste, nonpoint-source pollution, domestic sewage disposal, and other water quality problems in the area. Studies are also needed to understand the relationship of the seagrass beds and the rich sponge-soft coral communities situated just seaward of most of the seagrass beds.

Both Federal and State concerns are represented in the area. As mentioned before, the Federal government manages and operates (1) the St. Marks National Wildlife Refuge bordering Apalachee Bay, (2) Suwannee National Wildlife Refuge, and (3) Cedar Keys National Wildlife Refuge. The State manages the Aucilla Wildlife Management Area (which extends south along the coast from the St. Marks National Wildlife Refuge) and the Cedar Key Scrub State Preserve (adjacent to the boundaries of the proposed site) and retains jurisdiction over the coastal waters of the State to a distance of three leagues from shore.

Lands bordering the Big Bend Seagrass Beds are open to private and port authority development. Development plans are

on the drawing boards in almost every county. The area's population is expected to double by the year 2000. Shore-based construction activities are likely to adversely impact these sensitive seagrass beds. The Nature Conservancy currently has an option to purchase several islands which had previously been destined for residential development in the King's Bay section of the Crystal River. If the necessary funds are obtained to buy the islands, The Nature Conservancy will lease them to the U.S. Fish and Wildlife Service (at a cost of $1.00 per year) so that the Service may manage the islands as part of the National Wildlife Refuge system.

The waters around the Crystal River islands are designated as a manatee sanctuary by the State of Florida. However, other waters within the migratory range of the Florida manatee are not afforded this same protective status.

The Governor's Planning and Management Committee for the Suwannee River has written a comprehensive plan for the river, its tributaries, the Cedar Keys National Wildlife Refuge, Lower Suwannee National Wildlife Refuge, and the Cedar Key Scrub State Preserve, which provides for the coordination of management programs and protective measures at all levels of State government. The River has been classified as an Outstanding Florida Water (OFW) and is therefore afforded the highest protection. This classification insures no further degradation from industrial or municipal waste-water discharges. Waters within the National Wildlife Refuges and State Preserves are also classified OFW. This includes the lower St. Marks, Aucilla, and Waccasassa Rivers.

Still pending is a proposal to complete the Big Bend segment of the U.S. Intracoastal Waterway.

Research indicates that these seagrass beds are important in damping storm waves.

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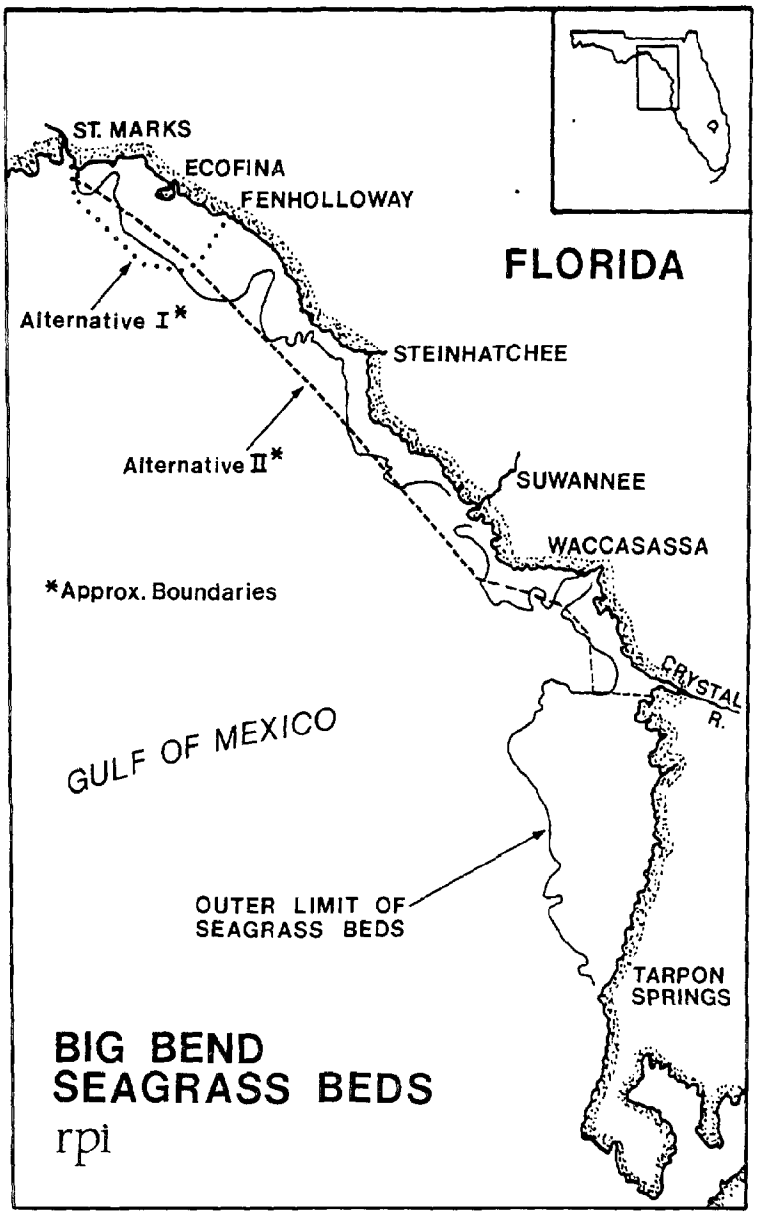

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME

A. SITE NAME: Florida Middle Ground, Florida

B. LOCATION: (GULF COAST REGION)

1. LATITUDE/LONGITUDE: The five corners of this site (conforming to a proposed Fishery Management Council habitat area of particular concern) are located at:

a)	28°42.5' N	84°24.8' W
b)	28°42.5' N	84°16.3' W
c)	28°11.0' N	84°00.0' W
d)	28°11.0' N	84°07.0' W
e)	28°26.6' N	84°24.8' W

2. DESCRIPTION: The Florida Middle Ground is the most northern example of a highly productive coral and algae reef community covering some 460 mi^2 (1200 km^2), approximately 95 mi (152 km) south of the northwest Florida coast and 100 mi (160 km) northwest of Tampa. This rugged hard bottom, representing drowned karst topography, has numerous steep limestone escarpments rising 33-49 ft (10-15 m) above the surrounding sand-shell bottom. Depths range from approximately 80 to 140 ft (24 to 42 m). The proximity of west Florida estuarine waters, Florida bay waters, and the Gulf Loop Current makes this a hydrologically complex area.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. This is an area of extremely high biological productivity and diversity and represents the northernmost extension of Caribbean reefal communities in the Gulf of Mexico.

2. The proposed area is highly utilized for recreational fishing and diving.

3. The area presents interacting resource management challenges, since oil and gas leases exist on or near proposed sanctuary.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Florida Middle Ground represents the northernmost extension of abundant Caribbean reefal communities in the Gulf of Mexico. The primary productivity of this area is very high, and zooplankton standing stocks are seasonally large. This is an area of great biological diversity; 170 fish species, 75

molluscan species, 56 decapod-crustacean species, 41 polychaete species, several dozen species of sponges, and 91 algal species, including 6 algae newly reported for Florida and the eastern Gulf of Mexico, as well as numerous hard and soft coral species, are known to occur within the proposed sanctuary.

This site has a mixed temperate and tropical ecological composition with a strong tropical affinity because of transportation by the impinging Gulf Loop Current of organisms northward to the site.

2. HUMAN USES

This area is fished extensively. The commercial harvest of grouper and snapper from this area is large each year. Recreational fishing boats from Clearwater, St. Petersburg, Panama City, Tarpon Springs, Dunedin, and Sarasota frequently fish this area during multiple-day outings. Fishery management in the area has been addressed by the Gulf of Mexico and South Atlantic Regional Fisheries Management Councils. The area has been designated as a Habitat Area of Particular Concern.

This site has been the subject of research by scientific investigators from many institutions, including Florida State University, Dauphin Island Sea Lab, the Florida Department of Natural Resources, and the National Marine Fisheries Service. This site presents excellent opportunities for future research.

Coral collecting by scuba divers, and anchoring in this area may have some impact upon the site.

The area includes approximately 60 OCS tracts and will again be considered for leasing as part of Lease Sale No. 79. Currently available information indicates that oil-and-gas resource potentials in this area are limited. However, only one well has been drilled on the Florida Middle Grounds, and it is possible that significant resources could be discovered in an area of this site. Portions of the Middle Ground have been designated "no activity zones" by the Bureau of Land Management.

Reconnaissance offshore drilling has located deposits of heavy minerals and phosphate nodules. No deposits of sufficient size or grade to be profitably mined have been located, but drilling has been very limited.

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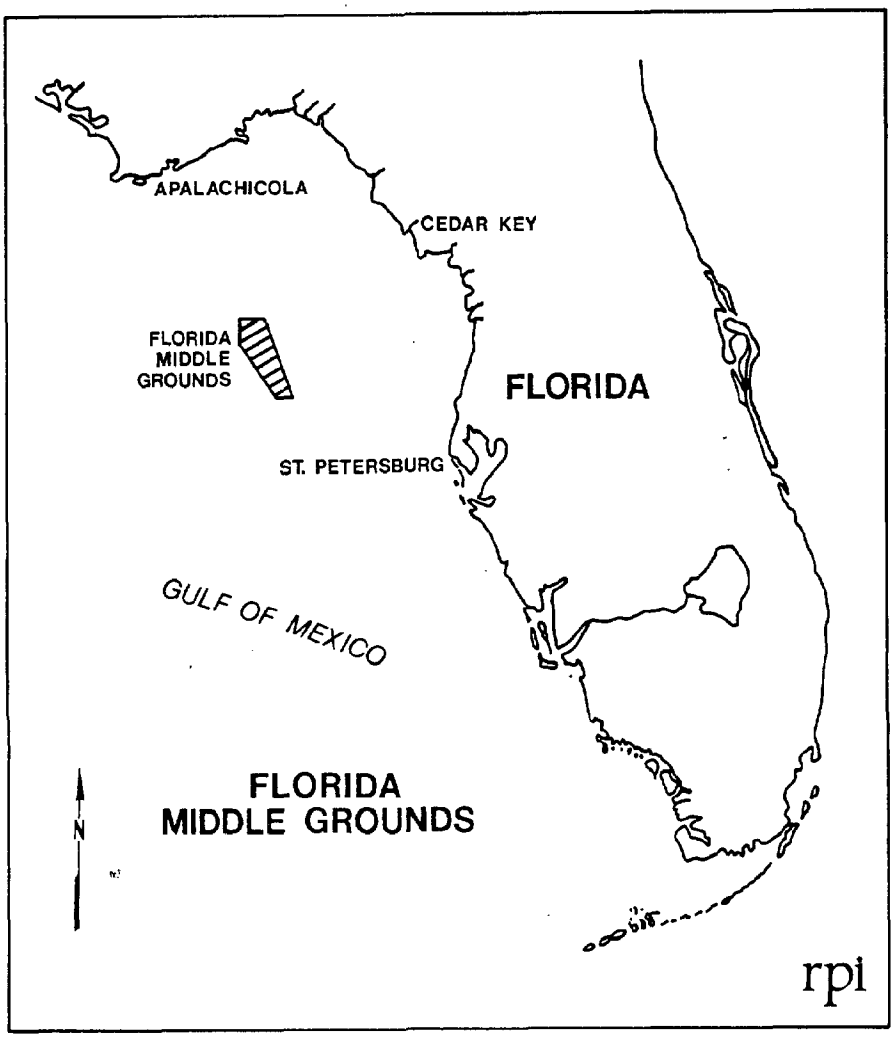

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME

A. SITE NAME: Shoalwater Bay-Chandeleur Sound, Louisiana

B. LOCATION: (GULF COAST REGION)

1. LATITUDE/LONGITUDE: 29°48' N, 88°58' W

2. DESCRIPTION: This proposed sanctuary occupies approximately 80 mi^2 (207 km^2) of pristine, shallow-water seagrass and algae beds located upon a subsiding remnant of abandoned Mississippi River delta (see map). Geologically, the area is highly dynamic. Unlike most barrier-island chains of the U.S. Atlantic and Gulf coasts, the Chandeleur Island chain (a transgressive barrier island arc) has no outside sediment source. It is the product of eroded and reworked deltaic deposits and is expected to move westward and diminish in size. The triggering mechanism for migration and erosion is hurricane activity, and the island chain has a remaining life expectancy (in a subaerial state) of one to two centuries. The sandy bottoms of the proposed marine sanctuary contrast with the turbid fine-grained bottoms in other portions of this deltaic region. Water depths within the proposed sanctuary are generally less than 23 ft (7.1 m) below the Gulf coast low waterline. Water currents are driven by tidal range differences at openings into Chandeleur Sound as well as by wind-generated surface stresses.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The proposed marine sanctuary is composed of highly productive, pristine seagrass beds and mangrove stands that provide a habitat for many species, including several bird species and sea turtles on the endangered species list.

2. The proposed area is significant in relation to its level of primary and secondary productivity.

3. The proposed site is an important spawning and nursery ground for commercial fishing, shellfishing, and crabbing industries operating within of the Gulf of Mexico.

4. The proposed area provides excellent opportunity for research in marine science and management practices.

5. The conjunction of the proposed site with Breton National Wildlife Refuge would provide adequate protection for resident and

migrating wildlife, and would provide a research/educational focus to the region.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The proposed site is different from most of the Mississippi deltaic plain nearshore waters. Sandy shoals in proximity to deep Gulf waters are an uncommon physiographic feature of the Louisiana coast in particular and of the northern Gulf coast in general. That feature, along with winter water temperatures moderated by the Florida current, and an excellent nekton foraging habitat (i.e., seagrass and marine algae beds), provides suitable conditions for the presence of several nekton species that are rare elsewhere in the northern Gulf. More than 80 percent of the nekton species collected by Lasca (1973) were juveniles or members of the subzero class, indicating the importance of the area as a breeding/nursery ground. Included were several species of commercial and recreational importance.

The neighboring islands support the northern limit of black mangrove. Investigators have identified 21 species of tropical marine algae which are not found in nearby Mississippi Sound. Black mangrove stands, salt marsh, seagrass beds, benthic algae, and phytoplankton all contribute to the high primary productivity of this area.

Dense stands of manatee grass (Syringodium), turtle grass (Thalassia), shoalgrass (Halodule), and widgeon grass (Ruppia) provide an important shallow-water habitat and spawning/nursery ground for numerous finfish and shellfish of commercial value. All five species of marine turtles which inhabit the Gulf of Mexico historically have been known to forage in this area. These are the Atlantic loggerhead turtle (Caretta caretta), Federally listed as a threatened species, and four endangered turtles: hawksbill (Eretmochelys imbricata), Atlantic ridley (Ledipochelys kempi), leatherback (Dermochelys coriacea), and the Atlantic green (Chelonia mydas). Evidence indicates that the loggerhead turtle nests in the area. The bottlenose dolphin is commonly observed in the area.

The island shores adjoining the proposed site support black mangrove (Avicennia germinans) and intertidal marsh grass communities. Approximately 13,000 migratory waterfowl rely upon the shoals of this area for winter foraging, and seabirds have established breeding colonies on the islands. Most of these birds are redhead ducks, but other species include bufflehead, ruddy duck, ring-necked duck, and lesser scaup. There are some 25,000 bird nests on Breton National Wildlife Refuge. These include canvasback ducks, the rare reddish egret, caspian and royal terns, black skimmers, laughing gulls, ibises, herons, the rare oystercatcher, plovers, blue

geese, snow geese, frigate birds, white pelicans, peregrine falcons, hawks, ospreys, bitterns, and sandpipers. Sandwich terns, sooty terns, and gull-billed terns are among the principal nest builders at the refuge. The endangered brown pelican, once eradicated from this area, has been successfully reintroduced onto the North Islands; some 400 brown pelicans currently inhabit the area.

2. HUMAN USES

The area receives moderate-to-heavy recreational fishing use since the Chandeleur Islands are located within the Breton National Wildlife Refuge. During 1980, approximately 2100 recreational visits were made to the refuge; most of these visits were for the excellent sportfishing, crabbing, shrimping, boating, and waterfowl hunting which the area offers. Picnickers and wildlife observers also use this area. The Chandeleur Islands, within the refuge, have been designated a "wilderness area."

While the area is far removed from urban areas, it is accessible to the universities of three states: Mississippi and Alabama (through Gulf Port or Biloxi), and of course, Louisiana (from launching sites in the southeastern portion of St. Bernard Parish). Professional researchers of various marine science institutions (including Louisiana State University, University of Southwestern Louisiana, Tulane University, and the University of Texas) conduct investigations within the area proposed for marine sanctuary status. At least ten Louisiana schools could readily utilize the site as an interpretive area and as a focus for marine research or weekend field trips. The St. Bernard Parish Planning Commission's Parish Coastal Zone Management Program owns a 3-story school building on Delacroix Island which could be used as an interpretive center and/or base from which to conduct field research.

Federal, State, and Parish entities all have some authority over activities within the proposed area. The proposed site encompasses a portion of the Breton Bird Refuge which provides protective measures for migratory and resident species. Several other federal wildlife refuges are located in coastal Louisiana as well. These include the Delta, Lacassine, and Sabine National Wildlife Refuges. In addition, the State of Louisiana has several refuges and management areas in the coastal zone and maintains jurisdiction over activities conducted in the coastal zone.

There is considerable fishing activity in the sea beds behind Freemason and North Islands. The area provides safe harbor for Mississippi and Louisiana fishing vessels enroute to port from offshore fishing grounds. The major commercial fisheries in this area of the Gulf include pink shrimp, brown shrimp, white shrimp, mullet, black drum, Spanish mackerel,

menhaden, oysters, hard-shell clams, and blue crab. The Gulf of Mexico Fishery Management Council, in cooperation with the State of Louisiana, enforces a regional Gulf Coast Fishing Management Plan.

Oil-and-gas activities already exist in the area, and it is believed that the area contains significant potential for further commercial oil-and-gas development.

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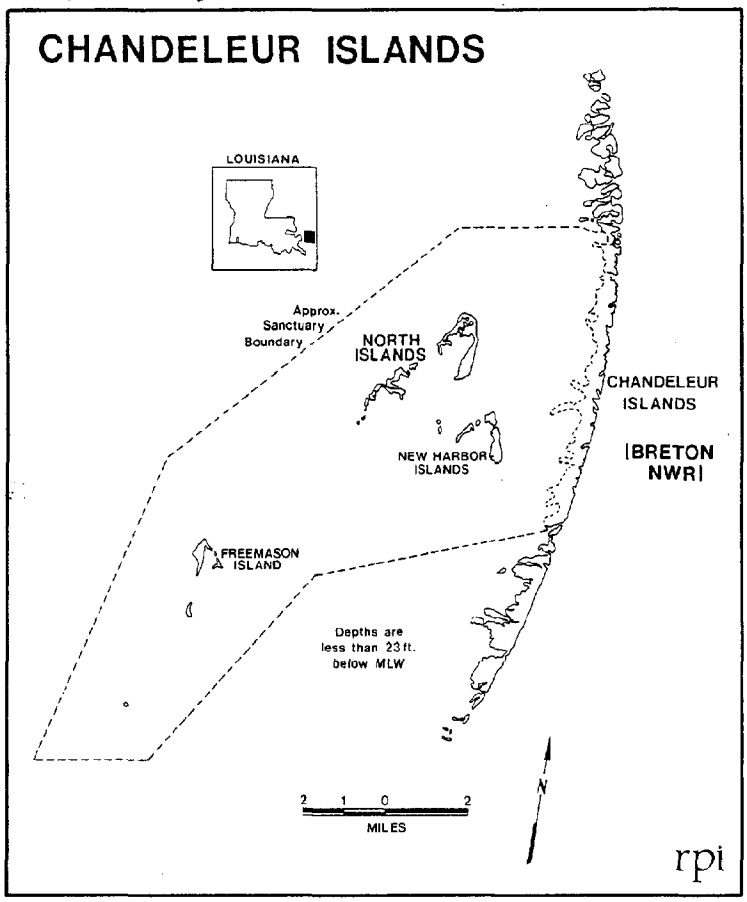

LOCATION MAP
(Subaerial Land Excluded)

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME

A. SITE NAME: Flower Garden Banks, Texas

B. LOCATION: (GULF COAST REGION)

1. LATITUDE/LONGITUDE: East Bank 27°54'32" N
93°36' W

West Bank 27°52'27" N
93°48'47" W

2. DESCRIPTION: The banks are located 123 mi (198 km) due south of Sabine Pass, Texas, on the outer edge of the continental shelf. They consist of east and west sections approximately 16 mi (25 km) apart and represent the northernmost thriving, shallow-water, tropical coral reef community on the eastern coast of North America. The formation of the banks is related to the upward intrusions of salt plugs from deeply buried deposits. Both are surrounded by clear waters 325-390 ft (100-120 m) deep. The living reefs rise from a depth of 148 ft (45 m) to a crest at 66 ft (20 m). The proposed borders of the sanctuary conform to the Bureau of Land Management "no activity zone" and encompass a total of 44 mi^2 (114 km^2). Other hard-bottom banks occur in this part of the Gulf, but only the Flower Gardens are located far enough from shore to be away from the sediment-bearing coastal water masses and have crests far enough off the bottom to be above the turbid water layer which directly overlies the continental shelf in much of the Gulf of Mexico.

II. RATIONALE FOR CONSIDERATION AS SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The Flower Gardens' biological communities represent the northernmost extent of tropical Atlantic coral reef communities in the western Gulf of Mexico.

2. The Flower Gardens' coral reefs may serve as a regional "reservoir" of shallow-water Caribbean reef fishes and invertebrates.

3. The Flower Gardens offer opportunities for scientific research and represent an aesthetic and educational resource because of the rich diversity of tropical marine floral and faunal species which inhabit the reefs.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The Flower Gardens represent a unique and valuable tropical coral reef community. The biotic character is of special interest, because it supports unique biological assemblages such as a hermatypic (reef-building) coral community, leafy algal fields, algal nodule terraces, and deep-water benthic biota. Several hundred species of tropical Atlantic fishes and invertebrates (many of which have not been recorded elsewhere in the northern Gulf of Mexico) thrive at the sites. The warm, clear, oceanic Gulf waters favor Caribbean reef development.

Encrusting coralline algae are the dominant plants on the banks, and leafy algae are abundant. The faunal components are dominated by hermatypic corals (Montastrea annularis, Porites astreoides, M. cavernosa, and Diploria strigosa) and associated reef fishes and invertebrates. The Banks exhibit a strong vertical biotic zonation pattern characterized by corals on the higher elevations, by an algal-sponge zone lower down, followed by a crinoid-asteroid zone at depths from 240 to 280 ft (73-85 m). Macroinvertebrates inhabiting the Banks include frame-building corals and fan corals, sponges, polychaete and sabellid worms, starfish, sea urchins, brittle stars, basket stars, gastropod snails, scaphopods, clams, mantis shrimp, snapping shrimp, amphipods, barnacles, a variety of crabs, bracheopods, and the rare cheilostome bryozoans. Hundreds of thousands of fish feed and find shelter among the Banks. Genera include damselfish, blue chroms, pufferfish, red and long snout butterflyfish, parrotfish, hogfish, wrasses angelfish, redlip blennies, gobies, goatfish, barjacks, amberjack, great barracuda, hawkfish, filefish, triggerfish, trumpetfish, trunkfish, squirrelfish, and groupers.

2. HUMAN USES

The beauty and diversity of any coral reef community are an attraction to scuba divers from within and outside Texas. The Flower Gardens are relatively pristine and are isolated in the northern Gulf, making them quite rare and unique. Commercial fishing is common along the edges of the banks. Because of their distance from shore, the area does not attract many recreational divers.

A great potential for scientific research exists. The majority of research performed thus far has been conducted by Texas A&M University, the result of which is a great number of preserved collections and on-site transects. The first phase of studying the area (i.e., systematics, descriptive ecology, and quantitative ecology of corals) is nearing completion. Major groups, such as sponges and seaweeds, remain to be identified to species. In the wake of these initial studies, a great potential exists for further ecological, physiological, and other

peripheral research. The community-structure investigations completed thus far have revealed valuable data on biological zonation and indicate directions for future research. The National Marine Fisheries Service, under a NOAA/EPA interagency agreement, is overseeing a study of the Flower Garden reef fish population.

A final special feature is the evidence derived from Flower Garden sediments which supports the theory that the late Wisconsin sea level withdrew from -300 ft (-91 m) to -416 ft (-127 m), followed by a rise to current sea level beginning about 18,000 years ago. A great potential for such research exists in the hard bank, which provides greater insight into the formation of the land and the oceans.

Of major concern to the integrity of the Flower Gardens is the mooring of ships directly on the banks. Mechanical damage from anchors is evident today and is increasing. This not only directly destroys coral, but also may cause the death of damaged coral through pathological infections of lacerated tissue.

The U.S. Minerals Management Service and the U.S. Environmental Protection Agency currently regulate oil and gas activities at the Flower Gardens. Areas adjacent to the site are used as mooring locations for large crude oil tankers and other commercial vessels. Since the prohibition of reef anchoring of vessels over 100 ft in length has been eliminated from the Coral Reef Fishery Management Plan adopted by the Gulf of Mexico and the South Atlantic Fishery Management Council, continued damage to the reef by heavy anchors and chains remains a major concern. In addition, areas surrounding the site appear to offer potential for commercial oil and gas development. Eleven tracts adjacent to the Banks have been leased to oil and gas companies. Drilling platforms are situated near the Banks. As commercial development advances, recreational use of the Banks may increase.

Offshore incineration of PCBS and other toxic chemicals is conducted within 50 miles of the Banks. Nearby offshore dumping and drilling are continuing practices authorized under NPDES-EPA permits.

The Banks are believed to be an important nursery area for brown shrimp and, therefore, are important to the commercial shellfishing industry.

The Gulf of Mexico and the South Atlantic Fishery Management Councils have developed a Coral Fishery Management Plan designed to preserve this and other coral habitats within the Gulf.

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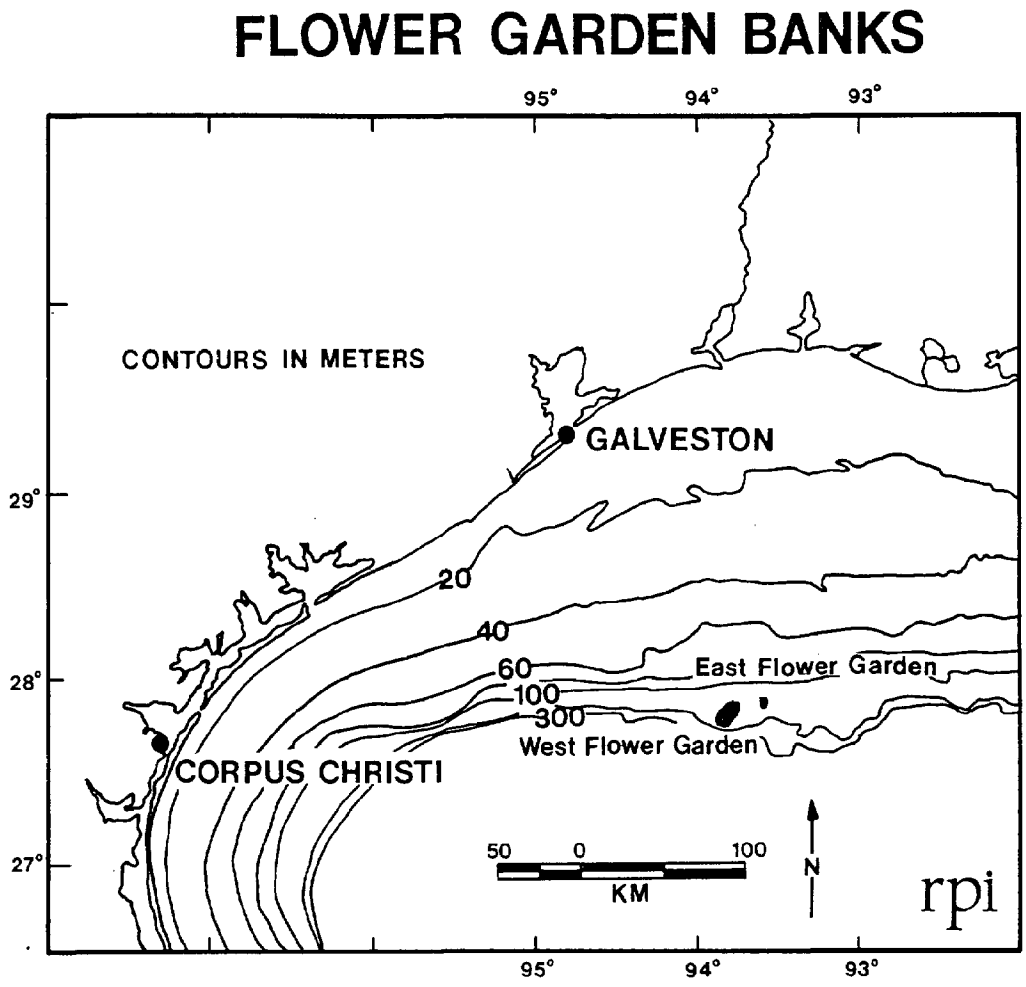

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Baffin Bay System, Texas

B. LOCATION: (GULF COAST REGION)

1. LATITUDE/LONGITUDE: 17°47' N, 64°45' W

2. DESCRIPTION: Baffin Bay is a system of interconnecting bays forming a natural unit of about 61,000 acres at high tide. The candidate site covers approximately 95 mi^2 (246 km^2), entirely within Texas State waters, and includes Baffin Bay, Salt Creek, Cayo Infernillo, Cayo del Grullo, and Alazan Bay. Approximately 25 percent of the Bay system is composed of intertidal salt flat communities. The waters of the Bay are confluent with the upper Laguna Madre; however, the waters of the Bay system remain notably hypersaline. Though the average salinity of the Bay system is determined to be 27 $^{o}/_{oo}$, the salinity commonly ranges between 45 $^{o}/_{oo}$ and 65 $^{o}/_{oo}$. With rainfall measured at 25 in/yr, and evaporation measured at 60 in/yr, salinity extremes of 0 $^{o}/_{oo}$ and 100 $^{o}/_{oo}$ frequently occur during periods of intense rainfall and drought, respectively. The pH of the Baffin Bay system varies between 8.3 and 8.5 throughout the year.

The Baffin Bay complex occupies a former river valley, drowned as the sea level rose after the last ice age 5,000-10,000 years ago. Depths throughout this area are shallow, averaging less than 9 ft (3 m). Extensive areas of soft black and grey mud, rich in hydrogen sulphide, cover the central bay bottoms. Isolated reef rocks and reef fields, composed of masses of calcareous tubes of living and dead serpulid worms, are scattered over the bay bottom, notably across the mouths of Baffin Bay and Alazan Bay. These reefs form hazards to navigation.

Turbidity is often high in the site due to several factors. Persistent winds continuously resuspend bottom sediments. Predominantly southeasterly winds cause persistent wave agitation to be greatest in the vicinity of Kleberg Point. In addition, irregularly distributed cloudbursts inundate ephemeral streams within the surrounding watershed, causing erosion and migration of upland clays into the Baffin Bay system. Much of the shoreline of the Baffin Bay complex is experiencing long-term erosion, but portions are accreting, notably in the upper reaches of the system. Astronomical tidal range in the site is low, less than a foot; but fluctuations of water level, driven by the wind (i.e., "wind tides"), cause periodic inundation of flats around the margins of the site. Hurricane tides at regular intervals flood the shorelines. Shallow pools around the site contain algal mats and mineral salt deposits which

precipitate out of solution due to the high rates of evaporation. Small marshes fringe portions of the system. Baffin Bay beaches often contain oolitic sand and shell fragments.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. Baffin Bay is a relatively large hypersaline embayment, unique to U.S. and most world environments.

2. Nearby Bird Island, managed by the Texas Parks and Wildlife Department, and Padre Island National Seashore both support continuing study programs. The area's high potential for future research is also enhanced by the proximity of the University of Texas' Marine Science Institute at Port Aransas, Corpus Christi State University, and Texas A&I University at Kingsville.

3. Public access to the site, over land, is provided only along the western shoreline where a paved highway leads to a site planned for a future research facility. The site, near Riviera Beach (see map), is adjacent to Texas A&I University's marine station.

4. The biological productivity of the area supports important commercial and recreational fisheries, and waterfowl populations of significant recreational value.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The Baffin Bay system, because of its hypersalinity caused by its semiarid location and limited freshwater inflow, is an unusual habitat, supporting a unique assemblage of marine organisms. It is one of only two such environments in the world (the other is the Sivash of the Crimea located west of the Sea of Azov). Species diversity is low and population density is extremely variable. Populations of a few benthic species may vary from 1-2 individuals per m^2 to 2000-3000 per m^2, depending upon the suddenness of the changes in temperature and salinity.

Indian middens composed of oyster shells in the vicinity of Baffin Bay have been interpreted as evidence of lower salinities in the area during recent geologic time. But only euryhaline species tolerant of extreme salinity fluctuations and desiccation are capable of surviving in the area today.

Shoalgrass; widgeon grass, and detritus, blown into Baffin Bay from the Upper Laguna Madre, form a major component of

the diet of many waterfowl (i.e., pintail, American widgeon, and redhead) that feed and nest within the large expanse of mud flats adjacent to Baffin Bay. An estimated 50-75 percent of the entire North American population of redhead ducks overwinter in the Laguna Madre area adjacent to Baffin Bay. The Bay's resources support rookeries of a wide spectrum of upland birds, shorebirds, and migratory waterfowl, including Wilson's plovers, ruddy turnstones, least and western sandpipers, willets, American avocets, black skimmers, laughing gulls, snowy egrets, common egrets, great blue herons, and Louisiana herons. Baffin Bay is the principal breeding and resting area of the only nesting colony of white pelicans in Texas. It is an important feeding and resting area for brown pelicans and roseate spoonbills.

The copepod known as Acartia tonsa is abundant in Baffin Bay, where it has been observed to occur in salinities of up to 80 $^{o}/_{oo}$. It has been suggested that this species in Baffin Bay may in fact be unique. Floating red, brown, and green seaweeds, including calcareous forms, have been observed within the Baffin Bay complex; however, these algae originate from the Laguna Madre and are less salt-tolerant than the more prevalent microscopic algae, widgeon grass, and shoalgrass. Microscopic forms found within the site include many species of diatoms, flagellates, etc. The green alga Cladophora is the only species of higher algae living in the Bay.

Algal mats of nitrogen-fixing, filamentous blue-green algae (whose top surface areas are composed mostly of Lyngbya confervoides) occur in the intertidal flats and in the shallow waters of the Bay. The undersides of these algal mats contain purple bacteria, protozoans, diatoms, marine worms, and amphipods.

Baffin Bay is important to the production of finfish, shrimp, and crabs. The area supports a diverse biotic community that includes polychaetes, amphipods, grass shrimp, juvenile penaeid shrimp, pistol shrimp, crabs, bivalves, gastropods, killifish, pipefish, and pinfish. Commercially important species such as red drum, spotted seatrout, croaker, and black drum have been observed feeding throughout the area, along with rays, catfish, and sand trout.

Reefs formed from living and dead serpulid worm tubes are substrates for barnacles, amphipods, and mats of filamentous algae. Salt cedar, cactus grasses, and many other plants grow in isolated clumps around the shore.

2. HUMAN USES

The Baffin Bay system is not intensively developed nor is development around the Bay anticipated. Road access is limited. Riviera Beach and nearby Loyola Beach, with a total combined population of less than 1,000 persons, are the only communities

near the Bay. The Baffin Bay complex is surrounded by privately owned ranch lands and the Laguna Madre. Very little channelization, dredging, filling, and bulkheading have occurred along the shoreline.

Recreational fishing, duck hunting, bird-watching, and ranching are the major human uses of the Baffin Bay system. Commercial fishing in the proposed site is based at Riviera Beach. Major seafood species harvested in the vicinity of Baffin Bay include black drum, red drum (redfish), spotted seatrout, and brown shrimp. The State has imposed a moratorium on the commercial harvesting of spotted seatrout and redfish and regulates other commercial fishing activities within the Bay.

Recently, the Bay system was the site used to conduct a major project to assess the value of Baffin Bay as a nursery ground for black drum populations within the Gulf of Mexico. The study was conducted by researchers at Texas A&I University (Kingsville, Tex.) and was sponsored by the Caesar Kleberg Wildlife Foundation. The investigations produced a data base that characterizes the hydrology, benthic structure and fauna, and fish populations. Studies on the effects of hypersalinity on marine organisms and unique hypersaline algal flats on the Kleberg Point shoreline have been conducted by researchers at the University of Texas Marine Science Institute (Port Aransas, Tex.) for many years. The area is of special interest to paleontologists because the area contains the only known serpulid worm reef in the United States.

The Baffin Bay system is bordered on the east by the Padre Island National Seashore and on the north by the Audubon Society's Bird Island, both of which support continuing coastal and ecological research programs. Baffin Bay offers significant opportunities for scientific research which is not possible in any other bay in the United States.

Since the 1940s, oil companies have disposed of a considerable volume of oil field brines into Alazan Bay. Recently, oil and gas exploration and development activities have accelerated within the Bay system, but production remains low and no significant oil or gas reserves have been discovered in the area. A number of oil and gas pipelines traverse the Bay in some areas.

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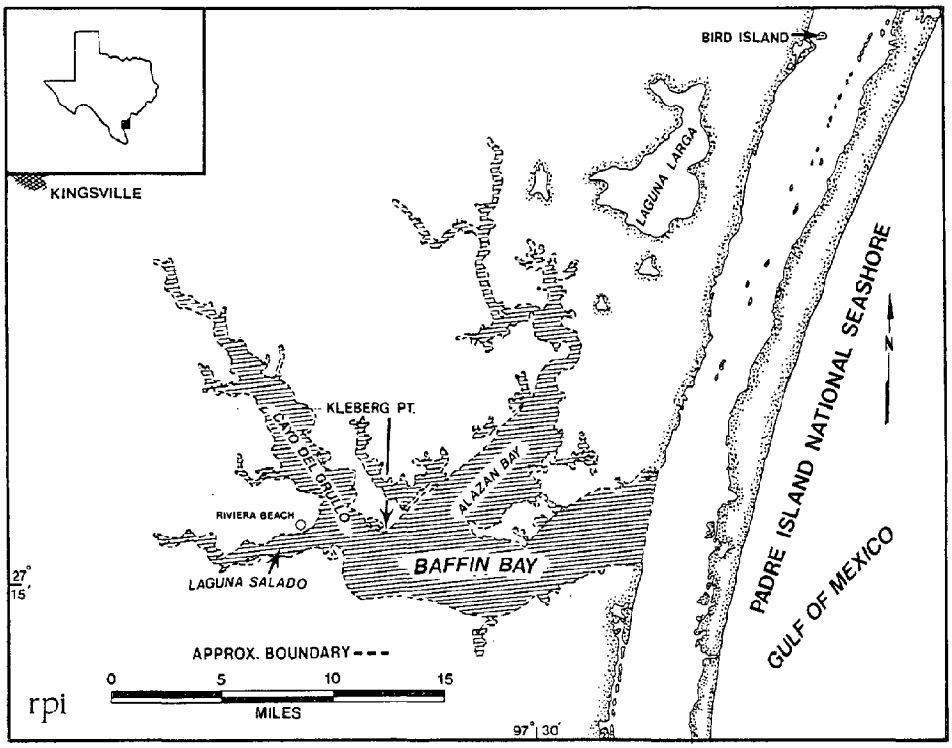

LOCATION MAP

NORTH ATLANTIC REGION

MARINE SANCTUARY SITE EVALUATION LIST
NORTH ATLANTIC REGION

MANAGEMENT OVERVIEW

1. Resource Evaluation Team

The North Atlantic resource evaluation team was initially comprised of four marine biological scientists, one each from Massachusetts, New York, Virginia, and the Smithsonian Institution in Washington, DC. The team leader was Dr. Maurice P. Lynch of the Virginia Institute of Marine Sciences, College of William and Mary. The other team members were Dr. Bostwick ("Buck") Ketchum, Professor-Emeritus from Woods Hole Oceanographic Institute; Dr. Jeffrey Levinton of the Department of Ecology and Evolution, State University of New York at Stony Brook, and Dr. Walter Adey, Director of the Marine Systems Laboratory of the Smithsonian Insitution.

At untold loss to the marine science community, Buck Ketchum died on July 15, 1982. He was replaced on the resource evaluation team by Dr. H. Perry Jeffries of the Graduate School of Oceanography, University of Rhode Island. Dr. Jeffries is also a biologist. During the site evaluation process, both Drs. Lynch and Jeffries made several contacts within their respective states with state government officials, environmental groups, and other marine scientists.

2. Site Evaluation and Public Participation Process

The team met on April 26-27, 1982, in Stony Brook, NY, for its initial consideration of potential North Atlantic sanctuary sites. Five potential sites were proposed after the team had evaluated 27 possible Marine Sanctuary sites, including all of the North Atlantic areas that were on NOAA's List of Recommended Areas (44 Fed. Reg. 62552, Oct. 31, 1979). Descriptions of the five sites were mailed to 250 individuals and groups, including 82 national organizations and Federal agencies, for comment. The initial five sites were:

NA-1. Isles of Shoals, ME and NH. This site encompassed the waters within a 3-mile radius of the Isles of Shoals, which are about 15 mi southeast of Portsmouth, NH, and lie astride the Maine - New Hampshire border.

NA-2. Plymouth Bay, MA. This 25 sq mi site included Plymouth Bay and the adjacent nearshore waters out to about one mile from shore.

NA-3. Barnstable Harbor, MA. This 18 sq mi Cape Cod site included Barnstable harbor and the adjacent waters out to about one mile from shore.

NA-4. Nantucket Shelf, MA and offshore. This was a 3-site proposal, including the 10 sq mi Nantucket Harbor, 345 sq mi of Nantucket Shoals, and 136 sq mi around Hydrographer Canyon.

NA-5. Virginia Barrier Island and Bays, VA. About 300 sq mi of waters surrounding the barrier islands of Virginia, from Chincoteague Inlet south to Fisherman's Island, were included in this proposal.

By the comment deadline of August 13, 1982, Chelsea had received 52 responses commenting on one or more of the five sites (75 responses were ultimately received). By the September 13 nomination deadline, six sites had been suggested by the public. Those sites were:

1. All Submarine Canyons off Georges Bank
2. The "hole in the Doughnut" area of Federal waters between Cape Cod and Nantucket Island
3. Stellwagen Bank, off MA
4. Narragansett Bay (3 sites), RI
5. Great Bay, NJ
6. Assateague Island, MD

The resource evaluation team met again on September 23, 1982, at the University of Rhode Island. At that meeting the team reviewed the public comments on their first five proposals, as well as the new nominations. The team concluded that two of the new nominations (Stellwagen Bank and Narragansett Bay) met the Marine Sanctuary criteria and that public comment should be solicited on those two proposals. They also reevaluated their original Virginia Barrier Islands and Bays proposal in light of the Assateague Island nomination, and determined that a new proposal should be constructed from those two. The team also reconsidered its original 3-site Nantucket Shelf proposal and decided to replace Nantucket Harbor with the "Hole-in-the-Doughnut" proposal received from the State of Massachusetts, and to replace Hydrographer Canyon with Oceanographer Canyon. The team was not of the opinion that Great Bay, NJ, should be proposed as a Marine Sanctuary, and they did not believe that there was any reason to include all three major submarine canyons rather than a single one. Four more site descriptions were then prepared for public comment, which were mailed to the original list for comment by November 22, 1982. The four new (or modified) sites were:

NA-4 Nantucket Shelf (modified)
NA-5 Virginia - Maryland Nearshore Waters and Barrier Island Bays (Modified)
NA-6 Stellwagen Bank
NA-7 Narragansett Bay and Block Island Sound, RI

In response to the second request for public comments, Chelsea received 92 responses, most of which were comments in favor of NA-5, the combined Assateague Island - Virginia Barrier Islands proposal.

2.1. The Maine Problem

At the beginning of the site evaluation process, Chelsea and the North Atlantic team were instructed not to consider the State of Maine because two contracts for Marine Sanctuary site evaluation were already underway in Maine. One contract had been let to the Marine Systems Laboratory of the Smithsonian Institution, and that project's principal investigator, Dr. Walter Adey, had since been named as a member of the resource evaluation team. The other contract had been let to the Maine Department of Marine Resources, headed by Dr. Spencer Appolonio. At an initial meeting of team leaders and NOAA personnel, the team leader, Dr. Maurice Lynch, was told that both contracts would produce nominations for Maine sites by the time of the second team meeting.

Neither contractor produced a recommendation by the time of the team's second meeting on September 23, 1982, and the entire coast of Maine might have been left out of the site evaluation process. Both contractors were then instructed by NOAA to submit site nominations immediately, so that the resource evaluation team could evaluate Maine sites along with the rest of the North Atlantic region. Those descriptions were received in early December, and were mailed out to the North Atlantic mailing list (except Virginia addressees) on December 17, 1982, with a 30-day deadline for comment. The two sites were:

NA-8. Frenchmen's Bay and the Gulf of Maine. A 407 sq mi site is next to Acadia National Park and extends several miles offshore to surround Mt. Desert Rock.

NA-9. Mid-coastal Maine. This 430 sq mi site lies to the west of Frenchmen Bay and takes in the waters around several offshore islands, three estuaries, and two bays.

The Maine public comment exercise turned out to be explosive. As the January 17 deadline approached, NOAA extended the comment period another 30 days, to February 17, 1983. Throughout the 60-day comment period, Chelsea periodically sent copies of all correspondence to the team members, with the final batch going to the team leader at the close of business on February 17. On or

about February 1, and again on February 18, 1983, Dr. Lynch polled the other team members -- with the exception of Dr. Adey -- by telephone to produce the final list of recommendations to NOAA.

3. Recommendations

3.1. The North Atlantic Team's Approach

The North Atlantic region contains two distinct biogeographic regimes; the Virginian and the Acadian. These two regimes meet in the area south of Cape Cod, and the transition area itself is as important as the two major regimes. The resource evaluation team sought to identify sites which would represent the Acadian and Virginian regimes, as well as the transition zone. At the same time that they were evaluating "representative" sites, the team tried to identify potential "unique" sites. The team believes that their final five recommendations meet both of those objectives.

3.2. Site Selection

The North Atlantic resource evaluation team recommends the following five sites to NOAA for placement on the Site Evaluation List. Without attempting to prioritize them, they are:

1. Virginia - Maryland Nearshore Waters and Barrier Island Bays, VA and MD
2. Narragansett Bay and Block Island Sound, RI
3. Nantucket Shelf
4. Stellwagen Bank
5. Frenchmen's Bay, ME

As part of the final regional report, RPI has prepared a set of short descriptions of each site, including a map showing the recommended boundaries of each proposed Marine Sanctuary. The balance of this part of the report contains highlights of the team's rationale for choosing each site, and comments on specific management issues that came to the team's attention during the process.

3.2.1 Virginia - Maryland Nearshore Waters and Barrier Island Bays, VA and MD.

This is the recommended Virginian site. It includes 1200 sq mi off the coasts of Maryland and Virginia, and extends 10 mi offshore. When the site was first put forward with only the Virginia offshore area included, it elicited 31 comments, 16 in favor, 8 opposed and 7 neutral. The local units of government opposed the proposal, but the State of Virginia officially adopted a "wait-and-see" attitude. At the same time, another 9 commenters recommended inclusion of the waters around Assateague Island (MD). It would be a mistake to take public support for granted on this site but the resource evaluation team believes that a Virginian biogeographic site should be on the final SEL.

When the Assateague nomination was added to the Virginia Barrier Islands proposal, the public response was overwhelmingly favorable. 64 commented, with 52 in support, 4 opposed and 8 neutral. The State of Maryland endorsed the new site, and Virginia was still willing to give it fair consideration. Local Virginia governments, however, are still opposed.

3.2.2. Narragansett Bay and Block Island Sound, RI

This site is the nearshore "anchor" in the biogeographic transition region between the Acadian and the Virginian regimes. Strong local support for this proposal was evidenced at the team's second meeting, where the nomination was defended by the new team member, Dr. Perry Jeffries of the University of Rhode Island. Although the site is entirely in State waters, it appears to have the support of the State of Rhode Island.

3.2.3. Nantucket Shelf

At the first team meeting, there was some interest in creating a "swath" sanctuary that would extend from Cape Cod to the southeastern edge of Georges Bank. This would have encompassed a large part of the biogeographical transition zone. In an effort to produce a manageable recommendation, the team proposed a nearshore site (Nantucket Harbor), a site on the shelf (Nantucket Shoals), and one of the canyons at the edge of the shelf (Hydrographer).

Between the two team meetings, the State of Massachusetts proposed the Federal waters between Cape Cod and Nantucket Island (the "Hole-in-the-Doughnut") as well as Great South Channel to the east of Nantucket Shoals. Cape Cod fishermen also asked the team leader to move the Nantucket Shoals boundary eastward to take in Great South Channel, which maintain is a major migratory route for commercial species.

Both of these suggestions were positively received, and the team made the appropriate changes at their second meeting. Massachusetts argues that their "Ocean Sanctuaries" under State law provide all of the protection necessary for Nantucket Harbor, and that only the Federal waters remain unprotected at this time. The team accepts the premise that the State Ocean Sanctuary statute functions as intended, and believes it would be presumptuous for the Federal Government to overlay that protection with yet another layer of regulation.

The rationale for initially picking Hydrographer Canyon rather than the better-studied Oceanographer Canyon at the first team meeting, was that it lay in a straight line drawn through the other two pieces of the team's initial proposal. At the second meeting the team agreed that they had no reason for selecting one over the other, but they did reconsider their earlier decision, and concluded that the extra attention paid to Oceanographer over the years may indicate that Oceanographer Canyon has more, or more interesting, resources than Hydrographer. Based upon this reasoning, the team recommends Oceanographer Canyon as part of the final Nantucket Shelf proposal.

The original proposal resulted in 22 comments, 14 supporting, 4 opposing and 4 neutral. The modified version elicited 17 responses, 10 in support, 1 opposing and 6 neutral.

3.2.4 Stellwagen Bank

This is a fairly large (480 sq mi) site, to the north of Cape Cod, that is known for its summer population of humpback, fin, minke, and northern right whales. It is adjacent to U.S. Army Corps of Engineers dredged material disposal site, which poses the only real conflict for Marine Sanctuary designation. Even that conflict appears to be a small one, hopefully corrected by trimming the northwest boundary of the proposed sanctuary.

Twenty-nine responded to the nomination, with 13 in support, 2 opposed and 11 neutral. Most of the latter were uncertain how the program worked or what the effect would be on commercial fishing. The Gloucester Fisheries Association and Gloucester Fisheries Commission expressed opposition only if commercial fishing would be affected.. The Massachusetts Office of Environmental Affairs, the Maine Department of Marine Resources and the Maine State Planning Office supported the proposal.

Some of the coastal communities are apprehensive about the potential designation of Stellwegen Bank as a Marine Sanctuary, but that is probably a result of the usual concern that fishing could be prohibited in a sanctuary. This site is the only one selected

by the North Atlantic resource evaluation team as a "special," rather than representative, site.

3.2.5. Frenchmen's Bay, ME

The resource evaluation team was of the opinion that an Acadian site should be placed on the Marine Sanctuary Site Evaluation List. Of the two sites recommended to the team, the Frenchmen's Bay-Gulf of Maine site was the preferred site based upon species representation and overall representation of the Acadian biogeographic province. [The resource evaluation team notes that Dr. Walter Adey was excluded from this decision, in light of the fact that he was the Principal Investigator on the NOAA contract that recommended Frenchmen's Bay.]

There was a tremendous response to this proposal - a total of 1,291 expressed their strong feelings, of which only 55 were supportive and 3 neutral. Environmental groups were unanimous in their support, while the fishing industry (with one exception) was unanimously opposed. Local governmental units were also opposed, as were state representatives from the area.

Early responses to the proposal were supportive. However, a substantial petition and post-card attack was organized in opposition to the proposal, which produced approximately 150 preprinted post-cards and over 1,000 signatures on various petitions. Individual letters of opposition (other than the post-cards) came from 8 fishermen and 16 others. The towns of Sullivan, Tremont and Bar Harbor officially opposed the designation, as did the Hancock County Planning Commission. The Mid-Atlantic Fisheries Development Foundation supported the proposal, so long as commercial fishing activities continued.

The team, in spite of the opposition, recommends that NOAA place Frenchmen's Bay and the Gulf of Maine on the SEL. In the likely event that the site cannot garner the level of public support that would be necessary in order to go forward, the North Atlantic resource evaluation team recommends that the Mid-Coastal Maine site appear on the final Site Evaluation List. The dominant consideration remains that of securing at least one Acadian site on the final SEL. For this reason, both site descriptions were prepared by RPI and are made part of the final report.

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Virginia-Maryland Nearshore Waters and Barrier Island Bays

B. LOCATION: (NORTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: 37°30' N, 75°40' W

2. DESCRIPTION: The candidate site would cover approximately 1200 mi^2 (3100 km^2) and lies within both State (Virginia and Maryland) and Federal waters. The site would include the estuarine waters and wetlands adjacent to the barrier islands and mainland along the Atlantic coast of Virginia and Maryland from the northern end of Assateague Island southward to Fishermans Island out to 10 mi (16 km) from shore (see map). This coastal environment is rich in marine species forming an important integral part of this region's ecosystem.

The bay waters of the proposed site are shallow and vertically well-mixed due to wind and tidal action; however, there is typically a horizontal gradient of water properties. Rain and runoff cause the water temperature and salinity to vary most nearshore. Typical salinities are from 25 to 34 o/oo. The estuarine substrate consists of soft mud, shell, sand, clay, or mixtures of those materials.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The wetlands of this proposed sanctuary support a large sector of the shore economy including a large, important seafood industry. Recreational and commercial fishermen harvest large quantities of fish and shellfish which occupy or utilize these waters.

2. The wetlands are biologically rich and diverse, support numerous marine organisms, and form a primary part of this region's ecosystem.

3. Several coastal islands adjacent to this area, including Assateague, Assawoman, Wreck, Mockhorn, and Fishermans Islands, are owned and protected by Federal or State agencies. Protected areas adjacent to the candidate site include Assateague Island State Park, Assateague Island National Seashore, Chincoteague National Wildlife Refuge, and E. A. Vaughn Wildlife Refuge.

4. A large portion of the barrier islands bordering this area is owned and maintained as a nature preserve by The Nature Conservancy (a nonprofit conservation organization).

5. The Wachapreague Laboratory and the Wallops Island Marine Science Center in this area are important marine science research facilities.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Along the periphery of this fragile ecosystem are extensive, immensely productive salt marshes dominated by Spartina alterniflora. These marshes mitigate flooding of the land and act as nutrient reservoirs releasing organic material into the estuarine waters. The high biological productivity of the vegetation is the basis of the complex food web in this area. The Assateague Ecological Study lists 64 benthic species, including at least 18 species of decapod crustaceans. Crabs, oysters, and clams feed upon the vegetation and microorganisms within these waters. Scallops have recently returned to the area. More than 96 species of fish inhabit, spawn, or migrate through these waters including sharks, skates, rays, herring, shad, menhaden, anchovies, eels, mummichogs, killifish, pollock, hake, stickleback, seahorse, pipefish, squirrel fish, seabass, perch, striped bass, bluefish, weakfish, and tarpon. The seasonal abundance of many finfish varies greatly. Seals and dolphins are occasionally reported in this area. Tracts of widgeon and eelgrass cover bay bottoms, and scallops inhabit beds of seagrass. A great diversity of waterfowl and shorebirds, including both migratory and resident species, are abundant. In fact, 95 percent of the brant found in Maryland feed on eelgrass within Chincoteague Bay. Active breeding colonies of birds exist on islands surrounded by these estuarine and marine waters. Eagles, ospreys, peregrine falcons, the endangered brown pelican, and the threatened Atlantic loggerhead and Atlantic green turtles utilize the habitat of the candidate areas.

2. HUMAN USES

The area supports a multimillion-dollar seafood industry and includes vast areas of public shellfish grounds and private shellfish leases. The entire economies and social traditions of most harbor communities focus on the seafood business. Access to the fishery resource is provided by navigational channels which have been maintained by U.S. Army Corps of Engineers. The area includes seven Federal navigation projects which require dredging and spoil disposal within the proposed site.

Protected by Federal and State agencies, the area is extensively used for diverse recreational activities such as swimming, picnicking, sunbathing, boating, hiking, wildlife observation, photography, waterfowl hunting, and sportfishing. The complex of wildlife refuges, public seashore, various associated research facilities, and the State Park (all of which have been established by the State of Virginia and the Nature Conservancy) supports these activities as well as extensive college and professional research programs and informal Federal, State, and private outdoor education programs. The area affords many opportunities for scientific research analyzing the impacts of man's activities on the fishery resource. Johns Hopkins University, Salisbury State College, Wallops Marine Science Center, and other institutions maintain active research programs utilizing the barrier islands and bays as an outdoor research laboratory for nonconsumptive educational programs.

The land adjacent to the proposed sanctuary area has been historically used for grazing, privateering, resort development, waterfowl and shorebird hunting, and homesteads. Storms have destroyed many of the early structures on the islands. Waters adjacent to the barrier islands contain countless submerged cultural resources, many of which are of national significance. Due to changes in sea level during the past 12,000 years, many of our earliest sites of human habitation now lie in shallow waters off the eastern shore of Maryland and Virginia. Ships lost during the days of the first European explorations may still be buried in the silts off these barrier islands. Submerged evidence preserved in these protective silts may provide evidence of the fishing and coasting patterns of these early European settlements.

Federal and State governments and The Nature Conservancy own practically all of the islands within the proposed site. Most of the islands are presently uninhabited, except for isolated residences and a lone Coast Guard station. However, the attraction of Assateague Island National Seashore, the State Park, and Chincoteague National Wildlife Refuge on Assateague Island has put great pressures for development on all adjacent lands. Resort development has been proposed near Ocean City.

There is some potential for oil-and-gas development within the area. The eastern portion of the proposed site was considered for oil-and-gas leasing as part of Lease Sale No. 59. Numerous sand-and-gravel pits are active commercial enterprises along the coast, and there is potential for additional development. It has been suggested that the area offers enormous potential for port-and-refinery development, and for energy and mining projects.

The Baltimore District Corps of Engineers maintains navigational channels within the proposed site's boundaries and is authorized to deepen to 16 feet the 14-mile-long channel from

Ocean City Inlet to Chincoteague Bay, and also operates a beach nourishment project on Assateague Island. Material produced during channel maintenance is deposited in waters adjacent to the channel.

The Commonwealth of Virginia, authorized by the revised Wetlands Act (Virginia State Code 62.1-13.1 through 62.1-13.20), operates a protective regulatory framework. Vegetated wetlands are protected by permit requirements for encroachment activities, while development of state-owned wetlands is prohibited. Intertidal flats come under protective state or local encroachment permit jurisdiction. The Nature Conservancy, a private nonprofit organization, owns and protects 35,000 acres of the Virginia barrier islands.

The barrier islands within the proposed sanctuary boundaries are geomorphically active. The area is subject to sudden squalls and flooding, although the dunes and beaches of the barrier islands absorb the impact of major storms. Navigation in the area is sometimes hampered by fog, rough seas, and strong tidal currents. Shorelines of the islands have been displaced throughout historical time.

III. PRINCIPAL REFERENCE MATERIAL

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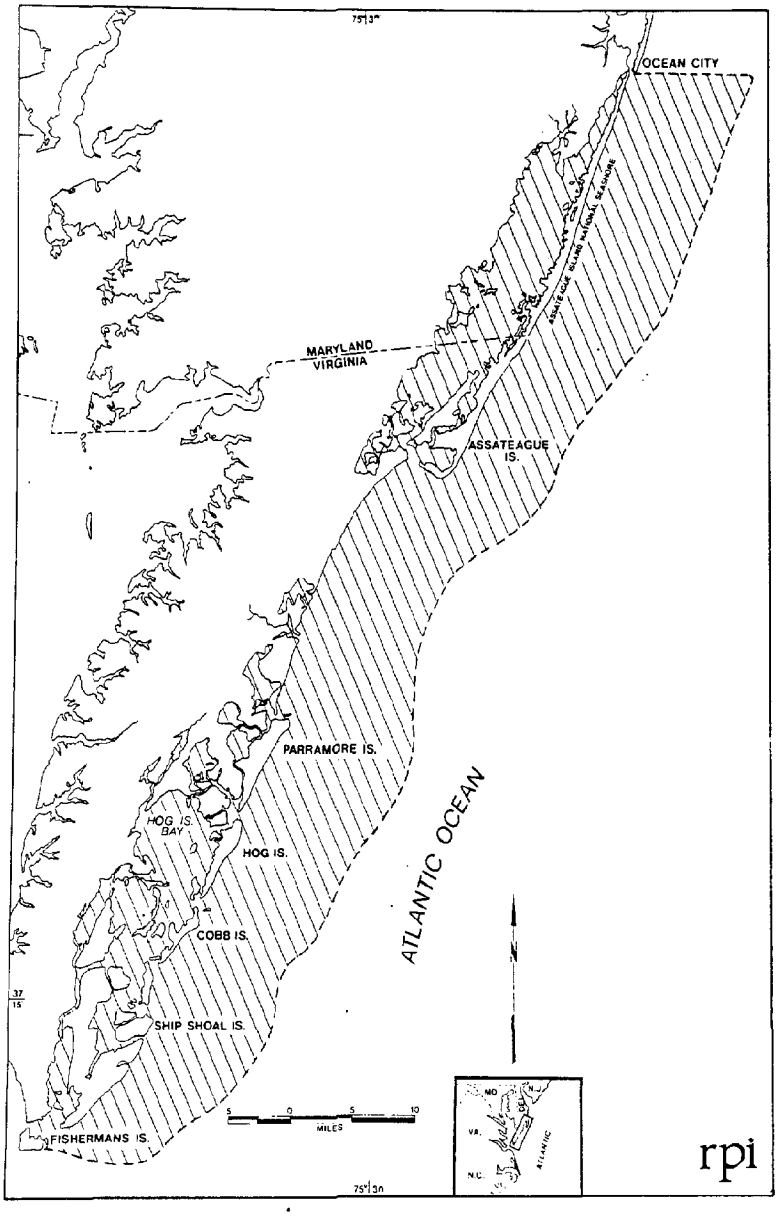
Worcester Environmental Trust, Snow Hill, Maryland, 1982, Unpublished recommendation to NOAA in support of establishing marine sanctuary: coastal bays and marshes and the ocean out to the three-mile limit, surrounding Assateague Island, Maryland/Virginia, 4 pp.



LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Narragansett Bay and Block Island Sound, Rhode Island

B. LOCATION: (NORTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: 41°20' N, 71°42' W to 41°28' N, 71°20' W

2. DESCRIPTION: Narragansett Bay is a drowned river valley whose topography dominates the State of Rhode Island. The candidate area site contains three core sites connected by a buffer zone (see map). The core locations represent different ecological habitats and would require appropriately different management programs. All locations are wholly within State waters. These core sites are:

a. Fort Wetherill and Newport Neck - Representative of a southern New England high-energy coast, this site contains a rocky shoreline that descends rapidly into deep 100-130 ft (30-40 m) water, grading into sand or mud substrate. The area contains a wide variety of habitats, and is, in many parts, difficult to approach from land because of high rocky cliffs. Heavy boat traffic is common. The area of the candidate site is approximately 2 mi^2 (5.2 km^2).

b. Charleston Pond (or Ninigret Pond) Area - Ninigret Pond is a microtidal, wave-dominated coastal lagoon system comprised of a shallow estuarine embayment that lies parallel to the coast, south of Charlestown (Rhode Island), and is separated from the open ocean by a barrier beach. The lagoon is 0.2-1.25 mi (0.3-2.0 km) in width. The pond is permanently connected to Block Island Sound through a reinforced breachway, flushed by tides twice a day. Fresh water flows into the landward side of the pond from streams and groundwater springs, which results in a salinity lower than Block Island Sound. Offshore of the pond lies the inner shelf beyond which lies a small, submerged reef as part of an outcrop of glacial sediments. The site within the candidate area would comprise about 4 mi^2 (3.2 km^2) and would include the coastal lagoon and adjacent nearshore waters approximately 0.5 mi (0.8 km) from shore.

c. Pettaquamscutt River - The Pettaquamscutt River passes through the towns of Narragansett, South Kingstown, and North Kingstown and represents a rich diversity of marine habitats, including deep, anoxic upper basins where the H_2S environment is inhabited by rare microorganisms,

extensive and undisturbed salt marshes, and the largest alewife run in the State. The tidal excursion is 6.5 mi (10.5 km) long and represents a salinity gradient ranging from 31.5 o/oo at the mouth of the river to 15 o/oo at the top of the upper pond. The total area encompassed is approximately 0.3 mi^2 (0.8 km^2).

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The sites are highly diverse with species from both the Virginian and Acadian biotic provinces. They are very representative of the southern New England coastal environment. The multiple core concept proposed here identifies three sites within the Narragansett Bay/Block Island Sound region that represent a diversity of ecologically important habitat types.

2. The area supports a number of active programs in scientific research and resource management. A great deal is known about the area due to many years of intensive research by scientists at the University of Rhode Island, the Rhode Island Department of Environmental Management (DEM), Brown University, Roger Williams College, and other research organizations.

3. The site is heavily used for recreation, shipping, commercial fishing, SCUBA diving, and marine education. It is an excellent example of a multiple-use area.

4. A great deal of effort has been made recently directed toward rational management of the Rhode Island coastal area. Much of the necessary framework for management is already present.

5. The Fort Wetherill site is highly diverse and is an excellent representation of the southern New England rocky subtidal zone.

6. The Ninigret Pond nomination represents an excellent example of a multiple-use coastal lagoon/barrier beach system, characterized by abundant fishery resources, mixed recreational demands, varied land-use patterns, a strong conservation ethic among local citizens, and high biotic diversity and productivity.

7. The Pettaquamscutt River represents an excellent example of a tidal river flowing into Narragansett Bay and is characterized by a wide diversity of marine habitats, including extensive, undisturbed salt marshes and, in particular, deep anoxic basins with sulfide environments.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

a. Fort Wetherill and Newport Neck - The rocky subtidal zone of Narragansett Bay exhibits a diversity of species that is high for the New England area. A recent survey of the Fort Wetherill area listed more than 60 species of macroinvertebrates, 30 species of chordates, and 15 species of algae. Because the waters are rich in a diverse assemblage of planktonic species, filter feeders which serve as forage for game fish are attracted to the area. Approximately 40 species of finfish have been captured in these or adjacent waters. Migratory waterfowl such as Canada geese, black duck, mallards, eider, brant, scoter, and buffleheads use these waters at some time during their seasonal migrations. Harbor seals are wintertime visitors. In late summer, tropical marine species appear, transported northward in Gulf Stream eddies.

b. Ninigret Pond - Ninigret Pond is characterized by high diversity, ranging from brackish-water species (e.g., oysters and blue crabs) to saltwater species (e.g., scallops, bluefish, and flounder). Because the pond is mainly shallow and its waters are relatively free of turbidity, sunlight penetrates through to the bottom, supporting dense beds of eelgrass and algae. These benthic plant communities, along with the phytoplankton in the water column, make the pond a very productive marine ecosystem. The waters of Ninigret Pond are well known to local fishermen as a rich fishing area, especially for striped bass. The Nebraska Shoal area, situated offshore nearby, is a particularly rich fishing area.

c. Pettaquamscutt River - This core site represents an estuarine water area of about 740 acres with a watershed of about 8700 acres. About 250 acres of undisturbed salt marshes are located in Pettaquamscutt Cove and the Narrows area. The river, also called Narrow River, shows a wide range of salinity and oxygen regimes, and supports a wide diversity of marine and estuarine species, including benthic forms (e.g., mussels, clams, oysters, bay scallops, and blue crabs) and finfish species (e.g., alewife, winter flounder, bluefish, white perch, and striped bass). The river constitutes the largest alewife run in the State, a phenomenon which has been studied for many years. A high diversity of bird species is also present, including herons, swans, ducks, hawks, gulls, terns, kingfishers, swallows, and sparrows. In addition, a wide variety of migratory fowl use the area. There are extensive freshwater wetlands and bog habitats at the northern end of the river above Carrs Pond and extensive mature woodlands in upland areas. There are three Audubon-designated Natural Areas within the watershed. The deep

[40-60 ft (12-18 m)] anoxic basins in the upper sections of the river provide a sulfide environment which supports a rich diversity of rare microorganisms. Studies of this unique habitat have indicated its biotic richness, as well as unusual biochemical and ecological characteristics (salinity stratification with occasional turnover, long residence time, nutrient sinks, etc.).

2. HUMAN USES

a. Site-Specific Uses

Fort Wetherill and Newport Neck - The area is used heavily for recreation. Three separate State Parks (Fort Wetherill, Fort Adams, and Brenton Point) provide both shore access and buffer zones for much of the proposed sanctuary area. The U.S. Coast Guard maintains a lighthouse and rescue station at Castle Hill. Fort Wetherill is a favored site for recreational SCUBA diving. On weekends in the summer, over 100 divers a day enter one of the two small coves. Sportsmen fish from the rocky points, and commercial fishing for lobsters and several finfish species is conducted extensively within the proposed boundaries of the site. Recreational boating is of great importance to the residents and tourists in the towns of Newport and Jamestown. All commercial shipping to Newport and Providence (Rhode Island) and to Fall River (Massachusetts) pass through the waters of the proposed sanctuary. A great deal of research has been conducted by marine ecologists from the University of Rhode Island at the proposed site, and the research continues. Additionally, the area has very high potential for marine education through the local schools and the Marine Advisory Service of the University of Rhode Island.

Ninigret Pond - Ninigret Pond, also called Charlestown Pond by local residents, is moderately developed in some sections. Formerly a naval airfield, the northern shore, as well as a portion of the barrier beach on the south side, is managed as part of the Ninigret National Wildlife Refuge. Large tracts of undeveloped land are found along the northwest periphery of the pond. These natural areas comprise about 20 percent of the pond's shoreline. The pond serves many public needs, including conservation, recreation, economic, and aesthetic needs. Many impacts result from extensive use, including eutrophication threats, sedimentation buildup, and overfishing. To better assess the extent of these and other problems, the URI Coastal Resources Center launched a broad-based study of Rhode Island coastal ponds, emphasizing in particular the Ninigret Pond complex.

At present, the major fisheries in the southern Rhode Island coastal ponds include blackback flounder, eel, quahog, lobster, clams, and scallops, with some effort being directed toward oyster cultivation. The tidal circulation, water quality, and hydrologic configuration of the estuarine rivers make the area unique for mariculture. It represents one of only three areas on the east coast that has these advantages occurring naturally. This salt-pond habitat contains the only naturally reproducing oyster population in the New England area. In the spring, perch and striped bass dominate the fishery. Recreational fishing focuses on quahogs, flatfish, tautog, and bass. An average yield of 20,000 pounds of flounder are taken commercially from Ninigret Pond. The 1979 fishery yield for Ninigret was 24,000 pounds of finfish, 1134 pounds of shellfish, and 2268 pounds yield from aquaculture. Recreational fishing, according to a survey made during April to July 1979, was estimated to comprise 7000 trips to Ninigret and Green Hill Ponds with an estimated catch of 6000 winter flounder taken mostly from small boats.

The pond and beaches provide a particularly good educational medium. Several years ago, a nuclear power plant was proposed for the area but was never built. Many volumes of baseline ecological information have been generated by the nuclear industry and government agencies. Substantial shore-land holdings are held by the U.S. Fish and Wildlife Service (USFWS), the State Department of Environmental Management (DEM), and the Town of Charlestown; all of which are held for nonconsumptive recreation, education, and preservation. The entire barrier beach is owned by DEM (as the Ninigret Conservation Area) and USFWS. At the center of the pond itself are over 500 acres of land, owned by the town and USFWS, known as Ninigret Park and the Ninigret Wildlife Refuge. The Frosty Drew Nature Center adjoins the USFSW refuge. This is a nature and environmental education center.

Pettaquamscutt River - This river represents an excellent candidate for assessing the environmental impacts of multiple-use activities in a marine ecosystem. About one-third of the watershed is residentially developed. Most of the undeveloped areas are in mature woodland forests, although some open space is farmland or pasture. Recreational wilderness areas include Canonchet Park, a 175-acre park in Narragansett, and YMCA, Boys' Club, and Girl Scout camps situated in the upper basin. The Audubon Society also has holdings in the area. Boating and swimming are extensive along the river, and many private docks are in place, mostly in the mid section of the river. Finfishing is popular from the bridges, and shellfishing is extensive in the mid portions and Cove.

Water quality is rated "SA," although some independent coliform tests taken in Carrs Pond and Mettatuxet Creek indicated "SB" coliform levels. The prime source of this water quality problem is thought to be from runoff in the mid portion and possibly failure of septic systems backing into storm drains. The State Department of Environmental Management and the Narrow River Watershed Advisory Commission are coordinating additional tests to assess the extent of this problem in order to recommend abatement measures.

b. General Uses

The Narragansett Bay area is heavily used. There is a great deal of shipping, commercial fishing, and recreational boating. Despite the extensive human use, environmental degradation of the lower bay area has been minimal. The coastal lagoons have been under severe pressure from expanding human populations.

The Rhode Island Coastal Resources Management Program enforces protective regulations governing the alteration of the coastline and tidal waters, including dredging, filling, waste disposal, and construction. The Rhode Island Marine Fisheries Council promulgates regulations specific to resource utilization (i.e., harvesting seasons, quotas, and size limits).

In the heavily used Fort Wetherill and Newport Neck core areas, the prime concern is the environmental disturbance caused by divers. At Ninigret Pond, management issues include threats from overfishing within the lagoon, rapid sedimentation of the tidal inlet and pond due to the emplacement of a permanent breachway, growing eutrophication and bacterial loading resulting from increased suburbanization and consequent septic system leachates and surface runoff, and aesthetic degradation that can result from dense development. A management plan is currently being developed by CRMC to address siltation, tidal flushing, salinity changes, eutrophication, and boating needs.

Identification of the Pettaquamscutt River for a marine sanctuary would provide an excellent opportunity to assemble data concerning multiple-use impacts on a tidal river. Protection of the river's resources are provided by the Federal government (floodplain regulations, dredging, and construction requirements of the Army Corps of Engineers and the Coastal Zone Management Program), the State of Rhode Island (Department of Environmental Management, Coastal Resources Management Council, and Department of Health), and by local town governments. Concerns expressed by the State and by the three towns along the river regarding land use, recreational policies, and water quality (especially as indicated by the enthusiastic formation of the Narrow River Watershed Council) provide a sound basis for developing an effective Sanctuary Management Plan.

In addition, the Narrow River Preservation Association, an active community organization whose members have worked for many years to protect the river, has focused on long-term management of the watershed area. The Coastal Resources Center at the University of Rhode Island is working with the Coastal Resources Management Council to develop Special Area Management Plans consistent with Rhode Island's coastal zone management policies. The Coastal Resources Center has developed an extensive citizen's network throughout the three towns. There is also special interest by research scientists in the unique features of the deep anoxic basins in the upper regions of the river. Better characterization of this habitat would provide valuable information for developing better management techniques for the nation's polluted harbors and bays.

The Environmental Impact Statement prepared by the U.S. Department of the Interior for OCS Lease Sale No. 52 identifies this site as a potential pipeline corridor for tranporting produced gas to shore. However, little interest, at present is shown in OCS oil-and-gas development in this adjacent area.

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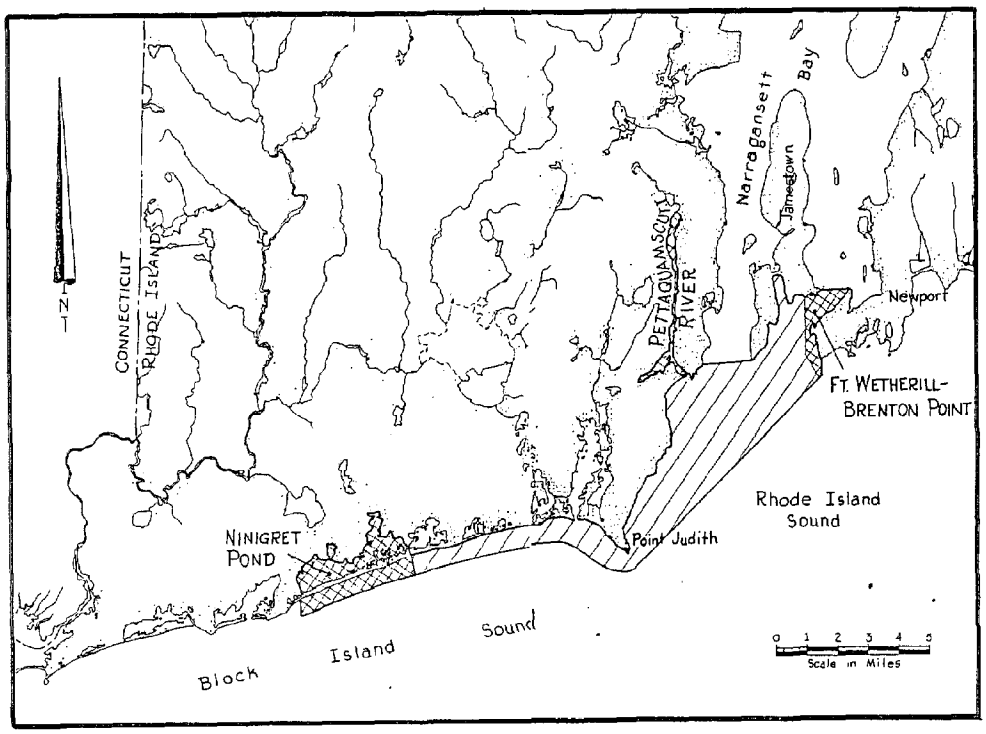

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Nantucket Shelf

B. LOCATION: (NORTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: 40° to 41°30' N, 68° to 70°30' W

2. DESCRIPTION: The proposed Nantucket Shelf sanctuary site, totaling 1805 mi^2 (4650 km^2), is a series of dissimilar, biologically rich habitat types associated with and influenced by the circulation and migration patterns unique to the Georges Bank region--a biogeographic transition zone between the northern Acadian and southern Virginian provinces. Habitats included are open bay (Nantucket Sound), nearshore open ocean and shoals (Nantucket Shoals), and shelf-edge submarine canyon (Oceanographer Canyon). The Nantucket Sound site is in Federal waters between Nantucket Island and Cape Cod, Massachusetts, and its boundaries are contiguous with the Massachusetts Ocean Sanctuaries. The Nantucket Shoals and Oceanographer Canyon sites lie wholly within Federal waters off the coast of Massachusetts. A major upwelling of cold, nutrient-rich water extending along the eastern edge of the shoals serves as a temperature barrier for warm-water species to the south and is responsible for the notably high productivity exhibited by this area. The Nantucket Shelf has been extensively influenced by glacial processes (i.e., forming Nantucket Island and adjacent features). Tidal range is about 3 ft (1 m). Total area of each portion of the potential sanctuary is: Nantucket Sound 80 mi^2 (200 km^2); Nantucket Shoals 1000 mi^2 (2590 km^2); and Oceanographer Canyon 100 mi^2 (250 km^2).

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The area contains distinctive ecological, recreational, historic, and aesthetic resources that form the basis of the predominant economic pursuits of the area: fishing and tourism.

2. The area supports the economically valuable commercial and recreational fisheries of the area which have traditionally been a social and economic mainstay for many Cape and Island communities.

3. The area is of exceptional value for its contribution to the heritage of the United States, forming an integral part of the maritime tradition of this country.

4. Proposed Marine Sanctuary designation would extend into Federal waters the management/protection activities already offered by the Massachusetts Ocean Sanctuary Act within State waters.

5. The research opportunities within the proposed site are high, offering potential in biology, oceanography, geology, and meteorology.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

a. NANTUCKET SOUND: The richness of this transition zone ecology enhances the stability of plant life and the productivity of the estuaries in bordering coastlands that provide habitats for the many species that use the proposed Marine Sanctuary areas as nursery and feeding grounds. More than 16 species of fish and shellfish are commercially harvested in the area. The most common species found are alewife, bluefish, cod, flounder, clams, whelks, scallops, and squid. Scup, black sea bass, striped bass, and tautog are also popularly sought species.

b. NANTUCKET SHOALS: Nantucket Shoals are a series of shifting sand shoals, derived from glacially deposited sediments that have been winnowed by marine processes. Most of the shoals are found under water depths of only 25 ft (8 m). Between many of the shallow areas are channels extending 60-120 ft (18-36 m) deep. Because of the shallow and ever-shifting nature of the area, as well as strong and erratic currents, Nantucket Shoals has been responsible for numerous wrecks and loss of lives. The site includes Great South Channel.

Long-finned squid and sea herring spawn in the vicinity of the shoals. Fishes common to this area include flounders, bluefish, striped bass, pollock, tuna, Atlantic cod, and mackerel. Clams, scallops, and quahogs are found in some of the shoals' areas. These waters are well known for recreational fishing. Swordfish and white marlin are occasionally seen in the vicinity of Asia Rip. The proposed site also includes areas important to scallopers and ground fishermen, and may include some environmentally sensitive spawning areas as well. The area is a major overwintering habitat for common eiders, white-winged scoters, and other migrating sea ducks which feed on blue mussels, sand lances, and other forage fish. Humpback whales occasionally feed within the area. Marine turtles also use the area, but more research is needed to fully understand the niche they occupy.

c. OCEANOGRAPHER CANYON: Submarine canyons, in general, provide a heterogeneous environment characterized

by a variety of substrate types, and because they act as conduits for the transport of material from the shelf to the abyss, filter-feeding organisms are more common than those found on the shelf. Within Oceanographer Canyon, the concentration of organisms per 100 m^2 reaches peak values of 400-450 at depths of 1300 ft (400 m) and 6000 ft (1800 m). Major faunal groups include corals (primarily alcyonarians), echinoderms, fish, and crustaceans (particularly shrimp). Tilefish and an abundance of lobsters occur in this submarine canyon. Oceanographer Canyon, in general, is one of the better studied, northeastern submarine canyons.

2. HUMAN USES

The Nantucket area is one of the most popular summer resorts on the East Coast. The high quality of the coastal waters supports a multitude of recreational activities essential to a viable tourist industry. Boating, swimming, fishing, and sightseeing enthusiasts have traditionally been lured by the area's aesthetic qualities.

The area supports significant commercial and recreational finfishing and shellfishing industries which depend upon the maintained ecological integrity and water quality of the area. Nearly 80 species of commercially important fish and shellfish occur in these waters. Black sea bass, striped bass, scup, flounder, squid, blackfish, quahog, and bay scallops are among those species which are commercially harvested locally.

The Nantucket Shelf is of exceptional value for its contribution to the maritime heritage of the United States. Since the Revolutionary War period, the area has been the location of shipyards and has served as a major shipping corridor and the home port for a large segment of America's fishing and trading industries situated along the coast. The proposed area contains a number of shipwrecks that are of historical and educational value in interpreting the maritime history of America.

Portions of the site lie on an area of the outer continental shelf which is currently being considered for oil-and-gas leasing (Lease Sale No. 82) in February 1984. Oceanographer Canyon is located in an area having high hydrocarbon potential.

The area supports a growing interest in biological and geological reasearch. The limited research performed on the canyons east and south of Nantucket indicates subtle but real differences among them in terms of current regime, habitat type, and biota. Detailed scientific study of the Nantucket Shelf complex is lacking, and therefore, the area provides a wealth of opportunities for investigating the interrelationships among the various biogeographic components. The University of Massachusetts operates Nantucket Field Station which engages in

research in all aspects of the marine and coastal environments surrounding Nantucket. In addition, other educational and research institutions in the area are hosted for teaching and research purposes.

Portions of the adjacent nearshore waters are already protected and managed by the Commonwealth of Massachusetts. Relevant State programs include the Ocean Sanctuary Act, the Areas of Critical Environmental Concern Program, the Wetlands Protection Act, the Wetlands Restriction Act, and other coastal protection regulations. The management of the area is of vital concern to the State Legislature, the Massachusetts Department of Environmental Management, and the local townships. Furthermore, since the area is the object of intense commercial fishing activity, the New England Fisheries Management Council regulates fishing in the area through a coordinated fishery management plan.

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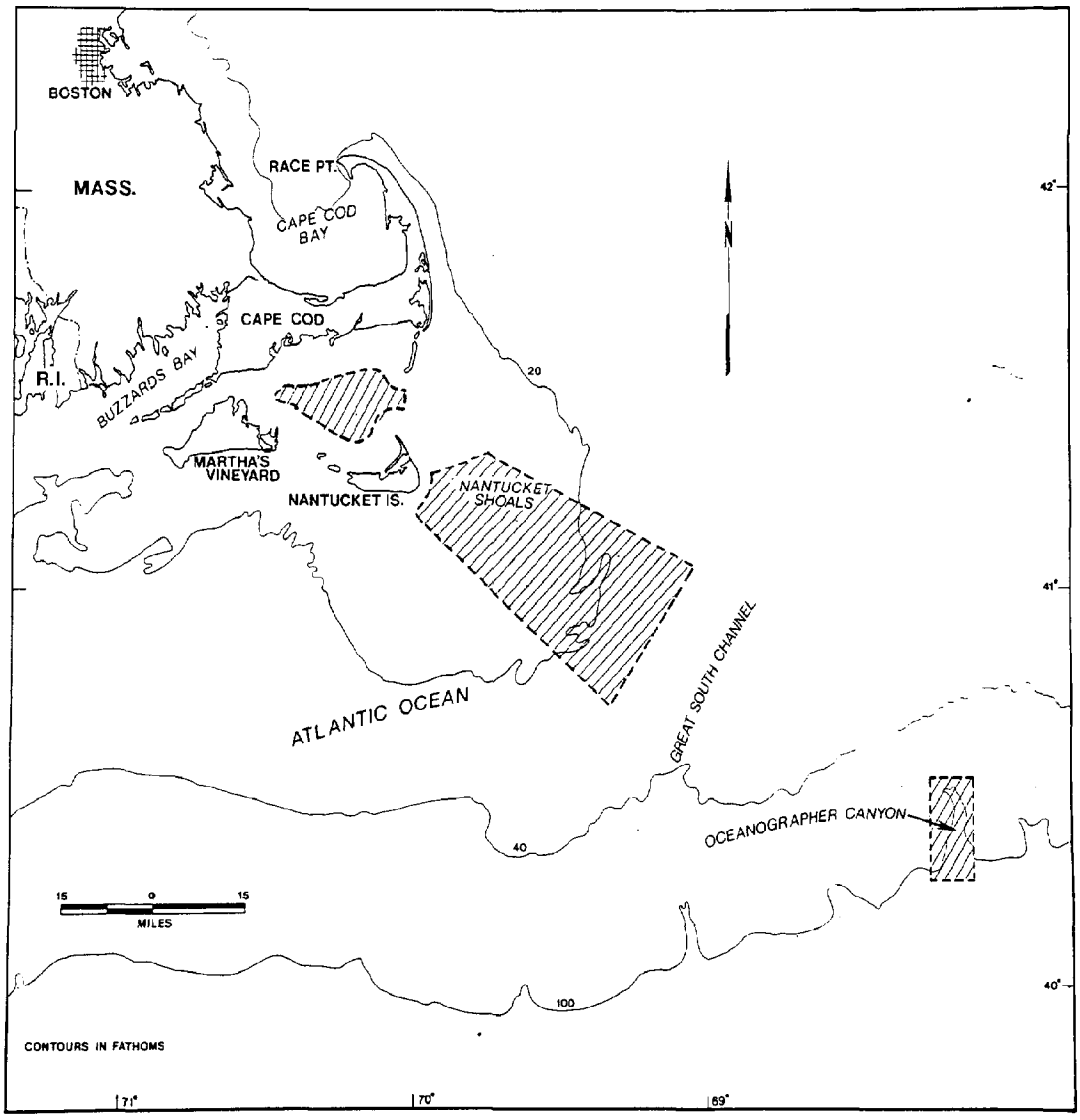

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Stellwagen Bank

B. LOCATION: (NORTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: The approximate coordinates of the candidate site are between 42°10' and 42°25' north latitude and 70°05' and 70°30' west longitude.

2. DESCRIPTION: The candidate site is approximately 32 mi (51 km) by 15 mi (24 km) covering approximately 480 mi^2 (1230 km^2). The site is entirely in Federal waters situated over the submerged Stellwagen Bank which is 6.3 mi (10.2 km) north of Cape Cod, Massachusetts. Stellwagen Bank is a glacially-deposited gravel feature, rising sharply above the surrounding sediments, approximately 16 mi (30 km) long and as wide as 5.4 mi (10 km). The Bank is arcuate in shape, and the water column over the Bank ranges from shallows of 61 ft (20 m) along the scarp on the broad southwest end and 78 ft (30 m) at the northwest end, downward toward a maximum of 120 ft (40 m) at the southeast end. North of the Bank, bottom sediments reach a maximum depth of approximately 600 ft (183 m).

Scientific and educational interest has been drawn to Stellwagen Banks due to the recurring seasonal abundance of several cetacean species, including the largest high-latitude population of humpback whales observed in the contiguous United States. The biologically-productive waters of the Bank provide important feeding and nursery grounds for the humpback, fin, minke, and northern right whales. Commercially valuable fishery resources are also found in the area, including mackerel, bluefin tuna, and bluefish. The Bank is extensively used by commercial and recreational fisherman, whalewatchers, and cargo vessels.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. Stellwagen Bank is a seasonally important feeding area to at least seven cetacean species and is of particular importance to a significant portion of the western North Atlantic population of humpback whales. Residency of humpback whales in the vicinity of the Bank is from approximately mid-March or mid-April through mid-November, one of the longest such periods known anywhere in the world.

2. High biological productivity at Stellwagen Bank results in an abundance of fishery resources important to both cetaceans and commercial fishing.

3. The Bank is accessible to researchers and recreationists. The site is used extensively for recreation, whalewatching, shipping, and commercial and sport fishing. Boat traffic congestion is increasing.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Stellwagen Bank is a rich fishery ground situated between Provincetown and Gloucester. The high biological productivity of the Bank, which supports extensive fisheries resources, is believed to be a result of turbulent upwelling of nutrient-rich bottom waters.

The Bank is seasonally inhabited by numerous fin- and shellfish which are harvested commercially and recreationally. Mackerel, bluefin tuna, bluefish, spiny dogfish, Atlantic sturgeon, shortnosed sturgeon, American shad, Atlantic menhaden, Atlantic herring, striped bass, Atlantic cod, haddock, silver hake, yellowtail flounder, winter flounder, and ocean quahog, American lobster, and deep sea scallop are caught here. A large population of sand lance feeds upon zooplankton and in turn is fed upon by balanopterid whales. A great diversity of pelagic and shore birds seasonally migrate through the candidate site, feeding and nesting on the Bank system.

Several species of sea turtles occasionally occur in the vicinity of Stellwagen Bank. Most frequently sighted are the loggerhead and the leatherback turtles, which feed in the general area. Transient species include Kemp's ridley and the green sea turtles, which are sometimes seen stranded in the Cape Cod Bay area.

At least seven cetacean species inhabit and feed within the Stellwagen Bank area. Scientific attention has focused on the four species of "great whales" found at the Bank: the humpback, the fin, the minke, and the northern right. With the exception of the minke (the smallest of rorqual whales), these species are all federally listed as "endangered" species. Smaller cetacean species include the Atlantic white-sided dolphin, the white-beaked dolphin, and the harbor porpoise. In addition to these frequently-observed cetacean species, killer whales and pilot whales have also been observed.

Minke, fin, and northern right whales are observed in the vicinity of Stellwagen Bank year round. It is estimated that no more than 150 northern right whales remain in the north Atlantic ocean, yet sightings of these animals continue to be made at Stellwagen Bank.

Humpback whales are the subject of ongoing study at Stellwagen Bank. More than 100 humpback whales return each year to the area, an important summer feeding ground, with as many as 80 percent of previously known individuals returning. Some individuals have been observed to reappear during each of 5 to 6 consecutive years at the Bank. These whales migrate along as yet undefined routes of approximately 2000 mi (3700 km) in length from mating and calving grounds in the east central Caribbean Sea to the nursery grounds provided by Stellwagen Bank.

2. HUMAN USES

The waters over and around Stellwagen Bank are used extensively for commercial and recreational fishing, whalewatching, and other recreational uses. The fishery resource is protected and managed under a plan adopted by the New England Fisheries Management Council. Shipping lanes for vessel traffic traveling in and out of Boston Harbor navigate directly across the Bank. The area is also used extensively for scientific, educational, and recreational programs. The increasing number of whale watchers, and commercial and recreational fishermen in the area is causing growing boat traffic congestion in the area.

The proximity of Stellwagen Bank to heavy populated and industrialized coastal communities has recently brought a number of proposals for utilizing the bank in a manner incompatible with its natural resource values. These proposals include construction of a mile-long waste-tire disposal site, dredging for sand and gravel, oil-and-gas exploration, and sewage sludge disposal.

In the past, there has been some dumping of toxic chemicals near the Bank; however, not much is known about the exact composition and/or location of these activities. Additionally, there have been discussions about possible gravel mining operations in the area. As yet, this activity has not occurred.

The western boundary of the proposed site lies adjacent to the eastern edge of a 300-ft deep Foul Area Dump Ground maintained by the New England District Army Corps of Engineers. The Foul Area is a disposal site for government and private dredging projects conducted within Massachusetts Bay. The Corps also conducts biological monitoring within the Foul Area and is cooperating with the National Marine Fisheries Service in bioaccumulation studies at the sand lance in order to assess the impact of disposal activities on the local whale community.

The southern boundary of the proposed site cuts across the waters of the Commonwealth north of Provincetown. These waters are protected by the Massachusetts Ocean Sanctuary Act.

The Environmental Impact Statement prepared by the U.S. Department of the Interior for Oil and Gas Lease Sale No. 42 identifies part of the proposed site as a potential pipeline corridor for transporting future North Atlantic OCS gas production to shore.

During the last five years, the Provincetown Center for Coastal Studies (a non-profit organization) has conducted cetacean-related research. They have compiled extensive collections of photograph and video recordings of cetaceans in the candidate site. Defenders of Wildlife is involved in a plan to study the interrelationship between pelagic bird species and the cetaceans of Stellwagen Bank.

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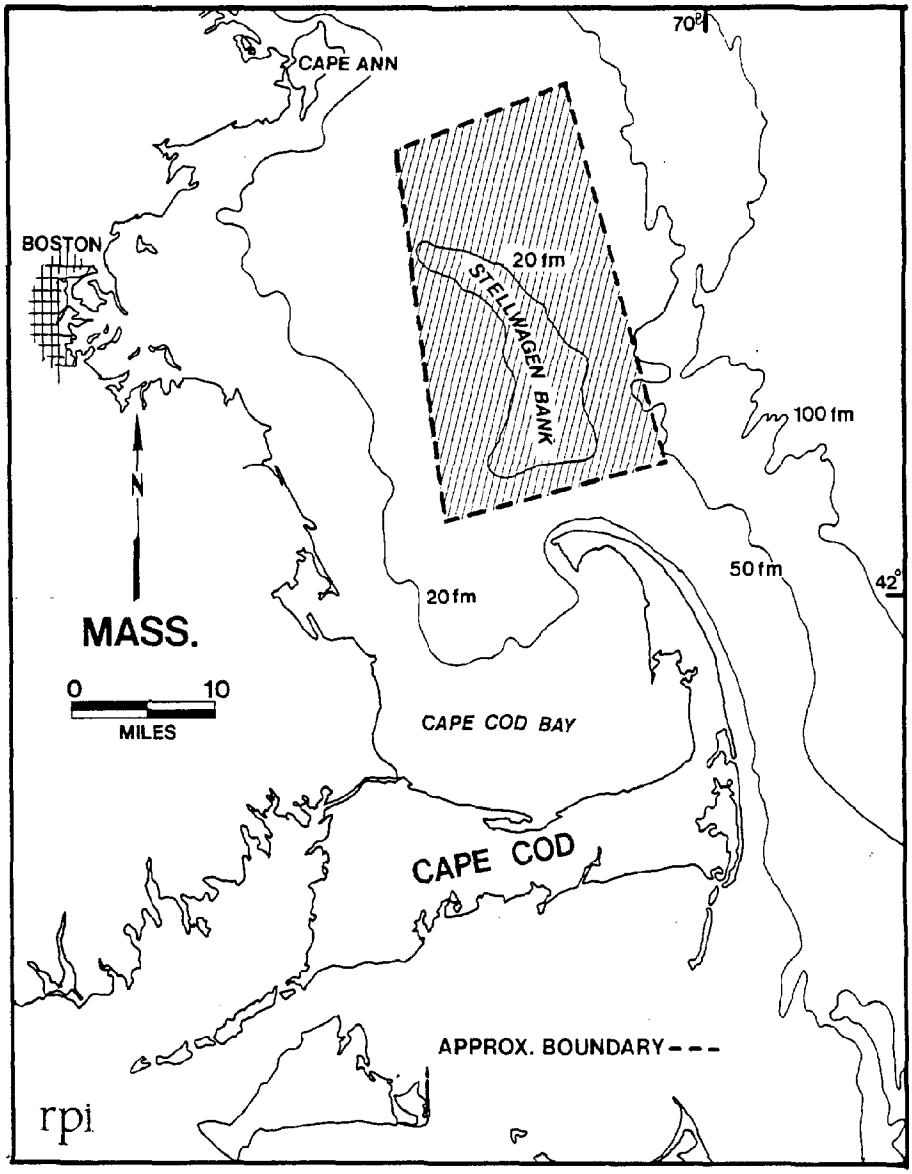

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Frenchman Bay and the Gulf of Maine

B. LOCATION: (NORTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: 43°55' to 44°35'N; 68°2' to 68°16'W

2. DESCRIPTION: The proposed Frenchman Bay sanctuary site and its off-lying waters [407 mi^2 (1070 km^2)] represent the entire range of coastal habitats existing within the Acadian biogeographic region of the North Atlantic. Habitats include open Gulf of Maine shelf waters with a variety of sea floor types below the critical 35 fathom (65 m) contour; inshore waters, including exposed rocky shore, shell, armored and deeper mud bottoms; and a wide variety of coastal Maine Bay types including rocky and cobble shore, mud and sand beaches, and extensive mud flats and salt marshes. The Frenchman Bay site includes both Federal and State waters and abuts the Acadia National Park on both eastern and western shores. The area has been heavily glaciated, and erosional and depositional features, as well as the whole spectrum of late Pleistocene and Holocene marine sedimentation types, occur in abundance. The tidal range is large [8-12 ft (2.5-3.7 m)] and is accompanied by rapid tidal currents and an extensive and richly productive intertidal zone. Moderate water temperature range and abundant fog prevail. The total area of the potential site is 407 mi^2 (1070 km^2).

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The area contains distinctive ecological, recreational, and aesthetic resources that form the basis of the predominant economic pursuits of the area: fishing and tourism. The coastal area abutting the site includes the highest point of land on the East Coast of the United States, has long been lauded for its great natural beauty, and includes the only coastal national park in the Acadian Region.

2. All of the major fisheries of the coast, particularly lobstering, clamming, scalloping, and herring fishing, are extensively practiced in the area of the sanctuary. On the Maine coast as a whole, all of the fisheries have suffered heavily from overfishing. A broader scale of resource management is needed if the industry and its heritage are to be preserved.

3. The area was one of the earliest settlements on the Maine coast and has a long maritime/fishing history.

4. The proposed Marine Sanctuary designation would extend seaward the management/protection activities now given to the exceptional shore-based resources by Acadia National Park.

5. The Acadian Region of the United States has been little studied in a resource management context. The research opportunities within the proposed site are high, offering potential in biology, oceanography, geology, and fisheries. The College of the Atlantic (a college emphasizing a curriculum and basic research in human ecology and conservation) and the Mount Desert Marine Biological Laboratory both lie on the shore of Frenchman Bay.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The Maine coast, along with its sister Maritime Provinces to the north, forms the distinctive Acadian Biogeographic Region. Maine possesses all of the basic biotic characteristics of the region as a whole. However, because of its large tides and consequent water climate moderation, particularly in eastern Maine and the Frenchman Bay area, many European boreal species are also included as elements of the flora and fauna. The large percentage of shoreline per straight mile of coast, a condition resulting from a unique geological history, along with a large tidal range, gives rise to a rich macroalgal flora and an exceptionally high primary productivity. The high benthic productivity, based on an algal-supplied detrital food chain, supports the traditional lobster and clam fisheries and provides a nursing and feeding ground for a wide variety of finfish including many species of economic value. Several seabird feeding and nesting sites, a large number of seal haul-outs, and an important whale feeding area (Mt. Desert Rock) are present within the area under consideration.

2. HUMAN USES

The Frenchman Bay and Mt. Desert area has long been one of the most visited resorts on the East Coast. Because of its great natural beauty and the presence of a carefully nurtured National Park, it is generally regarded as the archetype site for sightseeing, hiking, climbing, and boating on the rock-bound coast of Maine. The yachting, boat repair, and building facilities of Southwest and Northeast Harbors are among the most important on the entire coast. An international ferry, the "Bluenose," has long made its U.S. landing at Bar Harbor in Frenchman Bay.

The fishing practices of the region are characteristic for the coast as a whole. An extensive lobster fishery is carried out, particularly from Winter and Southwest Harbors, and historically, the large mud flats of the northern reaches of the Bay provided abundant soft-shelled clam. Scallops and herring are

taken by dragging and stop-seining, respectively. The fishing- and work-boat building and repair facilities are among the best on the coast.

A major segment of the permanent coastal population of this area has traditionally made its living from the coastal fishery. In the past few years, increased fishing efforts have characteristically yielded diminishing returns. The area is very rich in primary production and a modern, aquaculturally-based fishery could provide a much larger food and economic return while still supporting biological conservation.

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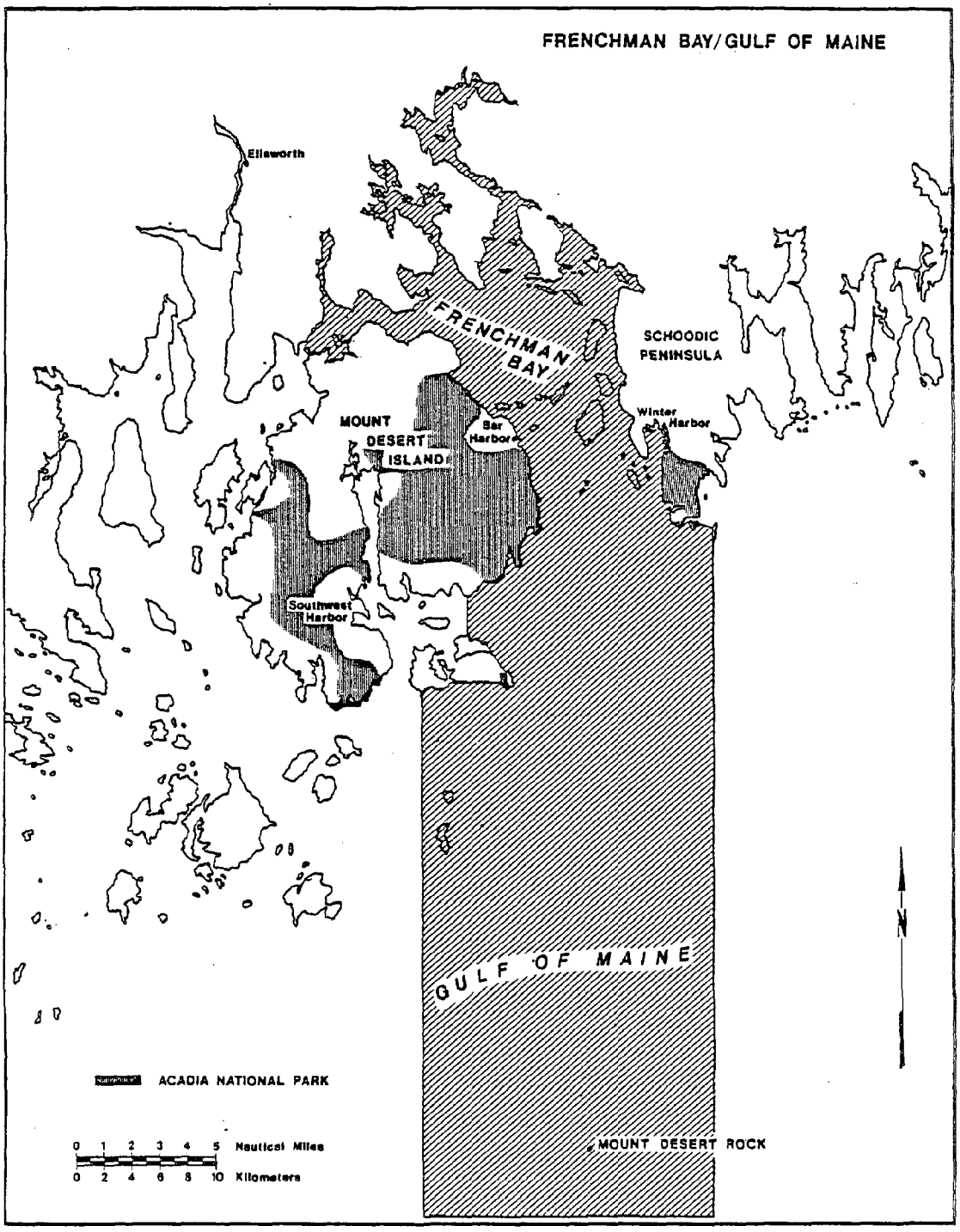

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Mid-Coastal Maine

B. LOCATION: (NORTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: 43°35' to 43°57' N, 69°15' to 69°50' W

2. DESCRIPTION: The site covers an area of 430 mi^2 (1114 km^2), including both State and Federal waters adjacent to the coast of Maine. Included in the site are the mouths of three major estuaries, two bays, several offshore islands (though no land is included in the proposed Marine Sanctuary site), and a large inshore region. The site contains intertidal, shallow subtidal, and deep-water zones which vary greatly in bottom type, wave exposure, and biological components. The three rivers are the Kennebec, Sheepscot, and the Damariscotta. The site includes Johns and Muscongus Bays; and Southport, Sequin, Damariscove, Fishermen's Inner Heron, Outer Heron, White, Squirrel, Georges, and Monhegan Islands.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The site is representative of the entire coast of Maine, containing diverse habitats and biological populations.

2. The area is highly productive, with intertidal and subtidal algae contributing substantially to primary production.

3. The area contains rocky intertidal, cobble, and sandy shores; mud flats; and salt marshes. Subtidal habitats include rock ledges, large stones, gravel, sand, and mud bottoms.

4. The site is the center for much of the marine research and educational activity in the State of Maine, with three institutions located on its boundaries.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The area under consideration is known for its magnificent scenic splendor created by the juxtaposition of diverse, contrasting geomorphic features. These natural features include wetlands, lakes, ponds, rivers, estuaries, marshes, long intertidal mud flats, high rocky shores, wide sandy beaches, subtidal granite ledges, offshore rock islands, and deep-sea habitats. The area is biotically rich and diverse in macrofauna, phyto- and zooplankton, and the colorful red, green,

and brown macroalgae (kelp). The ecological complexity of these interrelated habitat types is observed in the characteristic biological zonation patterns apparent along much of the rocky coastline and is reflected in the magnitude of the local fishing industry landings. The major fisheries dependent upon the Mid-Coastal Maine food web include alewife, eel, salmon, smelt, herring, cod, a variety of groundfish, lobster, shrimp, and soft-shelled clams. Worms are also commercially harvested.

Several endangered or threatened species, such as the bald eagle, osprey, and shortnosed sturgeon, inhabit the area. Harbor seals, harbor porpoises, finback, and pilot whales are occasionally observed in the site. The Muscongus Bay area, the site of the National Audubon Society Study Camp, is the area where puffins (federally designated as an "endangered" species) have been successfully reintroduced.

Thousands of shorebirds, including seagulls, eider ducks, etc., nest upon the rocky precipices of the mainland and offshore rock islands and feed upon mussels and other food species.

A unique feature of the area is a bubbling, freshwater spring sequestered in Damariscove Harbor. The spring issues from a rock cleft three feet below the high watermark.

2. HUMAN USES

The proposed site is one of the most important recreational areas along the coast of Maine. This pristine section of coastline with its myriad of rivers, harbors, coves, and islands provides exceptional opportunities for sailing and boating. The high intensity of these activities, together with the tourism they support, causes great seasonal fluctuations in population densities and constitutes an important and unique facet associated with this region.

Adjacent land regions support residential housing, but the population density generally is very low. The discharge of domestic sewage from houses has been one of the largest pollution sources, but is decreasing due to laws which require sewage treatment. Because of the low number of people, large area, and strong tidal currents, effluents are rapidly dispersed. The low level of agricultural development in the area is also expected to contribute no significant amounts of soil and pesticide runoff.

Maine's first permanent European settlement was on Damariscove Island in 1622. The island is on the National Register of Historic Places. Monhegan Island contains an archeological site which is believed to have been used for swordfish hunting 4000 years ago. There are also mainland sites adjacent to the proposed Sanctuary that were settled in the 1620s and 1630s. There is some evidence that prehistoric Indian settlements,

now underwater, exist within the site's boundaries. There are also at least 55 shipwrecks, dating from 1635 to 1941, thought to be located within the proposed site.

Fishing and recreation are the major uses of these waters. Commercial fishing is particularly active and of vital importance to the local economy and the region, producing nearly 10 percent of the total of Maine's fishery landings. Lobstering, clamming, worming, aquaculture, seining, otter trawling, and other types of finfishing provide major sources of revenue and contribute significantly toward the support of the tourist industry which is highly developed in this region. Sportfishing, pleasure boating, and swimming are similarly important to residents and tourists alike. While low water temperatures throughout much of the year and the absence of large sandy beaches discourage heavy beach use for swimming, both sailing and motorboating are very popular activities and represent important uses.

Many educational and research institutions are convenient to the region. The Maine Department of Marine Resources Research Laboratory, the Maine Aquarium, and the Bigelow Laboratory for Ocean Sciences are located in Boothbay Harbor. The University of Maine operates the University of Maine Darling Center in Walpole.

The Nature Conservancy owns a number of islands within the proposed site.

The major industry is shipbuilding, but it does not produce large pollutant loads. Other industries such as fish-processing plants, machine shops, and lumbering activities also have negligible pollutant impacts in this marine area.

Encompassed within the proposed sanctuary is a portion of the Maine Metamorphic Belt, an area known to contain near-economic deposits of nickel and copper. However, there has been little prospecting in this region.

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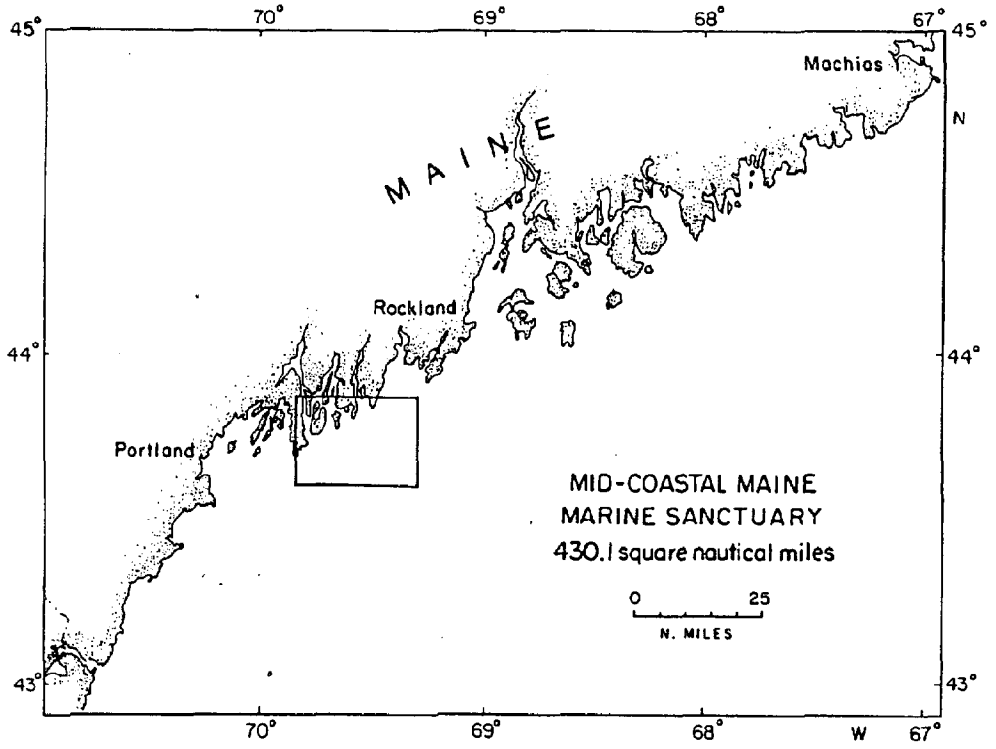

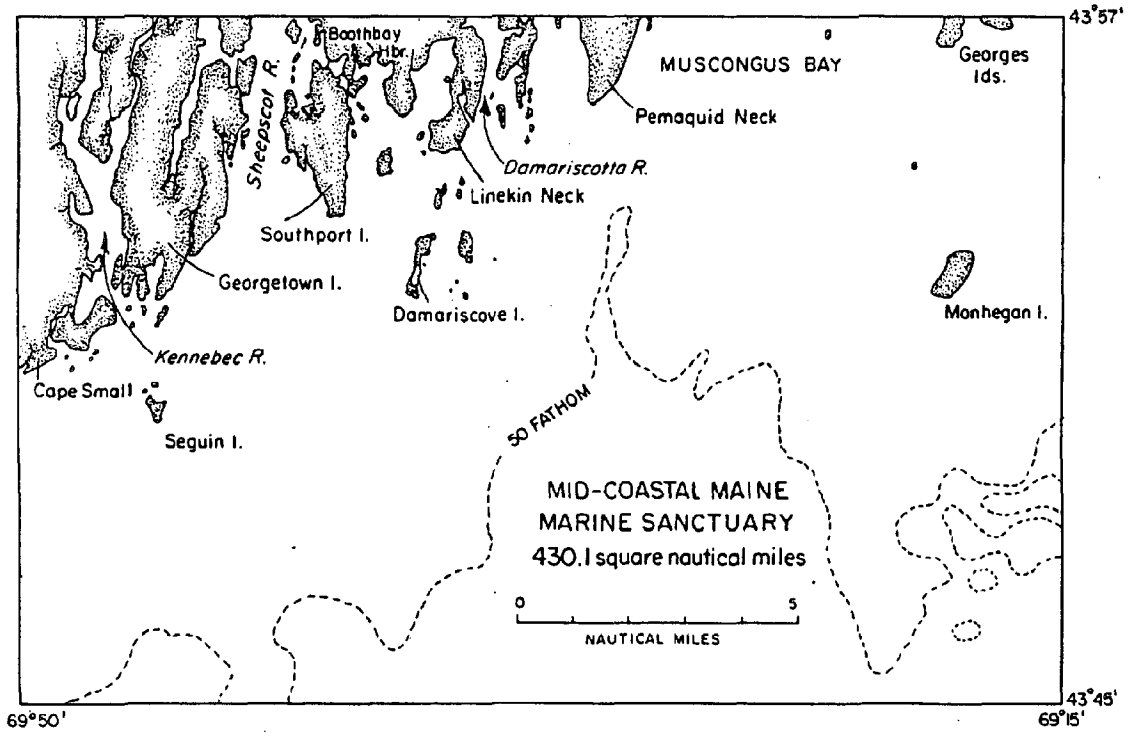

LOCATION MAP

SOUTH ATLANTIC REGION

MARINE SANCTUARY SITE EVALUATION LIST
SOUTH ATLANTIC REGION

MANAGEMENT OVERVIEW

1. Resource Evaluation Team

The South Atlantic resource evaluation team was comprised of four marine scientists, one each from North Carolina, South Carolina, Georgia, and Florida. The team leader was Dr. Vernon J. Henry, a Professor of Marine Geology who moved from Skidaway Institute of Oceanography to Chairman of the Geology Department at Georgia State University during 1982. The other team members were Dr. F. John Vernberg, Director of the Belle Baruch Institute for Marine Biology and Coastal Research, University of South Carolina; Dr. Dirk Frankenberg, Director, Marine Sciences Program, University of North Carolina; and Dr. Harold Wanless, Associate Professor of Marine Geology, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Florida. The team members made contacts with State agencies, local interest groups, and other marine scientists in their areas.

2. Site Evaluation and Public Participation Process

The team met on two occasions; on May 11-12, 1982, in Raleigh, NC, and on September 27, 1982, in Columbia, SC. At the first meeting, the team considered more than 20 discrete sites as potential Marine Sanctuary candidates, ranging from Cape Hatteras, NC, to the east side of Key West, FL, including the sites that were on NOAA's List of Recommended Areas (44 Fed. Reg. 62552, Oct. 31, 1979). At the first meeting, the team selected four sites, or groups of sites, that they considered potential Marine Sanctuaries:

SA-1. Beaufort Inlet, NC. This is a group of three distinct areas near Beaufort, NC. A total of about 33 sq mi, entirely located within State waters, would have been encompassed by this proposal.

SA-2. Cape Fear Inlet, NC. This is a two-site proposal near Wilmington, NC, also in State waters. This small (8.8 sq mi) site received little public support and was later dropped from consideration.

SA-3. Santee Delta, SC. This large delta system (75 sq mi in this proposal) is unique on the Atlantic coast. Just south of Georgetown, SC, the Santee Delta has a number of interesting features, not the least of which is the rediversion of the Santee River.

SA-4. South Atlantic Coral Grounds. The only offshore proposal initially made by the team, this system encompassed five discrete sites between Beaufort, NC, and St. Lucie, FL. Only two of the five sites, the St. Lucie Nearshore Reef and the Oculina Reefs off Florida, are part of the team's final five recommendations.

The writeups on these four potential Marine Sanctuaries were mailed to 195 groups and individuals in the states of North and South Carolina, Georgia, and Florida, plus 82 national organizations and Federal agencies. Chelsea received 37 responses to this mailing by the end of a 45-day comment period (August 20, 1982). In addition to commenting on the team's four proposals, the public was invited to submit nominations for other potential sanctuary candidates. Four such areas were nominated prior to the September 20, 1982, deadline. Those four areas were:

SA-5. Ten Fathom Ledge - Big Rock, off NC
SA-6. White Oak River System, NC
SA-7. Port Royal Sound, SC
SA-8. Sombrero Key Reef, Sambo Reefs and Content Keys, FL

Of the four public nominations, only the last one, off the southeast coast of Florida, did not meet the team's initial criteria. Descriptions of the other three proposals were mailed out, to the individuals and groups that received the first mailing, on October 22, 1982. Fifty-five responses were received, and most of those were in favor of Port Royal Sound. Following the expiration of the public comment period (November 22, 1982), the resource evaluation team made their final decisions by telephone.

3. Recommendations

3.1. State-Federal Relationships

Most potential sanctuary sites in the South Atlantic region are in State waters. In a number of instance, sites could also be considered for estuarine sanctuary status. Port Royal Sound, Santee Delta, White Oak River, Winyah Bay, Beaufort Inlet (2 of 3 sites), St. Helena Sound, and other locations considered by the team, are all State water, estuarine sites. The South Atlantic offshore area is characterized by relatively shallow and nutrient-rich waters. It does not contain features as dramatic as the Flower Garden Banks off Texas, or the coral reefs of southeast Florida and the Caribbean. Except for low to moderate relief live-bottom areas, already exemplified by Gray's Reef National Marine Sanctuary, the offshore area from Cape Hatteras to the Florida-Georgia border is relatively barren. The team's South Atlantic Coral Grounds proposal (SA-4) attempted to link several of the known live-bottom areas, both on the continental

shelf and at the shelf break, into a single unit for research and preservation purposes. Some of the shelf break sites, however, are so deep that the only way one could see them is with a submarine.

The productivity of the South Atlantic coastal ocean is directly related to the large estuarine areas along the coast. Those areas were considered by the team to be of high ecological value. The protection of those estuaries is extremely important, and their educational and recreational values cannot be overstated. The questions have been asked: "Why Port Royal Sound rather than St. Helena Sound?" and "Why not Winyah Bay?" There are no good answers to these questions. The purpose of the team was to select South Atlantic sites that would be representative of the ecosystems that are found there. The resource evaluation team, in making its recommendations to NOAA, is saying that these five sites, properly managed, will help to preserve an excellent cross-section of the ecosystems of the South Atlantic coast.

3.2. Site Selection

The South Atlantic resource evaluation team recommends the following five sites for placement on the Marine Sanctuary Site Evaluation List. Without prioritizing them, the sites are:

1. Ten Fathom Ledge - Big Rock, NC
2. White Oak River, NC
3. Santee Delta, SC
4. Port Royal Sound, SC
5. Florida Coral Grounds, FL

As part of its final regional report, the team has approved a set of brief site descriptions, including maps in each case which define the boundaries of the proposed sanctuaries. This portion of the report contains highlights of the team's rationale for choosing each of the five sites, as well as comments on specific management issues that came to the team's attention.

3.2.1. Ten Fathom Ledge - Big Rock, NC

This is a two-site proposal that was discussed by the North Carolina Marine Sciences Council. In the first request for public comment, the team solicited comments on seven discrete sites off the coast of North Carolina. Three sites made up the "Beaufort Inlet" complex; two went under the heading "Cape Fear Inlet;" and two more were offshore as part of the "South Atlantic Coral Grounds" proposal. Dr. Dirk Frankenberg, the team member from North Carolina, received several negative comments on the inshore sites (Cape Fear and Beaufort), as well as suggestions from State government scientists that the offshore sites were not the best choices. There was some concern over the benefits of

Marine Sanctuary status for some of the inshore areas, with the feeling expressed that they were adequately protected by State authority. Only eleven comments were received on this proposal, five in favor, six neutral, and none opposed.

The Ten Fathom Ledge - Big Rock proposal would be two distinct sites off the coast of North Carolina. This recommendation replaces the two sites off North Carolina originally proposed in the "South Atlantic Coral Grounds," while maintaining the same ecological approach as that earlier proposal. The inner shelf site (Ten Fathom Ledge) is a 135 sq mi rectangle with its center located about 17 miles south of Cape Lookout, NC. The outer shelf site, "Big Rock," is located on the shelf break about 36 miles offshore, and is a 36 sq mi square. These are both hard bottom areas, with high productivity and assemblages of tropical marine organisms at the northern extreme of their range. The inner site includes four popular recreational diving spots; one of which is a World War II German submarine. Both areas are popular with sport fishermen and "head-boats."

The site evaluation team felt that the two site proposal, encompassing only about 170 sq mi, was sufficient to protect the hard bottom resources contained within them. In the inner shelf site, the areas of high recreational, cultural, and sportfishing value are small, discrete areas. This should enhance the ability of NOAA to manage the proposed sanctuary.

3.2.2. White Oak River, NC

Even though the team dropped the inshore sites at Beaufort Inlet and Cape Fear, NC, it is recommending the White Oak River estuary in its entirety. This river system was proposed as a Marine Sanctuary by the local (White Oak River) chapter of the Izaak Walton League. It is a small estuary and, in Dr. Frankenberg's words, is "an absolutely wonderful place." It is already well protected on the land side by the Croatan National and Hoffman Forests. The entire area suggested for sanctuary consideration is only about 30 sq mi and would run from the upriver extreme of tidal influence out to the ocean. Much of the estuary bottom is subject to State oyster leases. Eleven comments were received on this proposal; four in favor, five neutral, and two opposed.

The principal objection to the White Oak River System is based on the premise that the area should be considered instead as an Estuarine Sanctuary. However, present State of North Carolina policy, the team was told, is to require a gift of fee simple land before the State will consider an Estuarine Sanctuary proposal. In the case of the White Oak River, too much of the land is already in Federal or State hands, and an Estuarine Sanctuary proposal would not receive favorable State consideration.

3.2.3. Santee Delta, SC

The Santee River Delta is the largest delta on the southeast U.S. coast. Some 75 sq mi of delta and Atlantic Ocean waters would be included in the proposed Marine Sanctuary. It is unusual in another aspect. Over 40 years ago, the State of South Carolina and the U.S. Public Works Administration diverted most of the flow of the Santee River to the Cooper River. Since diversion, the biological character of the marshes in the Santee Delta has changed significantly due to the reduction in freshwater flow. In 1983, this man-made change is scheduled to be reversed, with the Santee River flow to be rediverted down the Santee by the U.S. Army Corps of Engineers. The impact of the rediversion is likely to be as dramatic as the original diversion, and the process has attracted considerable attention in the scientific community.

There were only nine public comments on the Santee Delta proposal. Both the U.S. Fish and Wildlife Service and the American Petroleum Institute recommended that the area be considered as an Estuarine, rather than Marine, Sanctuary. The South Carolina Coastal Council came out in opposition to the site. While there are a number of equally important estuarine sites on the South Atlantic coast, the deltaic feature, plus the value of the scientific information to be gained from the rediversion, gave Santee Delta a place on the team's final list of recommended Marine Sanctuary sites.

3.2.4. Port Royal Sound, SC

There is a lot of enthusiastic public support for this proposal. Although Port Royal Sound had received considerable attention as a potential Marine Sanctuary several years ago, the resource evaluation team did not place it on the initial list of sites for public comment. A strong, well-drafted nomination was submitted jointly by L.P. Maggioni & Co., a South Carolina oyster processor, the Hilton Head Fishing Co-op (commercial shrimpers), the local Sierra Club chapter, and the regional vice-president of the Audubon Society. During the second public comment period petitions containing 199 signatures of local residents, and 40 additional comments, were received on Port Royal Sound - with only one dissenting comment. The sole voice in opposition to the proposal came from the Defenders of Wildlife, stating that the area should be considered as a candidate for the Estuarine Sanctuary program.

Port Royal Sound is South Carolina's largest deepwater sound. Freshwater input is low, and the Sound is one of the finest saltwater fishing areas on the South Carolina coast. The salt marshes bordering the Sound are extremely productive and vital to the fisheries of the area. Water based recreation and commercial

fishing are the primary uses of the Sound. The team was impressed by the fact that the Port Royal Sound sanctuary nomination came from commercial fishermen, while many of their colleagues in the rest of the country were nearly uniformly opposed to any kind of sanctuary proposal.

Many of the Port Royal Sound commenters objected to the drawing of an arbitrary eastern boundary that excluded the principal navigational channel and the port of Beaufort, SC. The team was aware that any boundaries they drew would be thrown wide open for debate at subsequent stages of the sanctuary designation process. Thus they chose not to expand the proposed boundaries. There is a lot of development around Port Royal Sound; particularly up the channel and in the Beaufort area. The portion of the Sound included in the team's recommendation fronts areas of relatively less development, with the possible exception of Hilton Head Island. This was considered beneficial by the team, in terms of maintaining strong local support for the proposal.

3.2.5. Florida Coral Grounds, FL

The fifth site recommended by the resource evaluation team consists of the two southernmost sites originally proposed as part of the "South Atlantic Coral Grounds." These two areas are the 4.5 sq mi "worm," or "bathtub," reef at St. Lucie, FL, and 106 sq mi of the the Oculina Reefs located 17 miles off the Florida coast in 70 to 100m of water. These two sites received several comments during the first public comment period. They were both received better than the other three sites in the team's earlier multiple-site proposal.

Local support for the "worm reef" was surprisingly strong. The Florida Department of Natural Resources (DNR) praised the reef's "outstanding . . . biological and recreational significance." The Martin County Board of Commissioners supported Marine Sanctuary status for the reef by a resolution passed July 27, 1982. The County is actively engaged in acquiring land at the north end of the reef for a potential park, with $5 million of County tax dollars. The Florida DNR has indicated a willingness to manage this site in the event that it is designated. Only one of the eight specific comments received on the St. Lucie site was negative; that of a private individual who noted that land use management was a more pressing concern than ocean use in that area.

The Oculina Reefs are unusual formations of a single type of coral that forms delicately branched structures of high relief. Of all shelf edge sites considered by the team, the Oculina Reef tracts are the most sensitive to damage by certain fishing techniques; e.g., roller trawling. While it may be difficult for the average person to view the corals in place, they are so

unique that they warrant the protection afforded by Marine Sanctuary designation.

The offshore site, the Oculina Reef, attracted few comments, probably due to its distance offshore and extreme depths. Only six respondants commented on this site specifically, with the Defenders of Wildlife, Florida Natural Areas Inventory, and the Florida League of Women voters in favor, and the Florida DNR taking a neutral stand. Two oil and gas industry commenters, Exxon and the American Petroleum Institute, opposed sanctuary status for the reef.

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Ten Fathom Ledge/Big Rock

B. LOCATION: (SOUTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE:

Ten Fathom Ledge	34°26' N	76°37' W
	34°13' N	76°37' W
	34°26' N	76°29' W
	34°13' N	76°29' W
Big Rock Area	34°12' N	76°15' W
	34°07' N	76°15' W
	34°12' N	76°10' W
	34°07' N	76°10' W

2. DESCRIPTION: The proposed Ten Fathom Ledge/Big Rock site includes six separate hard ground ledges of varying relief, displaying similar tropical algal and coral communities representing the northernmost extension of hard ground habitats that occur off Florida, Georgia, and South Carolina. Two separate areas are included. The inner shelf site called the Ten Fathom Ledge area includes such features as Ten Fathom Ledge, West Rock area, Thirty-Mile Rock area, and a World War II submarine wreck (total area: 135 mi^2 or 350 km^2). The outer shelf site, some 36 mi (58 km) offshore, includes the Big Rock area encompassing 36 mi^2 (90 km^2). Both sites lie entirely within Federal waters, offshore of North Carolina.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. These hard-bottom communities represent highly productive tropical biotic assemblages uncommon to the temperate geographic region in which they are found.

2. The biological productivity of the benthic algal communities peculiar to these hard-bottom reefs is significantly high in comparison to productivity in the overlying water column or in the surrounding sedimentary bottoms.

3. Several of the sites are special diving areas for recreational purposes.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

A wide variety of unique habitats are included in the proposed preliminary candidate site. The nearshore live-bottom areas harbor shallow-water subtropical populations. Due to the influence of seasonal temperatures, subtropical communities are not permanently established. The offshore sites, whose benthic communities are not as influenced by seasonal water temperature changes, offer permanent residence to subtropical species. These permanent offshore communities, as well as the "Gulf Stream transport," supply recruits to the nearshore areas. Water temperature is the main factor influencing the distribution of the subtropical biota; depth is of secondary importance. Many of these subtropical flora and fauna in the Cape Lookout area are at the northern extension of their range.

The algae, invertebrates, and fishes of Ten Fathom Ledge, a nearshore high-relief area (3-16 ft; 1-5 m), have been intensively studied. Nearly 100 species of fishes have been identified from the ledge; most have southern affinities. The area harbors commercially and recreationally sought species such as black sea bass, gag, scamp, longspine porgy, whitebone porgy, tautog, sheepshead, and gray triggerfish. At least 40 algal species, dominated by brown algae, have been recorded from the ledge. The algae are seasonal in occurrence and abundance with fluctuations in red algae species most noticeable. Ten Fathom Ledge is used recreationally by fishermen and scuba divers; commercial use is predominantly harvesting of black sea bass.

Live-bottom areas in the transitional depths of 100-130 ft (30-40 m), such as West Rock and Thirty-Mile Rock, show an increase in the dominance of subtropical biota which is less influenced by seasons than the nearshore areas. The fauna includes deep-water components, rare in the shallower depths. Purple reef fish, yellowtail reef fish, spotfin hogfish, Spanish hogfish, hogfish, bank butterflyfish, red snapper, vermilion snapper, red porgy, and knobbed porgy are examples of species occurring on habitats of these depths. Scuba, hook and line, and submersible data have indicated the presence of at least 100 species of fishes at the two mentioned locations. Diving and commercial and recreational fishing occur on live-bottom sites of these depths.

Diversity of fishes peaks on offshore live-bottom areas in the depth range of 130-246 ft (40-75 m). These areas are typically low in profile (less than 6 ft; 2 m) and offer stable temperatures. Epinepheline groupers, lutjanids, and red porgy dominate the recreational and commercial catches of these areas. Species such as reef butterflyfish, bigeye, and tattler, rare in shallower environments, have been collected in depths

of this range. These sites are fished recreationally and commercially; research trawl data are available for some of the areas.

The Big Rock area marks the seaward boundary of the proposed sanctuary. The Big Rock is a large area on the continental shelf break, ranging in depth from 200-400 ft (60-120 m). The deepest areas, though decreased in diversity due to cold-water upwelling from the continental slope, maintain several fish populations of commercial importance. Trolling for billfish is a frequent activity in the area.

Nearby Beaufort Inlet provides easy access for fishermen, divers, and researchers. The proposed area receives high recreational and commercial use. The predominant commercial activity is hook and line fishing, but some trapping for sea bass occurs; trawling activities are negligible. Adjacent (within 30 mi; 50 km) to the proposed site are calico scallop beds which are periodically dredged.

2. HUMAN USES

The major human use of the Ten Fathom Ledge/Big Rock complex is recreational. Scuba-diving clubs and recreational fishermen visit the reefs. Commercial trawling occurs over some low-relief hard grounds. A significant commercial headboat (i.e., commercial boats which take private rod-and-reel fishermen out for a day of recreational fishing) fishery makes use of the hard grounds.

Scientific research has been conducted to varying degrees at the different live bottoms since 1920, and increased research emphasis on these habitats is anticipated.

There are few activities currently undertaken that would be incompatible with designation of these coral reefs as a marine sanctuary. Commercial and recreational fishing, using hand and long lures, probably does not harm the reef habitat. However, there is an increasing utilization of potentially destructive fishing gear (i.e., roller trawls) designed to fish reef habitats for grouper and snapper. Although the trawlers may avoid high-relief areas, some of the coral colonies occur on relatively flat bottom away from the pinnacles. Anchoring may also have a potential impact.

The U.S. Department of the Interior, Bureau of Mines, indicates that the Ten Fathom Ledge/Big Rock areas may have potential for mineral resources including oil and gas, phosphate, and possibly uranium associated with phosphate.

Recent OCS oil and gas exploration activities present a potential management concern. Both Ten Fathom Ledge and Big Rock were considered for oil and gas leasing as part of OCS Lease Sales Nos. 56 and 78. The entire area from Virginia to

the Florida Keys is now open for oil and gas leasing. These shelf-edge reefs occur in areas of major interest to oil companies.

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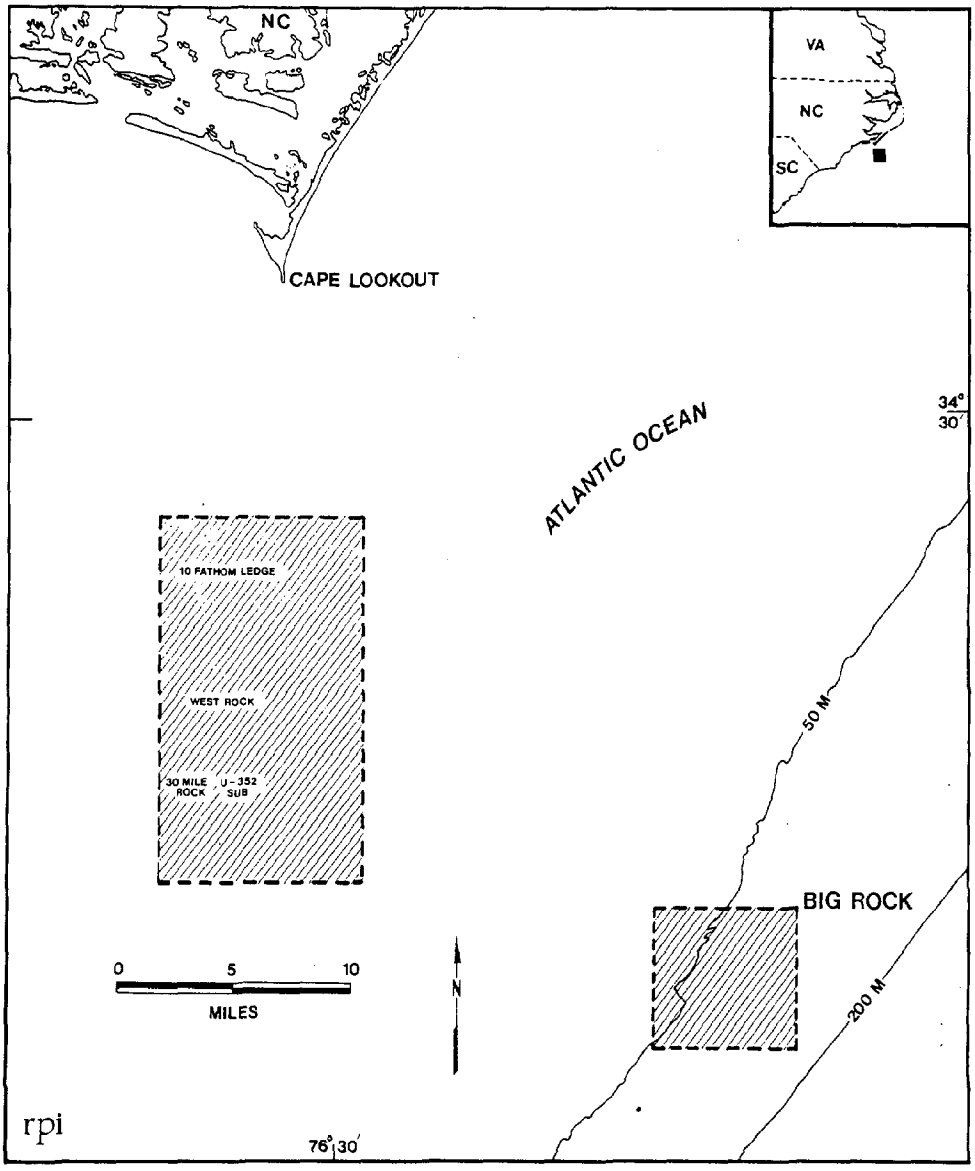

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: White Oak River System, North Carolina

B. LOCATION: (SOUTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: 34°45' N, 77°08' W

2. DESCRIPTION: The candidate site covers approximately 30 mi^2 (78 km^2) entirely within State jurisdiction. The site contains Bogue Inlet, the waters surrounding Bear Island and several nearby islands, the White Oak River Bay, and approximately 10 mi (16 km) of the White Oak River above the Bay (see map). The White Oak River system is situated on the Atlantic Coastal Plain. The Pee Dee formation is the basement rock in this locality, and it is overlain by limestone formations. Southward from U.S. Highway 17, the river flows through seven distinct lakes which were formed between 1940 and 1960 by limestone quarrying activities. This river system extends further southward discharging into the Onslow Bay area of the Atlantic Ocean. The major tributaries of the White Oak River system are: Hunter Creek, Grant Creek, Pettiford Creek, Starkey Creek, Black Swamp, and Holston Creek. All of these tributaries are small and densely vegetated. The bottom of the White Oak River system is primarily sand and mud with sand shoals along the margins. Diverse habitats occur along and in the candidate site. Forests, including Hoffman Forest and Croatan National Forest, line a substantial amount of the White Oak River system shore. Marshes also rim the area and extensive seagrass beds cover portions of the bottom. The area has not been intensively developed.

The White Oak River, north of the bay up to U.S. Highway 17, ranges in depth from 5 to 14 ft (1.5 to 4.3 m) and in width from 490 ft (150 m) to 20 ft (6.1 m). The river meanders between fresh and brackish hardwood swamp and grassy marshes.

Bear Island is the site of Hammocks Beach State Park and has no permanent inhabitants. There is extensive vegetation and approximately 4 mi (6.4 km) of beach on this island, including sand dunes 60 ft (20 m) high.

The Bogue Inlet area has several large islands including Huggins Island. Huggins Island has rather well-preserved Civil War earth fortifications. A number of these islands have bird rookeries, oyster rocks, sand and mud flats, and seagrass beds associated with them.

Historically, this area has been repeatedly impacted by hurricanes. These storms have affected the area by cutting new

inlets, closing old inlets, and shifting submerged sediments. Northeast storms occurring primarily during winter and fall do not severely impact this area due to the east-west alignment of the shoreline; however, these storms do generate heavy rain, high tides, and episodes of coastal erosion.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The candidate site is an estuarine system whose high biological productivity supports a rich variety of commercially and recreationally important species.

2. Several major centers of scientific research are within 35 mi (40 km) of the candidate site and the research potential is high for this area. Past studies, including studies of Bear Island, have documented baseline data for future investigators.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

There is a large diversity of wildlife and plants directly associated with this complex estuarine system. Surrounding the White Oak River system are tracts of marsh and beach dune--scrub thickets including giant cord grass, smooth cord grass, needle rush, sedges, sea ox-eye, sea oats, sea myrtle, groundsel, marsh elder, and other plants. Migratory and resident shorebirds, wading birds, and waterfowl including herons, egrets, ducks, warblers, vultures, hawks, rails, gulls, sandpipers, terns, ospreys, cormorants, and skimmers utilize the White Oak River system habitat for feeding and rookery grounds. Also closely associated with this estuary are many reptiles, amphibians, mammals, and abundant estuarine invertebrates. Bear Island is an important nesting area for the threatened loggerhead sea turtle.

Numerous species of freshwater fish reside in the upper reaches of the White Oak River system. Among the saltwater species found in the lower waters are: Atlantic menhaden, bluefish, spotted seatrout, spot, Atlantic croaker, black drum, red drum, striped mullet, summer flounder, and southern flounder. Anadromous runs of blueback herring, alewife, American shad, and hickory shad occur also.

2. HUMAN USES

The White Oak River system remains in a relatively undisturbed condition. The estuary and its associated watershed is mainly free of the massive impacts of agricultural drainage and land clearing that are affecting nearly all of North Carolina's estuaries. The White Oak estuary is protected because it is

nearly surrounded by lands designated for forest production, particularly the Croatan National Forest and Hoffman State Forest. There is little urban development in the watershed with Swansboro (population just under 1,000) being the largest town. The proposed area is easily accessible from Highway 17 on the north, Highway 58 on the east, and Highway 24 on the south between the river bay and Bogue Inlet. The University of North Carolina, Chapel Hill, Institute of Marine Science, Duke University Marine Laboratory and the National Oceanic and Atmospheric Administration Southeastern Fisheries Center Beaufort Laboratory, the North Carolina Division of Marine Fisheries, Morehead City, and the North Carolina Marine Resources Center, Bogue Banks, are scientific institutions all within 25 miles of the river. Baseline data for future research is available from past studies of the area.

The Cedar Point Campground maintained by the National Forest Service provides extensive camping facilities and boating access to the river bay approximately 1 mi (1.6 km) above Swansboro. An excellent nature walk over the marshes and bird observation towers are also provided. The North Carolina Wildlife Service provides boat ramps at several locations. Haywood's Landing facility several miles north of Stella and the bay area allows access to approximately 6 mi (9.6 km) of uninhabited river canopied by hardwood trees and cypress.

The point sources of pollution, including a tertiary sewage treatment plant, along the candidate site have been in compliance with State regulations, Nonpoint sources of pollution include stormwater runoff, silvicultural and agricultural runoff, and septic tank seepage. Portions of the site are closed to shellfishing.

Commercial and recreational finfishing, clamming, oystering, and shrimping are activities in the site. Transplantation of oysters among areas has been undertaken. Fishing pressure in the area is considered to be at a low intensity.

Boating, hiking, camping, and hunting in and around the candidate site are popularly enjoyed. Ferry boats provide access to Bear Island and Hammocks Beach State Park during the summer.

The Atlantic Intracoastal Waterway, which crosses the eastern extremity of the proposed site, is maintained by the Wilmington District of the U.S. Army Corps of Engineers. Dredged material disposal sites are associated with the maintenance of navigational channels.

The U.S. Department of the Interior, Bureau of Mines, indicates that the area may have potential as a commercial source of clay, peat, sand, gravel, and heavy minerals.

III. PRINCIPAL REFERENCE MATERIAL

Henry Von Oesen and Associates, Inc. (Wilmington, N.C.), 1981, Final report, White Oak River system study (a plan of action for the White Oak River): Prep. for the White Oak River Advisory Council and Town of Cape Carteret, Town of Swansboro, Carteret County, Onslow County.

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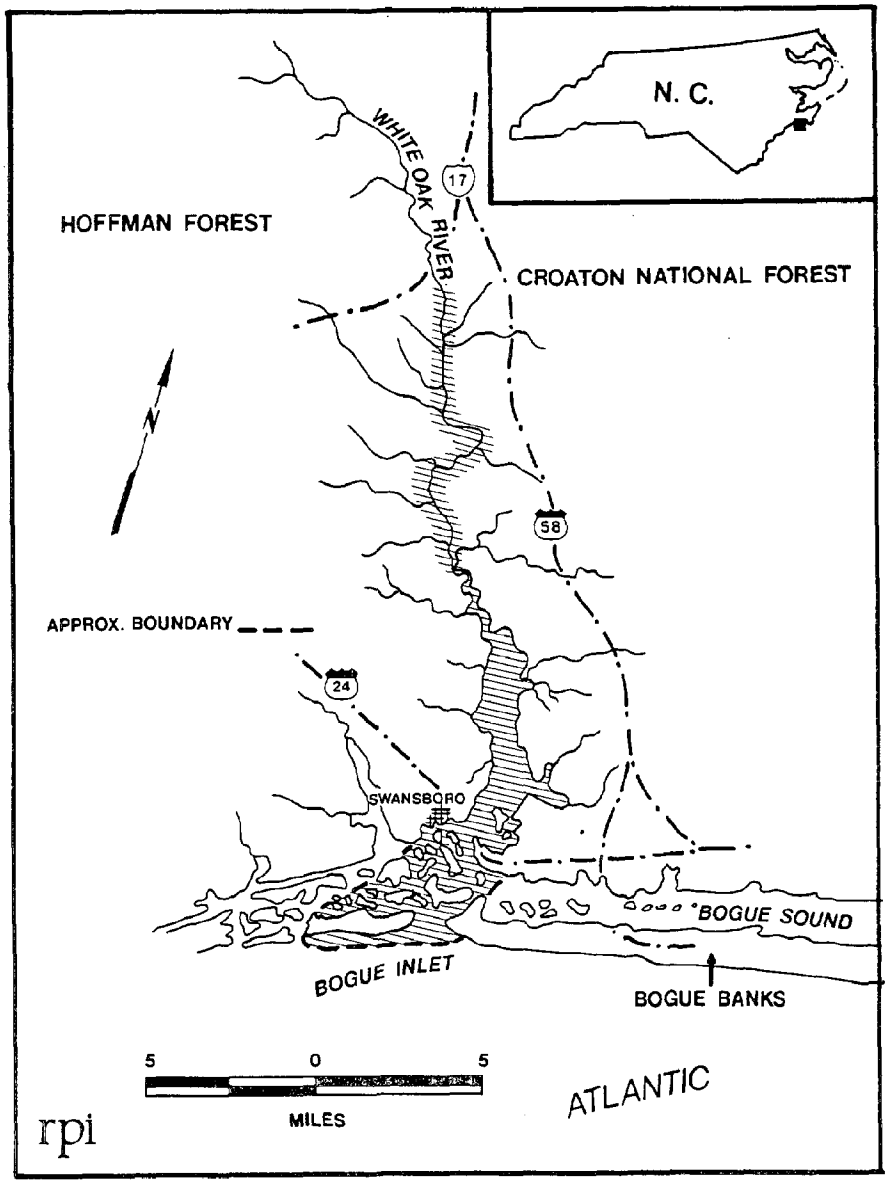

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Santee Delta, South Carolina

B. LOCATION: (SOUTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: 79°16' W, 33°10' N

2. DESCRIPTION: The Santee River delta system includes 75 mi^2 (194 km^2) of salt marshes, brackish marshes, and freshwater wetlands. The delta extending out into the Atlantic Ocean as a geomorphic feature is entirely unique to the Atlantic Coast. Bottom sediments are primarily sand and clay, supporting lush growths of marsh cordgrass (Spartina alterniflora) and other brackish marsh vegetation. The tidal range varies from 0-4 ft (0-1.2 m), exposing 60 percent of the total area at low tide. The proposed area, located entirely within the State boundary, extends from a point 6 mi (9.6 km) west of the divergence of the North and South Santee Rivers, eastward to the Atlantic Ocean to a distance 3 mi (4.8 km) from shore. It would include the waters of the Santee River and tidal inflows coursing through the North and South Santee Rivers as well as the numerous channels and creeks of the adjacent coastal wetlands.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The Santee River delta as a geologic feature is entirely unique to the U.S. East Coast. It also represents one of the most biologically productive brackish marshes along the south Atlantic Coast of the United States.

2. The Santee River estuary is an important spawning ground and nursery for a variety of commercially important migratory finfish and shellfish species.

3. The proposed sanctuary has been the subject of detailed scientific research investigations and lies adjacent to a number of scientific research facilities and wildlife management areas.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Characteristic of South Atlantic salt marshes, the Santee River delta supports a rich diversity and abundance of marine organisms, components of water-related food webs necessary to the growth and survival of other ecologically important predators and commercially and recreationally important species.

Hundreds of species of algae, microfauna, and macrobenthic invertebrates inhabit the sandy-mud sediments of the marsh. Oyster reef communities are prominent throughout the area. The reefs, Spartina marshes, and sand and mud flats support a rich diversity of marine invertebrates including tube-dwelling and burrowing annelid worms, snapping shrimp, grass shrimp, stomatopod shrimp, white and brown shrimp, blue crabs, stone crabs, clams, mussels, mud snails, and a great variety of microscopic organisms. The area supports an almost homogenous marsh of giant cordgrass, Spartina cynosuroides, which is unique to the two Carolinas.

The productivity of these waters is reflected in the abundance and variety of higher predators utilizing the area as a habitat, feeding, spawning, and nursery ground. Great blue herons, little blue herons, osprey, ibises, egrets, oystercatchers, brown pelicans, wood storks, anhingas, and the rare swallow-tailed kite nest in the area, along with numerous shorebirds and migrating seabirds. Pairs of porpoises migrate through the channels. Several endangered species, such as the southern bald eagle and the red-cockaded woodpecker, nest and feed within the boundaries of this proposed sanctuary. More than 40 species of fish feed and spawn in the waters of the lower Santee Delta. Several commercially important species may depend upon the lower Santee as a nursery ground. These species include sturgeon, blueback herring, silver perch, shad, American eel, Atlantic menhaden, sea bass, sea trout, weakfish, Atlantic croaker, star drum, red drum, mullet, and spot. Blue crab, oysters, hard clams, white shrimp, and brown shrimp are also present in great abundance.

The Santee River is an important habitat for several endangered species, including the southern bald eagle, red-cockaded woodpecker, American alligator, loggerhead sea turtle, Ridley sea turtle, hawksbill turtle, and the short-nosed sturgeon.

2. HUMAN USES

The area retains much of its pristine character and primarily supports South Carolina's recreational and commercial finfishing and shellfishing industries. Though some tracts are closed to shellfishing because of domestic pollution, the area contains a number of large and historically important shellfish leases. South Carolina's shellfishing fleet is located in McClellanville, just 8 mi (12.8 km) to the south. The Cape Romain National Wildlife Refuge is adjacent to McClellanville and to the proposed marine sanctuary. North Inlet estuary, the site of intensive marine research conducted by the Belle W. Baruch Institute for Marine Biology and Coastal Research, lies just north of the proposed marine sanctuary. The South Carolina Department of Wildlife and Marine Resources owns and manages 24,000 acres of the Santee Coastal Reserve, the 13,000-acre Yawkey Wildlife Center, and the Santee Delta Game Management Area. The Santee Delta contains several plantations. The

riparian owners manage their lands as excellent habitat for waterfowl, other game, and fish, and have repaired and maintained the former rice field banks and water control structures.

Considering the pristine nature of the site, the extensive research investigations conducted within and adjacent to the area, the State's commitment to wildlife management as evidenced by the establishment of five Game Management Areas surrounding the delta, and the proximity of the Federally regulated Cape Romain National Wildlife Refuge, the Santee River Delta would add an important ecological component to the management area already loosely defined by State and Federal programs.

For the past 42 years, the waters of the Santee River have been diverted by the State of South Carolina and the Works Progress Administration to flow down the Cooper River to the south. It is now planned to be rediverted back down the Santee River in 1983. The rediversion would therefore affect this site, and scientists are in a unique position to study the nature and magnitude of such effects.

III. PRINCIPAL REFERENCE MATERIAL

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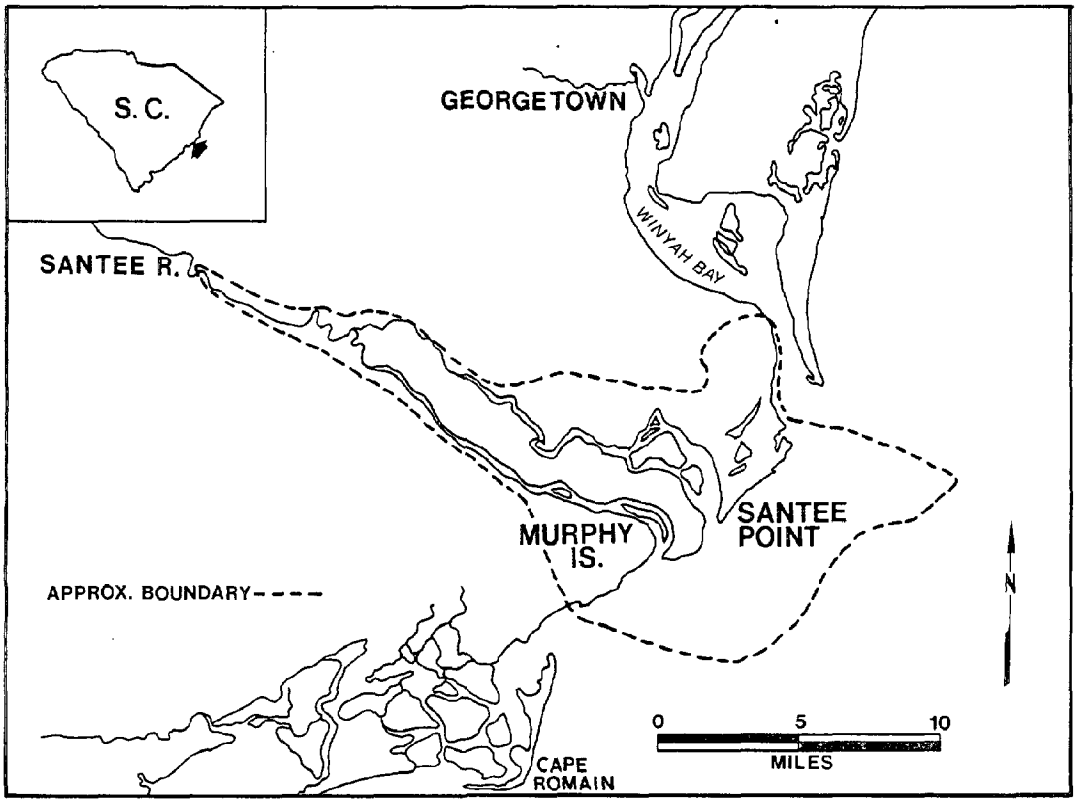
Tiner, R. W., 1977, An inventory of South Carolina's coastal marshes: S.C.M.R.C. Tech. Rept. No. 23, S.C. Dept. Wildlife and Mar. Res., Charleston, S.C., 33 pp.

U.S. Fish and Wildlife Service, 1980, Atlantic Coast ecological inventory: U.S. Dept. Int., Biol. Serv. Prog. FWS/OBS-80/51, 163 pp.



LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Port Royal Sound, South Carolina

B. LOCATION: (SOUTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE: 32°17' N, 80°45' W

2. DESCRIPTION: The candidate site lies entirely within State waters covering an area of approximately 54 mi^2 (140 km^2). Port Royal Sound is South Carolina's largest deepwater sound and largest high-salinity body of water. Freshwater influence is primarily from the Coosawhatchie and Pocotaligo Rivers with a combined mean discharge of less than 500 cubic feet per second; consequently, turbidity remains low and salinity remains high. The tidal amplitude averages 7.5 ft (2.3 m) with tides occasionally exceeding 9 ft (3 m). The high-quality waters of this site are used primarily for fishing and recreation.

The candidate site is bordered in part by over 70,000 acres of highly productive marshlands which provide important nutrient input for the area's foodweb. Numerous shellfish including shrimp, oysters, crabs, and clams inhabit these waters. Many species, such as king and Spanish mackerel, found primarily in coastal ocean waters elsewhere, are commonly found in the high-salinity candidate site.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The candidate site includes areas of high quality wildlife habitat with substantial populations of fin- and shellfish species. The waters of the site and adjacent marshlands are highly productive habitat for numerous marine invertebrates, adult, and juvenile fish, and resident and migratory waterfowl, wading and shorebirds.

2. The candidate site is habitat for threatened and endangered species. The bald eagle, brown pelican, alligator, and loggerhead turtle are regularly observed in the vicinity of this site.

3. The area is an easily accessible and aesthetically attractive area for recreational activities such as sailing, motorboating, swimming, and nature study.

4. The diversity and high quality of habitats and wildlife in the area are the subject of continuing research conducted by the State of South Carolina and universities in the region.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The extensive marshes of the Port Royal Sound area form the basis of this estuarine site's detritus-based foodweb. The marshes are important nesting and foraging grounds for migratory mallards, pintails, canvasbacks, and teals, and provide a permanent habitat for willets, ospreys, marsh hens, rails, gulls, terns, egrets, herons, coots, marsh hawks, clapper rails, sandpipers, plovers, and black-winged blackbirds. Minks, raccoons, opossums, marsh rabbits, grey squirrels, and insects also live among and are associated with the marshes. The lower marsh consists of smooth cordgrass and Spartina alterniflora. The higher marsh plant life is more diversified including smooth cordgrass, needlerush, sea ox-eye, salt grass, Salicornia, marsh elder, and other species.

The site's high-salinity, high-quality waters are a major spawning and nursery area for numerous recreationally and commercially important fin and shellfish species including cobia, menhaden, black drum, blue crabs, clams, oysters, and shrimp. Large quantities of rock shrimp, brown shrimp, white shrimp, blue crabs, and oysters are harvested from the site. Approximately 46 species of finfish utilize these waters.

The candidate site is a habitat for the endangered bald eagle, brown pelican, and alligator. The threatened loggerhead turtle nests on beaches in the vicinity of the site. Other turtle species which are occasionally reported nesting or washed up in the area include the leatherback, green (federally listed as a "threatened" species), hawksbill, and Kemp's Ridley turtles. Bottle-nosed dolphins, whales, and porpoises have been observed in the area.

2. HUMAN USES

The candidate site is used for waterborne transportation, fin- and shellfishing, as well as various additional outdoor recreational activities.

Angling is a popular pastime within this area. Sea trout, drum, flounder, cobia, mackerel, jack, bluefish, and sheepshead are caught from boats, bridges, and the shore. Since the implementation of the State Record Fish Program in 1967, twelve record fish have come from the waters of Port Royal Sound. The potential for expansion of the recreational fishery is good. Public shellfish grounds are within the candidate site. The waters of this area supply major portions of the State's total production of oysters, clams, blue crabs, and shrimp. Over 25 percent of the state's commercial catch of white and brown shrimp, over 75 percent of the blue crabs, and a major percentage of oysters harvested commercially in South Carolina come from Port Royal Sound. The oyster and

blue crab fisheries are confined almost entirely within the inner estuarine area of the sound and tidal streams. Shrimping is primarily carried out by trawlers in the sound and in the open ocean from nearshore to five miles offshore. Oysters and clams are obtained from commercially leased shellfish banks. Approximately 300 shrimp trawlers and 150 crab fishermen licensed by the South Carolina Wildlife and Marine Resources Department operate regularly in the area. Slightly over 2000 acres of intertidal shellfish bottoms are currently under lease to 17 oyster and clam producers.

The candidate area is easily accessible and aesthetically very attractive for recreational activities such as sailing, motorboating, swimming, photography, and nature study. There are several public boat launching ramps and marinas in the area. Waterfowl and rail hunting is popular during the colder months.

Scientific research has been conducted by various universities, and the South Carolina Wildlife and Marine Resources Department conducts ongoing research and monitoring programs in the area concerning fisheries management. The South Carolina Department of Health and Environmental Control conducts ongoing research and monitoring of water quality and shellfish areas.

The Intracoastal Waterway traverses the candidate site and is maintained by the U.S. Army Corps of Engineers. Shipping traffic to and from the State Ports Authority Terminal at Port Royal is extremely light.

The U.S. Department of the Interior, Bureau of Mines, indicates that the Port Royal Sound area may have potential as a source of clay, peat, sand, gravel, and heavy minerals.

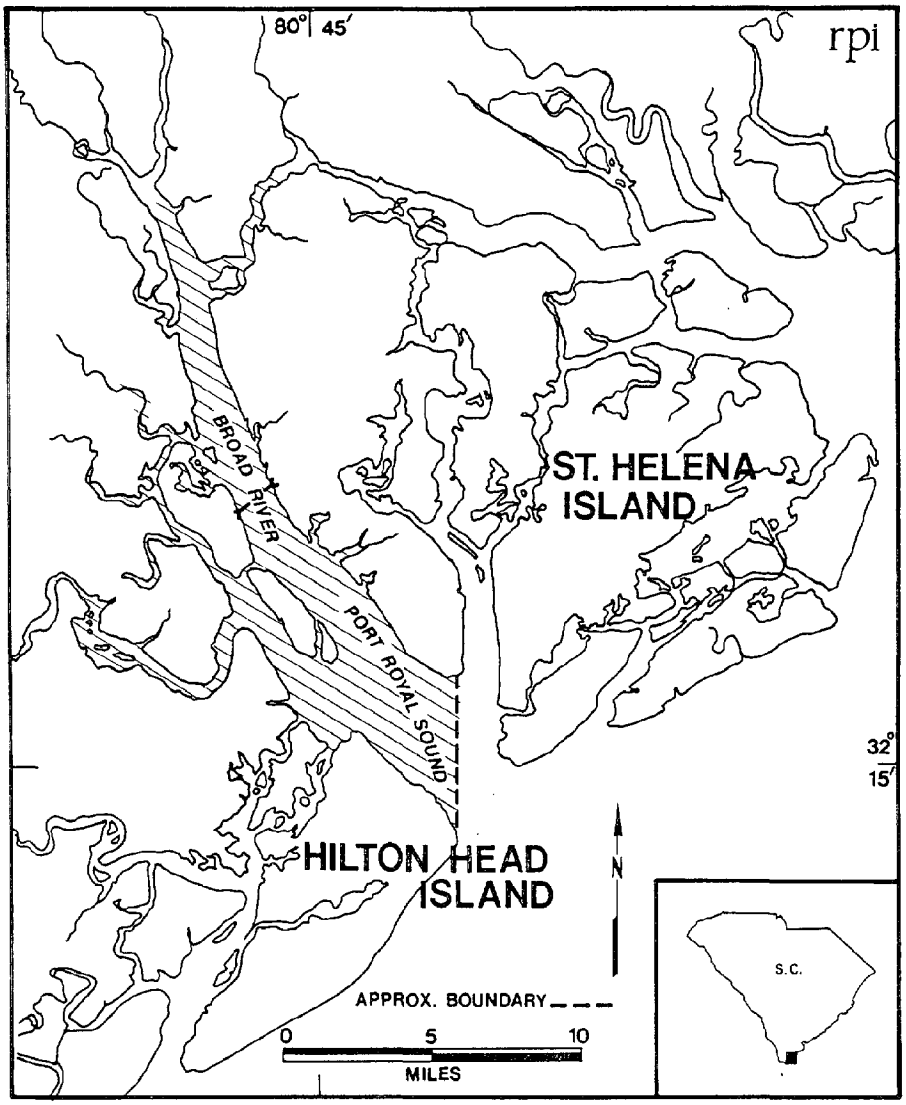
The area is adjacent to Hilton Head Island, a rapidly urbanizing island community.

III. PRINCIPAL REFERENCE MATERIAL

The Center for Low Country Environments, 1981, Nomination of Port Royal Sound as a marine sanctuary: Unpubl. Communication to NOAA, 30 pp.

Drane, E. B. (P. O. Box 4904, Hilton Head, SC 29938) et al., 1982, Nomination of Port Royal Sound for designation as a marine sanctuary: Unpubl. Communication to NOAA, 11 pp.

South Carolina Water Resources Commission, 1972, Port Royal Sound environmental study: 555 pp.



LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Florida Shelf Coral Grounds

B. LOCATION: (SOUTH ATLANTIC REGION)

1. LATITUDE/LONGITUDE (approximate):

Oculina Reefs, Fla.	27°30' N to 27°53' N 79°56' W to 80°00' W
St. Lucie Nearshore Reef, Fla.	27°08' N, 80°09' W

2. DESCRIPTION: This candidate site contains two separate areas. The inner shelf site includes the reefs immediately north and south of the St. Lucie Inlet, encompassing an area of 4.5 mi^2 (11.7 km^2). Sabellariid wormrock and areas of limestone bedrock with 1-15 ft (0.3-4.9 m) relief are common at depths less than 30 ft (10 m) and within 1 mi (1.6 km) of shore. The area is rich in temperate and subtropical fishes and invertebrates and represents the northern known limit for several species of hard and soft corals. The outer shelf site is 106 mi^2 (275 km^2) in area and contains monospecific coral reefs of moderate-to-high relief. It is located 17 mi (27 km) off the coast of central eastern Florida at a depth of 230-328 ft (70-100 m). Both sites together are approximately 110 mi^2 (286 km^2).

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. Located in a transition zone for subtropical-to-temperate faunal affinities, the reefs at St. Lucie Inlet appear to be the northernmost limit in the United States for several species of hard and soft corals.

2. The St. Lucie Reefs are readily accessible and are used heavily by sport scuba divers, snorklers, and recreational fishermen. The area north of the inlet is used heavily by bathers and snorklers.

3. The Oculina Reefs are the only known banks of monospecific colonial coral that occur on the continental shelf anywhere in the United States.

4. The Oculina Reefs show great species diversity, with over 200 species of molluscs, 50 species of decapod crustaceans, 20 species of echinoderms, and 23 families of polychaete worms.

5. The Oculina Reefs form an impressive breeding nursery and feeding grounds for numerous commercial fish species.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

a. St. Lucie Reefs - Several different biologic and geologic features are present in the site. Intertidal and subtidal colonies of sabellariid wormrock (Sabellaria vulgaris) are common, forming an intertidal barrier-like reef that parallels the shore at the northern end of the site. Subtidal colonies form rounded heads 1-3 ft (36-90 cm) high and are common immediately north and south of the inlet. Coquinoid limestone of the Pleistocene Epoch is present as flat pavement, ledges with relief up to 15 ft (5 m), arches, and spur and groove buttresses which are best developed at the southern portion of the site but also occur north of the inlet seaward of the subtidal wormrock. Large patches [10-20 ft (3-6 m) diameter] of red boring sponge (Cliona sp.) are present along with carpets of the anemone-like zoanthids [up to 20 ft (6 m) diameter], flat colonies [1-3 ft (25-100 cm) diameter] of brain coral, and some soft corals. Sea urchins, stone crabs, and numerous marine worms inhabit the reef. These invertebrates and other microscopic forms are vital to the abundant fish populations that feed along this shelf. More than 122 species of fish and shellfish inhabit the area, including herring, anchovy, sea bass, jack, snapper, grunts, porgy, drum, moray eels, butterflyfish, damselfish, wrasses, parrotfish, barracuda, blennies, gobies, scorpionfish, triggerfish, puffers, porcupines fish, lobsters, and scallops. Sea turtles frequent the area and nest on the beaches nearby.

The fore reef is variable, consisting in some areas as a spur-and-groove system with buttresses 10 ft (3 m) high with surge channels cut between perpendicular to shore. In other areas, the fore reef is a rubble slope of irregular steps and ledges of limestone. The cover consists of algae, sponges, and widely scattered colonies of hard and soft corals. The base of the forereef grades into sand at depths of approximately 30 ft (9.1 m). Landward of the reef crest are ledges which drop to a maximum of 15 ft (4.6 m) depth and are best developed, with undercuts and arches, along the southern half of the reef tract. The ivory tree coral, Oculina, is common along with myriads of tropical and temperate fish.

Geologically, the area is also unusual. Not only is the reef directly connected to the beach, but the continental shelf width narrows sharply between the St. Lucie Inlet and Palm Beach. This has an impact on the proximity of the Gulf Stream to the beach and affects littoral and other currents in the reef area. The impact of current turbulence and mixing in this area on the prevalence of marine

species and the overall ecology is inadequately understood. The onshore movement of very cold bottom water during the summer months in recent years is another manifestation of the complex current movements in the St. Lucie Inlet vicinity.

b. Oculina Reefs - These reefs represent highly productive and richly diverse biotic assemblages dominated by ivory tree coral (Oculina varicosa). Oculina forms extensive thickets of delicately branched bushes and coral banks with pinnacles up to 82 ft (25 m) in height providing a substrate and protection for a diversity of marine macroinvertebrates. Some of the molluscs, 85 percent of the amphipod crustaceans, and other species are yet undescribed and new to science.

Hundreds of species of macroinvertebrates are directly associated with Oculina including 200 species of molluscs, 50 species of decapod crustaceans, 50 species of amphipods, 20 species of echinoderms, and 23 families of polychaete worms. These invertebrates help to support the dense and diverse populations of fishes (over 70 species) including morays, herring, porgies, drums, butterflyfish, angelfish, damselfish, wrasses, gobies, tunas, sharks, mantas, scorpionfish, and the unique sunfish, Mola mola.

The Oculina Reefs form important breeding grounds for commercially valuable populations of gag and scamp grouper, nursery grounds for these and other fish including black sea bass, red grouper, amberjack, and red snapper. This shelf-edge system may form part of the migration pathway for king mackerel. Large populations of the commercially important squid, Illex oxygonius, spawn on reefs and spiny tail stingray use the reef region for courtship and mating.

2. HUMAN USES

The reefs adjacent to St. Lucie Inlet front County, State, and Federally owned beaches, making the area easily accessible to the public. Recreational diving, boating, shelling, lobstering, and fishing are common ongoing activities. There is also a State-designated aquatic preserve inside the inlet and adjacent to the inlet. The provided access through publicly owned lands insures that these activities will flourish and more than likely increase in popularity.

The shelf-edge Oculina Reefs are popular grounds for charter and private fishing boats. The sailfish tournaments of the area are well known. The area is also important from a scientific standpoint, particularly in determining the interrelationship of the reefs and indigenous organisms to the surrounding waters (including trophic structure, upwelling, etc.).

The nearshore reef, wholly in State waters, also suffers from its easy accessibility. Divers and boat-anchoring could cause damage, as could pollution and dredging of the St. Lucie River.

At the outer shelf edge site, there are few activities currently undertaken that would be incompatible with designation of these coral reefs as a marine sanctuary. Commercial and recreational fishing, using hand and long lines, takes place in some of these areas, and there is an increasing utilization of certain fishing gear (i.e., roller trawls) designed to fish reef habitats for grouper and snapper. Sea turtles are often caught in shrimping nets and are drowned. Indiscriminate anchoring on or near the reefs damages the coral structure. Although the trawlers may avoid high-relief ares, some of the shelf-edge Oculina colonies occur on relatively flat bottom away from the pinnacles. There are no programs at present which protect coral reefs in Federal waters from trawling, dredging, or otherwise removing or harming the coral of the shelf-edge habitat.

Shore-based construction activities which may impact on the water quality of the nearshore St. Lucie reefs are regulated by the State of Florida. The Gulf of Mexico and South Atlantic Fishery Management Councils have developed a Coral Fishery Management Plan designed to provide comprehensive management of all corals and coral reefs within the proposed site. This plan identifies a portion of the Oculina reef tract as a Habitat Area of Particular Concern and would prohibit the use of bottom long lines, dredges, bottom trawls, and fish pots and traps in this area.

Public access to the St. Lucie Nearshore Reefs is good. Martin County is currently acquiring beachfront lands to develop the Bathtub Reef County Park at the northern end of the St. Lucie Nearshore Reefs. There currently exist the St. Lucie Inlet State Park and a U.S. Fish and Wildlife Service Hobe Sound National Wildlife Refuge with a total of 4 mi (6.4 km) of beachfront facing the reef. A one-mile stretch of beach directly north of St. Lucie Inlet is owned and under development by the Mobil Oil Corporation. Immediately south of the inelt is the State Park which extends for 2.7 mi along the beach. The 0.8 mi of shoreline abutting the park is part of the Reed Wilderness Seashore Sanctuary in which development is barred. Access to this area is restricted to boat or by foot from the State Park or from the town of Jupiter Island.

The boundaries of the St. Lucie Nearshore Reef site includes a portion of the Intracoastal Waterway, a portion of the existing small-boat navigation project for St. Lucie Inlet, and the Florida State Park at the northern end of Jupiter Island which is periodically nourished to control beach erosion. The U.S. Army Corps of Engineers, Jacksonville District, is responsible for maintaining these navigational channels within the proposed site by dredging and spoil disposal operations.

This site is also part of the Federal lease program for oil and gas exploration.

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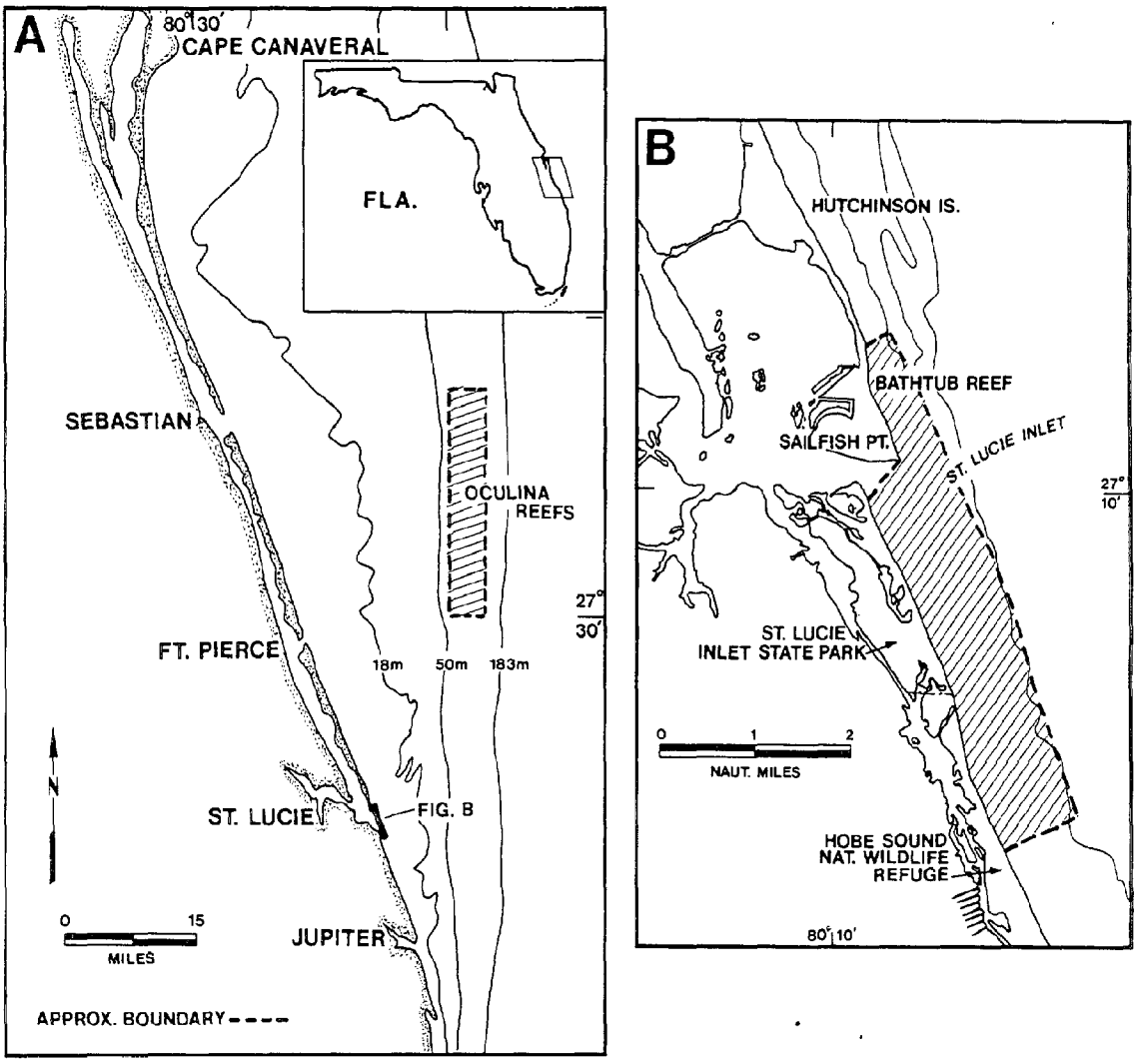

LOCATION MAP

WEST PACIFIC REGION

MARINE SANCTUARY SITE EVALUATION LIST
WESTERN PACIFIC REGION

MANAGEMENT OVERVIEW

1. Resource Evaluation Team

The Western Pacific resource evaluation team was made up of three marine scientists from the region. The team leader was Dr. Roy Tsuda, Dean of Graduate School and Research, University of Guam. The other team members were Dr. Richard C. Wass, Office of Marine Resources, American Samoa, and Dr. E. Alison Kay, Professor of Zoology at the University of Hawaii.

2. Site Evaluation and Public Participation Process

The team held its first meeting in Guam and Saipan on May 6-7, 1982. Prior to this meeting the team members made numerous contacts with their associates in academic institutions, territorial and local governments, Federal agencies, environmental, fishing and other interest groups in the area. The regm included Guam, the Northern Mariana Islands and American Samoa. It did not include the American Trust Terrritories as they are currently in political transition and will probably acquire independence shortly. At the first meeting the team considered and discussed many potential marine sanctuary sites in the Western Pacific region. They also reviewed all Western Pacific sites that were contained in NOAA's List of Recommended Areas (44 Fed. Reg. 62552, Oct. 31, 1979).

No Hawaiian sites were considered because NOAA determined that the proposed Humpback Whale Marine Sanctuary, off Maui, now an active candidate in the designation process, satisfies the sanctuary needs of the islands.

At the first meeting held in Guam and Saipan, the team narrowed the candidate list down to seven potential Marine Sanctuary Sites. They were:

WP-1. Northern Mariana Islands. The original site included waters around Saigon, Pagen and Maug islands out to 10 miles. The expanded site added waters adjacent to three more islands - Uracas, Asuncion and Guguaran. All six are high islands of volcanic origin and all are unpopulated.

WP-2. Southern Mariana Islands. These areas provide a variety of tropical marine habitats in selected sites off the islands of Saipan, Tinian and Rota. All display species diversity and sustain recreational, educational and research activities.

WP-3. Tuman Bay, Guam. This site, located on the western side of Guam, consists of a broad fringing reef of varying width. It is a significant recreational area.

WP-4. Cocos Lagoon, Guam. This site consists of Cocos Lagoon (2.8 sq mi) and approximately 1.1 sq mi of barrier reef at the southern tip of Guam. It contains a diversity of seaweeds, invertebrates and fishes.

WP-5. Goat Island Point - Utulei Reef, American Samoa. Located on the western side of Pago Pago Bay, this site extends along 6,000 feet of shoreline. It includes the intertidal area, reef flat and associated dredge area.

WP-6. Pala Lagoon, American Samoa. This roughly circular lagoon, of about 1.2 sq mi, is located on the east side of Tutuilla Island. It is the only large semi-enclosed body of brackish water in American Samoa.

WP-7. Papalaloa Point, Ofu Island, American Samoa. This site encompasses about 3 miles of shoreline and adjacent fringing reef on the southern border of Ofu Island.

Descriptions and maps of these sites were mailed to 80 groups and individuals in the Western Pacific area and to 82 national organizations and Federal agencies. Chelsea received 16 responses by the end of the 45-day public comment period (September 3, 1982).

Five additional or expanded sites were also nominated by the public by the October 4, 1982, nomination deadline. These were:

1. Luminao Barrier Reef, Guam
2. Inner Apra Harbor, Guam
3. Double Reef, Guam
4. Guam Coastline from Facpi Point to Fort Santo Angel
5. Expanded Northern Marianas Islands

The team held their second meeting in Pago Pago, American Samoa, on October 12-14, 1982. During this meeting the team reexamined their seven original candidates in light of the comments received during the public participation process, and considered the five additional or expanded sites nominated by the public.

The Luminao Barrier Reef was nominated by Charles Birkeland, Director, Marine Laboratory, University of Guam. The Inner Apra Harbor, Double Reef and Facpi Point to Fort Santo Angel proposed sites were nominated by the Guam Environmental Protection Agency. The Governor of the Commonwealth of the Northern Marina Islands requested that the original Northern Mariana Islands candidate site be expanded from three to six Islands. The team considered

each of these new nominations and concluded that two candidates met the criteria set forth in the NOAA Program Development Plan (PDP) and deserved to be considered with the original candidates during the final evaluation process. They were:

WP-8. Facpi Point to Fort Santo Angel, Guam. This 2 sq mi site includes the offshore waters to a depth of 60 feet on the southwest side of Guam. A wide variety of fish and coral are found there and it is a significant recreation area.

WP-1. Northern Mariana Islands (expanded)

In addition to the above, the Pacific Seabird Group nominated the waters surrounding Rose Atoll (American Samoa) and the waters surrounding the Hawaiian Islands National Wildlife Refuge in the northwestern Hawaiian Islands. The team concluded that these nominations did not contain sufficient background information to support comprehensive evaluation.

3. Recommendations

The Western Pacific team, using the criteria outlined in the NOAA PDP, recommends the following five sites, in the order of their priority, for placement on the Marine Sanctuary Site Evaluation List:

1. Northern Mariana Islands (expanded)
2. Cocos Lagoon, Guam
3. Papaloloa Point, Ofu Island, American Samoa
4. Southern Mariana Islands
5. Facpi Point to Fort Santo Angel, Guam

In addition, the team wishes to express unanimous support for the two active candidate sites in the Western Pacific that currently are proceeding toward site designation. They are the proposed Humpback Whale Sanctuary in Hawaii and Fagatele Bay in American Samoa. In the case of the latter, the team suggested that NOAA consider expanding the Fagatela Bay site to include neighboring Larson Bay.

This portion of the regional report contains highlights of the team's rationale for selecting each of the five sites, a summary of public comments received and specific comments on management issues that came to the team's attention.

3.1. Northern Mariana Islands (expanded)

The proposed site, approximately 700 sq mi, includes the waters out to 12 miles adjacent to six of the ten Northern Mariana Islands. These islands are Uracas, Maug, Asuncion, Pagan, Guguan and Sarigan. Oriented in a north to south direction, the islands

are unique and offer a natural laboratory for biogeographical studies of marine organisms along a north to south temperature gradient. The proposed site surrounds islands representing different geological ages. The northernmost island, Uracas, is the youngest, with each island to the south being progressively older. The principle reasons for nominating these islands as a potential marine sanctuary are for geological and marine research, preservation and fisheries management.

The team spent the second day of the first meeting in Saipan with members of the Fish and Wildlife Division of the Department of Natural Resources and the Commonwealth CZM program. As originally conceived the Northern Mariana site included only 3 islands - Maug, Pagan and Sarigan. However, during the public participation process, Governor Tenorio of the Commonwealth suggested that the site be expanded to include the islands of Uracas, Asuncion and Guguan. The team agreed with this recommendation and the expanded site description was sent out for public review. The original recommendation elicited six responses, five in favor and one opposed. Fourteen comments were received on the expanded nomination, six in favor and only one opposed. There was no governmental opposition; two environmental groups supported the new proposal, while the Sport Fishing Institute reiterated its opposition, saying only Pagan Island needed additional protection.

3.2. Cocos Lagoon, Guam

The proposed sanctuary includes the Cocos barrier reefs, Cocos Lagoon, three islets (Cocos Island, Babe Island, and a third sandy island), and the coastal region lying between the mouth of Mamaon and Manell Channels. Together the barrier reef and lagoon have an area of 3.9 sq mi. The proposed site, already well known for its recreation, educational and research activities, contains habitat and species diversity unique to Guam. The area is the nursery ground for offshore fisheries. To date, tourists have not had a negative effect on water quality, but overcollecting is beginning to denude the lagoon of corals. A luxury hotel is now being constructed on Cocos Island, which will increase the impact of tourists on the area. The team believes that Marine Sanctuary status is needed to protect the area by providing funds for increased enforcement, public education and research.

During the public participation process, eight comments were received, all were in favor of the nomination. Support came from Guam Governor Paul Calvo, USEPA Region IX, U.S. Department of the Interior, Defenders of Wildlife, Sport Fishing Institute, Marianas Recreation and Parks Society, and the Guam Fisherman's Cooperative, who offered "enthusiastic support," so long as access to southern fishing grounds was not restricted.

The local EPA suggested extending the boundaries to include the mangrove area immediately to the east of the proposed area. The team considers Cocos Lagoon the best site for a marine sanctuary in Guam and recommends that, if it achieves active candidate status, the issue of boundaries be reopened. They believe that consideration should be given to including the mangroves and combining this area with Facpi Point to create a larger multi-habitat sanctuary (see 3.5 below).

3.3 Papaloloa Point, Ofu Island, American Samoa

The proposed site, encompassing about 3 miles of shoreline and adjacent fringing reef down to 150 feet, is located on Ofu Island between Papaloloa Point and the Asaga Strait, which separates Ofu and Olosega Islands. The marine life in the area is plentiful and diverse. The site is unique in that it is the only place in American Samoa where the blue coral is known to occur. The area is the best snorkeling spot in American Samoa, containing extremely clear water. It contains a wide variety of coral life and is protected from swells and surf by a fringing reef. The proposed sanctuary is a short plane ride from Tutuila and a grass landing strip is located next to the site. A small hotel is presently being built near the site.

During the public participation process, 5 letters supported this site while none were opposed. Support came from the USEPA Region IX, U.S. Department of the Interior, Sport Fishing Institute, and the Director of the University of Guam Marine Laboratory. Tentative support was given by the Defenders of Wildlife pending more information regarding the national significance and the potential educational or research values to be served by sanctuary designation.

3.4. Southern Mariana Islands

Like the proposed Northern Mariana Sanctuary, this site was also originally nominated by members of the Commonwealth Government. It consists of a variety of coral reef habitats in selected areas off the islands of Saipan, Rota and Tinian, as well as the waters surrounding Aguijan Island and Naftan Rock. The proposed boundary in each area extends from the high-water line to the 150 foot depth contour.

Most of the areas proposed are already experiencing increasing human related impacts as tourism continues to expand. Fishing, boating, and diving are popular and there have been reported cases of dynamiting and poisoning reef fishes. The team believes that sanctuary status would help protect these reefs for future generations.

Six comments were received on this site; five in support and none opposed. Governmental support came from Commonwealth Governor Pedro Tenorio, USEPA Region IX, and the U.S. Department of the Interior. The Sport Fishing Institute supported the nomination while the Defenders of Wildlife did not take a position, stating they did not possess enough information to base an assessment. Additional support came from the Director of the University of Guam Marine Laboratory.

3.5. Facpi Point to Fort Santo Angel, Guam

This site was one of the new areas nominated during the public participation process and the only one to make the final list of five. It includes the waters from Facpi Point to Fort Santo Angel out to the 60 foot contour and is almost two square miles in area.

There were 14 comments received; 7 in favor and none opposed. The Whale Center and Sport Fishing Institute favored the recommendation, while Defenders of Wildlife did not comment because of a lack of information. The Marianas Recreation and Parks Association offered enthusiastic support.

The area is an important recreational site for local residents and tourists who use the area for fishing, diving, swimming, boating and hiking. It is located next to Cocos Lagoon, but contains a distinctively different habitat. The team suggests that if Cocos Lagoon achieves active candidate status, this area might be included as part of an expanded Cocos Marine Sanctuary.

* * *

In summary, the team strongly endorses the proposed Humpback Whale and Fagatele Bay Sanctuaries now in the designation process and believes the five new sites proposed in this report constitute an excellent cross-section of marine habitat in the Western Pacific Region and would make ideal Marine Sanctuaries.

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Northern Mariana Islands Sanctuary

B. LOCATION: (WESTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE:

Uracas (Farallon de Pajaros):	20°35' N, 144°54' E
Maug:	20°01' N, 145°13' E
Asuncion:	19°40' N, 145°24' E
Pagan:	18°07' N, 145°46' E
Guguan:	17°15' N, 145°51' E
Sarigan:	16°42' N, 145°47' E

2. DESCRIPTION: The proposed site includes the waters of the Commonwealth out to 12 miles (20 km) adjacent to six of the ten northern Mariana islands (see map). All of these islands are high islands of volcanic origin. Pagan was the only populated island until the volcano erupted in May 1981. At present, all islands are unpopulated and volcanically active. The total area encompassed by the boundaries of the proposed site approximates 700 mi^2 (1813 km^2).

Broad fringing reefs are not found within the proposed site; instead, there are apron reefs, cliffs, rocky shorelines, wave-washed beaches, black volcanic beaches, and some coralline beaches. Apron reefs are thin, incipient fringing reefs lacking any significant reef flat. Steep slopes to the sea floor from volcanic activity and/or tectonic instability inhibit reef growth and vigor. The foreslopes of apron reefs may be capped by algal ridges.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The six islands represent biological communities varying in structure along a north-south orientation and in the presence of an active volcano (Pagan).

2. Human use value lies mainly in the beauty of these islands and surrounding waters since they are all presently unpopulated.

3. Development of the islands as oil storage sites (proposed for Maug in 1976) may have the potential for modifying the natural resources.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The primary reason for designating these islands as a potential marine sanctuary is for research, preservation, and fisheries management. These islands, with their north-south orientation, are unique and present a natural setting for biogeographical studies of marine organisms along a temperature gradient [mean sea surface temperatures on Guam and Maug are 81.5° F (27.5° C) and 80.4° F (26.9° C), respectively]. They are part of the Northeast Trade Wind Zone and are located within the Indo West Pacific Marine area which is described as the world's largest and most diverse marine zoogeographic zone, in which relative richness of island ecosystems is found to the west and decreased richness is found to the east. Each island of the northern area of the Marianas Archipelago and the six which are part of the newer northern arc represent different geological ages. The northernmost island of Uracas is the youngest with each island to the south progressively older. A rich diversity of marine species and habitat are associated with these islands, ranging from pristine to volcanically devastated.

More than 519 species of marine organisms have been recorded from the waters of the northern Mariana Islands. The green and ridley sea turtles, Federally-listed as "threatened" species, and the "endangered" hawksbill turtle inhabit these waters. Eleven species of porpoises and whales (including the "endangered" humpback and sperm whales) frequent the area during their annual migrations. These islands represent important nesting, breeding, and resting areas for more than 16 species of shorebirds and seabirds (e.g., terns, noddies, boobies, frigate birds), many of which are listed in the Migratory Bird Treaty between the United States, Japan, and the U.S.S.R. More than 100 species of reef fish and schools of pelagic fish, deep-water shrimp, and spiny lobster, and nearly 300 species of molluscs inhabit the coral reef communities surrounding the Northern Marianas.

Especially noteworthy within the area are two species of abalone (Haliotis spp.) which do not occur south of Anatahan (approx. 16° N), the phenomenon of bioluminescence, the observation that Maug's marine flora has a closer affinity to Hawaiian species than to southern Mariana Island species, the occurrence of high-quality precious corals with an apparent southern limit at 18°N, and the occurrence of flyingfish and three species of rare algae.

2. HUMAN USES

In the Constitution of the Commonwealth of the Northern Mariana Islands (CNMI), Maug and Sarigan are required to be "maintained as uninhabited places and used only for the preservation of bird, fish, wildlife, and plant species." The CNMI

Coastal Zone Management Program identifies these islands as Areas of Particular Concern for the future purpose of preservation and restoration. Maug, Guguan, and Uracas were also designated as "islands for science" during the Technical Meeting on Conservation of Nature and Natural Resources (IUCN) held on Guam and Palau in November 1968. The Commonwealth Department of Natural Resources has promulgated stringent regulations governing hunting, fishing, and trapping on these islands.

Pagan, which was the only populated island (39 people in 1975) until May 1981, has been considered as an ideal site for a marine station. In the past, there have been proposals to develop the island as a tourist attraction because of its beautiful landscape and natural hot springs.

The bottom-fish and highly migratory species fisheries offer great potential for development. Though present harvest yield is insignificant, there are plentiful catches taken by local fishermen and the elusive foreign fleet. The marine species of the northern islands constitute a high pool from which the degraded fisheries of the islands to the south can be replenished.

The scientific research and education potential of the site is very high. Several unique research opportunities include the analysis of the medicinal value of rare algae and other biota, identifying the occurrences and determining the cause of ciguaterra fish poisoning, investigations of Acanthaster planci (crown-of-thorns starfish) biology, tuna migration, fish catch statistics, the life histories of Indo-West-Pacific fishes, coral reefs, marine communities, marine mammals, birds, successional theory, shoreline development, plate tectonics, submarine volcanism, and energy (geothermal, ocean thermal, wave, and solar) resource assessment. Such research investigations may have an important economic impact on the islands resulting in investments, employment, and world recognition. At minimum, the information will be extremely important for resource planning and management throughout the Northern Marianas and elsewhere in Micronesia.

Interisland transportation is currently limited. At present, the islands' inhabitants are dependent on vessels which make quarterly sallies, bringing mail, food, and supplies. No air service is available between the islands. Radio is the only form of instant communication. Establishment of a marine sanctuary would mean more ships visiting the area, better communication facilities, and perhaps even the establishment of administrative facilities on one of the inhabited Northern Islands. Visitors to the sanctuary, whether scientists, managers, or tourists, could offer the local people a small but dependable market for foods, crafts, guide service, information, and transportation. This might help to slow or reverse the trend of migration to the main island of Saipan.

Oil pollution from ships transiting the area has become a serious and growing problem. Oil regularly washes ashore to the detriment of living marine and coastal resources. Japan recently announced its plans to dump low-level radioactive wastes in international waters approximately 300 mi east of Pagan Island. It has also been suggested that this dump site might later serve as a disposal area for high-level radioactive wastes as well. The United States and Japan are collaborating on such a plan.

The U.S. Department of the Interior, Bureau of Mines, reports that the proposed Marine Sanctuary lies within an area which may contain potential for phosphate, sand and gravel, shell, and calcium carbonate sand mining development.

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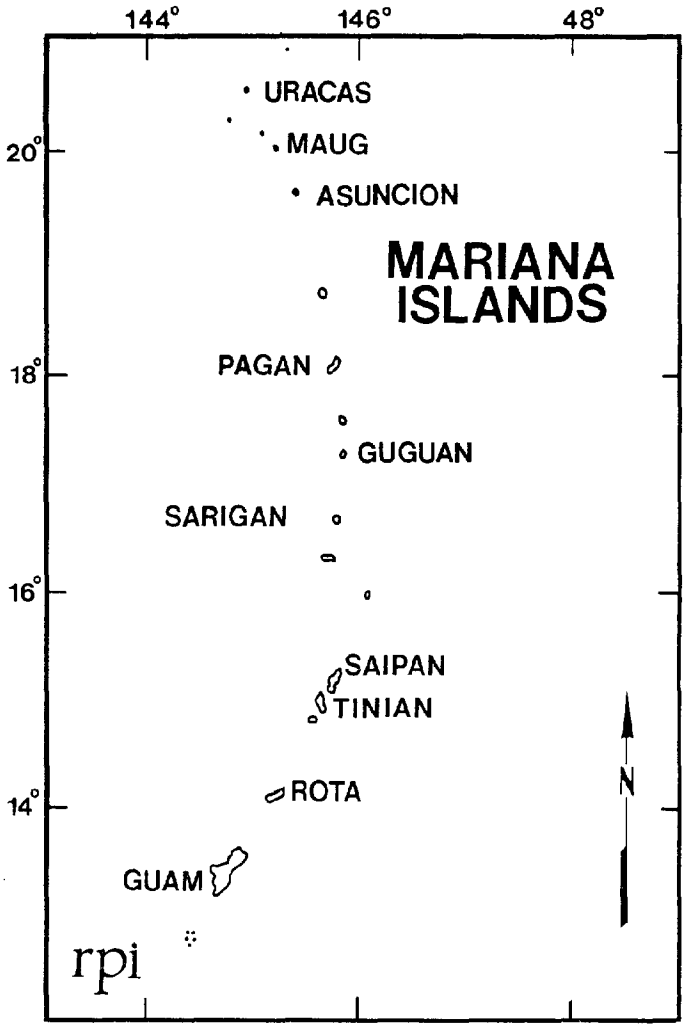

LOCATION MAP

PRELIMINARY EVALUATION
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Cocos Lagoon, Guam

B. LOCATION: (WESTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE: 13°15' N, 144°40' E

2. DESCRIPTION: The proposed area includes the Cocos barrier reefs, Cocos lagoon, three islets (Cocos Island, Babe Island, and a third sandy island), and the coastal region lying between the mouth of Mamaon and Manell Channels (see map). The triangular lagoon is enclosed by barrier reefs nearly 3 mi (5 km) long on the northwest side, 3.5 mi (5.6 km) long on the south side, and by 2.5 mi (4 km) of steep mountainous land and alluvial coastal lowland on the northeast side. The Geus River forms a broad alluvial valley which trends northeasterly from the head of Mamaon Channel. Several rivers form alluvial valleys and a broad coastal plain at the head of Manell Channel. Two deep channels connect the lagoon waters with the open sea--Mamaon Channel opens to the Philippine Sea and Manell Channel opens to the Pacific Ocean.

Three islands are located on the south barrier reef. Cocos Island, slightly longer than a mile (1.6 km), lies along the west end of the south barrier reef. Babe Island, an elongated low strip of raised limestone, lies on the south barrier reef midway between the east end of Cocos Island and Manell Channel. A third, small, sandy island has developed on the lagoon side of the barrier reef, 1,000 ft (300 m) east of Cocos Island.

Cocos Lagoon is unique in that it is the only shallow-water, barrier-reef lagoon on Guam. The proposed site, excluding the barrier reefs, has an area of 2.8 mi^2 (7.2 km^2) and lies entirely within the territorial waters of Guam. The area of the barrier reefs and lagoon together is 3.9 mi^2 (10 km^2). Aside from the deep Mamaon and Manell Channels, the deepest part of the lagoon is about 45 ft (14 m).

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. Natural resources display habitat and species diversity unique to Guam including two species of marine turtles and an occasional marine mammal (Dugong dugong).

2. The area sustains substantial recreation, educational and research activities.

3. Impact of uncontrolled land activity resulting in siltation will degrade the environmental quality of the area.

4. The area serves as a significant recreational site for both local population and tourists. Recreation includes fishing, boating, diving, and other water-related sports.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The Cocos Lagoon site consists of various habitats with its own unique community of marine organisms: (1) fringing reef flats and nearshore area, (2) barrier reef with its seaward slopes and lagoonal slopes, (3) deep channels with its vertical and oblique sloping walls, (4) patch reefs, and (5) shallow lagoon floor. Cocos Lagoon supports 159 coral species including staghorn, soft, fire, and razor corals. The astonishing array represents more species than are found in all of the tropical Pacific Ocean. Both red and yellow mangroves are found along the island's shores which, in addition to protecting the coastline from the effects of tropical typhoons, also provide important nursery areas for reef fish, shellfish, and other invertebrate species. Large numbers of juvenile fish are commonly observed in areas of natural reef cover and within the extensive beds of seagrass (e.g., Enhalus acoroides, Halodule uninervis) that provide food and cover on the fringing reef flats and areas of the shallow lagoon floor. The Cocos area is one of the more important schooling sites for juvenile rabbitfish (e.g., Siganus argenteus, S. spinus) during the months of April and May and, occasionally, during June and October. Rabbitfish are considered a delicacy by the local islanders.

Other observations indicate that portions of the lagoon may be important spawning areas. One Guam Department of Aquatic and Wildlife Resources (DAWR) biologist recently noted what appeared to be a spawning aggregation of the goatfish (Parupeneus trifasciatus) near the mouth of Mamaon Channel. The occurrence of this type of activity near the channel mouth is supported by existing data indicating that optimum spawning conditions are found in areas of strong seaward flushing, thus increasing the efficiency of larval disbursement away from reef-associated predation.

Aside from the diversity of seaweeds, invertebrates, and fish associated with the above habitats, marine turtles (both the "threatened" green turtle and the "endangered" hawksbill turtle) inhabit the lagoon. Recently, a specimen of the sea cow (Dugong dugong) was sighted in the lagoon at Merizo Channel; the first observation of a sea cow in Cocos Lagoon was in February 1974. Several pods of spinner dolphins (Stenella longirostris), often accompanied by calves, are regularly observed in the waters just outside the lagoon. Pilot whales and the "endangered" humpback whale have also been seen in the surrounding waters.

Cocos Island is a major breeding ground of the white tern (Gygis alba candida) during the months of January through June. Offshore fishermen depend upon these birds to locate schools of fish. Cocos Island also supports a small population of the Micronesian staling (Aplonis opacus quami) which is slowly disappearing from southern Guam.

2. HUMAN USES

Cocos Island and its accompanying lagoon is the most popular recreational site on Guam for the residents and tourists alike because of the lagoon's aesthetic qualities and the shelter from storm swell and wind-generated waves that the barrier reef provides. In 1981, 255,130 Japanese tourists visited Guam and the majority of these tourists visited the Cocos area. Recreational activities include swimming, snorkeling, scuba diving, boating, water skiing, and fishing. Tourists, so far, have not had a negative effect on the environmental quality of the waters; however, corals are collected despite a local law which prohibits the collection of corals above the 60 ft (15 m) depth.

Commercial fishing within Cocos Lagoon is restricted to the operation of six fish weir sites. Subsistence and recreational fishermen also use and depend on the lagoon's resources. Illegal fishing practices (i.e., use of explosives and chlorine bleach) have recently destroyed many productive fishing spots. DAWR policy has been to issue permits for existing, active sites, phasing them out as their use is discontinued, and opening no new sites. A small fleet of offshore fishing (trolling and bottom-fishing) vessels in the 16-35 ft size range is based out of Mamaon Channel. Throw nets and gill nets are used nearshore and on the reef flats.

The relatively pristine nature of the lagoon and its accessibility by the public help to establish this area as an exceptional educational resource requiring only minimal development such as the construction of interpretive displays and other appropriate educational exhibits.

Two-thirds of Cocos Island is under the control of a private development corporation which is now constructing a 260-room resort hotel complex. Until now, tourists have been restricted to day visits, resulting in minimal biological impact. The most direct negative tourist-related impact on the biological quality of the lagoon is probably the opportunistic taking of coral and shells as souvenirs. The western third of Cocos Island has been recently acquired by the Government of Guam.

Siltation from surrounding lands during storms can also impact the area. The major cause of murky waters in the lagoon, especially during the rainy season (July to November), can be attributed to the silt-laden runoffs from the shore and river systems emptying into the lagoon.

The U.S. National Park Service is considering this proposed area as part of a Guam National Seashore and will hold public review meetings late in 1983. Portions of the park's funding will be supplied by NOAA's Office of Coastal Zone Management.

The U.S. Department of the Interior, Bureau of Mines, reports that the proposed Marine Sanctuary lies within an area which may contain potential for phosphate, sand and gravel, shell, and calcium carbonate sand mining development.

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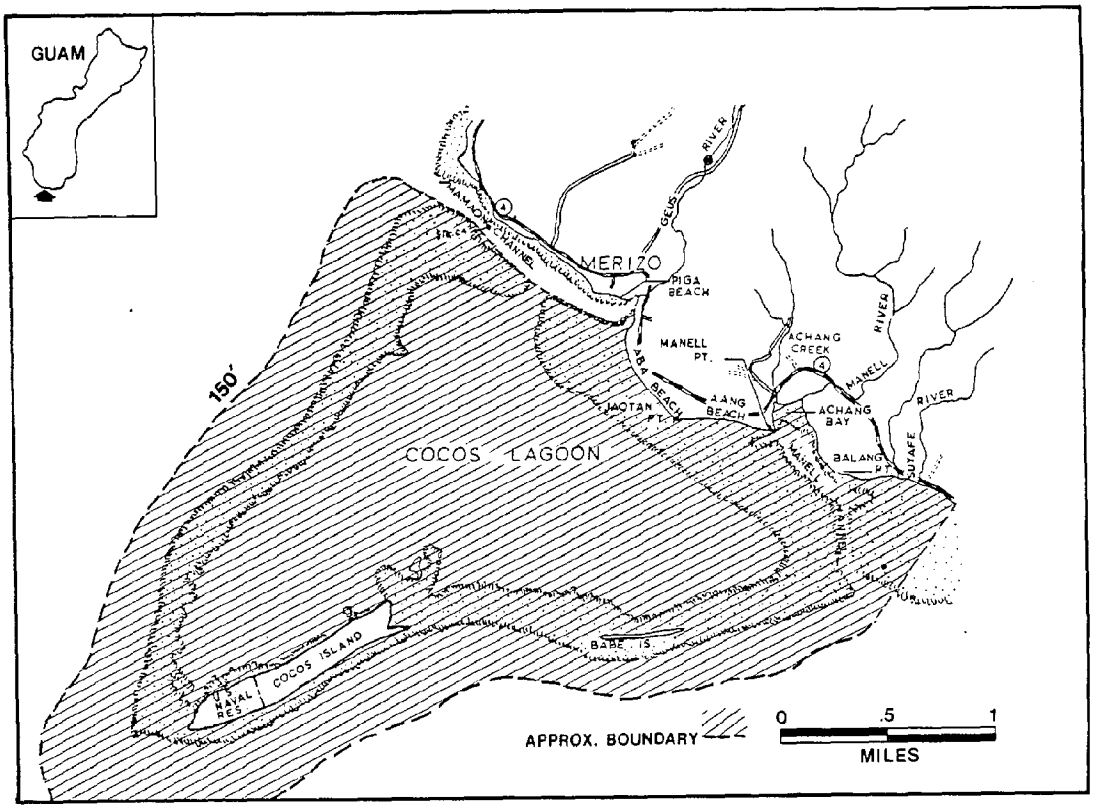

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Papaloloa Point-Asaga Strait, Ofu Island
American Samoa

B. LOCATION: (WESTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE: 14°11' S, 169°40' W

2. DESCRIPTION: The site is located on Ofu Island (Papaloloa Point) and Asaga Strait (the channel between Ofu and Olosega Islands). These waters are within the jurisdiction of American Samoa and are, therefore, administered by the US Department of Interior. The site encompasses approximately 3 mi (4.8 km) of shoreline and adjacent fringing reef to 150 ft (45 m) depth for an approximate total area of 0.75 sq mi (1.9 sq km). Most of the fringing reef is shallow (3 ft (1 m) deep at high tide and consists of rubble and consolidated limestone. A nearshore depression, 5-8 ft (1.5-2.5 m) deep, supports numerous microatolls of living coral on a sandy bottom.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. This is the only site in Samoa where the blue coral (Heliopora coerulea) is known to occur.

2. The location offers exceptional recreational opportunities for snorkeling and swimming.

3. The marine life is diverse, abundant, and unaffected by pollution.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

Papaloloa Point is an excellent example of a fringing reef community and is typical of that found throughout the tropical insular South Pacific. Fishes, corals, and other invertebrates are highly diverse and abundant. The site is pollution free and subject only to relatively light subsistence and recreational fishing pressure because of its fairly remote location.

The site is unique in that it is the only place in Samoa where the blue coral, Heliopora coerulea, is known to occur. This species forms large microatolls (10-16 ft; 3-5 m diameter) in the nearshore depression offering shelter to fishes and invertebrates alike. Other abundant corals are Porites, Millepora, and Montipora. Sea cucumbers are abundant in the sandy depressions as is the green alga Halimeda discoidea. Damselfish

(Glyphidodontops spp., Stegastes spp.), parrotfish (Scarus spp), surgeonfish (Acanthurus spp.), and butterflyfish (Chaetodon spp) dominate the ichthyofauna.

2. HUMAN USES

The fringing reef at Papaloloa Point-Asaga Reef is not heavily used at present. Some subsistence fishing occurs here, and an occasional snorkeler enjoys a quiet swim, but the site largely remains to be discovered by tourists. It has the potential for becoming one of the most popular snorkling and swimming areas in American Samoa. The sandy beach, clear water, and the wide shallow reef on the seaward side for protection from surf are physical attributes complementary to the diversity and abundance of marine life. The presence of the Ofu Airport provides access which will be increased upon the completion of a small hotel(10 rooms) presently under construction.

The U.S. Department of the Interior, Department of Mines, reports that the proposed Marine Sanctuary lies within an area which may contain potential for phosphate, sand and gravel, shell, and calcium carbonate sand mining development.

III. PRINCIPAL REFERENCE MATERIAL

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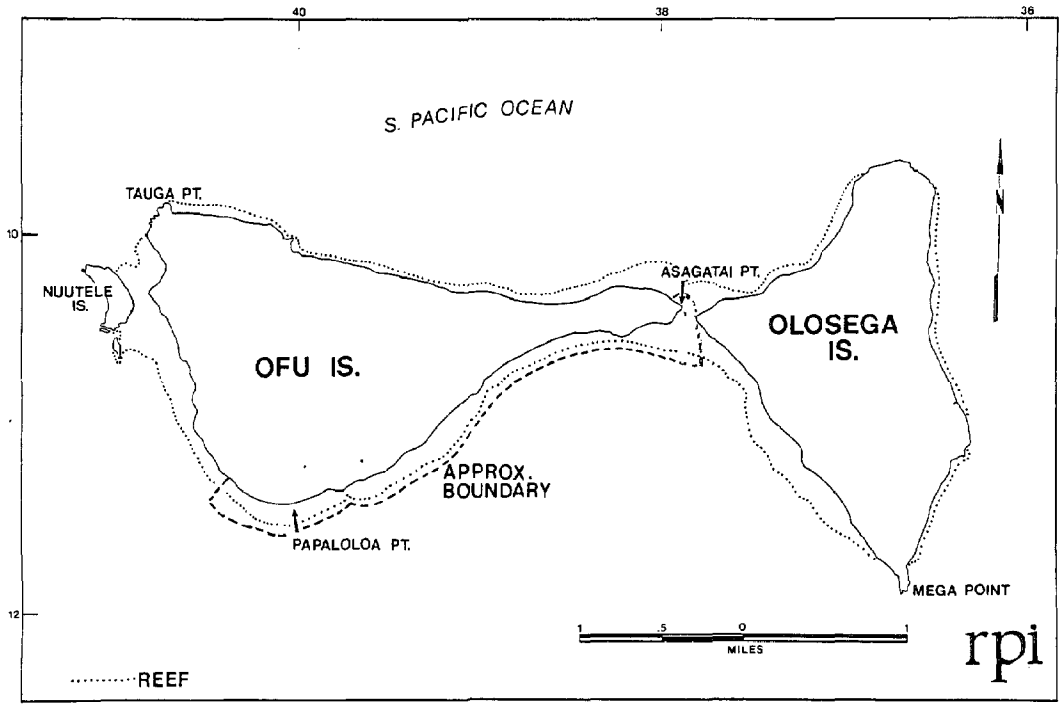

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Southern Mariana Islands Marine Sanctuary

B. LOCATION: (WESTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE:

Saipan:	15°15' N, 145°47' E
Rota:	14°08' N, 145°10' E
Tinian:	14°58' N, 145°38' E
Aguijan:	14°51' N, 145°34' E
Naftan Rock:	14°50' N, 145°32' E

2. DESCRIPTION: The proposed marine sanctuary consists of a variety of tropical marine habitats in selected sites off the islands of Saipan, Rota, and Tinian, as well as the waters surrounding Aguijan (Island) and Naftan Rock. All boundaries extend from the high waterline to the 150 ft (46 m) depth contour. The total area encompassed within the boundaries of the proposed Marine Sanctuary is approximately 18 mi^2 (46 km^2), entirely within the jurisdiction of the Commonwealth of the Northern Mariana Islands.

On Saipan: The site boundaries encompass Tanapag Lagoon and the intertidal reef flat platforms, rocky shoreline, beaches, and barrier reef outside the lagoon. Two small islands are located within the site: Managaha Island, inside the lagoon, and Bird Island (Maigo Fahang) on the northeast side of Saipan. The seaward boundary of the site extends to the 150 ft (46 m) depth contour.

On Tinian: The site boundaries encompass the patch reef just south of the harbor.

On Rota: The site boundaries encompass the fringing reefs and submarine terrace from West Dock south around Puntan Taipingot to East Dock, as well as the southeastern portion of Sosanjaya Bay.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. Natural resources display habitat and species diversity representative of southern Mariana Islands.

2. The area offers exceptional recreational, educational, and research opportunities.

3. An increase in tourism may have an impact on the environmental quality of the area.

4. Areas (on Saipan, Rota, and Tinian) serve as recreational sites for both local populations and tourists. Recreation includes fishing, boating, diving, and other water-related sports.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

The sites selected for inclusion in the proposed Southern Mariana Islands Marine Sanctuary each represent relatively pristine coral communities, rich in species diversity and high in water quality. Each is similar in many ways, and yet each has something unique to offer.

The Saipan site contains a variety of habitat types. Fifteen distinct habitat types can be identified within the lagoon. Tanapag Lagoon is unique in that few lagoons exist in the Mariana Islands. The lagoon is also an important nesting area for the green sea turtle, a species Federally-listed as "threatened." Outside the lagoon are several examples of flat reef platforms, rocky shorelines, wave-washed sandy beaches, and barrier reefs which when exposed during low tides present an ideal opportunity to observe the intertidal flora and fauna. Bird Island is a nesting site for many species of marine birds. Humpback whales, a species Federally-listed as "endangered," have been observed off Sabaneta Point on the northern extremity of Saipan. Outside Tanapag Lagoon (Saipan), there is a grotto which contains colonies of a sponge which at one time was considered to be extinct. The reef flat at Bird Island is noted for its abundance of cowrie shells. In addition to natural habitats, several artifacts of World War II dot the lagoon. Two sunken ships, three landing craft, and three planes provide suitable substrate and habitat for a variety of coral and fish species. Offshore of Wing Beach in 70 ft (21 m) of water are seven amphibious tractors, dumped there by marines after the invasion of Saipan, which have also evolved into artificial reef communities. Bonzai Cliff, the site where many Japanese soldiers jumped to their deaths rather than face capture, is also situated within the proposed site.

The patch reef south of Tinian Harbor is noted for an abundant and diverse assemblage of corals. Of particular interest is an area dominated by soft corals which take on various pastel colors and grow together resembling a large patch quilt. Aguijan Island and Naftan Rock are characterized by rocky shorelines and shallow, submarine slopes. No reef flats have developed; however, coral is diverse and active reef development can be observed. Aguijan is uninhabited, which results in less fishing pressure and, hence, in the presence of larger fish. Naftan Rock is an important nesting area for marine birds.

The Rota site offers a contrast in coral communities. The western side of the island is subject to prevailing winds and seas, while the eastern margin is tucked in under high cliffs and therefore is generally calm. Large, stacked colonies of Porites spp. grow in the harbor. Rota, the southernmost island in the Marianas archepelago, provides an interesting data base for comparing zonation and biological community variation within the northern Mariana Islands.

2. HUMAN USES

The two major uses of the areas within the proposed Marine Sanctuary site are recreation and fishing. On Saipan, recreational activities include sailing, boating, glass-bottom boat sightseeing, surfing, scuba diving, and snorkeling. Although tourist activity is high and will probably increase, the impact upon the environment is minimal. The entire area is within the lagoon and reef Area of Particular Concern (APC) for the Coastal Resource Management Program (CRMP). The CRMP reviews all new activities and activities which intensify the use of APC. An application was recently received for the development of a park on Managaha Island. The application was approved with conditions limiting the daily number of tourists to the island. Sanitation facilities must be closed systems, and signs must be posted informing visitors not to remove corals. Fishing and removing coral are by far the most significant activities impacting on the integrity of these areas. Until this year, no appropriate regulations were in effect in the Commonwealth of the Northern Marianas (CNMI) with the exception of regulations prohibiting the use of dynamite and chlorine bleach. These regulations, however, are not enforced. These destructive fishing practices and the use of large nets with very small mesh size have contributed to a very noticeable and steady decline of nearshore fish populations. The CNMI legislature is now considering a bill which would restrict the removal of corals and shells. Underwater parks have been proposed for portions of each of the sites selected for designation as a Marine Sanctuary, and regulations have been drafted; however, funds have not been made available to establish or manage them.

The patch reef off Tinian and the proposed sites on Rota are also recreational areas used by local island residents.

Tinian may be the site of further military activity.

The U.S. Department of the Interior, Bureau of Mines, reports that the proposed Marine Sanctuary lies within an area which may contain potential for phosphate, sand and gravel, shell, and calcium carbonate sand mining development.

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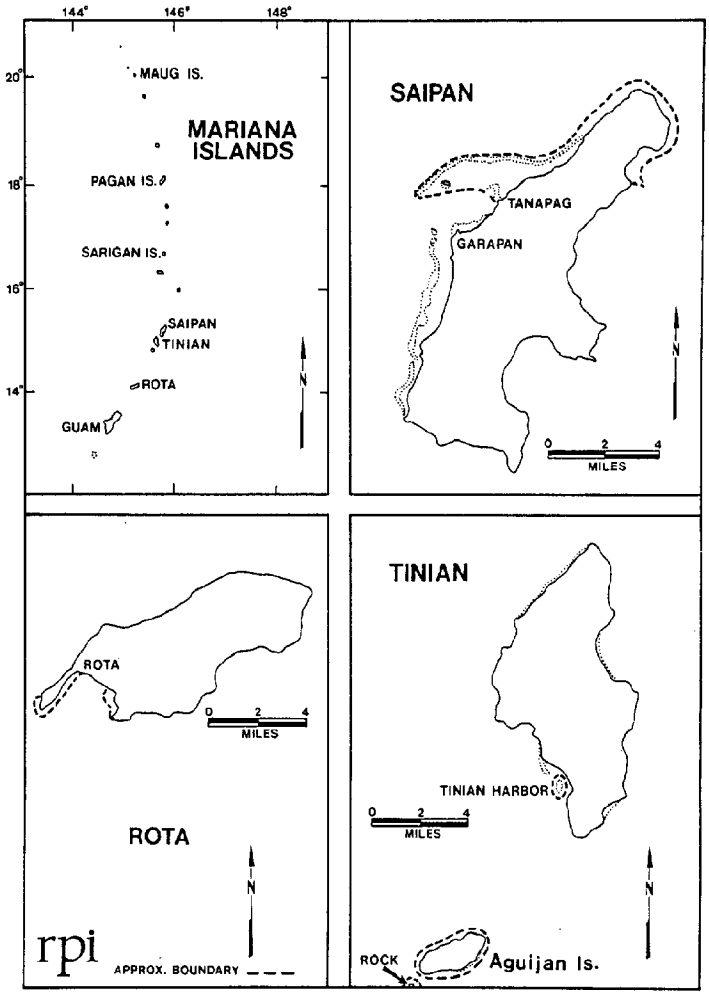

LOCATION MAP

PRELIMINARY CANDIDATE
MARINE SANCTUARY SITE EVALUATION

I. SITE LOCATION AND NAME:

A. SITE NAME: Facpi Point to Fort Santo Angel, Guam

B. LOCATION: (WESTERN PACIFIC REGION)

1. LATITUDE/LONGITUDE: 130°17' N to 13°21' N, 144°39' E

2. DESCRIPTION: The proposed area includes the offshore waters to depths of 60 ft (18.3 m) from Facpi Point to Fort Santo Angel on the northern side of Umatac Bay. The shoreline consists of rocky volcanic headlands with steep volcanic shorelines and beaches at the heads of three bays: Sella Bay, Cetti Bay, and Fouha Bay. Low-lying narrow terraces of limestone border much of the shoreline. The bordering reef flat is narrow intertidal reef. The total area of the site is approximately 2 mi^2 (5 km^2), situated entirely within Guam's waters.

II. RATIONALE FOR CONSIDERATION AS A SANCTUARY

A. DOMINANT CONSIDERATIONS

1. The natural resources of this coastline include habitat and species diversity unique to Guam.

2. The entire coastline and adjacent waters are a significant recreational site for local residents and tourists. Recreational activities include fishing, diving, swimming, boating, and hiking.

3. Although the area is presently included in a territorial seashore park, some development pressure exists.

B. SITE EVALUATION NARRATIVE

1. NATURAL RESOURCES

A wide variety of coral and fish are found in the area, despite the influx of fresh water from numerous small streams. The coastal strand vegetation provides a fine example of this ecological community. Both the "threatened" green turtle and the "endangered" hawksbill turtle utilize the area. The coastline also contains seven prehistoric archaeological sites and five historic sites from the Spanish occupation.

Located 11 mi off the southern coast of Guam are fishing banks which attract dolphins (Stennella longirostris). The dolphins rest in Bile Bay, Umatac Bay, and Cetti Point. There have also been verified sightings of pilot whales off Facpi Point. Therefore, these represent areas of great importance to the

life histories (i.e., movement and resting patterns) of native dolphins and whales.

2. HUMAN USES

The coastline area is extensively used for recreation with visitors arriving by boat and on foot--no other means of access is available. Activities include charter fishing, overnight yachting, shelling, swimming, diving, and hiking. A semipermanent shelter exists at the head of Cetti Bay. Tourists enjoy the area via charter boat service and from a scenic overlook on the main highway.

The coastline area is a major resource in the Guam Territorial Seashore Park which is managed by Guam's Department of Parks and Recreation with partial (if appropriated) funding made available from NOAA's Office of Coastal Zone Management. Most of the land behind the coastline is privately owned, and development pressure is growing. Sella Bay was an active candidate for a new ammunition wharf proposed by the U.S. Navy in the late 1960s, but intense pressure from environmental groups and a law suit from a private landowner has ceased further consideration of the site.

The U.S. National Park Service is considering this proposed area as part of a Guam National Seashore, and they will hold public review meetings late in 1983.

The U.S. Department of the Interior, Bureau of Mines, reports that the proposed marine sanctuary lies within an area which may contain potential for phosphate, sand and gravel, shell, and calcium carbonate sand mining development.

The government permits subsistence fishing on the islands. It is now legal to take endangered sea turtles in the Commonwealth of Northern Mariana Islands.

III. PRINCIPAL REFERENCE MATERIAL

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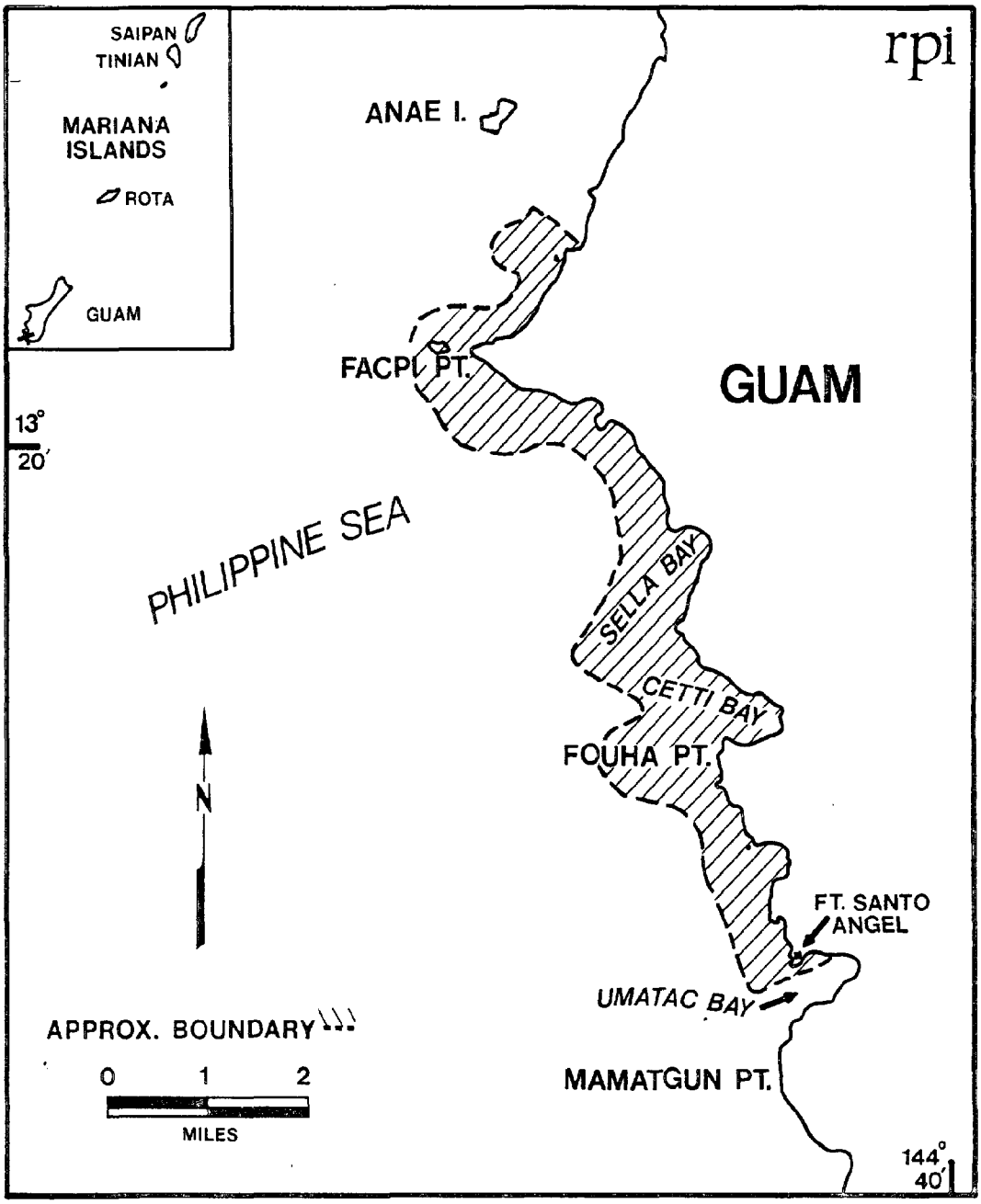

LOCATION MAP

ATTACHMENT A National Marine Sanctuary Site Identification Criteria

ATTACHMENT A

NATIONAL MARINE SANCTUARY SITE IDENTIFICATION CRITERIA

During summer 1981, the National Marine Sanctuary Program draft Site Identification Criteria were reviewed and refined by three marine scientists: Drs. Walter H. Adey, Rezneat M. Darnell, and G. Carlton Ray. Taking their recommendations into consideration, the criteria presented below and the Site Evaluation Matrix in Appendix D were developed.

The site identification criteria are directly related to the Program's purposes: (1) that the system of sanctuaries established is illustrative of the variety of ecosystems found in the United States; (2) that sanctuaries allow, to the maximum extent feasible, multiple use for public and private interests; (3) that sanctuaries are designated for the purpose of protecting or restoring conservation, recreational, ecological, or esthetic values; and (4) that sanctuaries are established to serve as a conservation component, or a management tool, in a broad national-interest approach to marine resource development, conservation, and utilization. The criteria are grouped accordingly into four categories: (1) natural resource values; (2) human use values; (3) potential activity impacts; and (4) management concerns. The criteria under each category reflect concerns significant to the Program.

Sites initially identified using the Sanctuary Program Classification System (Appendix B) are evaluated in terms of these criteria (i.e., to see which criteria are met). Appendix D describes how sites meeting a majority of the criteria are further assessed to identify priority sites. The Regional Resource Evaluation Teams are to utilize these criteria in their site evaluations. A glossary of terms which are used in this and other sections of the PDP is presented in Appendix F.

I. Natural Resource Values

A. Regional Representation

The area under consideration is characteristic of the broad biogeographic region in which it is located. (Reference: Sanctuary Program Classification System for biogeographic regions of the United States and its territories -- Appendix B).

B. Subregional Representation

The area under consideration is representative of the biogeographic subregion in which it is located. (Reference: Sanctuary Program Classification System).

Example: This criterion would apply to an area containing species assemblages which are especially characteristic of the Oregonian subregion of the British Columbian region. Another example would be an area containing species assemblages which are especially characteristic of the Floridian or American Atlantic Antillean subregion of the West Indian region.

C. Community Representation

The area under consideration is significant in relation to the ecological communities which are found within the specified habitat type or within the biogeographic region or subregion (i.e., on a macroscale, communities are assemblages of species populations within a prescribed area or habitat).

Examples: (1) The wide spectrum of marine habitats in the Channel Islands National Marine Sanctuary in California created by accentuated bottom relief, varied bottom substrates, and gradation in water depth from island shorelines to deep coastal basins support a variety of ecological communities.

(2) Coral reef, grass bed, soft bottom, and open-bay habitat areas in the Key Largo National Marine Sanctuary support a variety ecological communities associated with the east Florida reef tract.

D. Biological Productivity

The area under consideration is significant in relation to its level of primary and/or secondary production.

Examples: (1) East Breaks at the edge of the outer continental shelf off Corpus Christi, Texas is characterized by intense local upwelling, high primary productivity, and exceptional fish production.

(2) In the Gray's Reef National Marine Sanctuary, much production may be imported; outcroppings of limestone rocks may serve to entrap, conserve, and circulate detritus and plankton which provide energy sources for reef invertebrates, which in turn support marine fisheries and sea turtles.

(3) In the Channel Islands National Marine Sanctuary, the cold waters of the California Current flowing north meet the warm waters of the California Counter Current flowing south to create upwellings of cold nutrient-rich waters that enhance the biological productivity of the area. (Note: This example also meets Criterion I.G.).

(4) In many cases, coral reefs are not only energetically self-sustaining (i.e., they produce locally enough food to support the community), but they are also specifically organized to entrap, hoard, and recycle materials received from the surrounding waters (i.e., products that are imported and conserved).

E. Biotic Character/Species Representation

The area under consideration is of special interest because it supports:

(1) ecologically limited species;
(2) ecologically important species; or
(3) unique species associations or biological assemblages.

Examples: (1) This criterion would apply to marine habitat areas upon which ecologically limited species (e.g., threatened, endangered, rare, depleted, endemic, or peripheral species) are dependent during all or part of their lives.

(2) This criterion would apply to marine areas containing species which contribute in a significant way to the maintenance of a specified ecosystem found in the region or subregion, such as the Channel Islands National Marine Sanctuary which supports one of the largest and most varied assemblages of marine mammals and seabirds in the world.

(3) The waters off Point Lobos, California support a unique assemblage of kelp, sea urchin, abalone, and sea otters.

(4) Submarine canyons support unusual biological communities of soft corals, crustaceans, and fish known as "pueblo villages."

(5) This criterion would also apply to wide sandy bottom areas which are characterized by low productivity, but unique species composition, such as certain areas off central Texas.

F. Species Maintenance

The area under consideration is important to life history activities, including special feeding, courtship, breeding, birthing/nursery, resting/wintering, and migration areas.

Examples: (1) The waters off the Point Reyes-Farallon Islands provide deep and shallow water feeding areas for a wide variety of marine organisms, including seabirds, marine mammals, and marine fisheries. The Farallon Islands support the largest seabird rookeries in the contiguous United States and are used, along with the mainland, by California sea lions, harbor seals, and elephant seals for hauling out and pupping purposes. Whales, including several endangered species, and porpoises pass through the sanctuary on annual migrations.

(2) The waters around certain Hawaiian Islands are important wintering, birthing/nursery, and perhaps courtship/breeding areas for endangered humpback whales.

(3) Spiny lobster migration routes off Florida are important for the "off shelf" movement of this species.

(4) The mouth of the Mississippi River is an important brown shrimp over-wintering ground.

G. Ecosystem Structure/Habitat Features

The area under consideration is characterized by special chemical, physical, and/or geological habitat features.

Examples: (1) The Florida Middle Grounds on the Gulf of Mexico continental shelf represent an unusual geological formation -- a drowned Pleistocene reef--which supports rich and diverse reef communities.

(2) Transition zones occur where two different marine systems converge -- such as at coastal/marine system interfaces, shelf/slope interfaces, soft bottom/hard bottom ecotones, or cold water/warm water current convergence zone. These areas of mixing often have unique physical and ecological characteristics, high production, and species diversity/ population densities which are often greater than in areas flanking them. For example, a transition zone is formed near Cape Hatteras where cold northern waters of the Labrador Current mix with warm water eddies of Gulf Stream/Florida Current and as a result, northern and southern species mix and co-exist with species endemic to the area. (Note: This example also meets Criterion I.D.).

(3) Easternmost coastal areas of Maine--with unique bay-heads and rocky coasts, varied substrates derived from glacial materials, extensive sub-fjord character, and numerous offshore islands--are matched by few areas in the world in habitat types and species diversity.

II. Human-Use Values

A. Fishery Resources of Recreational Importance

The area under consideration contains fish and shellfish species, species groups (e.g., snapper-grouper complex), or fishery habitats which are important to the recreational fishing industry/community and for which conservation and management is in the public interest.

Example: The Florida Middle Grounds rank high in statistical surveys of demersal and pelagic fish catch and effort, recreational sector participation, and socioeconomic contribution.

B. Fishery Resources of Commercial Importance

The area under consideration contains fish and shellfish species, species groups (e.g., snapper-grouper complex), or fishery habitats which are important to the commercial fishing industry and for which conservation and management is in the public interest.

Example: The waters of the Point Reyes-Farallon Islands National Marine Sanctuary provide substantial fishing opportunities, including commercial fisheries for bottom fishing, crab, salmon, albacore, and pelagic anchovy, herring, and other species.

C. Ecological/Aesthetic Resources of Importance for Recreational Activities Other Than Fishing

The area under consideration contains exceptional natural resources and features which, because of their importance to nature watching and other nonconsumptive recreational activities, enhance human appreciation, understanding, and enjoyment of nature.

Examples: (1) Rocky shorelines, shallow nearshore waters, and intertidal pools in the Channel Islands and Point Reyes-Farallon Islands National Marine Sanctuaries have rich and varied plant and animal life which attract many persons interested in photography and nature study.

(2) The prominent topography around the Channel Islands and Point Reyes-Farallon Islands National Marine Sanctuaries provides outstanding ocean vistas.

(3) The spectacular spur-and-groove coral reef formation in the Looe Key National Marine Sanctuary attracts SCUBA and snorkeling enthusiasts from all over the world.

(4) The waters off Maui, Hawaii are popular for humpback whale watching.

D. Research Opportunity

The area under consideration provides exceptional opportunities for research in marine science and resource management.

Examples: (1) The Gray's Reef National Marine Sanctuary serves as a natural laboratory or control area for research in live bottom ecology.

(2) The Key Largo National Marine Sanctuary is amenable to onsite research activities for many reasons, including the diversity of resources available, the past history of scientific research and education in the area, the compatibility with similar research efforts in adjacent John Pennekamp State Park and Biscayne National Park, and the proximity of the site to user groups. In addition, the Carysfort Reef Lighthouse provides a unique research base from which to launch studies concerning the sanctuary environment.

(3) The Channel Islands National Marine Sanctuary offers a special opportunity to coordinate research with the Channel Islands National Park. Such coordination will contribute to a better scientific understanding of the marine environment and to more effective management by answering questions such as those related to fisheries, marine mammals, seabirds and those related to development and use of marine resources.

E. Interpretive Opportunity

The area under consideration provides an excellent opportunity to interpret the meanings and relationships of special marine resources in order to enhance general understanding, appreciation, and wise use of the marine environment.

Examples: (1) Through a variety of interpretive media, including aquaria displays, narrated slide shows and glassbottom boat tours, a visitor to the Key Largo National Marine Sanctuary is exposed to a variety of marine and coastal ecosystems, including open ocean, fringing coral reefs, patch reefs, mangroves, and open bay and barrier islands.

(2) The Channel Islands National Marine Sanctuary provides an exceptional opportunity to interpret marine and insular ecosystem features through the use of various interpretive "hands on" techniques that go beyond traditional educational tools, such as brochures and pamphlets.

F. Historical, Archaeological or Paleontological

The area under consideration contains (or is likely to contain) submerged remnants of past life that are of special historical, cultural or paleontological value.

Examples: (1) This criterion would apply to marine areas where known or possible shipwrecks, armaments, or other maritime relics occur and where protection is desirable to conserve or restore aesthetic values and to advance the goal of the United States antiquities laws to protect historical resources.

(2) This criterion would apply to marine areas containing, or suspected of containing, remnants of historic human occupation by Indians, Eskimos, early Americans, or other peoples.

(3) This criterion would apply to marine areas containing fossils and geological formations whose study would reveal clues to the earth's geologic history, the characteristics of ancient environments and the relationship of ancient plants and animals to the earth's evolutionary history.

ADDITIONAL FACTORS IN SITE IDENTIFICATION

III. Potential Activity Impacts

Many marine areas are subject to human use, some of which bring adverse pressures to bear on the natural resources. The initial identification of potential marine sanctuary areas by Resource Evaluation Teams should include a summary of existing and potential human activities in these areas as well as a preliminary assessment of environmental impacts. Since the pressures may arise from various activities, the present or potential ecological significance of each activity, as well as the cumulative impact of several activities, must be analyzed so that appropriate management action may be designed and implemented. Definitive environmental impact analyses, however, are hampered by the fact that adequate field data on natural or "existing" conditions are often lacking, thus making assessments of "human-induced" versus "natural" conditions difficult. Many judgments are, therefore, based on projections and can be subjective, i.e., the evaluation depends largely upon the experience and special interest of the reviewer.

Regional resource evaluation teams will preliminarily assess activity impacts based on a review of scientific literature (e.g., baseline studies and environmental impact studies) and discussions with persons knowledgeable in the field. The types of activities which may be considered for potential impacts include: (1) vessel traffic; (2) aircraft overflights; (3) commercial and recreational fishing; (4) other recreational activities such as SCUBA, snorkeling, spearfishing, and specimen collecting; (5) ocean dumping and waste disposal (including litter); (6) scientific research and educational demonstrations; (7) dredging and dredge disposal; (8) disturbing marine mammals and seabirds; (9) anchoring; (10) salvage operations; and (11) oil and gas recovery and associated activities. This is not meant as an exhaustive listing, but rather to illustrate the range and types of activities which may be evaluated for potential impacts on resources within a site identified for future marine sanctuary consideration.

IV. Management Concerns

A. Relationship To Other Programs

While some sanctuaries may be designated to protect resources not currently managed by other existing programs (e.g., the U.S.S. MONITOR on the continental shelf off North Carolina), most recommendations involve cooperation with some other Federal, State, or local agency or organization. The ability of existing regulatory mechanisms to protect the values of the area and the contribution of the Sanctuary Program to that existing management effort may be an important factor in selecting sanctuary candidates. Depending on the location, the resource, and the existing system, the Program could either complement the status quo by filling specific gaps or form a management umbrella over a fragmented system to help coordinate and strengthen diverse, but related efforts. At different sites, NOAA may work to complement other programs efforts such as estuarine sanctuaries, national parks, wildlife

refuges, or state preserves, among others. There may be instances where NOAA's primary contribution to protection of special marine areas will be in the form of enhanced public awareness through interpretive and research programs.

B. Management of a Conservation Unit

Optimum size of a marine sanctuary is an issue to be considered in potential sanctuary sites. Sanctuary boundaries are discussed in some detail in Section III.F and Appendix E of the PDP. The size or extent of a marine sanctuary should be a cohesive conservation unit amenable to effective management given fiscal and staff constraints of the managing entities.

C. Accessibility

Since national marine sanctuaries are to be readily available for public use, when use is compatible with the sanctuary's goals and objectives, consideration should be given to factors which limit or enhance public access to a particular site.

D. Surveillance and Enforcement

Another issue to be considered when evaluating a potential sanctuary site is the the degree to which the area (i.e., the location, its size, and the types of resources involved) lends itself to adequate enforcement and surveillance and the capabilities of responsible agents (e.g., U.S. Coast Guard, state law enforcement divisions, or the like). Specifically, consideration should be given to: (1) degree of surveillence/enforcement presence needed in the area-light, medium, or heavy; (2) schedule--routine, prescribed, or case-by-case basis; and (3) logistics--vessels, aircraft, manpower, equipment, and budgetary requirements.

E. Economic Considerations

The designation of any national marine sanctuary could have economic effects at both local and national levels. Prior to the development of a management plan for a particular site which describes permitted and restricted activities, it is difficult to calculate the economic impact of sanctuary designation. It is even more difficult to determine the economic value of the sanctuary to society as a whole based on such things as public use, research and interpretive value. Sanctuary designation often enhances economic value by ensuring long-term protection for commercially significant resources, such as commercial or recreational fish stocks, vital habitats, and resources which generate tourism. Conversely, a marine sanctuary may also have negative economic impacts if management regulations restrict activities that generate income. However, in these cases, the economic value is usually not irretrievably lost since the resources remain protected for the long term and could be used if necessary. In cases where certain economic values are reduced or foregone, this impact must be weighed against the long-term benefits to society. Analysis of a potential site for marine sanctuary status will take socioeconomic impacts into consideration.

APPENDIX D

SITE EVALUATION MATRIX

Appendix C outlines the criteria for identifying potential marine sanctuary sites. Four categories of criteria are presented, namely, natural resource values, human use values, potential activity impacts, and management concerns. The criteria address characteristics which are of particular significance to the national marine sanctuary program.

After a site is examined to determine which criteria are met, the next step involves an evaluation of the relative value of each criterion. This is accomplished using the Site Evaluation Matrix (see Figure 2, page 25) and the guidelines provided below. Sites are evaluated in terms of the individual value of each criterion met (e.g., low, moderate, or high value) and in relation to other sites with complementary characteristics. The following rating system is recommended:

Low Value (L) -- Low quality; not significant but still a viable concern; of minor contribution to national system; of minor importance; other equally good representatives are available; or duplicates, in significant measure, another recommended area or designated sanctuary.

Moderate Value (M) -- Moderately good quality; significant but not the most important concern; helps to support species, but not critical; helps to support the regional ecology, but only in a small measure or in a general way; a few other good representatives are available; or moderate contribution to the national system.

High Value (H) -- Very high value; high quality; a major reason for sanctuary consideration; extremely important to regionally significant species; of great importance in terms of ecological features and processes; regional ecology would likely be significantly altered if the values were not protected; no significant duplication of other recommended areas; absolutely unique; one of a kind; best available regional representive; or excellent contribution to the national system.

Unknown Value (X) -- Value or consequences unknown; more study needed to determine value or consequence; factor does not apply; or factor is not an issue, does not need to be considered.

Sites which consistently have relatively low values receive an overall "low priority" assessment and are eliminated. In contrast, sites which consistently have relatively high values receive a "high priority" assessment and are recommended for further consideration. The Site Evaluation Matrix is used to tabulate this information. From this evaluation, the Regional Resource Evaluation Teams compile an initial list of the most highly qualified sites for public review (see page D-11). Guidelines for evaluating sites using program criteria are presented in the following pages.

I. NATURAL RESOURCE VALUES

A. Regional Representation

L -- Other equally good or better sites available; not a good representative of the region.

M -- Few other sites available; good representative of the region.

H -- Best available site; only one or two sites in the region; best representative of regional characteristics.

B. Subregional Representation

L -- Other equally good or better sites available; not a good representative of the subregion.

M -- Few other sites available; good representative of the subregion.

H -- Best available site; only one or two sites in the subregion; best representative of subregional characteristics.

C. Community Representation

L -- Poor representation of the community types found within the specified habitat type or within the biogeographic region or subregion; low percentage of communities on site; low percent cover of communities on site.

M -- Good representation of the community types found within the specified habitat type or within the biogeographic region or subregion; limited number of communities on site; good range of common communities present; moderate percent cover of communities on site.

H -- Excellent representation of the community types found within the specified habitat area or within the biogeographic region or subregion; good or very good range of habitats and communities on site; localized, relict, or special communities present.

D. Biological Productivity

L -- Contribution to regional/subregional production minor.

M -- Contribution to regional/subregional production moderate; trophic relationships are typical or common for the region or subregion.

H -- Contribution to regional/subregional production extremely important; regional/subregional ecology would likely be significantly altered if natural (normal) production levels change; highly exemplary, special or unusual trophic relationships.

E. Biotic Character/Species Representation

L -- Characteristic species are common in the region/subregion; few, if any: (1) ecologically limited species (e.g., threatened, endangered, rare, depleted, endemic or peripheral species); (2) ecologically important speices; or (3) special species combinations or biological assemblages; low percentage of regionally or locally available species; other equally good or better sites available.

M -- The area is only of moderate importance to populations of ecologically limited species or ecologically important species; few, if any, special species combinations or assemblages; percentage of regionally or locally available species is moderate; some other similar sites available.

H -- Very important to species which are of high ecologic value or ecologically limited in regional, national or international distribution or existence (e.g. endemic, threatened, endangered, rare, depleted); contains special species combinations or biological assemblages; outstanding diversity for a particular habitat or community type; best available site; only one or two sites in the region or subregion.

F. Species Maintenance

L -- Of some importance to supporting life history activities of regional/subregional species; no local dependence upon this area; many other equally important sites available.

M -- Important to supporting life history activities of regional/subregional species, but not critical; some other equally important sites available.

H -- Extremely important to supporting life history activities of regional/subregional species; only one or two other sites available.

G. Ecosystem Structure/Habitat Features

L -- Habitat features are common in the region/subregion, but are not outstanding representatives; no significant contribution to regional/subregional ecosystem structure; no special chemical, physical or geological habitat features.

M -- Habitat features are common in the region/subregion; some special features are available; few other sites available; moderate contribution to the regional/subregional structure.

H -- Unique, different or special habitat features; only one or two other sites available; significant contribution to regional/subregional structure; structual features have strong influence on ecological processes in the area.

I. Human Use Values

A. Fishery Resources of Recreational Importance

L -- Low recreational importance; many other fishery opportunities available.

M -- Moderate recreational importance; some other fishery opportunities available.

H -- High recreational importance; only one or two other fishery opportunities available.

B. Fishery Resources of Commercial Importance

L -- Low commercial importance; many other fishery opportunities available.

M -- Moderate commercial importance; some other fishery opportunities available.

H -- High commercial importance; only one or two other fishery opportunities available.

C. Ecological/Aesthetic Resources of Importance for Recreational Activities Other Than Fishing

L -- Low value; minimum opportunity for recreation; many other sites available.

M -- Moderate value. good opportunity for recreation; few other sites available.

H -- High value; excellent opportunity for recreation; rare in the region; only one or two sites available.

D. Research Opportunity

L -- Very limited research opportunities; the site has already received considerable research attention (i.e., "researched to death"); not suitable for study; many other sites available.

M -- Good research opportunities; good for use at most levels of research, formal and informal; few other sites available.

H -- Excellent research opportunities; outstanding for use at all levels of research, formal and informal; can withstand some pressure from these activities; only one or few other sites available.

E. Interpretive Opportunity

L -- Low or minimal interpretive value; opportunities for interpretation are limited; has already received considerable interpretive attention; resource features are common in the region; many other sites available.

M -- Moderate or good interpretive value; opportunities for interpretation fairly good; visually attractive features; resource features are fairly limited in the region; few other sites available.

H -- Excellent interpretive value; opportunities for interpretation excellent or unusual; visually attractive features; resource features are special in the region or subregion; only one or two other sites available; good potential for interpretive center and/or displays; the enhancement of public awareness through this resource is paramount.

F. Historical, Cultural or Paleontological Importance

L -- Little or no historical, cultural or paleontological importance; many other sites available.

M -- Moderate or good historical, cultural or paleontological importance; few other sites available.

H -- Very special historical, cultural or paleontological value; only one or two other sites available.

III. Potential Activity Impacts

Existing and potential activities within a particular area are listed by Resource Evaluation Teams on the Site Evaluation Matrix. The potential impact of each activity is evaluated using the following recommended scheme:

L -- This activity is not highly significant, but still a viable issue; little or no impact at current activity levels; very little potential for harm by increase of this activity; if the activity is remote, there is an adequate buffer to protect the area; no known or proposed future development which could affect resource or human use value; no current or potential user conflict.

M -- This activity is significant, but not the most important issue; some impact on resources of current activity levels, but the system is resilient with little permanent damage or other long-lasting effect; some possible negative impact if activity level increases; if the activity is remote, there is a fairly good buffer zone to protect the area; some

possible future development likely which could affect resource or human use values; some current or potential user conflicts which threaten resource or human use value.

H -- Potential for impact at current activity levels is high or is already major issue; resources are suspected to be very sensitive to environmental change, not resilient; resources would likely be significantly altered if values are not protected; the area is in immediate need of protection; negative impact likely if activity levels increase or continue continue at present level; current or potential user conflicts could significantly threaten resource or human use values.

X -- Environmental consequences unknown. More study is needed.

IV. Management Concerns

A. Relationship to Other Programs

L -- Other equally good or better programs in effect for all aspects of marine sanctuary management.

M -- Few complementary programs in place, but none that offer the same comprehensive management opportunities or public benefits.

H -- No other programs available or in place; marine sanctuary program is the best available program; offers unique or special management opportunities or public benefits; fills existing regulatory or nonregulatory management gaps; coordinates management, research and education efforts.

B. Management of a Conservation Unit

L -- Does not represent a conservation unit; contains only fragments of the ecosystem of concern; protection of a portion of the system does not help or only minimally helps the overall system; not a manageable unit; excessive size; some boundary problems foreseen.

M -- Represents a good portion of the ecosystem in question; represents fairly good conservation unit; protection of this area would benefit the ecosystem, but only in a small measure or in a general way; fairly manageable unit; moderate size; few, if any, boundary problems.

H -- Represents a complete and ecologically sound conservation unit; protection of this area would benefit the ecosystem in a significant way; manageable unit; not of excessive size; no boundary problems foreseen.

C. Accessibility

L -- Inaccesible or accessible with considerable difficulty; situated in an extremely remote area; no human interest in visiting the site.

M -- Fairly accessible; if remote, access is good, but often with some difficulty (e.g., weather or sea conditions variable); only limited human interest in visiting the site.

H -- Easily accessible, with no major difficulty; considerable human interest in visiting the site; increased visitation is likely and/or could severely threaten resource or human use values without some management structure.

D. Surveillance and Enforcement

L -- Open, long, or insecure boundary; remote, not amenable to surveillance and enforcement efforts; requires considerable commitment of manpower, equipment and budget; no on-going or potential activities that would require an increase in surveillance and enforcement efforts.

M -- Moderate boundary, fairly secure; accessible; requires moderate commitment of manpower, equipment and funds; some on-going or potential activities in the area which would require an increase in current surveillance and enforcement efforts.

H -- Reasonable boundary, secure; accessible; amenable to surveillance and enforcement efforts; minimal commitment of manpower, equipment and funds; major activity (ies) in the area which require an increase in surveillance and enforcement efforts.

E. Economic Considerations

L -- High management costs likely; designation or restriction of certain activities would result in negative economic impact; public benefit does not outweigh economic values which may be reduced or foregone by designation.

M -- Moderate management costs likely; designation or restriction of certain activities would result in some short-term negative economic impact, but public benefit outweighs economic values which may be reduced or foregone; resources are protected for the long term.

H -- Low management costs; designation or restriction of certain activities would result in very minor if any negative economic impact; benefit to society greatly outweighs any reduction of economic value; designation enhances economic value.

ATTACHMENT B List of Acronyms

ATTACHMENT B
LIST OF ACRONYMS

CRI	--	Caribbean Research Institute
CZM	--	Coastal Zone Management
DEC	--	Department of Environmental Concervation
DEIS	--	Draft Environmental Impact Statement
DNR	--	Department of Natural Resources
FEIS	--	Final Environmental Impact Statement
F&WS	--	Fish and Wildlife Service
LCDC	--	Land Conservation Development Commission
LRA	--	List of Recommended Areas
LSU	--	Louisiana State University
NEPA	--	National Environmental Policy Act
NOAA	--	National Oceanic and Atmospheric Administration
NWR	--	National Wildlife Refuge
PCB	--	Poly-chlorinated biphenyls
PDP	--	Program Development Plan
RPI	--	Research Planning Institute, Inc.
SEL	--	Site Evaluation List
SPO	--	Sanctuary Programs Office
UNESCO	--	United Nations Environmental
USEPA	--	United States Environmental Protection Agency
USVI	--	United States Virgin Islands
WCMC	--	Wisconsin Coastal Management Council

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