4TH PRIORITY PROJECT LIST REPORT

PREPARED BY:

LOUISIANA COASTAL WETLANDS CONSERVATION AND RESTORATION TASK FORCE

December 1994

Coastal Wetlands Planning, Protection and Restoration Act

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INTRODUCTION

The State of Louisiana contains 40 percent of the Nation's coastal wetlands, but is experiencing 80 percent of the Nation's coastal wetland loss. The widespread and complex nature of the coastal wetland loss problem, coupled with the diversity of agencies involved and numerous alternatives proposed, has led many in Federal, state, and local government, as well as the general public, to the conclusion that a comprehensive approach is needed. The Coastal Wetlands Planning, Protection and Restoration Act (PL 101-646) was signed into law by President Bush on November 29, 1990, to address the need for a comprehensive approach to this significant environmental problem.

This report documents the implementation of Section 303(a) of the cited legislation.

STUDY AUTHORITY

Section 303(a) of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), displayed in Appendix A, directs the Secretary of the Army to convene the Louisiana Coastal Wetlands Conservation and Restoration Task Force to:

> . . . initiate a process to identify and prepare a list of coastal wetlands restoration projects in Louisiana to provide for the long-term conservation of such wetlands and dependent fish and wildlife populations in order of priority, based upon the cost-effectiveness of such projects in creating, restoring, protecting, or enhancing coastal wetlands, taking into account the quality of such coastal wetlands, with due allowance for small-scale projects necessary to demonstrate the use of new techniques or materials for coastal wetlands restoration.

STUDY PURPOSE

The purpose of this study effort was to prepare the 4th Priority Project List (PPL) and transmit the list to Congress, as specified in Section 303(a)(3) of the CWPPRA. Section 303(b) of the act calls for preparation of a comprehensive restoration plan for coastal Louisiana; that effort was completed in November 1993, with the submission of the Louisiana Coastal Wetlands Restoration Plan.

PROJECT AREA

Plate 1 is a map which delineates the Louisiana coastal zone. The entire coastal area, which comprises all or part of 20 Louisiana parishes, is considered to be the

CWPPRA project area. To facilitate the study process, the coastal zone was divided into nine hydrologic basins, as shown on the map.

STUDY PROCESS

<u>The Interagency Planning Groups.</u>

Section 303(a)(1) of the CWPPRA directs the Secretary of the Army to convene the Louisiana Coastal Wetlands Conservation and Restoration Task Force, to consist of the following members:

- the Secretary of the Army (Chairman)
- the Administrator, Environmental Protection Agency
- the Governor, State of Louisiana
- the Secretary of the Interior
- the Secretary of Agriculture
- the Secretary of Commerce.

The State of Louisiana is a full voting member of the Task Force except for selection of the Priority Project List [Section 303(a)(2)], as stipulated in President Bush's November 29, 1990, signing statement (Appendix A). In addition, the State of Louisiana may not serve as a "lead" Task Force member for design and construction of wetlands projects of the Priority Project List.

In practice, the Task Force members named by the law have delegated their responsibilities to other members of their organizations. For instance, the Secretary of the Army authorized the commander of the Corps' New Orleans District to act in his place as chairman of the Task Force.

To assist it in putting the CWPPRA into action, the Task Force established the Technical Committee and the Planning and Evaluation Subcommittee. Each of these bodies contains the same representation as the Task Force--one member from each of the five Federal agencies and one from the State. The Planning and Evaluation Subcommittee is responsible for the actual planning of projects and preparation of this restoration plan, as well as the other details involved in the CWPPRA process (such as development of schedules, budgets, etc.); the subcommittee makes recommendations to the Technical Committee and lays the groundwork for all decisions which will ultimately be made by the Task Force. The Technical Committee reviews all materials prepared by the subcommittee, makes appropriate revisions, and provides recommendations to the Task Force. The Technical Committee operates at an intermediate level between the planning details considered by the subcommittee and the policy matters dealt with by the Task Force, and often formalizes procedures and assists in formulating policy for the Task Force.

The Planning and Evaluation Subcommittee established several working groups to evaluate projects for priority project lists and the restoration plan. The Environmental Work Group was charged with estimating the benefits (in terms of wetlands created, protected, enhanced, or restored) associated with various projects. The Engineering Work Group reviewed project cost estimates for consistency. The Economic Work Group performed the economic analysis which permitted comparison of projects on the basis of their cost effectiveness. The Monitoring Work Group established a standard procedure for monitoring of CWPPRA projects and developed a monitoring cost estimating procedure based on project type (Appendix E).

The Citizen Participation Group.

The Task Force also established a Citizen Participation Group to provide general input from the diverse interests across the coastal zone: local officials, landowners, farmers, sportsmen, commercial fishermen, oil and gas developers, navigation interests, and environmental organizations. The Citizen Participation Group was formed to promote citizen participation and involvement in formulating priority project lists and the restoration plan. The group meets at its own discretion, but may at times meet in conjunction with other CWPPRA elements, such as the Technical Committee. The purpose of the Citizen Participation Group is to maintain consistent public review and input into the plans and projects being considered by the Task Force and to assist and participate in the public involvement program. The membership of the Citizen Participation Group is shown in Table 1.

Table 1
Membership of the Citizen Participation Group

Gulf Coast Conservation Association	Concerned Shrimpers of America
Coalition to Restore Coastal Louisiana	Gulf Intracoastal Canal Association
Lake Pontchartrain Basin Foundation	Louisiana Association of Soil and Water Conservation Districts
Louisiana Farm Bureau Federation, Inc.	Louisiana Landowners Association
Louisiana League of Women Voters	Louisiana Nature Conservancy
Louisiana Oyster Growers and Dealers Association	Louisiana Wildlife Federation, Inc.
Midcontinent Oil and Gas Association	New Orleans Steamship Association
Oil and Gas Task Force (Regional Economic Development Council)	Police Jury Association of Louisiana
Organization of Louisiana Fishermen	

Involvement of the Scientific Community.

While the agencies sitting on the Task Force possess considerable expertise regarding Louisiana's coastal wetlands problems, the Task Force recognized the need to incorporate another invaluable resource: the state's scientific community. The Task Force therefore retained the services of the Louisiana Universities Marine Consortium (LUMCON) to provide scientific advisors to aid the Environmental Work Group in performing Wetland Value Assessments.

Public Involvement.

Even with its widespread membership, the Citizen Participation Group cannot represent all of the diverse interests affected by Louisiana's coastal wetlands. The CWPPRA public involvement program provides an opportunity for all interested parties to express their concerns and opinions and to submit their ideas concerning the problems facing Louisiana's wetlands. The Task Force has held at least six public meetings each of the last four years to obtain input from the public. In addition, the Task Force plans to distribute a semiannual newsletter with information on the CWPPRA program and on individual projects.

FORMULATION PROCESS FOR THE PRIORITY PROJECT LIST

INTRODUCTION

The planning effort associated with the CWPPRA proceeded simultaneously along two tracks. Section 303(b) of the act calls for the development of a comprehensive restoration plan for Louisiana's coastal wetlands. This long term plan was developed over a three-year period, with the report completed in November 1993. Section 303(a), on the other hand, deals with projects which can be implemented within a short period of time. This section requires that any project selected for a priority project list be substantially complete within five years of its appearance on a list. The intent of this section is to provide a rapid response to the loss of coastal wetlands. The first Priority Project List was to be submitted within one year of enactment of the CWPPRA, with subsequent lists to be prepared annually through 1995.

The one-year time limit associated with developing a priority project list necessitated a deviation from the usual plan formulation process. Rather than beginning with a clean slate, it was preferable to begin with projects which were already developed to some degree--if possible, projects on which some planning had already been done. The projects on the Priority Project List submitted in November 1991 fell into this category.

Preparation of the second (submitted in November 1992), third (submitted in November 1993), and fourth lists, which involved somewhat more lead time than did the first list, employed a more traditional approach. This section describes the process by which the fourth list was developed.

IDENTIFICATION OF PROJECTS

Projects considered for the fourth list were derived from the Louisiana Coastal Wetlands Restoration Plan. In the Restoration Plan, an identification number was assigned to each project to help keep track through the screening and evaluation process. Each project received a two-letter code to identify its basin; these codes are shown below.

PO	Pontchartrain	AT	Atchafalaya
BS	Breton Sound	TV	Teche/Vermilion
MR	Mississippi River Delta	ME	Mermentau
BA	Barataria	CS	Calcasieu/Sabine
TE	Terrebonne		

Projects which were originally part of the State's Coastal Wetlands Conservation and Restoration Plan use these two letters followed by a number. Projects which were derived from the scoping meetings held in the fall of 1991 are identified by a "P" ("public") preceding the two-letter code (e.g., PPO-52, PTV-18).

Plan formulation meetings held from February through May 1992 were an additional source of projects for consideration for priority project lists. Projects which were proposed during and after these meetings are identified with an "X" (e.g., XTE-41).

SCREENING OF PROPOSED PROJECTS

The procedure used in developing the 2nd and 3rd Priority Project Lists involved the use of the basin teams which had been established by the Task Force to formulate the comprehensive restoration plan called for by the CWPPRA. From among hundreds of proposed projects, each team nominated a number of projects from its basin. These nominees were then presented to the public in a series of meetings across the coastal zone. The Planning and Evaluation Subcommittee considered the comments made at these meetings when it selected candidate projects from among the nominees; these candidates were to be evaluated in detail for consideration for the priority project list. Following the evaluations, the Task Force made the final selection of priority list projects.

This procedure was modified in January 1994 with the intent of increasing the level of public involvement in the selection process. The Planning and Evaluation Subcommittee held three meetings for the purpose of selecting candidate projects for the 4th Priority Project List. These were held in Lake Charles , Thibodaux, and New Orleans. Each meeting was held over a two-day period to provide ample time for consideration of projects.

The public was invited to participate in these meetings, not only by commenting on projects nominated by the CWPPRA agencies, but also by nominating projects of their own. The sole requirement for nomination was that a project must be listed in the Louisiana Coastal Wetlands Restoration Plan. The subcommittee selected the candidate projects from among the nominees at each of the three meetings. Tables 2 through 10 show the projects nominated for each basin, along with an estimate of the cost and benefits of each project. (The "Status" column in each table shows whether a project is considered to be a critical part of its basin's restoration plan or a supporting part, and also whether it is considered to be a short-term or a long-term solution. The determinations were made by the basin teams in assembling the Louisiana Coastal Wetlands Restoration Plan.)

Selection of the candidates was accomplished by having each agency rank the nominees, assigning the most points to what it regarded as the most worthwhile project. The three projects gathering the most points were then named as the candidate projects from that basin. The rankings for the nominees in each basin are displayed in tables 11 through 17.

In all, 22 candidate projects were chosen to be evaluated in detail; these were the projects from which the 4th Priority Project List would be selected. In addition, the Planning and Evaluation Subcommittee decided 11 demonstration projects (some proposed by the agencies, some proposed by the public) merited consideration for the 4th Priority Project List. By Task Force policy, the total cost of demonstration projects for any list is generally limited to about $2 million.

A lead federal agency was then assigned to each candidate project. The lead agency was responsible for developing the project more fully and producing designs and cost estimates. The lead agencies furnished design information to the Environmental Work Group, which performed a Wetland Value Assessment for each candidate project. The section entitled "Evaluation of Candidate Projects" summarizes the information developed by the lead agencies in this process.

Table 2
Potential Candidate Projects for the 4th Priority Project List
Pontchartrain Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Net Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
PO-11	Cutoff Bayou Hydrologic Restoration	Critical-Short	103	503	722,000	7,000	1,400	DNR/SCS
PO-13	Tangipahoa Shore Protection	Critical-Short	142	627	4,850,000	34,200	7,700	SCS
PO-15	Alligator Point Marsh Restoration	Critical-Short	139	1,489	1,575,000	11,300	1,100	DNR/SCS
PPO-4	Eden Isles East Marsh Restoration	Support-Long	1,092	1,494	8,856,000	8,100	5,900	NMFS
XPO-48a	Tennessee Williams Canal Bank Mod	Support-Short	70	122	269,000	3,800	2,200	EPA
XPO-48b	Hope Canal Bank Modification	Support-Short	160	281	290,000	1,800	1,000	EPA
XPO-51	Mancha WMA Hydrologic Rest	Critical-Short	486	1,195	1,021,000	2,100	900	DNR/USACE
XPO-69	Bayou Chevee Shoreline Protection	Critical-Short	468	1,367	2,672,000	5,700	2,000	USACE/USFWS
XPO-80a	Lower Pearl River Sediment Trapping	Support-Short	55	2,940	660,000	12,000	200	EPA
XPO-83	Lake Athanasio Spit	Critical-Short	99	1,713	895,000	9,000	500	NMFS/USACE
XPO-84	St. Malo Hydrologic Restoration	Critical-Short	2	122	658,000	329,000	5,400	NMFS
XPO-88	Point Platt Sediment Trapping	Support-Short	74	1,138	1,199,000	16,200	1,100	EPA
XPO-93	Marsh Creation w/ Biosolids Demo	Demonstration	NA	NA	NI	NA	NA	USACE
XPO-92	Shore Prot Demo @ Bayou Chevee	Demonstration	NA	NA	NI	NA	NA	USACE
PPO-2b	Lk Borgne SP South of B Bienvenue	Critical-Short	41	91	578,000	14,100	6,400	Public
PPO-2d	Lk Borgne SP East of Shell Beach	Support-Short	246	383	1,664,000	6,800	4,300	Public
PPO-2g	Lk Borgn SP Chef to GIWW Bypass	Critical-Short	81	96	1,708,000	21,100	17,800	Public

DNR Louisiana Department of Natural Resources
EPA U.S. Environmental Protection Agency
NMFS National Marine Fisheries Service
SCS Soil Conservation Service
USACE U.S. Army Corps of Engineers
USFWS U.S. Fish and Wildlife Service
NA Not Available

Table 3
Potential Candidate Projects for the 4th Priority Project List
Breton Sound Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
BS-1a/b	Rest of Bohemia Div & Oufall Mgt	Support-Short	124	658	1,642,000	13,200	2,500	NMFS/USACE
BS-5	Bayou Lamoque Outfall Management	Support-Short	350	555	317,000	900	600	DNR/SCS/USACE
BS-6	Pump Outfall Mgy of N Lake Lery	Support-Short	169	746	2,241,000	13,300	3,000	DNR/SCS
PBS-6	Grand Bay Crevasse	Support-Short	364	800	1,563,000	4,300	2,000	DNR/EPA/NMFS/SCS/USACE

Table 4
Potential Candidate Projects for the 4th Priority Project List
Mississippi River Delta Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
MR-2	Pass a Lourtre Sediment Fencing	Support-Short	1,500	1,817	2,666,000	1,800	1,500	DNR/USACE (dropped)
FMR-4	Tiger Pass Dredged Material Disposal	Support-Short	415	457	4,434,000	10,700	9,700	DNR/USACE (dropped)
PMR-5	Benny's Bay Diversion	Support-Short	10,761	12,125	6,328,000	600	500	EPA (dropped)
PMR-8	Pass a Lourtre Sediment Mining	Support-Short	118	252	1,247,000	10,600	4,900	USACE
XMR-12	Beneficial Use Hopper Dredged Mat	Demonstration	NA	NA	NA	NA	NA	DNR
XMR-14	Miss River Dredged Matarial Dispos	Support-Long	NA	NA	NA	NA	NA	DNR (dropped)

Table 5
Potential Candidate Projects for the 4th Priority Project List
Barataria Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Net Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
BA-3c	Naomi Outfall Management	Critical-Short	840	1,640	1,428,000	1,700	900	DNR/SCS/USACE/USFWS
BA-10	Davis Pond Outfall Management	Critical-Long	580	1,610	6,525,000	11,300	4,100	USACE
BA-12	Grand/Spanish Pass Diversion	Critical-Long	NA	NA	NA	NA	NA	NMFS
PBA-12	Barataria Bay WW Bank Protection	Support-Short	140	190	1,762,000	12,600	9,300	SCS
PBA-34	Maintain Bayou L'Ours Ridge	Support-Short	780	2,780	2,327,000	3,000	800	DNR/SCS/USACE
PBA-36	Lagan Freshwater Diversion	Critical-Long	NA	NA	NA	NA	NA	NMFS
PBA-38	Shell Island Segmented Breakwaters	Support-Short	510	1,580	22,060,000	43,300	14,000	DNR
XBA-1a	West Grand Terre Sediment Replenish	Critical-Short	440	450	7,934,000	18,000	17,600	EPA
XBA-1b	East Grand Terre Sediment Replenish	Critical-Short	380	400	7,441,000	19,600	18,600	EPA
XBA-1d	Cheniere Ronquille Sediment Replenish	Critical-Short	180	190	2,368,000	13,200	12,500	NMFS

Table 6
Potential Candidate Projects for the 4th Priority Project List
Terrebonne Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
TE-10/XTE-	Grand Bayou/GIWW	Critical-Short	1,825	4,929	5,515,000	3,000	1,100	DNR/SCS/USFWS
PTE-3	HNC Bank Stabilization	Critical-Short	311	1,059	1,600,000	5,100	1,500	USACE
PTE-15	Isles Dernieres Restoration	Critical-Short	1,050	1,864	33,188,000	31,600	17,800	EPA
PTE-15bii	Restore Isles Dernieres (Breakwaters)	Critical-Short	NA	NA	NA	NA	NA	DNR/SCS
PTE-26	Upper B Penchant Watershed Mgmt	Critical-Short	10,600	49,153	50,000,000	4,700	1,000	NMFS
XTE-45	Restoration of Timbalier Island	Critical-Short	NA	NA	NA	NA	NA	NMFS
XTE-54b	Flotant Marsh Creation/Enhancement	Demonstration	NA	NA	NA	NA	NA	DNR/SCS
XTE-57	South Pointe au Chien Hydro Rest	Critical-Short	610	1,285	805,000	1,300	600	USACE
XTE-58	South Bully Camp	Critical-Short	1,401	3,109	1,879,000	1,300	600	USACE
XTE-64	Avoca Island Sediment Diversion	Support-Short	413	1,030	922,000	2,200	900	NMFS
XTE-66	Sediment Conveyance Dist System	Demonstration	550	1,080	1,228,000	2,200	1,100	EPA
XTE-67b	East Timbalier to West Belle Pass	Critical-Short	NA	NA	NA	NA	NA	DNR/SCS
	Avoca Island Siphon Distribution	Demonstration	NA	NA	NA	NA	NA	EPA (dropped)

Table 7
Potential Candidate Projects for the 4th Priority Project List
Atchafalaya Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
XAT-4	Established Wetland Management	Support-Long	800	800	300,000	400	400	DNR
XAT-5a	Sediment Distribution	Demonstration	NA	NA	NA	NA	NA	EPA
XAT-8	Dredge Sediment into Wax Lake Outlet	Support-Short	40	2,070	1,530,000	38,300	700	DNR/USACE

Table 8
Potential Candidate Projects for the 4th Priority Project List
Teche/Vermilion Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
TV-1	Shark Island Shore Protection/HR	Critical-Short	463	593	7,559,000	16,300	12,700	DNR/SCS/USACE
TV-5/7	Marsh Island Marsh Creation/HR	Critical-Short	512	1,090	2,328,000	4,500	2,100	USACE/DNR/NMFS
PTV-19	Little Vermilion Bay Sediment Trap	Critical-Short	27	1,200	600,000	22,200	500	EPA/NMFS
PTV-13	Marsh S. of GIWW, Ver R to Week B	Critical-Long	NA	NA	NA	NA	NA	EPA
PTV-14	Marsh S. of GIWW, Ver R to Com C	Critical-Long	NA	NA	NA	NA	NA	EPA
PTV-4	Vermilion River SP -- Live Oak	Support-Short	7	70	300,000	42,900	4,300	SCS
PTV-8	Avery Canal to Weeks Island Veg	Support-Short	128	173	242,000	1,900	1,400	NMFS
XTV-27	Freshwater Bayou Bank Stab	Support-Short	61	61	1,925,000	31,600	31,600	DNR/SCS/USACE
	Marsh Island Sediment Demo	Demonstration	NA	NA	NA	NA	NA	EPA (dropped)
XTV-30	Marsh Island Wave Break Device	Demonstration	NA	NA	NA	NA	NA	LDWF/Public
XTV-25	Oaks Canal Bank Protection	Support-Short	120	125	1,069,000	8,900	8,600	Public

Table 9
Potential Candidate Projects for the 4th Priority Project List
Mermentau Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
PME-4	White Lake Diversion	Critical-Short	126	1,133	2,000,000	15,900	1,800	EPA/NMFS
XME-19	Old Vermilion Lock Overflow	Critical-Short	NA	NA	NA	NA	NA	NMFS (Dropped)
XME-20	Schooner Bayou Bypass Structure	Critical-Short	NA	NA	468,000	NA	NA	NMFS
XME-42	Hog Island Freshwater Introduction	Critical-Short	1,274	2,264	2,000,000	1,600	900	DNR/USACE
PME-1	GIWW Bank Protection	Support-Short	178	178	3,160,000	17,800	17,800	EPA
XME-17	North Canal to Mermentau	Support-Short	221	241	6,300,000	28,500	26,100	USFWS/NMFS
XME-22	Pecan Island Terracing	Support-Short	23	1,007	1,700,000	73,900	1,700	USACE/EPA
XME-35a	Shore Protection, Unbrella Bay	Support-Short	74	78	1,100,000	14,900	14,100	DNR
XME-35b	Shore Protection, Mallard Bay	Support-Short	74	78	900,000	12,200	11,500	DNR
XME-36	Tebo Point	Support-Short	9	11	200,000	22,200	18,200	SCS
XME-38	Grand Volle to Bear Lake	Support-Short	204	242	1,000,000	4,900	4,100	USACE/DNR
XME-44	GIWW Bank Stabilization	Support-Short	20	23	620,000	31,000	27,000	SCS (Dropped)
XME-41	Grand Cheniere Levee	Support-Long	NA	NA	900,000	NA	NA	SCS
XME-40	North Little Pecan Bayou	Support-Short	117	767	1,400,000	12,000	1,800	Public
XME-39	Mud Lake Levee Repair	Support-Long	NA	NA	750,000	NA	NA	Public
CS-16	Black Bayou Bypass	Critical-Short	115	1,661	4,600,000	40,000	2,800	Public
XME-29	Freshwater Bayou Bank Stab	Support-Short	118	118	3,763,000	31,900	31,900	Public

Table 10
Potential Candidate Projects for the 4th Priority Project List
Calcasieu/Sabine Basin

Project No.	Project Name	Status	Acres Created, Protected and Restored	Acres Benefitted	Cost ($)	Cost per Acre ($/Ac)	Cost per Benefitted Acre ($/Ac)	Sponsoring Agency
PCS-14	Kelso Bayou Structure	Critical-Short	34	319	1,587,000	46,700	5,000	SCS
XCS-44	West Cove Canal Plug	Critical-Short	52	985	253,000	4,900	300	USACE
XCS-48f	Structure Near Long Point Bridge	Critical-Short	52	3,672	526,000	10,100	100	USACE
XCS-51/44	Mine CSC and Plug West Cove Canal	Critical-Short	235	1,056	1,929,000	8,200	1,800	EPA/NMFS
CS-11b	Sweet Lake/Willow Lake Shore Prot	Critical-Short	294	4,477	2,626,000	8,900	600	DNR/USACE
PCS-26	Perry Ridge Shore Protection	Critical-Short	109	657	3,886,000	35,700	5,900	SCS
XCS-50	St. John's Island	Support-Short	137	295	1,934,000	14,100	6,600	NMFS
CS-10	Grand Lake Ridge Area	Support-Short	662	832	1,177,000	1,800	1,400	DNR/SCS
CS-14	Tripod Bayou	Support-Short	51	190	1,127,000	22,100	5,900	DNR/SCS
XCS-36	Compost Demonstration Project	Demonstration	10	10	250,000	25,000	25,000	EPA
XCS-49	Turner's Bay Vegetative Plantings	Support-Short	18	18	287,000	15,900	15,900	NMFS
XCS-45	Mine Ship Channel Disposal	Critical-Short	NA	NA	NA	NA	NA	EPA
XCS-54	Goose Lake Restoration	Critical-Short	34	105	1718000	50,500	16,400	Public

Table 11
Ranking of Potential Candidate Projects for the 4th Priority Project List
Pontchartrain Basin

Project No.	Project Name	EPA	DNR	USFWS	NMFS	SCS	USACE	Total
PO-11	Cutoff Bayou Hydrologic Restoration		4			4	3	11
PO-13	Tangipahoa Shore Protection		3			3		6
PO-15	**Alligator Point Marsh Restoration**		**5**	**2**		**5**		**12**
PPO-4	**Eden Isles East Marsh Restoration**	**5**		**4**	**5**		**5**	**19**
XPO-48a/b	Tennessee Williams/Hope Canal	4					2	6
XPO-51	Mancha WMA Hydrologic Rest		1	5			1	7
XPO-69	Bayou Chevee Shoreline Protection			3	1	2		6
XPO-80a	Lower Pearl River Sediment Trapping							
XPO-83	Lake Athanasio Spit				4			4
XPO-84	St. Malo Hydrologic Restoration	1			2			3
XPO-88	Point Platt Sediment Trapping	2						2
PPO-2g	Lk Borgne SP Chef to GIWW Bypass							
PPO-2b	**Lk Borgne SP South of B Bienvenue**	**3**	**2**	**1**	**3**	**1**	**4**	**14**
PPO-2d	Lk Borgne SP East of Shell Beach							
Demonstration Projects								
XPO-93	Marsh Creation w/ Biosolids Demo							
XPO-92	Shore Prot Demo @ Bayou Chevee							

Table 12
Ranking of Potential Candidate Projects for the 4th Priority Project List
Breton Sound Basin

Project No.	Project Name	EPA	DNR	USFWS	NMFS	SCS	USACE	Total
BS-1a/b	Rest of Bohemia Div & Oufall Mgt	2	2	1	3	1	2	11
BS-5	**Bayou Lamoque Outfall Management**	**1**	**3**	**4**	**2**	**3**	**3**	**16**
BS-6	**Pump Outfall Mgy of N Lake Lery**	**4**	**4**	**2**	**1**	**4**	**1**	**16**
PBS-6	**Grand Bay Crevasse**	**3**	**1**	**3**	**4**	**2**	**4**	**17**

Table 13
Ranking of Potential Candidate Projects for the 4th Priority Project List
Barataria Basin

Project No.	Project Name	EPA	DNR	USFWS	NMFS	SCS	USACE	Total
BA-3c	**Naomi Outfall Management**	**3**	**2**	**5**	**3**	**2**	**5**	**20**
BA-10	Davis Pond Outfall Management							
BA-12	Grand/Spanish Pass Diversion	4		2	4			10
BA-16	Bayou Segnette Wetland Protection			1	2	1		4
PBA-12	**Barataria Bay WW Bank Protection**	**1**	**5**		**1**	**5**	**2**	**14**
PBA-34	**Maintain Bayou L'Ours Ridge**		**4**	**4**		**4**	**4**	**16**
PBA-36	Lagan Freshwater Diversion							
PBA-38	Shell Island Segmented Breakwaters		3	3		3	3	12
XBA-1a	West Grand Terre Sediment Replenish							
XBA-1b	East Grand Terre Sediment Replenish	2						2
XBA-1d	Cheniere Ronquille Sediment Replenish	5	1		5		1	12

Table 14
Ranking of Potential Candidate Projects for the 4th Priority Project List
Terrebonne Basin

Project No.	Project Name	EPA	DNR	USFWS	NMFS	SCS	USACE	Total
TE-10/XTE-49	**Grand Bayou/GIWW**		**3**	**5**		**4**	**5**	**17**
PTE-3	HNC Bank Stabilization	3		2	2	1	1	9
PTE-15	Isles Dernieres Restoration	5	4		4		2	15
PTE-15bii	**Restore Isles Dernieres (Breakwaters)**	**4**	**5**	**3**	**3**	**5**	**4**	**24**
PTE-26	Upper B Penchant Watershed Mgmt	1		1	1			3
XTE-45/67b	**Restoration of Timbalier Island**	**2**	**2**	**4**	**5**	**3**	**3**	**19**
XTE-57	South Pointe au Chien Hydro Rest							
XTE-58	South Bully Camp		1			2		3
XTE-64	Avoca Island Sediment Diversion							
XTE-67b	East Timbalier to West Belle Pass							
Demonstration Projects								
XTE-54b	Flotant Marsh Creation/Enhancement							
XTE-66	Sediment Conveyance Dist System							

Table 15
Ranking of Potential Candidate Projects for the 4th Priority Project List
Teche/Vermilion Basin

Project No.	Project Name	EPA	DNR	USFWS	NMFS	SCS	USACE	Total
TV-1	Shark Island Shore Protection/HR		4	1		4	2	11
TV-5/7	**Marsh Island Marsh Creation/HR**	**1**	**3**	**5**	**4**	**3**	**5**	**21**
PTV-19	**Little Vermilion Bay Sediment Trap**	**5**		**3**	**5**		**4**	**17**
PTV-13	Marsh S. of GIWW, Ver R to Week B	2						2
PTV-14	Marsh S. of GIWW, Ver R to Com C							
PTV-4	Vermilion River SP -- Live Oak		2		1	2		5
PTV-8	Avery Canal to Weeks Island Veg	3		2	3			8
XTV-27	**Freshwater Bayou Bank Stab 2**		**5**	**4**		**5**	**3**	**17**
XTV-25	Oaks Canal Bank Protection	4	1		2	1	1	9

Table 16
Ranking of Potential Candidate Projects for the 4th Priority Project List
Mermentau Basin

Project No.	Project Name	EPA	DNR	USFWS	NMFS	SCS	USACE	Total
PME-4	White Lake Diversion	4			2			6
XME-19	Old Vermilion Lock Overflow							
XME-20	Schooner Bayou Bypass Structure							
XME-42	Hog Island Freshwater Introduction				3		4	7
PME-1	**GIWW Bank Protection**	**3**	**5**	**1**		**4**	**5**	**18**
XME-17	North Canal to Mermentau		2	3		1		6
XME-22	Pecan Island Terracing	5			4			9
XME-35a	Shore Protection, Unbrella Bay							
XME-35b	Shore Protection, Mallard Bay							
XME-36	Tebo Point							
XME-38	Grand Volle to Bear Lake			2			1	3
XME-44	GIWW Bank Stabilization							
XME-41	Grand Cheniere Levee		4			5	3	12
XME-40	North Little Pecan Bayou							
XME-39	Mud Lake Levee Repair							
CS-16	**Bayou Black Bypass**	**1**	**1**	**5**	**5**	**2**	**2**	**16**
XME-29	**Freshwater Bayou Bank Stab Phase 3**	**2**	**3**	**4**	**1**	**3**		**13**

Table 17

Ranking of Potential Candidate Projects for the 4th Priority Project List

Calcasieu/Sabine Basin

Project No.	Project Name	EPA	DNR	USFWS	NMFS	SCS	USACE	Total
PCS-14	Kelso Bayou Structure		2			2		4
XCS-44	West Cove Canal Plug							
XCS-48f	Structure Near Long Point Bridge		1			1	2	4
XCS-51/44	**Mine CSC and Plug West Cove Canal**	**5**		**5**	**4**		**3**	**17**
CS-11b	**Sweet Lake/Willow Lake Shore Prot**	**1**	**4**	**3**	**1**	**5**	**5**	**19**
PCS-26	**Perry Ridge Shore Protection**		**5**	**4**	**3**	**4**	**4**	**20**
XCS-50	St. John's Island	2						2
CS-10	Grand Lake Ridge Area		3	1		3		7
CS-14	Tripod Bayou				2			2
XCS-49	Turner's Bay Vegetative Plantings	3		2	5		1	11
XCS-45	Mine Ship Channel Disposal (East)	4						4
XCS-54	Goose Lake Restortion Project							

EVALUATION OF CANDIDATE PROJECTS

Wetland Value Assessment Methodology and Community Models

I. INTRODUCTION

The Wetland Value Assessment (WVA) methodology is a quantitative habitat-based assessment methodology developed for use in prioritizing project proposals submitted for funding under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) of 1990. The WVA quantifies changes in fish and wildlife habitat quality and quantity that are projected to be brought about as a result of a proposed wetland enhancement project. The results of the WVA, measured in Average Annual Habitat Units (AAHU's), can be combined with economic data to provide a measure of the effectiveness of a proposed project in terms of annualized cost per AAHU gained.

The WVA was developed by the Environmental Work Group (Group) assembled under the Planning and Evaluation Subcommittee of the CWPPRA Technical Committee; the Group includes members from each agency represented on the CWPPRA Task Force. The WVA was designed to be applied, to the greatest extent possible, using only existing or readily obtainable data.

The WVA has been developed strictly for use in ranking proposed CWPPRA projects; it is not intended to provide a detailed, comprehensive methodology for establishing baseline conditions within a project area. Some aspects of the WVA have been defined by policy and/or functional considerations of the CWPPRA; therefore, user-specific modifications may be necessary if the WVA is used for other purposes.

The WVA is a modification of the Habitat Evaluation Procedures (HEP) developed by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1980). HEP is widely used by the Fish and Wildlife Service and other Federal and State agencies in evaluating the impacts of development projects on fish and wildlife resources.

A notable difference exists between the two methodologies, however, in that HEP generally uses a species-oriented approach, whereas the WVA utilizes a community approach.

The WVA has been developed for application to the following coastal Louisiana wetland types: fresh marsh (including intermediate marsh), brackish marsh, saline marsh, and cypress-tupelo swamp. Future reference in this document to "wetland" or "wetland type" refers to one or more of those four communities.

II. WVA CONCEPT

The WVA operates under the assumption that optimal conditions for fish and wildlife habitat within a given coastal wetland type can be characterized, and that existing or predicted conditions can be compared to that optimum to provide an index of habitat quality. Habitat quality is estimated or expressed through the use of a mathematical model developed specifically for each wetland type. Each model consists of 1) a list of variables that are considered important in characterizing fish and wildlife habitat, 2) a Suitability Index graph for each variable, which defines the assumed relationship between habitat quality (Suitability Index) and different variable values, and 3) a mathematical formula that combines Suitability Index for each variable into a single value for wetland habitat quality; that single value is referred to as the Habitat Suitability Index, or HSI.

The Wetland Value Assessment models (Attachments 1-4) have been developed for determining the suitability of Louisiana coastal wetlands in providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. Models have been designed to function at a community level and therefore attempt to define an optimum combination of habitat conditions for <u>all</u> fish and wildlife species utilizing a given marsh type over a year or longer. Earlier attempts to capture other wetland functions and values such as storm-surge protection, flood water storage, water quality functions and nutrient import/export were abandoned due to the difficulty in defining unified model relationships and meaningful model outputs for such a variety of wetland benefits. However, the ability of a Louisiana coastal wetland to provide those functions and values may be generally assumed to be positively correlated with fish and wildlife habitat quality as predicted through the WVA.

The output of each model (the HSI) is assumed to have a linear relationship with the suitability of a coastal wetland system in providing fish and wildlife habitat.

III. COMMUNITY MODEL VARIABLE SELECTION

Habitat variables considered appropriate for describing habitat quality in each wetland type were selected according to the following criteria:

1) the condition described by the variable had to be important in characterizing fish and wildlife habitat quality in the wetland type under consideration;

2) values had to be easily estimated and predicted based on existing data (e.g., aerial photography, LANDSAT, GIS systems, water quality monitoring stations, and interviews with knowledgeable individuals); and

3) the variable had to be sensitive to the types of changes expected to be brought about by typical wetland projects proposed under the CWPPRA.

Variables for each model were selected through a two part procedure. The first involved a listing of environmental variables thought to be important in characterizing fish and wildlife habitat in coastal marsh or swamp systems.

The second part of the selection procedure involved reviewing variables used in species-specific HSI models published by the U.S. Fish and Wildlife Service. Review was limited to models for those fish and wildlife species known to inhabit Louisiana coastal wetlands, and included models for 10 estuarine fish and shellfish, 4 freshwater fish, 12 birds, 3 reptiles and amphibians, and 2 mammals (Attachment 7). The number of models included from each species group was dictated by model availability.

Selected HSI models were then grouped according to the wetland type(s) used by each species. Because most species for which models were considered are not restricted to one wetland type, most models were included in more than one wetland type group. Within each wetland type group, variables from all models were then grouped according to similarity (e.g., water quality, vegetation, etc.). Each variable was evaluated based on 1) whether it met the variable selection criteria; 2) whether another, more easily measured/predicted variable in the same or a different similarity group functioned as a surrogate; and 3) whether it was deemed suitable for the WVA application (e.g., some freshwater fish model variables dealt with riverine or lacustrine environments). Variables that did not satisfy those conditions were eliminated from further consideration. The remaining variables, still in their similarity groups, were then further eliminated or refined by combining similar variables and/or culling those that were functionally duplicated by variables from other models (i.e., some variables were used frequently in different models in only slightly different format, such as percent marsh coverage, salinity, etc.).

Variables selected from the HSI models were then compared to those identified in the first part of the selection procedure to arrive at a final list of variables to describe wetland habitat quality. That list includes six variables for each of the marsh types and three for the cypress-tupelo swamp (Attachments 1-4).

IV. SUITABILITY INDEX GRAPHS

Suitability Index graphs were constructed for each variable selected within a wetland type. A Suitability Index (SI) graph is a graphical representation of how fish and wildlife habitat quality or "suitability" of a given wetland type is predicted to change as values of the given variable change, and allows the model user to numerically describe, through a Suitability Index, the habitat quality of a wetland area for any variable value. Each Suitability

Index ranges from 0.0 to 1.0, with 1.0 representing the optimum condition for the variable in question.

A variety of resources were utilized to construct each Suitability Index (SI) graph, including personal knowledge of Group members, the species HSI models from which the final list of variables was partially derived, consultation with other professionals and researchers outside the Group, and published and unpublished data and studies. An important "non-biological" constraint on SI graph development was the need to insure that graph relationships were not counter to the purpose of the CWPPRA, that is, the long term creation, restoration, protection, or enhancement of coastal vegetated wetlands. That constraint was most operative in defining SI graphs for Variable 1 under each marsh model (see discussion below).

The process of graph development was one of constant evolution, feedback, and refinement; the form of each Suitability Index graph was decided upon through consensus among Group members.

V. SUITABILITY INDEX GRAPH ASSUMPTIONS

Suitability Index graphs were developed according to the following assumptions:

1. **Fresh/Intermediate Marsh Model**

Variable V_1- Percent of wetland covered by persistent emergent vegetation (≥ 10 percent canopy cover). Persistent emergent vegetation plays an important role in coastal wetlands by providing foraging, resting, and breeding habitat for a variety of fish and wildlife species; and by providing a source of detritus and energy for lower trophic organisms that form the basis for the food chain. An area with no marsh (i.e., shallow open water) is assumed to have minimal habitat suitability in terms of this variable, and is assigned an SI of 0.1.

Optimum vegetation coverage in a fresh/intermediate marsh is assumed to occur at 100 percent persistent emergent vegetation cover (SI=1.0). That assumption is dictated primarily by the constraint of not having graph relationships conflict with the CWPPRA's purpose of long term creation, restoration, protection, or enhancement of coastal vegetated wetlands. The Group had originally developed a strictly biologically-based graph defining optimum habitat conditions at marsh cover values between 60 and 80 percent, and sub-optimum habitat conditions at 100 percent cover. However, application of that graph, in combination with the time analysis used later in the evaluation process, often reduced project benefits or generated a net <u>loss</u> of habitat quality through time with the project. Those situations arose primarily when: existing (baseline) emergent vegetation cover exceeded the optimum (> 80 percent); the project was predicted to maintain baseline cover values; and without the project the marsh was predicted to degrade, with a concurrent decline in percent emergent vegetation cover into the optimum range (60-80 percent). The time factor aggravated the situation when the without-project degradation was not rapid enough to reduce marsh cover values significantly below the optimum range, or below the baseline SI, within the 20-year evaluation period. In those cases, the analysis would show net negative benefits for the project, and positive benefits for letting the marsh degrade rather than maintaining the existing marsh. Coupling that situation with the presumption that marsh conditions are not static, and that Louisiana will continue to lose coastal emergent marsh; and taking into account the purpose of the CWPPRA, the Group decided that, all other factors being equal, the WVA should favor projects that maximize emergent marsh creation, maintenance, and protection. Therefore, the Group agreed to deviate from a strict biologically-based habitat suitability graph for V_1 by setting optimum habitat conditions at 100 percent marsh cover.

Variable V_2- Percent of open water area dominated (> 50 percent canopy cover) by aquatic vegetation. Fresh and intermediate marshes often support diverse communities of floating-leaved and submerged aquatic plants that provide important food and cover to a wide variety of fish and wildlife species. A fresh/intermediate open water area with no aquatics is assumed to have low suitability (SI=0.1). Optimum condition (SI=1.0) is assumed to occur when 100 percent of the open water is dominated by aquatic vegetation. Habitat suitability may be assumed to decrease with aquatic plant coverage approaching 100 percent due to the potential for mats of aquatic vegetation to hinder fish and wildlife utilization; to adversely affect water quality by reducing photosynthesis by phytoplankton and other plant forms due to shading; and contribute to oxygen depletion spurred by warm-season decay of large quantities of aquatic vegetation. The Group recognized, however, that those affects were highly dependent on the dominant aquatic plants species, their growth forms, and their arrangement in the water column; thus, it is possible to have 100 percent cover of a variety of floating and submerged aquatic plants without the above-mentioned problems due to differences in plant growth form and stratification of plants through the water column. Because predictions of which species may dominate at any time in the future would be tenuous, at best, the Group decided to simplify the graph and define optimum conditions at 100 percent aquatic cover.

Variable V_3- Marsh edge and interspersion. This variable takes into account the relative juxtaposition of marsh and open water for a given marsh:open water ratio, and is measured by comparing the project area to sample illustrations (Attachment 5) depicting different degrees of interspersion. Interspersion is assumed to be especially important when considering the value of an area as foraging and nursery habitat for freshwater and estuarine fish and shellfish; the marsh/open water interface represents an ecotone where prey species often concentrate, and where post-larval and juvenile organisms can find cover. Isolated marsh ponds are often more productive in terms of aquatic vegetation than are larger ponds due to decreased turbidities, and, thus, may provide more suitable waterfowl habitat. However, interspersion <u>can</u> be indicative of marsh degradation, a factor taken into consideration in assigning suitability indices to the various Interspersion Types.

A relatively high degree of interspersion in the form of stream courses and tidal channels (Interspersion Type 1, Attachment 5) is assumed to be optimal (SI=1.0); streams and channels offer interspersion, yet are not indicative of active marsh deterioration. Areas exhibiting a high degree of marsh cover are also ranked as optimum, even though interspersion may be low, to avoid conflicts with the premises underlying the SI graph for variable V_1. Without such an allowance, areas of relatively healthy, solid marsh, or projects designed to create marsh, would be penalized with respect to interspersion. Numerous small marsh ponds (Interspersion Type 2) offer a high degree of interspersion, but are also usually indicative of the beginnings of marsh break-up and degradation, and are therefore assigned a more moderate SI of 0.6. Large open water areas (Interspersion Types 3 and 4) offer lower interspersion values and usually indicate advanced stages of marsh loss, and are thus assigned SI's of 0.4 and 0.2, respectively. The lowest expression of interspersion (i.e., no emergent marsh at all within the project area) is assumed to be least desirable and is assigned an SI=0.1.

Variable V_4- Percent of open water area ≤ 1.5 feet deep in relation to marsh surface. Shallow water areas are assumed to be more biologically productive than deeper water due to a general reduction in sunlight, oxygen, and temperature as water depth increases. Also, shallower water provides greater bottom accessibility for certain species of waterfowl, better foraging habitat for wading birds, and more favorable conditions for aquatic plant growth. Optimum depth in a fresh/intermediate marsh is assumed to occur when 80 to 90 percent of the open water area is less than or equal to 1.5 feet deep. The value of deeper areas in providing drought refugia for fish, alligators and other marsh life is recognized by assigning an SI=0.6 (i.e., sub-optimal) if all of the open water is less than or equal to 1.5 feet deep.

Variable V_5- Mean high salinity during the growing season. It is assumed that periods of high salinity are most detrimental in a fresh/intermediate marsh when they occur during the growing season (defined as March through November, based on dates of first and last frost contained in Soil Conservation Service soil surveys for coastal Louisiana). Mean high salinity is defined as the average of the upper 33 percent of salinity readings taken during a specified period of record. Optimum condition in fresh marsh is assumed to occur when mean high salinity during the growing season is less than 2 parts per thousand (ppt). Optimum condition in intermediate marsh is assumed to occur when mean high salinity during the growing season is less than 4 ppt.

Variable V_6- Aquatic organism access. Access by aquatic organisms, particularly estuarine fishes and shellfishes, is considered to be a critical component in assessing the "quality" or suitability of a given marsh system to provide habitat to those species. Additionally, a marsh with a relatively high degree of access by default also exhibits a relatively high degree of hydrologic connectivity with adjacent systems, and therefore may be considered to contribute more to nutrient exchange than would a marsh exhibiting a lesser degree of access. The Suitability Index for V_7 is determined by calculating an "Access Value" based on the interaction between the percentage of the project area wetlands considered accessible by estuarine organisms during normal tidal fluctuations, and the type of man-made structures (if any) across identified points of ingress/egress (bayous, canals, etc.). Standardized procedures for calculating the Access Value have been established (Attachment 6). Optimum condition is assumed to exist when all of the study area is accessible and the access points are entirely open and unobstructed. A fresh/intermediate marsh with no access is assigned an SI=0.3, reflecting the assumption that, while fresh/intermediate marshes are important to some species of estuarine fishes and shellfish, such a marsh lacking access continues to provide benefits to a wide variety of other wildlife and fish species, and is not without habitat value.

2. Brackish Marsh Model

Variable V_1- Percent of wetland covered by persistent emergent vegetation (≥ 10 percent canopy cover). Refer to the V_1 discussion under the fresh/intermediate marsh model for a discussion of the importance of persistent emergent vegetation in coastal marshes. The V_1 Suitability Index graph in the brackish marsh model is identical to that in the_fresh/intermediate model.

Variable V_2- Percent of open water area dominated (> 50 percent canopy cover) by aquatic vegetation. Like fresh/intermediate marshes, brackish marshes have the potential to support aquatic plants that serve as important sources of food and cover for a wide variety of wildlife. However, brackish marshes generally do not support the amounts and kinds of aquatic plants that occur in fresh/intermediate marshes (although certain species, such as widgeon-grass, can occur abundantly under certain conditions). Therefore, a brackish marsh entirely lacking aquatic plants is assigned an SI=0.3. It is assumed that optimum open water coverage of aquatic plants in a brackish marsh occurs at 100 percent aquatic cover.

Variable V_3- Marsh edge and interspersion. The Suitability Index graph for edge and interspersion in the brackish marsh model is the same as that in the fresh/intermediate marsh model.

Variable V_4- Open water depth in relation to marsh surface. As in the fresh/intermediate model, shallow water areas in brackish marsh habitat are assumed to be important. However, brackish marsh generally exhibits deeper open water areas than fresh marsh due to tidal scouring. Therefore, the SI graph is constructed so that lower percentages of shallow water receive higher SI values relative to fresh/intermediate marsh. Optimum open water depth condition in a brackish marsh is assumed to occur when 70 to 80 percent of the open water area is less than or equal to 1.5 feet deep.

Variable V_5- Average annual salinity. The suitability index graph is constructed to represent optimum average annual salinity condition at between 0 ppt and 10 ppt. The Group acknowledges that average annual salinites below 6 ppt will effectively define a marsh as fresh or intermediate, not brackish. However, the suitability index graph makes allowances for lower salinities (i.e., < 6 ppt) to account for occasions when there is a trend of decreasing salinities through time toward a more intermediate condition. Implicit in keeping the graph at optimum for salinites less than 6 ppt_ is the assumption that lower salinites are not detrimental to a bracksih marsh. However, average annual salinites greater than 10 ppt are assumed to be progressively more harmful to brackish marsh vegetation, as illustrated in the downward sloping right leg of the suitability index graph. Average annual salinities greater than 16 ppt are assumed to be representative of those found in a saline marsh, and thus are not considered in the brackish marsh model.

Variable V_6- Aquatic organism access. The general rational and procedure behind the V_6 Suitability Index graph for the brackish marsh model is identical to that established for the fresh/intermediate model. However, brackish marshes are assumed to be more important as providers of habitat to estuarine fish and shellfish than fresh/intermediate marshes. Therefore, a brackish marsh providing no access is assigned an SI of 0.1.

3. Saline Marsh Model

Variable V_1- Percent of wetland covered by persistent emergent vegetation (≥ 10 percent canopy cover). Refer to the V_1 discussion under the fresh/intermediate marsh model for a discussion of the importance of persistent emergent vegetation in coastal marshes. The V_1 Suitability Index graph in the saline marsh model is identical to that in the fresh/intermediate and brackish models.

Variable V_2- Percent of open water area dominated (> 50 percent canopy cover) by aquatic vegetation. Refer to the V_2 discussion under the brackish marsh model for a discussion of persistent emergent vegetation in more saline coastal marshes. The V_2 Suitability Index graph in the saline marsh model is identical to that in the brackish model.

Variable V_3- Marsh edge and interspersion. The Suitability Index graph for edge and interspersion in the saline marsh model is the same as that in the fresh/intermediate and brackish marsh models.

Variable V_4- Open water depth in relation to marsh surface. The Suitability Index graph for open water depth in the saline marsh is similar to that for brackish marsh, where optimum conditions are assumed to occur when 70 to 80 percent of the open water area is less than or equal to 1.5 feet deep. However, at 100 percent shallow water, the saline graph yields an SI= 0.5 rather than 0.6 for the brackish model. That change reflects the increased abundance of tidal channels and generally deeper water conditions prevailing in a saline marsh due to increased tidal influences, and the importance of those tidal channels to estuarine organisms.

Variable V_5- Average annual salinity. The Suitability Index graph is constructed to represent optimum salinity conditions at between 9 ppt and 21 ppt. The Group acknowledges that average annual salinites between 9 and 12 ppt will effectively define a marsh as brackish, not saline. However, the suitability index graph makes allowances for lower salinities (i.e., < 12 ppt) to account for occasions when there is a trend of decreasing salinities through time toward a more brackish condition. Implicit in keeping the graph at optimum for salinites less than 12 ppt is the assumption that lower salinites (9-12 ppt) are not detrimental to a saline marsh. Average annual salinites greater than 21 ppt are assumed to be slightly stressful to saline marsh vegetation, as illustrated in the downward sloping right leg of the suitability index graph.

Variable V_6- Aquatic organism access. The Suitability Index graph for aquatic organism access in the saline marsh model is the same as that in the brackish marsh model.

4. Cypress-Tupelo Swamp Model

Variable V_1- Water regime. Four water regime categories are described for the cypress-tupelo swamp model. The optimum water regime for a cypress-tupelo swamp is assumed to be seasonal flooding (SI=1.0); seasonal flooding with periodic drying cycles is assumed to contribute to increased nutrient cycling (primarily through oxidation and decomposition of accumulated detritus), increased vertical structure complexity (due to growth of other plants on the swamp floor), and increased recruitment of dominant overstory trees. Semipermanent flooding is also assumed to be desirable, as reflected in the SI=0.8 for that water regime category. Permanent flooding is assumed to be the least desirable (SI=0.2).

Variable V_2- Water flow/exchange. This variable attempts to take into consideration the amounts and types of water inputs into a cypress-tupelo swamp. The Suitability Index graph is constructed under the assumption that abundant and consistent riverine input and water flow-through is optimum (SI=1.0), because under that regime the full functions and values of a cypress-tupelo swamp in providing fish and wildlife habitat are assumed to be maximized. Habitat suitability is assumed to decrease as water exchange between the swamp and adjacent systems is reduced. A swamp system with no water exchange (e.g., an impounded swamp where the only water input is through rainfall and the only water loss is through evapotranspiration and ground seepage) is assumed to be least desirable, and is assigned an SI= 0.2.

Variable V_3- Average high salinity. Average high salinity is defined as the average of the upper 33 percent of salinity measurements taken during a specified period of record. Because baldcypress is salinity-sensitive, optimum conditions for baldcypress survival are assumed to occur at average high salinities less than 1 ppt. Habitat suitability is assumed to decrease rapidly at average high salinities in excess of 1 ppt.

VI. HABITAT SUITABILITY INDEX FORMULA

The final step in WVA model development was to construct a mathematical formula that combines all Suitability Indices for each wetland type into a single Habitat Suitability Index (HSI) value. Because the Suitability Indices range in value from 0.0 to 1.0, the HSI also ranges in from 0.0 to 1.0, and is a numerical representation of the overall or "composite" habitat quality of the particular wetland study area being evaluated. The HSI formula defines the aggregation of Suitability Indices in a manner unique to each wetland type depending on how the formula is constructed.

Within an HSI formula, any Suitability Index can be weighted by various means to increase the power or "importance" of that variable relative to the other variables in determining the HSI. Additionally, two or more variables can be grouped together into subgroups to further isolate variables for weighting.

In constructing HSI formulas for the marsh models, the Group recognized that the primary focus of the CWPPRA is on vegetated wetlands, and that some marsh protection strategies could have adverse impacts to estuarine organism access. Therefore, the Group made an *a priori* decision to emphasize variables V_1, V_2, and V_6 by grouping and weighting them together. Weighting was facilitated by treating the grouped variables as a geometric mean. Variables V_3, V_4, and V_5 were grouped to isolate their influence relative to V_1, V_2, and V_6.

For all marsh models, V_1 receives the strongest weighting. The relative weights of V_2 and V_6 differ by marsh model to reflect differing levels of importance for those variables between the marsh types. For example, the amount of aquatic vegetation was deemed more important in the context of a fresh/intermediate marsh than in a saline marsh, due to the relative contributions of aquatic vegetation between the two marsh types in terms of providing food and cover. Therefore, V_2 receives more weight in the fresh/intermediate HSI formula than in the saline HSI formula. Similarly, the degree of estuarine organism access was considered more important in a saline marsh than a fresh/intermediate marsh, and V_6 receives more weight in the saline HSI formula than in the fresh/intermediate formula.

As with the Suitability Index graphs, the Habitat Suitability Index formulas were developed by consensus among the Group members.

VI. BENEFIT ASSESSMENT

The net benefits of a proposed project are estimated by predicting future habitat conditions under two scenarios: with the proposed project in place and without the proposed project. Specifically, predictions are made as to how the model variables will change through time under the two scenarios. Through that process, HSI's are established for baseline (pre-project) conditions and for future-with- and future-without-project scenarios for selected "target years" throughout the expected life of the project. Those HSI's are then multiplied by the acreage of wetland type known or expected to be present in the target years to arrive at Habitat Units.

Habitat Units (HU's) represent a numerical combination of quality (HSI) and quantity (acres) existing at any given point in time. The "benefit" of a project can be quantified by comparing HU's between the future-with and future-without-project scenarios. The difference in HU's between the two scenarios represents the net benefit attributable to the project in terms of habitat quantity <u>and</u> quality.

The HU's resulting from the future-with- and future-without-project scenarios are annualized, averaged out over the project life, and compared to determine the net gain in average annual HU's (AAHU's) attributable to the project. Net gain in AAHU's is then combined with annualized cost data to arrive at a cost per AAHU for the evaluated project. That figure is compared to the same figure from other projects in order to rank all proposed projects in order of cost per AAHU.

Revised June 2, 1993

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Fresh/Intermediate Marsh

Vegetation:

Variable V_1 Percent of wetland area covered by emergent vegetation (≥ 10% canopy cover).

Variable V_2 Percent of open water area dominated (> 50% canopy cover) by aquatic vegetation.

Interspersion:

Variable V_3 Marsh edge and interspersion.

Water Depth:

Variable V_4 Percent of open water area ≤ 1.5 feet deep, in relation to marsh surface.

Water Quality:

Variable V_5 Mean high salinity during the growing season (March through November).

Aquatic Organism Access:

Variable V_6 Aquatic organism access.

HSI Calculation:

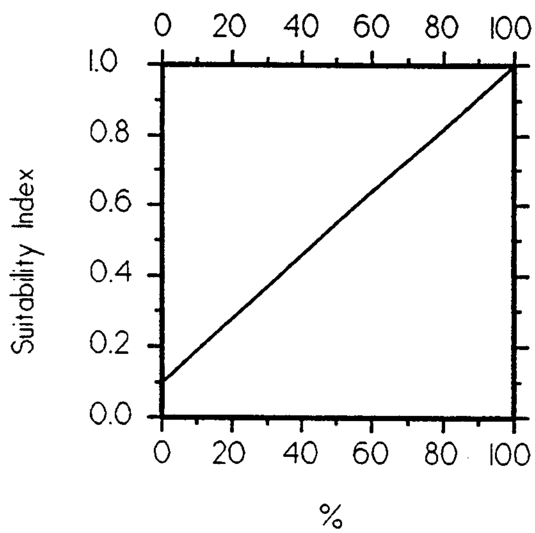
$$HSI = \frac{\left[3.5 \times (SIV_1^{3} \times SIV_2^{1.2} \times SIV_6^{0.5})^{(1/4.7)}\right] + \left[\frac{(SIV_3 + SIV_4 + SIV_5)}{3}\right]}{4.5}$$

Attachment 1

FRESH/INTERMEDIATE MARSH

Variable V_1 Percent of wetland area covered by emergent vegetation (≥ 10% canopy cover).

Suitability Graph

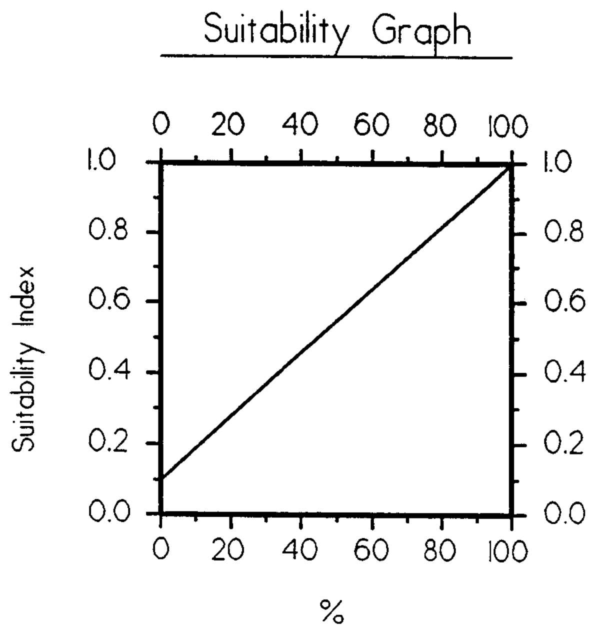


<u>Line Formulas</u>

SI = (0.009 * %) + 0.1

FRESH/INTERMEDIATE MARSH

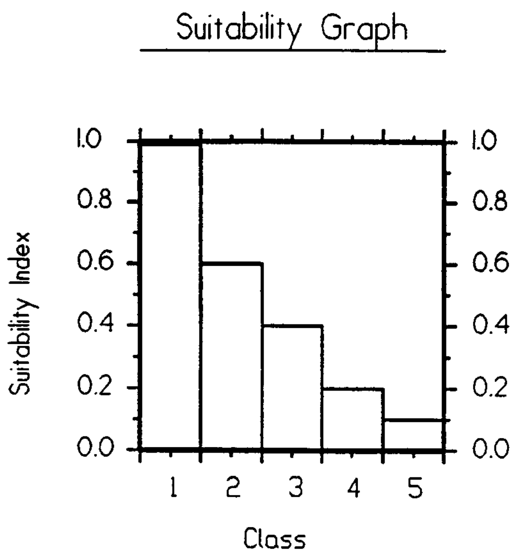
Variable V_2 Percent of open water area dominated (> 50% canopy cover) by aquatic vegetation.



Line Formulas

SI = (0.009 * %) + 0.1

Variable V_3 Marsh edge and interspersion.

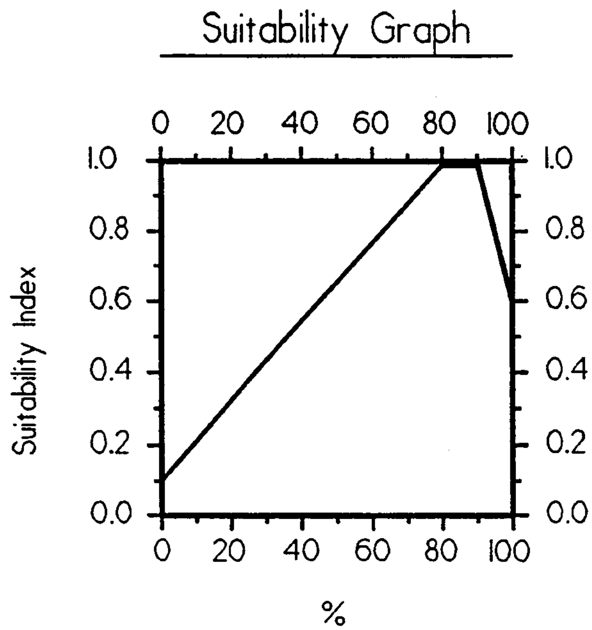


<u>Instructions for Calculating SI for Variable 3:</u>

1. Refer to Attachment 5 for examples of the different interspersion classes (=types).

2. Estimate percent of project area in each class and compute a weighted average to arrive at SIV_3. If the <u>entire</u> project area is solid marsh, assign an interspersion class #1 (SI=1.0). Conversely, if the <u>entire</u> project area is open water, assign an interspersion class #5 (SI=0.1).

Variable V_4 Percent of open water area ≤ 1.5 feet deep, in relation to marsh surface.



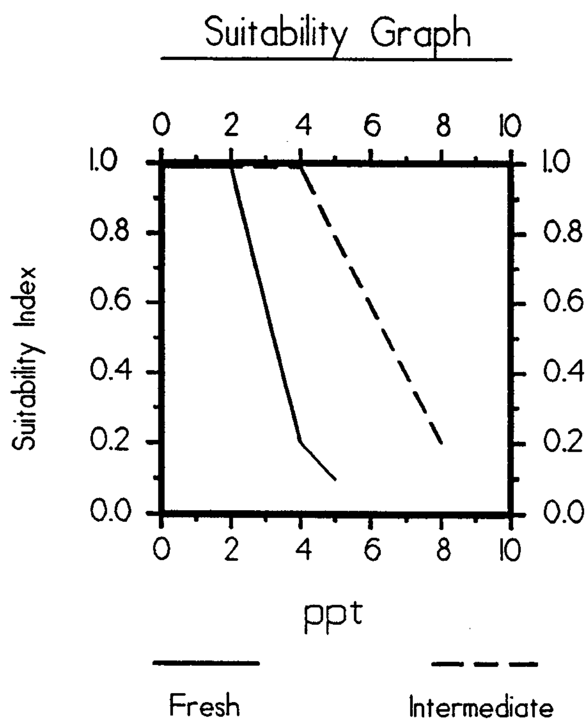
Line Formulas

If 0 ≤ % < 80, then SI = (0.01125 * %) + 0.1

If 80 ≤ % < 90, then SI = 1.0

If % ≥ 90, then SI = (-0.04 * %) + 4.6

Variable V_5 Mean high salinity during the growing season (March through November).



Line Formulas

Fresh Marsh:

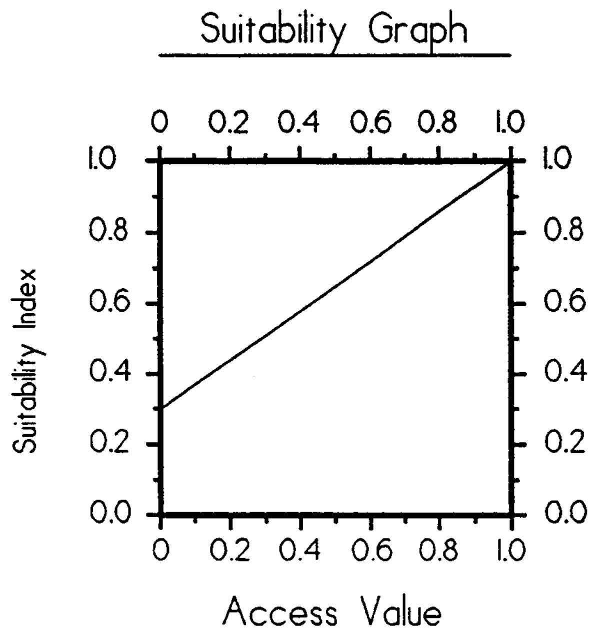
If $0 \leq ppt < 2$, then SI = 1.0
If $2 \leq ppt < 4$, then SI = (-0.4 * ppt) + 1.8
If $4 \leq ppt \leq 5$ then SI = (-0.1 * ppt) + 0.6

Intermediate Marsh:

If $0 \leq ppt < 4$, then SI = 1.0
If $4 \leq ppt \leq 8$, then SI = (-0.2 * ppt) + 1.8

NOTE: Mean high salinity is defined as the average of the upper 33 percent of salinity readings taken during the period of record.

Variable V_6 Aquatic organism access.



Line Formula

SI = (0.7 * Access Value) + 0.3

NOTE: Access Value = P * R, where "P" = percentage of wetland area considered accessible by estuarine organisms during normal tidal fluctuations, and "R" = Structure Rating.

Refer to Attachment 6 "Procedure For Calculating Access Value" for complete information on calculating "P" and "R" values.

Revised May 2, 1994

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Brackish Marsh

Vegetation:

Variable V_1 Percent of wetland area covered by emergent vegetation (≥ 10% canopy cover).

Variable V_2 Percent of open water area dominated (> 50% canopy cover) by aquatic vegetation.

Interspersion:

Variable V_3 Marsh edge and interspersion.

Water Depth:

Variable V_4 Percent of open water area ≤ 1.5 feet deep, in relation to marsh surface.

Water Quality:

Variable V_5 Average annual salinity.

Aquatic Organism Access:

Variable V_6 Aquatic organism access.

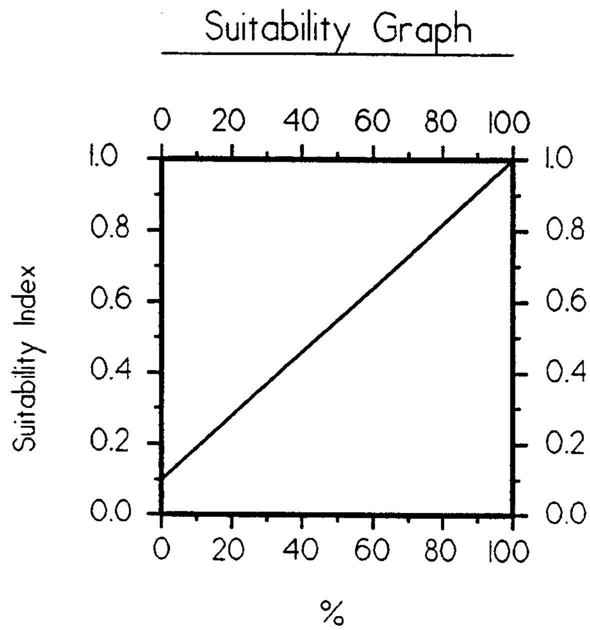
HSI Calculation:

$$HSI = \frac{\left[3.5 \times (SIV_1^3 \times SIV_2 \times SIV_6)^{(1/5)}\right] + \left[\frac{(SIV_3 + SIV_4 + SIV_5)}{3}\right]}{4.5}$$

Attachment 2

BRACKISH MARSH

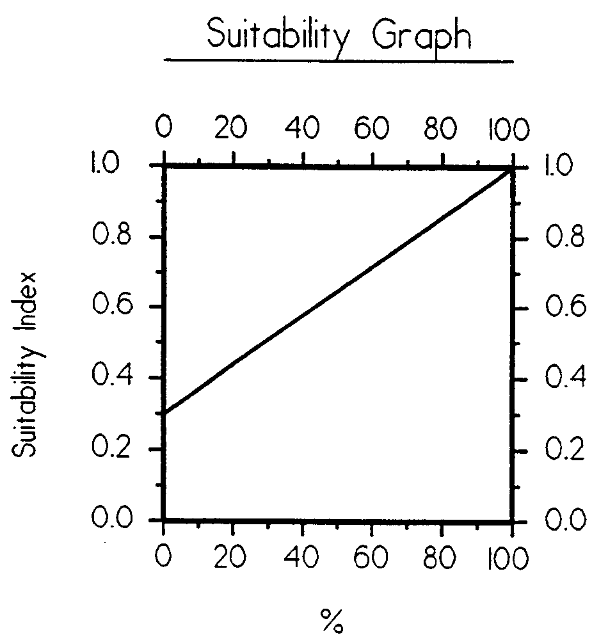
Variable V_1 Percent of wetland area covered by emergent vegetation (≥ 10% canopy cover).



<u>**Line Formulas**</u>

SI = (0.009 * %) + 0.1

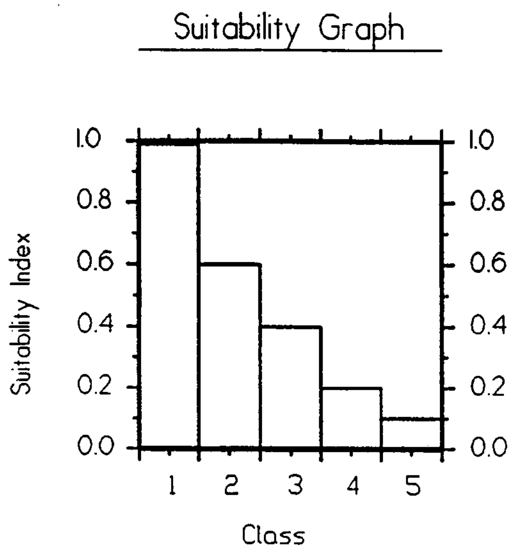
Variable V_2 Percent of open water area dominated (> 50% canopy cover) by aquatic vegetation.



Line Formulas

SI = (0.007 * %) + 0.3

Variable V_3 Marsh edge and interspersion.



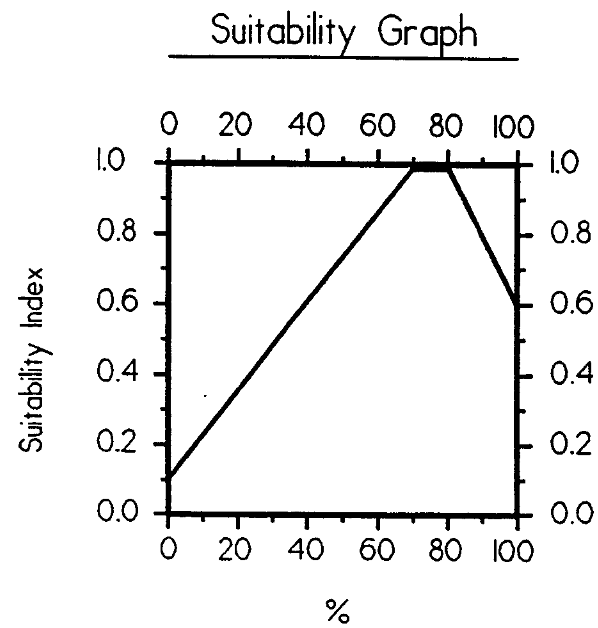
Instructions for Calculating SI for Variable 3:

1. Refer to Attachment 5 for examples of the different interspersion classes (=types).

2. Estimate percent of project area in each class and compute a weighted average to arrive at SIV_3. If the entire project area is solid marsh, assign an interspersion class #1 (SI=1.0). Conversely, if the entire project area is open water, assign an interspersion class #5 (SI=0.1).

BRACKISH MARSH

Variable V_4 Percent of open water area ≤ 1.5 feet deep, in relation to marsh surface.



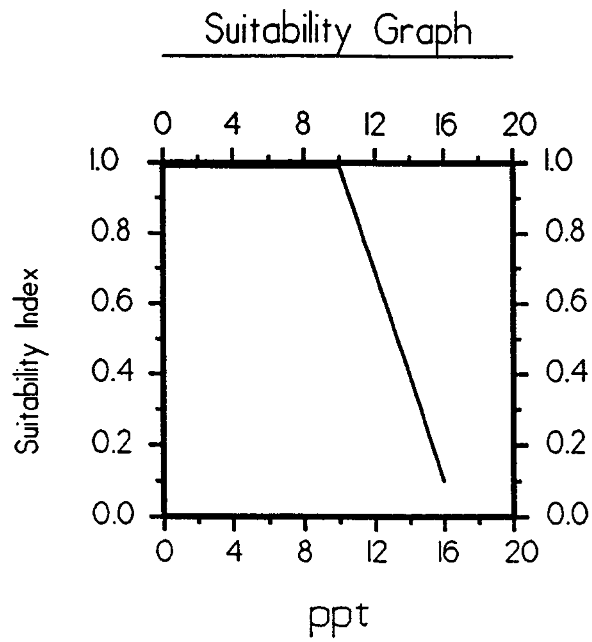
<u>**Line Formulas**</u>

If $0 \leq \% < 70$, then SI = (0.01286 * %) + 0.1

If $70 \leq \% < 80$, then SI = 1.0

If $\% \geq 80$, then SI = (-0.02 * %) + 2.6

Variable V_5 - Average annual salinity.



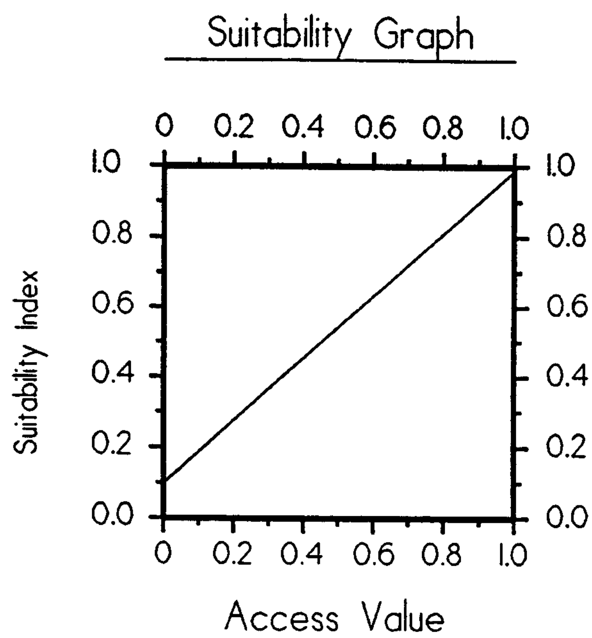
Line Formulas

If $0 \leq ppt < 10$, then SI = 1.0

If $ppt \geq 10$, then SI = (-0.15 * ppt) + 2.5

BRACKISH MARSH

Variable V_6 - Aquatic organism access.



Line Formula

SI = (0.9 * Access Value) + 0.1

Note: Access Value = P * R, where "P" = percentage of wetland area considered accessible by estuarine organisms during normal tidal fluctuations, and "R" = Structure Rating.

Refer to Attachment 6 "Procedure For Calculating Access Value" for complete information on calculating "P" and "R" values.

Revised May 2, 1994

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Saline Marsh

Vegetation:

Variable V_1 Percent of wetland area covered by emergent vegetation (≥ 10% canopy cover).

Variable V_2 Percent of open water area dominated (> 50% canopy cover) by aquatic vegetation.

Interspersion:

Variable V_3 Marsh edge and interspersion.

Water Depth:

Variable V_4 Percent of open water area ≤ 1.5 feet deep, in relation to marsh surface.

Water Quality:

Variable V_5 Average annual salinity.

Aquatic Organism Access:

Variable V_6 Aquatic organism access.

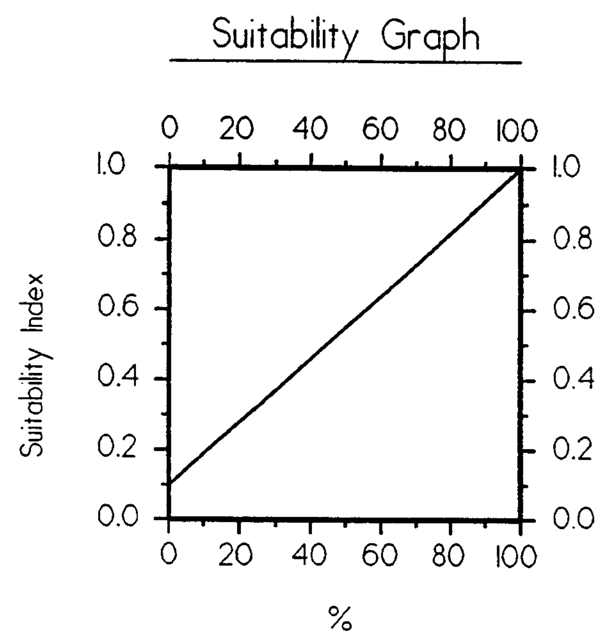
HSI Calculation:

$$HSI = \frac{\left[3.5 \times (SIV_1^{3} \times SIV_2^{0.5} \times SIV_6^{1.2})^{(1/4.7)}\right] + \left[\frac{(SIV_3 + SIV_4 + SIV_5)}{3}\right]}{4.5}$$

Attachment 3

SALINE MARSH

Variable V_1 - Percent of wetland area covered by emergent vegetation (≥ 10% canopy cover).

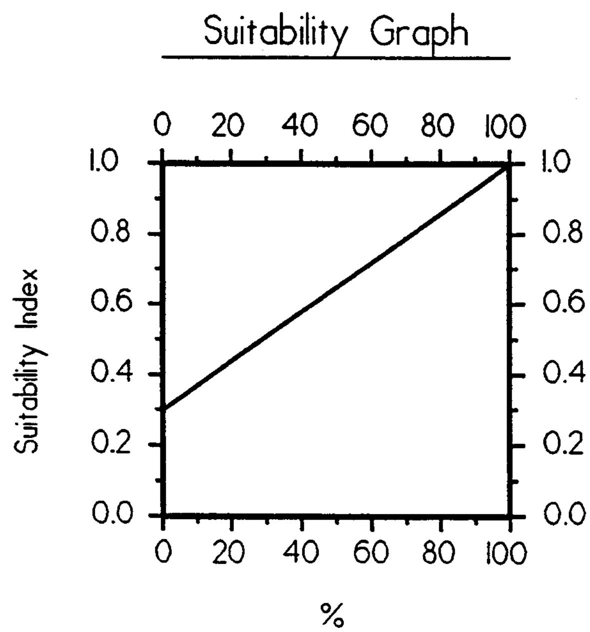


Line Formulas

SI = (0.009 * %) + 0.1

SALINE MARSH

Variable V_2 - Percent of open water area dominated (> 50% canopy cover) by aquatic vegetation.



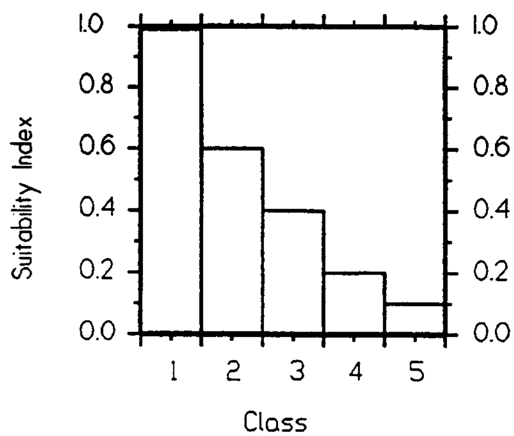
Line Formulas

SI = (0.007 * %) + 0.3

SALINE MARSH

Variable V_3 - Marsh edge and interspersion.

Suitability Graph

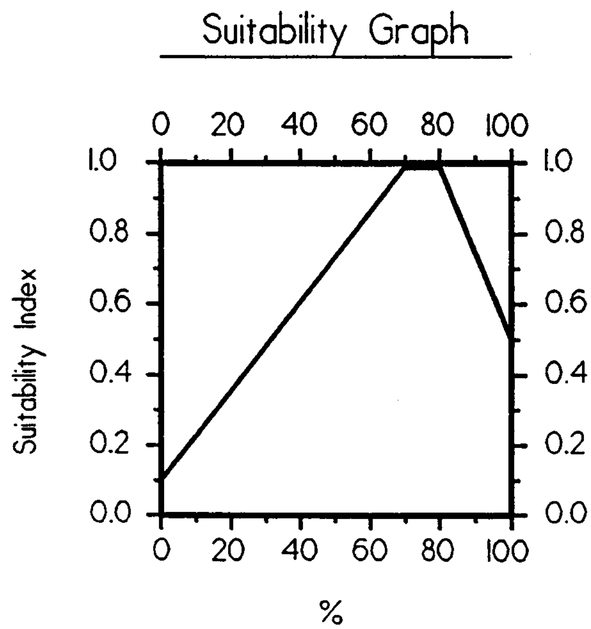


<u>Instructions for Calculating SI for Variable 3:</u>

1. Refer to Attachment 5 for examples of the different interspersion classes (=types).

2. Estimate percent of project area in each class and compute a weighted average to arrive at SIV_3. If the <u>entire</u> project area is solid marsh, assign an interspersion class #1 (SI=1.0). Conversely, if the <u>entire</u> project area is open water, assign an interspersion class #5 (SI=0.1).

Variable V_4 Percent of open water area ≤ 1.5 feet deep, in relation to marsh surface.



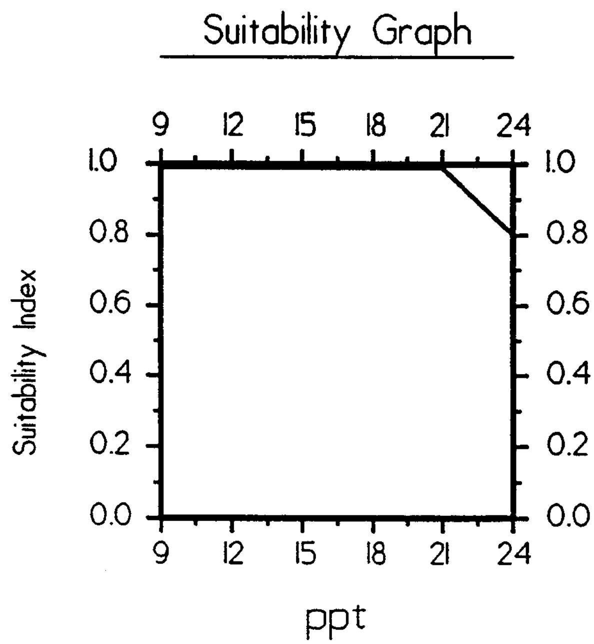
Line Formulas

If 0 ≤ % < 70, then SI = (0.01286 * %) + 0.1

If 70 ≤ % < 80, then SI = 1.0

If % ≥ 80, then SI = (-0.025 * %) + 3.0

Variable V_5 Average annual salinity.

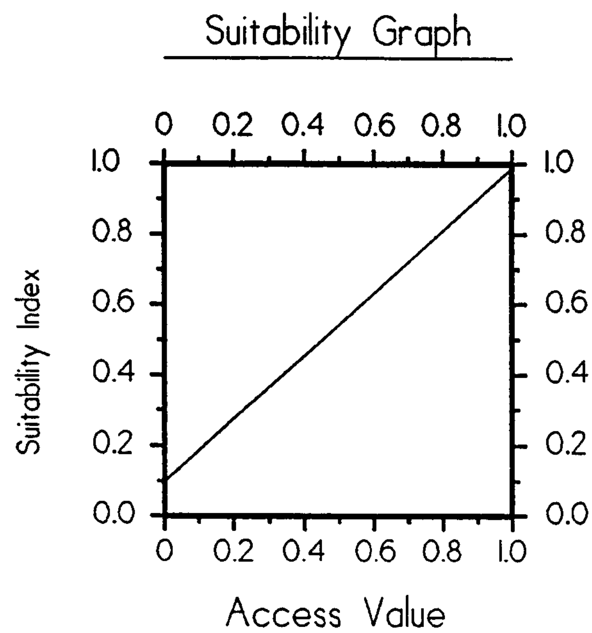


Line Formulas

If $9 \le ppt < 21$, then SI = 1.0

If $ppt \ge 21$, then SI = (-0.067 * ppt) + 2.4

Variable V_6 Aquatic organism access.



Line Formula

SI = (0.9 * Access Value) + 0.1

Note: Access Value = P * R, where "P" = percentage of wetland area considered accessible by estuarine organisms during normal tidal fluctuations, and "R" = Structure Rating.

Refer to Attachment 6 "Procedure For Calculating Access Value" for complete information on calculating "P" and "R" values.

Revised August 6, 1992

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Cypress-Tupelo Swamp

Water Depth and Duration:

Variable V_1 Water regime.

Water Quality:

Variable V_2 Water flow/exchange.

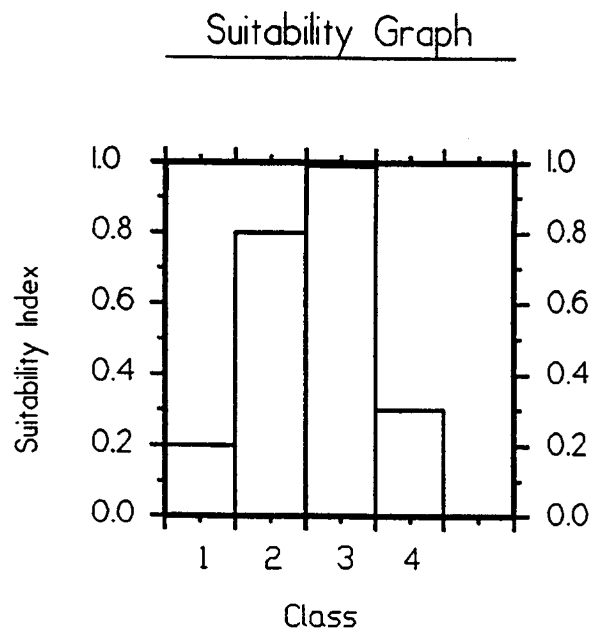
Variable V_3 Average high salinity.

HSI Calculation:

$$HSI = (SI_{V_1} \times SI_{V_2} \times SI_{V_3})^{1/3}$$

Attachment 4

Variable V_1 Water regime.



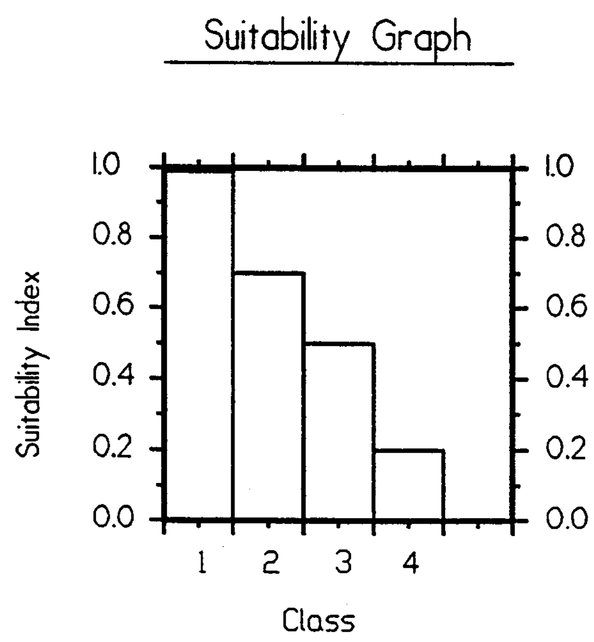
1 - Permanently Flooded: water covers the substrate throughout the year in all years.

2 - Semipermanently Flooded: surface water is present throughout the growing season in most years.

3 - Seasonally Flooded: surface water is present for extended periods, especially in the growing season, but is absent by the end of the growing season in most years.

4 - Temporarily Flooded: surface water is present for brief periods during the growing season, but the water table usually lies well below the surface for most of the season.

Variable V_2 Water flow/exchange.



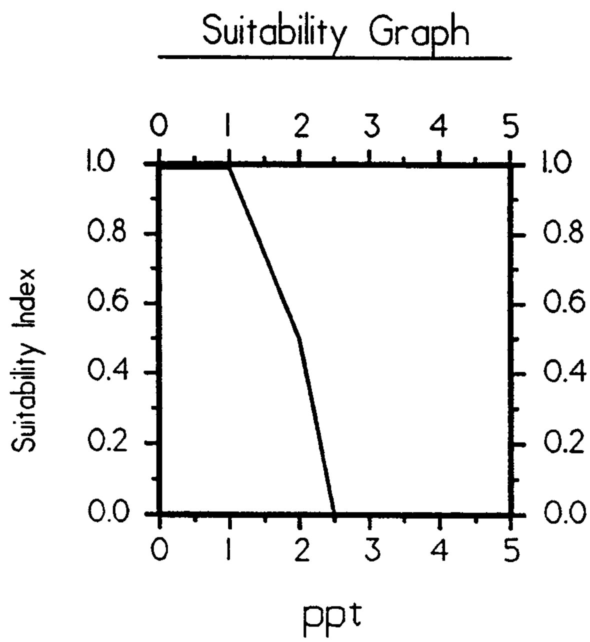
1 - Receives abundant and consistent riverine input and through-flow.

2 - Moderate water exchange, through riverine and/or tidal input.

3 - Limited water exchange, through riverine and/or tidal input.

4 - No water exchange (stagnant, impounded).

Variable V_3 Average high salinity.



Line Formulas

If $0 \le ppt < 1$, then SI = 1.0

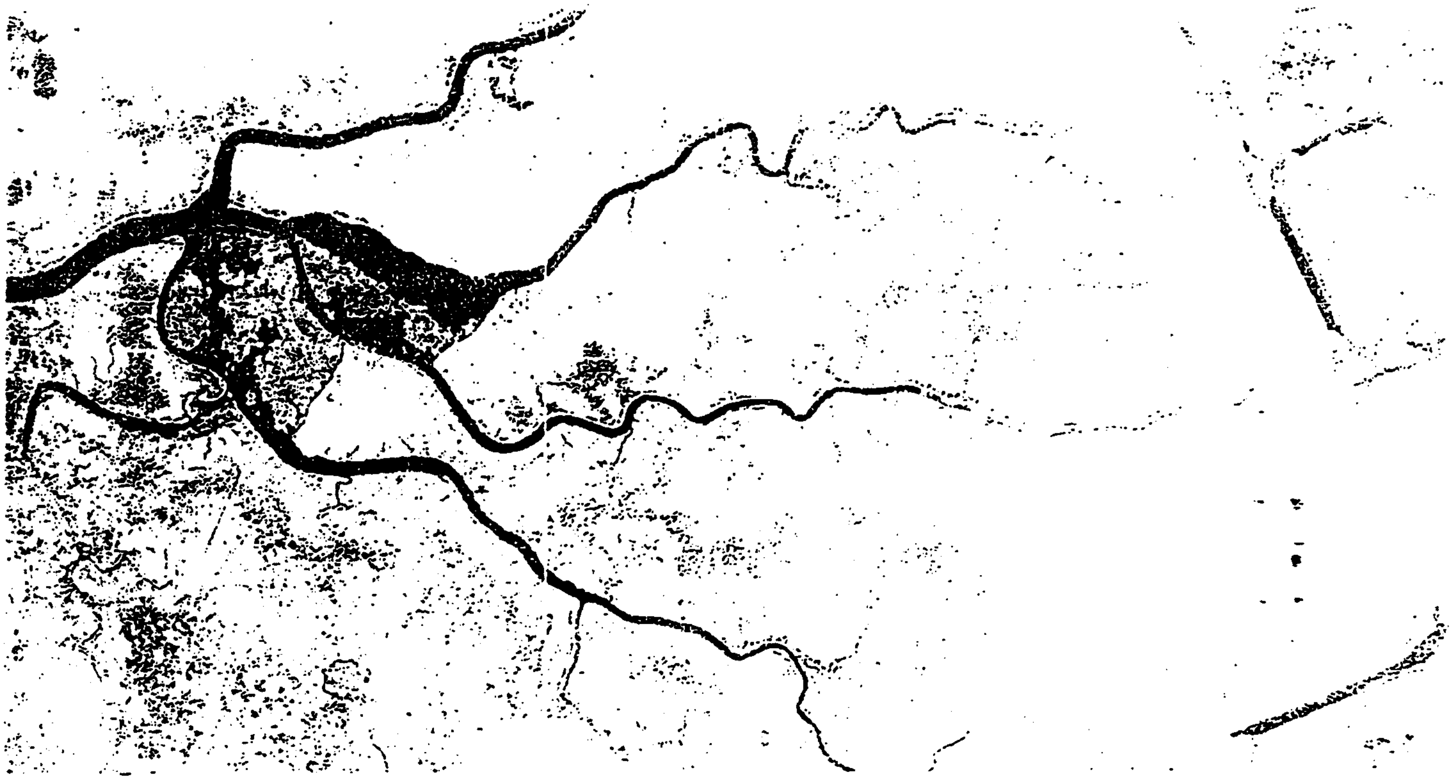
If $1 \le ppt < 2$, then SI = (-0.5 * ppt) + 1.5

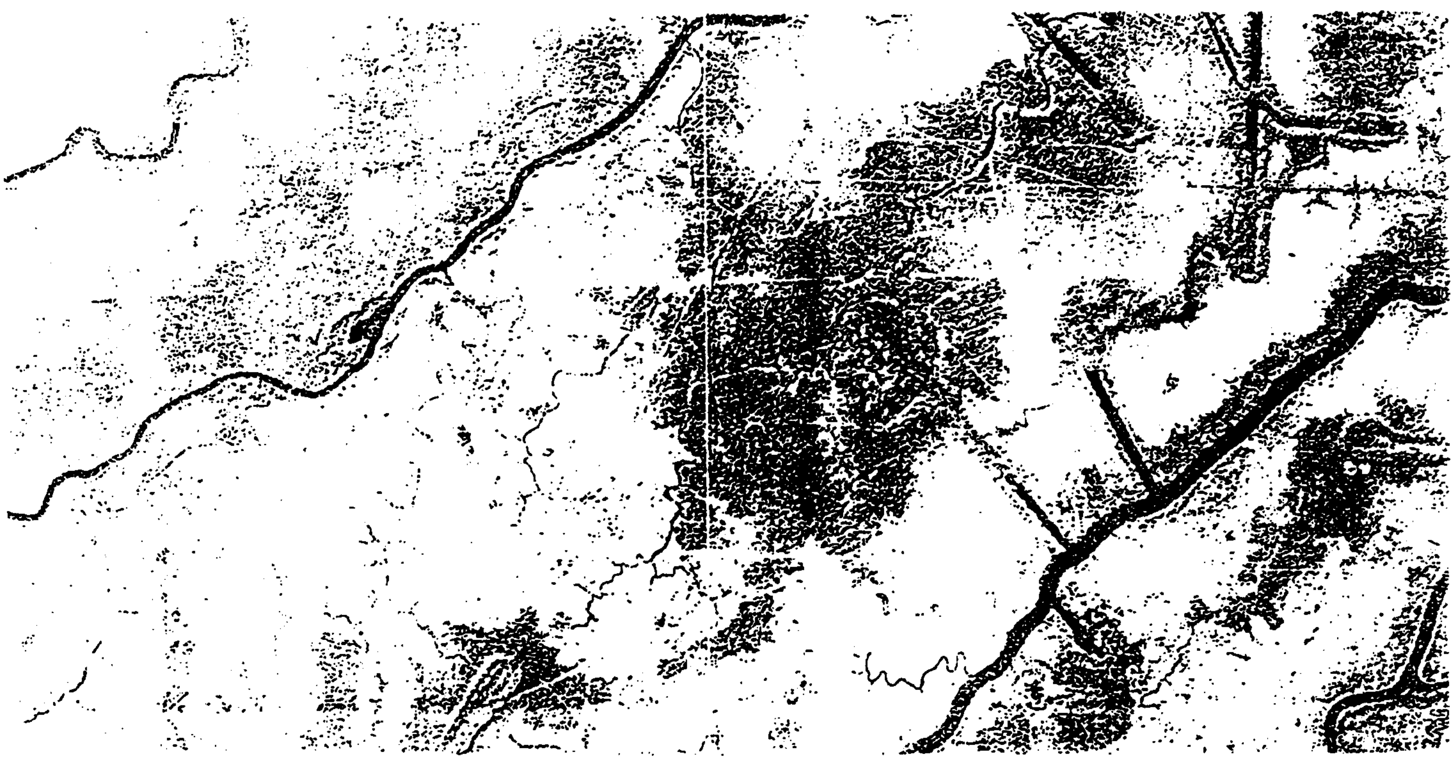
If $2 \le ppt < 2.5$, then SI = (-1.0 * ppt) + 2.5

If $ppt \ge 2.5$, then SI = 0

Average high salinity is defined as the average of the upper 33 percent of salinity readings taken during the period of record.

Variable 3-Marsh Interspersion Type 1
Scale 1" = 2000'



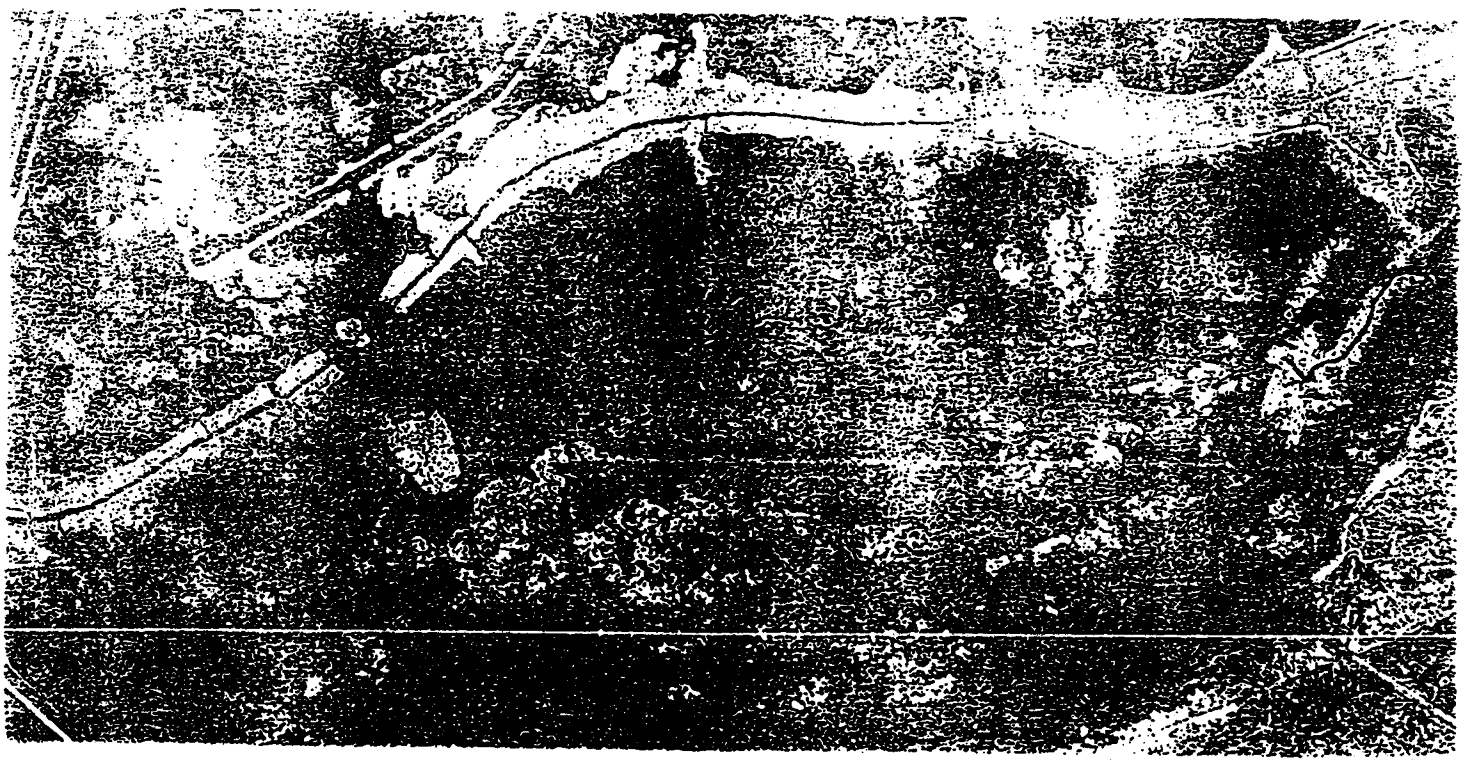


Attachment 5

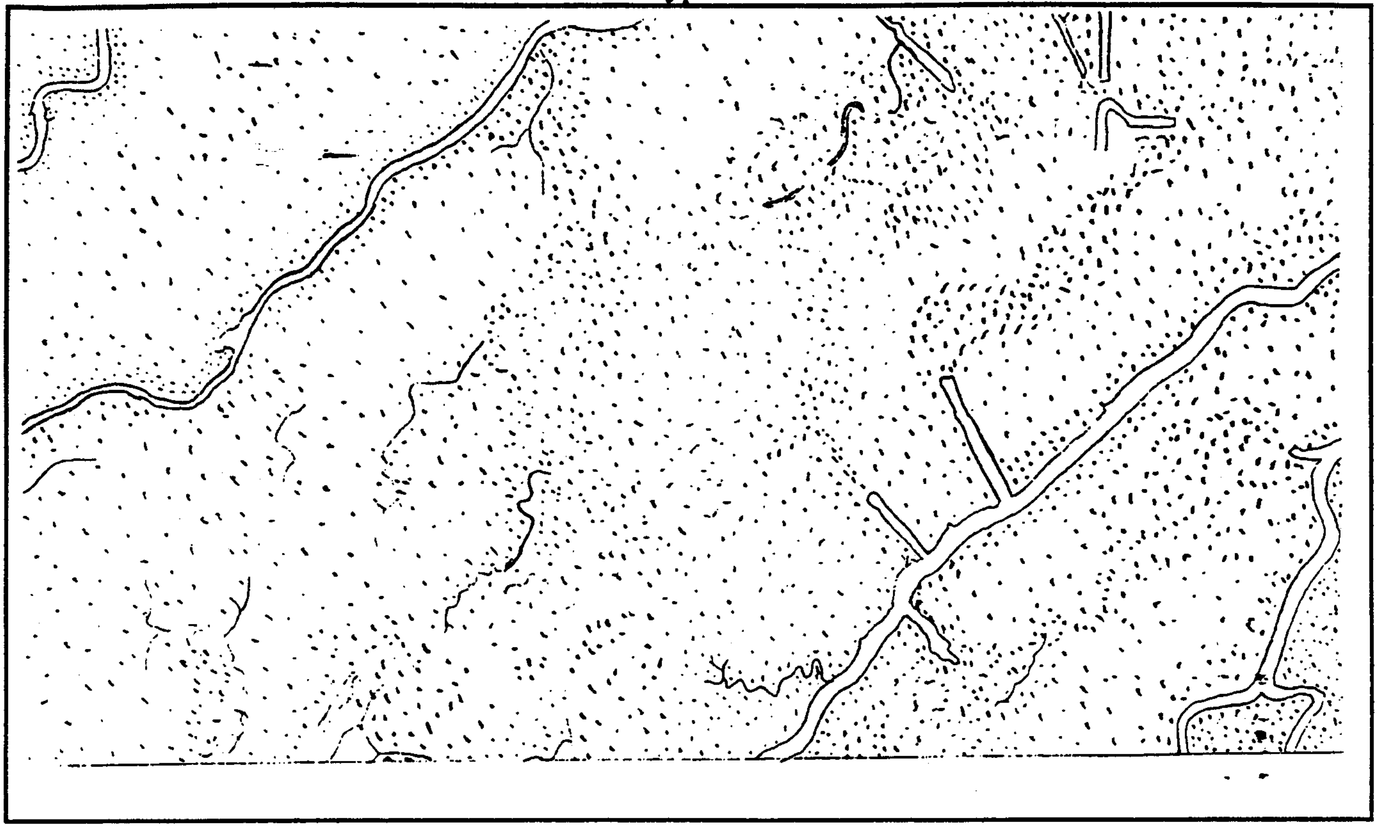
Variable 3 - Marsh Interspersion Type 2
Scale 1" = 2000'

– Variable 3 - Marsh Interspersion Type 3
Scale 1" = 2000'

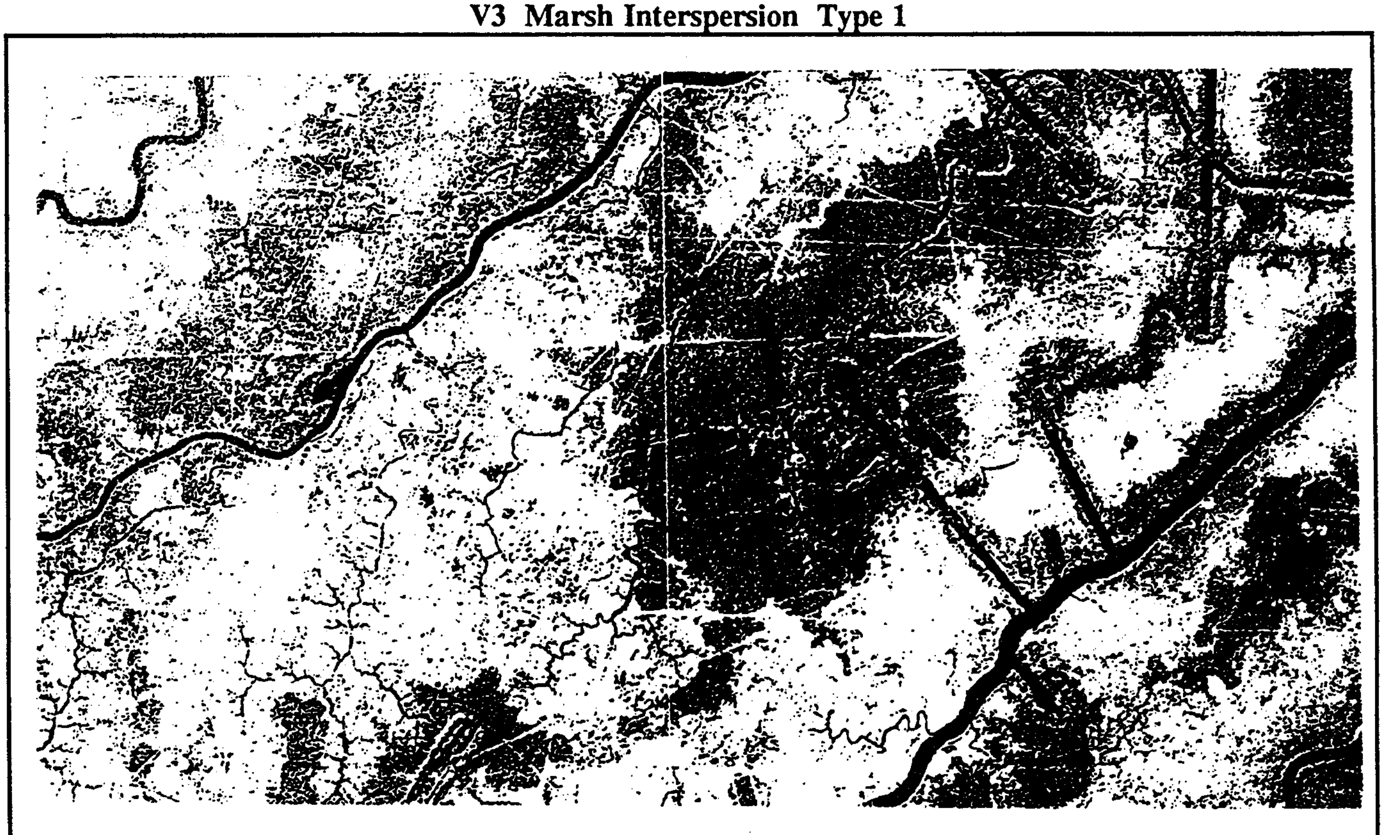
Variable 3 - Marsh Interspersion Type 4
Scale 1" = 2000'



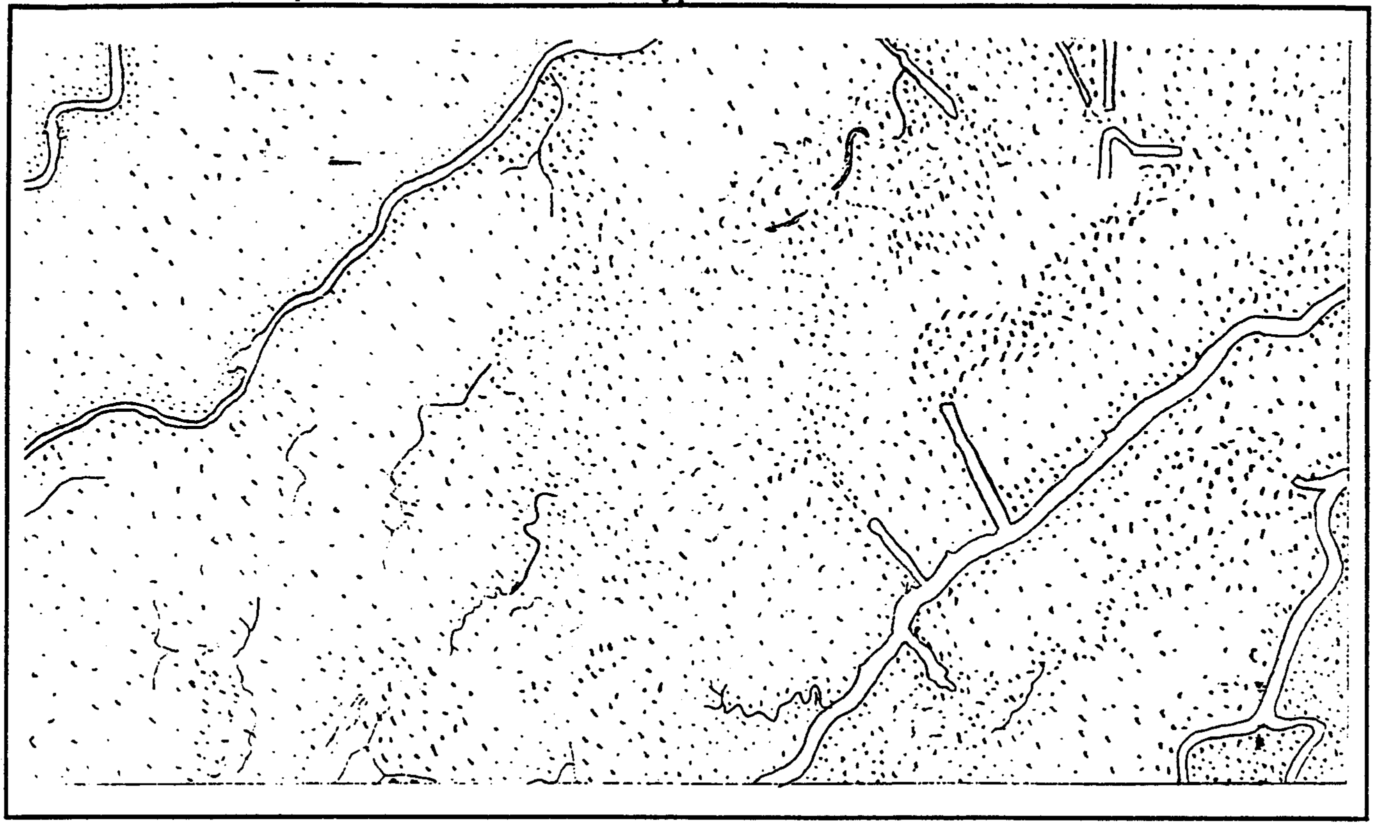
V3 Marsh Interspersion
Type 1



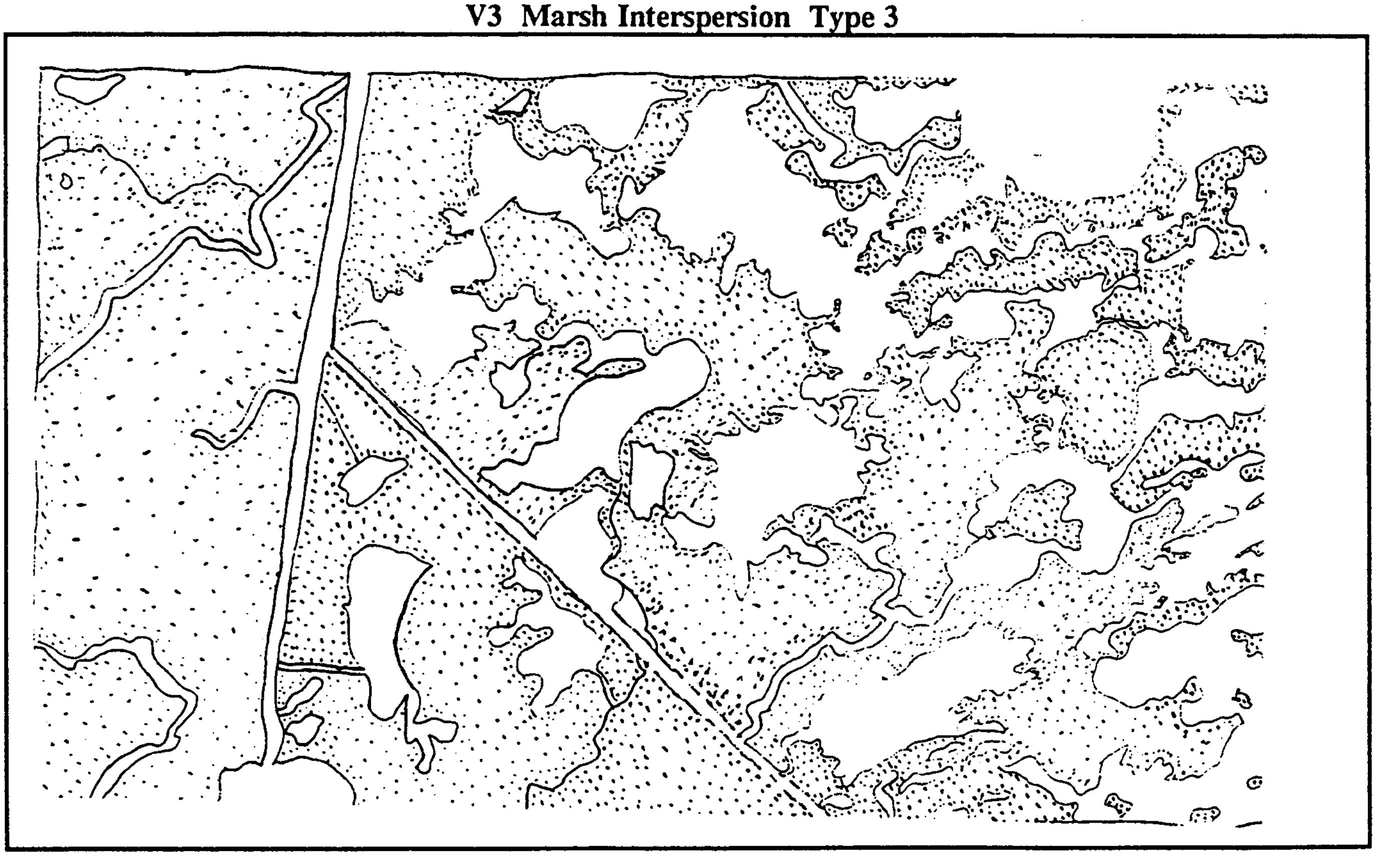
V3 Marsh Interspersion Type 1



V3 Marsh Interspersion
Type 1



V3 Marsh Interspersion Type 3



Revised June 2, 1993

PROCEDURE FOR CALCULATING ACCESS VALUE

1. Determine the percent of wetland area accessible by estuarine organisms during normal tidal fluctuations (P) for baseline (TY0) conditions. P may be determined by examination of aerial photography, knowledge of field conditions, or other appropriate methods.

2. Determine the Structure Rating (R) for each project structure as follows:

Structure Type	Rating
open system	1.0
rock weir set at 1ft BML[1], w/ boat bay	0.8
rock weir with boat bay	0.6
rock weir set at ≥ 1ft BML	0.6
slotted weir with boat bay	0.6
open culverts	0.5
weir with boat bay	0.5
weir set at ≥1ft BML	0.5
slotted weir	0.4
flapgated culvert with slotted weir	0.35
variable crest weir	0.3
flapgated variable crest weir	0.25
flapgated culvert	0.2
rock weir	0.15
fixed crest weir	0.1
solid plug	0.0001

For each structure type, the rating listed above pertains only to the standard structure configuration and assumes that the structure is operated according to common operating schedules consistent with the purpose for which that structure is designed. In the case of a "hybrid" structure or a unique application of one of the above-listed types (including unique or "non-standard" operational schemes), the WVA analyst(s) may assign an appropriate Structure Rating between 0.0001 and 1.0 that most closely approximates the relative degree to which the structure in question would allow ingress/egress of estuarine organisms. In those cases, the rational used in developing the new Structure Rating shall be documented.

3. Determine the Access Value. Where multiple openings <u>equally</u> affect a common "accessible unit", the Structure Rating (R) of

[1] Below Marsh Level

the structure proposed for the "major" access point for the unit will be used to calculate Access Value. The designation of "major" will be made by the Environmental Work Group. An "accessible unit" is a defined as a portion of the total accessible area that is served by one or more access routes (canals, bayous, etc.), yet is isolated in terms of estuarine organism access to or from other units of the project area. Isolation factors include physical barriers that prohibit further movement of estuarine organisms, such as natural levee ridges, and spoil banks; and dense marsh that lacks channels, trenasses, and similar small connections that would, if present, provide access and intertidal refugia for estuarine organisms.

Access Value should be calculated according to the following examples (Note: for all examples, P for TY0 = 90%. That designation is arbitrary and is used only for illustrative purposes; P could be any percentage from 0% to 100%):

a. One opening into area; no structure.

Access Value = P
= .90

b. One opening into area that provides access to the entire 90% of the project area deemed accessible. A flapgated culvert with slotted weir is placed across the opening.

Access Value = P * R
= .90 * .6
= .54

c. Two openings into area, each capable by itself of providing full access to the 90% of the project area deemed accessible in TY0. Opening #2 is determined to be the major access route relative to opening #1. A flapgated culvert with slotted weir is placed across opening #1. Opening #2 is left unaltered.

Access Value = P
= .90

Note: Structure #1 had no bearing on the Access Value calculation because its presence did not reduce access (opening #2 was determined to be the major access route, and access through that route was not altered).

d. Two openings into area. Opening #1 provides access to an accessible unit comprising 30% of the area. Opening #2 provides access to an accessible unit comprising the remaining 60% of the project area. A flapgated culvert with slotted weir is placed across #1. Opening #2 is left open.

Access Value = weighted avg. of Access Values of the two accessible units

$$= ([P_1*R_1] + [P_2*R_2])/(P_1+P_2)$$
$$= ([.30*0.6] + [.60*1.0])/(.30+.60)$$
$$= (.18 + .60)/.90$$
$$= .78/.90$$
$$= .87$$

<u>Note</u>: $P_1 + P_2 = .90$, because only 90 percent of the study area was determined to be accessible at TY0.

e. Three openings into area, each capable of providing full access to the entire area independent of the others. Opening #3 is determined to be the major access route relative to openings #1 and #2. Opening #1 is blocked with a solid plug. Opening #2 is fitted with a flapgated culvert with slotted weir, and opening #3 is left open.

Access Value = P
= .90

<u>Note</u>: Structures #1 and #2 had no bearing on the Access Value calculation because their presence did not reduce access (opening #3 was determined to be the major access route, and access through that route was not altered).

f. Three openings into area, each capable of providing full access to the entire area independent of the others. Opening #2 is determined to be the major access route relative to openings #1 and #3. Opening #1 is blocked with a solid plug. Opening #2 is fitted with a flapgated culvert with slotted weir, and opening #3 is fitted with a fixed crest weir.

Access Value = $P * R_2$
= .90 * .6
= .54

<u>Note</u>: Structures #1 and #3 had no bearing on the Access Value calculation because their presence did not reduce access. Opening #2 was determined beforehand to be the major access route; thus, it was the flapgated culvert with slotted weir across that opening that actually served to limit access.

g. Three openings into area. Opening #1 provides access to an accessible unit comprising 20% of the area. Openings #2 and #3 provide access to an accessible unit comprising the remaining 70% of the area, and within that area, each is capable by itself of providing full access. However, opening #3 is determined to be the major access route relative to opening #2. Opening #1 is fitted with an open culvert, #2 with a flapgated culvert with slotted weir, and #3 with a fixed crest weir.

$$\text{Access Value} = ([P_1*R_1] + [P_2*R_3])/(P_1+P_2)$$

$$= ([.20*.7]+[.70*.6])/(.20+.70)$$
$$= (.14 + .42)/.90$$
$$= .56/.90$$
$$= .62$$

h. Three openings into area. Opening #1 provides access to an accessible unit comprising 20% of the area. Opening #2 provides access to an accessible unit comprising 40% of the area, and opening #3 provides access to the remaining 30% of the area. Opening #1 is fitted with an open culvert, #2 a flapgated culvert with slotted weir, and #3 a fixed crest weir.

$$\text{Access Value} = ([P_1*R_1]+[P_2*R_2]+[P_3*R_3])/(P_1+P_2+P_3)$$

$$= ([.20*.7]+[.40*.6]+[.30*.1])/(.20+.40+.30)$$
$$= (.14+.24+.03)/.90$$
$$= .41/.90$$
$$= .46$$

Published Habitat Suitability Index (HSI) Models Consulted for Variables for Possible Use in the Wetland Value Assessment Models

Estuarine Fish and Shellfish

pink shrimp
white shrimp
brown shrimp
spotted seatrout
Gulf flounder
southern flounder
Gulf menhaden
juvenile spot
juvenile Atlantic croaker
red drum

Reptiles and Amphibians

American alligator
slider turtle
bullfrog

Mammals

mink
muskrat

Freshwater Fish

channel catfish
largemouth bass
red ear sunfish
bluegill

Birds

clapper rail
great egret
northern pintail
mottled duck
coot
marsh wren
great blue heron
laughing gull
snow goose
red-winged blackbird
roseate spoonbill
white-fronted goose

Attachment 7

Designs and Cost Analysis.

During the plan formulation process, each of the Task Force agencies assumed responsibility for developing designs, and estimates of costs and benefits for a number of candidate projects. The cost estimates for the projects were to be itemized as follows:

1. Construction Cost
2. Contingencies
3. Engineering and Design
4. Supervision and Administration
5. Supervision and Inspection (Construction Contract)
6. Real Estate
7. Operation and Maintenance
8. Monitoring

In addition, each lead agency was to provide a detailed itemized construction cost estimate for each project. These estimates are shown in Appendix C.

An Engineering Work Group was established by the Planning and Evaluation Subcommittee, with each Federal agency and the State of Louisiana represented. The work group reviewed each estimate for accuracy and consistency.

When reviewing the construction cost estimates, the work group verified that each project feature had an associated cost and that the quantity and unit price for those items were reasonable. In addition, the work group reviewed the design of the projects to determine whether the method of construction was appropriate and the design feasible.

All of the projects were assigned a contingency of 25 percent because detailed information such as soil borings, surveys, and to a major extent hydrologic data were not available, in addition to allowing for variations in unit prices.

Engineering and design, supervision and administration, and supervision and inspection costs were reviewed for consistency, but ordinarily were not changed from what was presented by the lead agency.

Most projects contained estimates of costs for real estate activities; however, many projects that are located in open water did not require a real estate cost estimate.

Monitoring costs for each project were estimated by the Monitoring Work Group. Monitoring program information is included as Appendix E.

Economic Analysis.

The CWPPRA directed the Task Force to develop a prioritized list of wetland projects "based on the cost-effectiveness of such projects in creating, restoring, protecting, or enhancing coastal wetlands, taking into account the quality of such coastal wetlands." The Task Force satisfied this requirement through the integration of a traditional time-value analysis of life-cycle project costs and other economic impacts and an evaluation of wetlands benefits using a community-based version of the U.S. Fish and Wildlife Service's Habitat Evaluation Procedure. The product of these two analyses was a Cost per Habitat Unit figure for each project, which was used as the primary ranking criterion. The method permits incremental analysis of varying scales of investment and also accommodates the varying salinity types and habitat quality characteristics of project wetland outputs.

The major inputs to the cost effectiveness analysis are the products of the lead Task Force agencies and the Engineering and Environmental Work Groups. The various plans were refined into estimates of annual implementation costs and annual Habitat Units (HU).

Implementation costs were used to calculate the economic and financial costs of each wetland project. Financial costs chiefly consist of the resources needed to plan, design, construct, operate, and maintain the project. These are the costs, when adjusted for inflation, that the Task Force uses in budgeting decisions. The economic costs include, in addition to the financial cost, monetary indirect impacts of the plans not accounted for in the implementation costs. Examples would include impacts on dredging in nearby commercial navigation channels, effects on water supplies, and effects on nearby facilities and structures not reflected in right-of-way and acquisition costs.

The stream of economic costs for each project was brought to present value and annualized at the current discount rate, based on a 20-year project life. Beneficial environmental outputs were annualized at a zero discount rate and expressed as average annual habitat units (AAHU). These data were then used to rank each plan based on cost per AAHU produced. Annual economic costs were also calculated on a per acre basis. Financial costs were adjusted to account for projected levels of inflation and used to monitor overall budgeting and any future cost escalations in accordance with rules established by the Task Force.

Following the review by the Engineering Work Group, costs were expressed as first costs, fully funded costs, present worth costs, and average annual costs. The Cost per Habitat Unit criterion was derived by dividing the average annual cost for each wetland project by the Average Annual Habitat Units (AAHU) for each wetland project. The average annual costs figures are based on 1993 price levels, a discount rate of 8 percent, and a project life of 20 years. The fully funded cost estimates developed for each project were used to determine how many projects could be supported by the funds expected to be available in fiscal year 1995. The fully funded cost estimates include operation and maintenance and other compensated financial costs.

The cost component of the cost-effectiveness criterion was based on the following procedures and assumptions:

a. Average annual costs represent the sum of direct and known indirect construction and operating costs, discounted over time.

b. Construction or first costs include many different cost elements besides actual construction of a project, such as engineering and design, inspection, contingencies, and real estate (land, easements, rights-of-way, and relocations) and administration.

c. Operating or ongoing costs for a project include many different cost elements besides direct operation and maintenance, including environmentally related costs. The cost elements include monitoring, replacement or closure, and induced dredging. Note that operating costs are not counted if they are part of an existing program which would not be expanded because of the project.

d. The discount rate used to account for the time value of money was 8 percent. Operating costs extend through 20 years from the base, which is also the time when first costs are considered fully amortized. Costs (and benefits) beyond 20 years are not considered.

e. The funding requirements for each project were based on the current dollar value of the construction and operating costs, except that costs paid for by sources other than the CWPPRA were not included. Whereas average annual costs assume no inflation over time, the calculation of funding requirements does include an inflation adjustment. Project benefits are not adjusted over time, *i.e.*, they are not considered to inflate nor are they discounted to give extra value to near-term habitat gains.

The results of the economic analysis are presented in Table 18.

The following section presents summary information on each of the candidate projects.

Table 18

Candidate Projects for the 4th Priority Project List

Project No.	Project Name	Average Annual Cost ($)	Average Annual Habitat Units (AAHU's)	Avg Annual Cost/AAHU ($/AAHU)	Average Annual Acres	Net Acres After 20 Years	Fully Funded Cost ($ X 1000)	Cummulative Fully Funded ($ X 1000)	Sponsoring Agency	Status
PPO-4	Eden Isles East Marsh Restoration	363,500	1,253	290	934	1,454	5,019	5,019	NMFS	4th PPL *
PCS-26	Perry Ridge Bank Protection	220,700	624	354	632	1,203	2,224	7,243	NRCS	4th PPL *
BA-3c	Naomi Outfall Management	139,700	379	369	334	633	1,857	9,100	NRCS	4th PPL
PBA-34	Bayou L'Ours Ridge Hydrologic Restoration	184,100	467	394	387	737	2,419	11,519	NRCS	4th PPL *
TE-10/XTE-49	Grand Bayou /GIWW Freshwater Introduction	406,000	771	527	844	1,609	5,181	16,700	USFWS	4th PPL
PTV-19	Little Vermilion Bay Sediment Trapping	110,100	149	739	238	441	1,133	17,833	NMFS	4th PPL
TV-5/7	Marsh Island Marsh Creation & Hydrologic Restoration	354,700	452	785	233	408	3,907	21,740	USACE	4th PPL
PBS-6	Grand Bay Crevasse	256,800	257	999	333	634	2,469	24,209	USACE	4th PPL *
PMR-8	Pass a Loutre Sediment Mining	162,800	125	1,302	132	120	1,633	25,842	USACE	4th PPL
CS-16	Black Bayou Culverts	849,300	592	1,435	440	837	8,296	34,138	USACE	4th PPL
PBA-12b	Barataria Bay Waterway Bank Protection (East)	220,900	128	1,726	114	217	2,361	36,499	NRCS	4th PPL
BS-5	Bayou Lamoque Outfall Management	95,700	39	2,454	31	59	1,048	37,547	NRCS	
XME-29	Freshwater Bayou Bank Stabilization	628,100	248	2,533	262	511	8,038	45,585	USACE	
PO-15	Alligator Point Marsh Restoration	190,300	73	2,607	30	58	2,555	48,140	NRCS	
PBA-12a	Barataria Bay Waterway Bank Protection (West)	204,400	63	3,244	122	232	2,195	50,335	NRCS	4th PPL *
CS-11b	Sweet Lake/Willow Lake Shoreline Protection	423,400	119	3,558	70	138	4,917	55,252	USACE	
XTE-45/67b	East Timbalier Barrier Island Restoration	617,800	140	4,413	140	215	5,752	61,004	NMFS	4th PPL *
XTV-27	Freshwater Bayou Bank Stabilization	782,700	173	4,524	354	739	10,109	71,113	USACE	
PME-1	GIWW Bank Stabilization	115,100	25	4,604	3	7	1,270	72,383	USACE	
PPO-2b	Lake Borgne Shoreline Protection	228,200	45	5,071	63	81	2,504	74,887	NRCS	
XCS-44/51	Plug West Cove Canal	80,800	15	5,387	6	11	1,033	75,920	USFWS	
BS-6	Lake Lery Hydrologic Restoration	158,500	26	6,096	22	37	1,904	77,824	NRCS	
PTE-15bii	Raccoon Island Breakwaters	248,500	14	17,750	22	26	2,631	80,455	NRCS	
	Demonstration Projects									
PPO-21	N.O. East Marsh Creation for Stormwater Treatment	NA	NA	NA	NA	NA	1,203	NA	EPA	
XPO-92a	Bayou Chevee Shoreline Protection Demo	NA	NA	NA	NA	NA	1,566	NA	USACE	
XPO-92b	Lake Borgne South of Bayou Bienvenue Shore Prot Demo	NA	NA	NA	NA	NA	253	NA	USACE	
XPO-93	Marsh Creation with Biosolids	NA	NA	NA	NA	NA	891	NA	EPA	
XTE-54b	Flotant Marsh Fencing Demonstration	NA	NA	NA	NA	NA	367	NA	NRCS	4th PPL *
XAT-5a	Marsh Creation w/ Flexible Dredge Pipe Demonstration	NA	NA	NA	NA	NA	318	NA	EPA	
XTE-66	Sediment Distribution System Demonstration	NA	NA	NA	NA	NA	1,311	NA	EPA	
XTV-30	Wave Dissipation Demo at Marsh Island Demonstration	NA	NA	NA	NA	NA	335	NA	NRCS	
XCS-36	Compost Demonstration	NA	NA	NA	NA	NA	371	NA	EPA	4th PPL *
XCS-56	Plowed Terraces Demonstration	NA	NA	NA	NA	NA	300	NA	NRCS	4th PPL *
XMR-12	Beneficial Use of Hopper Dredged Material Demo	NA	NA	NA	NA	NA	300	NA	USACE	4th PPL *

EPA Environmental Protection Agency

NMFS National Marine Fisheries Service

NRCS Natural Resources Conservation Service (formerly Soil Conservation Service)

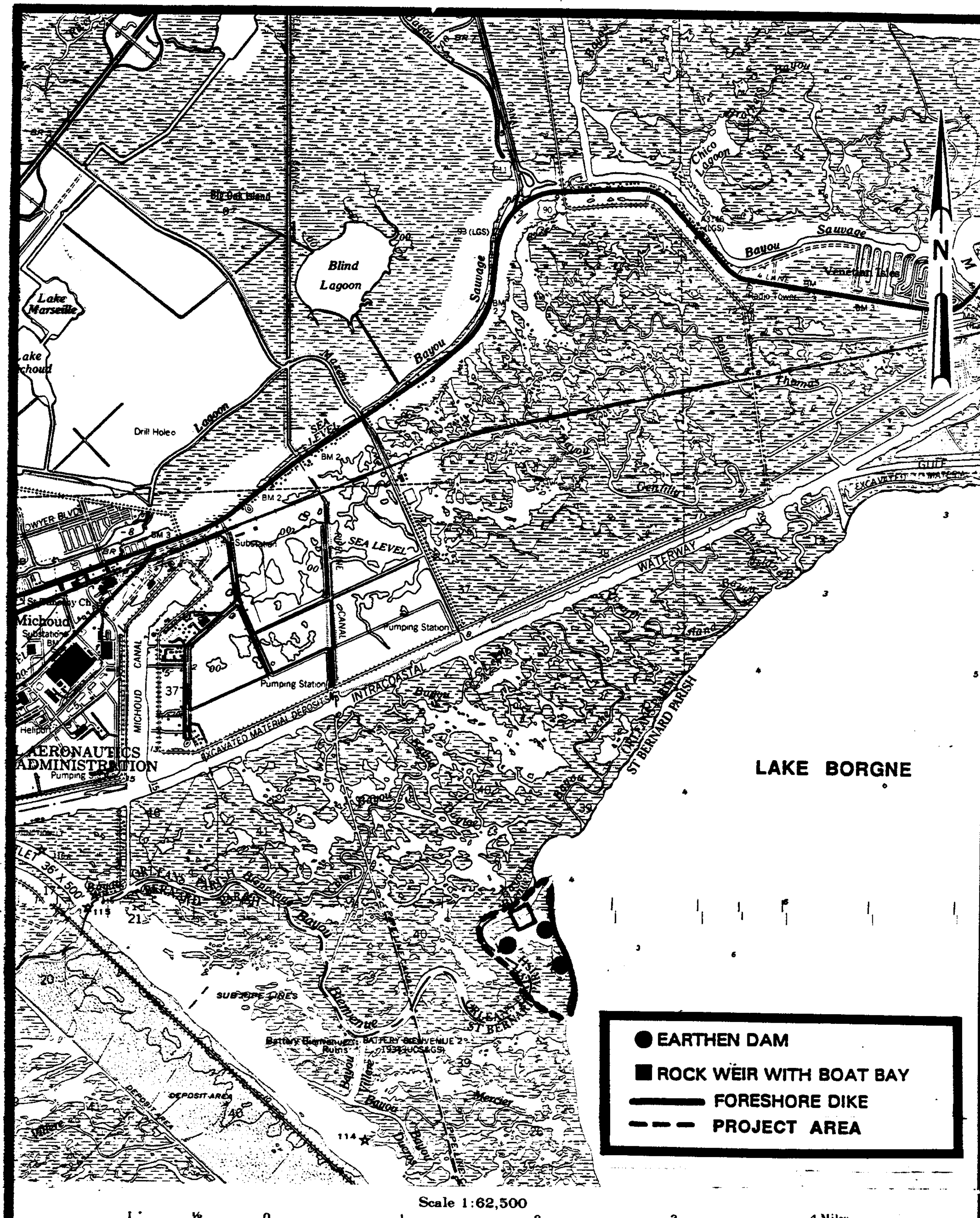
USFWS US Fish and Wildlife Service

USACE US Army Corps of Engineers

* Indicates priority set by the state of Louisiana (Department of Natural Resources) on projects to cost share with funds established under Louisana Act 6.

DESCRIPTION OF CANDIDATE PROJECTS

This section provides a description of each of the candidate projects including: location, justification, objectives, features, cost, benefits, and a map identifying the project area and project features.



PPO-2B LAKE BORGNE SHORE PROTECTION SOUTH OF BIENVENUE

Lake Borgne Shore Protection South of Bayou Bienvenue (PPO-2b)

Location:

This project is located in St. Bernard Parish on the west Lake Borgne shore south of Bayou Bienvenue.

Justification:

The long-term shoreline erosion rate for this area is 9.4 feet per year. However, most of the more erosion-resistant lake rim has been lost, and erosion is occurring at a rate approaching 20 ft/yr. At this rate, it will not be long before shoreline breaches result in a total loss of this marsh area.

Objective:

The project is designed to protect a 200-acre saline marsh and open water habitat from rapid loss due to shore erosion and tidal scour.

Project Features:

The structural components are as follows:

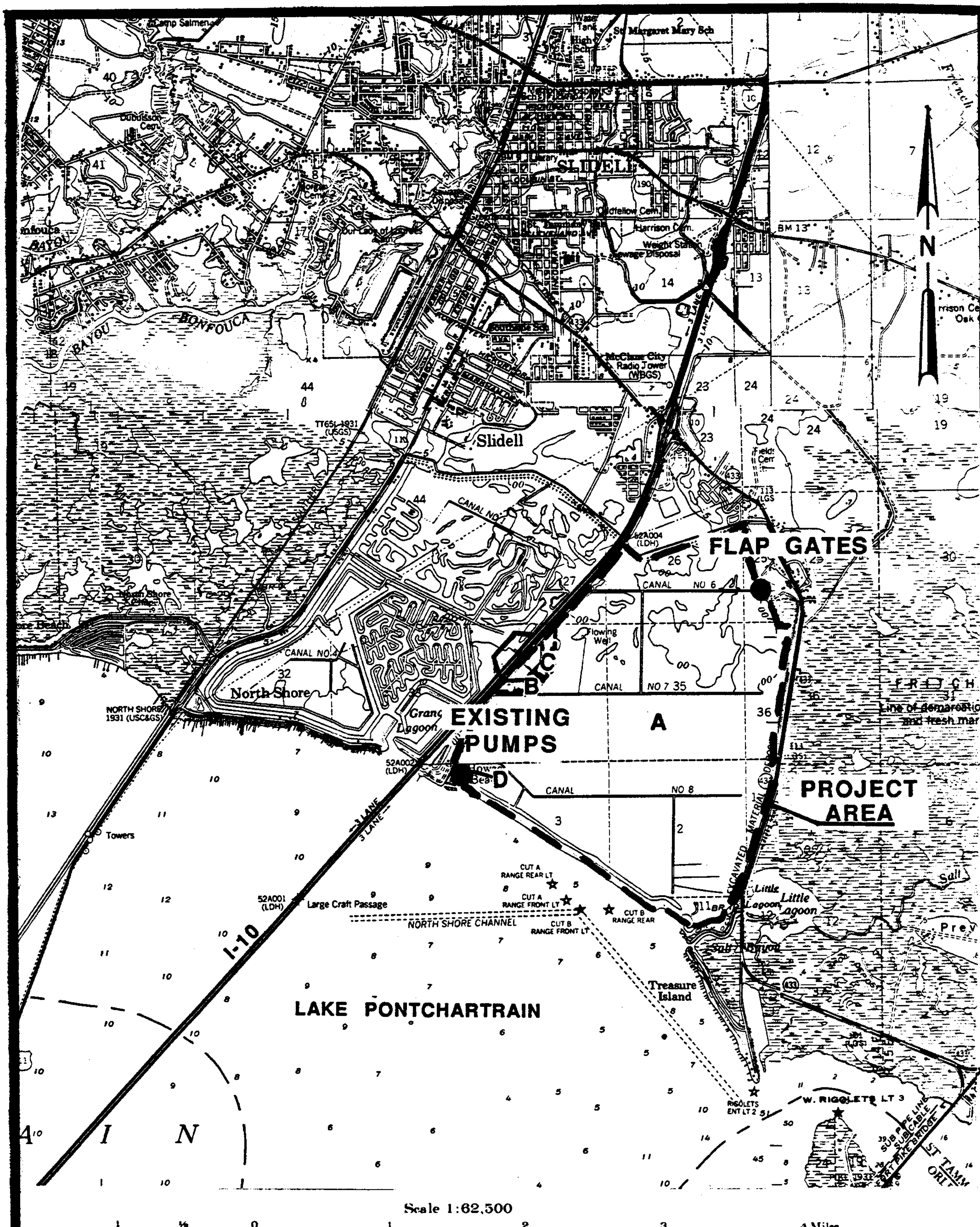
1. install one mile of foreshore dike 40 to 60 feet offshore in 3 to 4 feet of water;
2. close two shoreline breaches on Lake Borgne. The northern breach is approximately 50 feet wide and 3 feet deep. The southern breach is approximately 100 feet wide and 3 feet deep;
3. close two additional breaches on Bayou Bienvenue. These breaches are roughly 100 feet and 400 feet wide and between 3 and 4 feet deep; and
4. install a fixed crest rock weir in the channel connecting an open water area to Bayou Bienvenue.

Cost:

First Cost	$1,978,000
Average Annual Cost	$228,200
Fully Funded Cost	$2,504,000

Benefits:

Average Annual Habitat Units	45
Average Annual Acres	63
Acres Created, Protected, or Restored	81



PPO-4 EDEN ISLES EAST MARSH RESTORATION

Eden Isles East Marsh Restoration (PPO-4)

Location:

The project area is in western St. Tammany Parish, Louisiana, between Interstate 10 and Louisiana Highway 433, and adjacent to Lake Pontchartrain. The project area consists of four parcels of land, tracts A, B, C, and D. The southern limit of the project site abuts Lake Pontchartrain, where a protection levee 12 feet high forms the boundary. The perimeter of inland portions of the project area is delineated by levees lower than the one along the lake. Approximately 52,000 feet of man-made canals drain the area, and all are linked to a parish drainage pumping station, in the southwest corner of the site.

Land Classification	Acres
Drainage Canals (open water)	22
Fresh Marsh	149
High lands (area above 1.5 NGVD)	223
Fastlands (wet pasture)	2,536
Total	2,930

Justification:

The area was leveed and drained for farming in the early 1920's but apparently had been abandoned by the early 1950's when the levees failed. The area was a shallow bay until the 1970's, when the area was converted to fastlands by the combined use of levees, drainage canals, and the pumping station.

Objective:

The project objective is to restore 2,536 acres of drained fastlands to wetlands by purchasing the property, modifying the operation of the pump so that a large portion of the area would be flooded, and then actively managing water levels to maximize marsh creation.

Project Features:

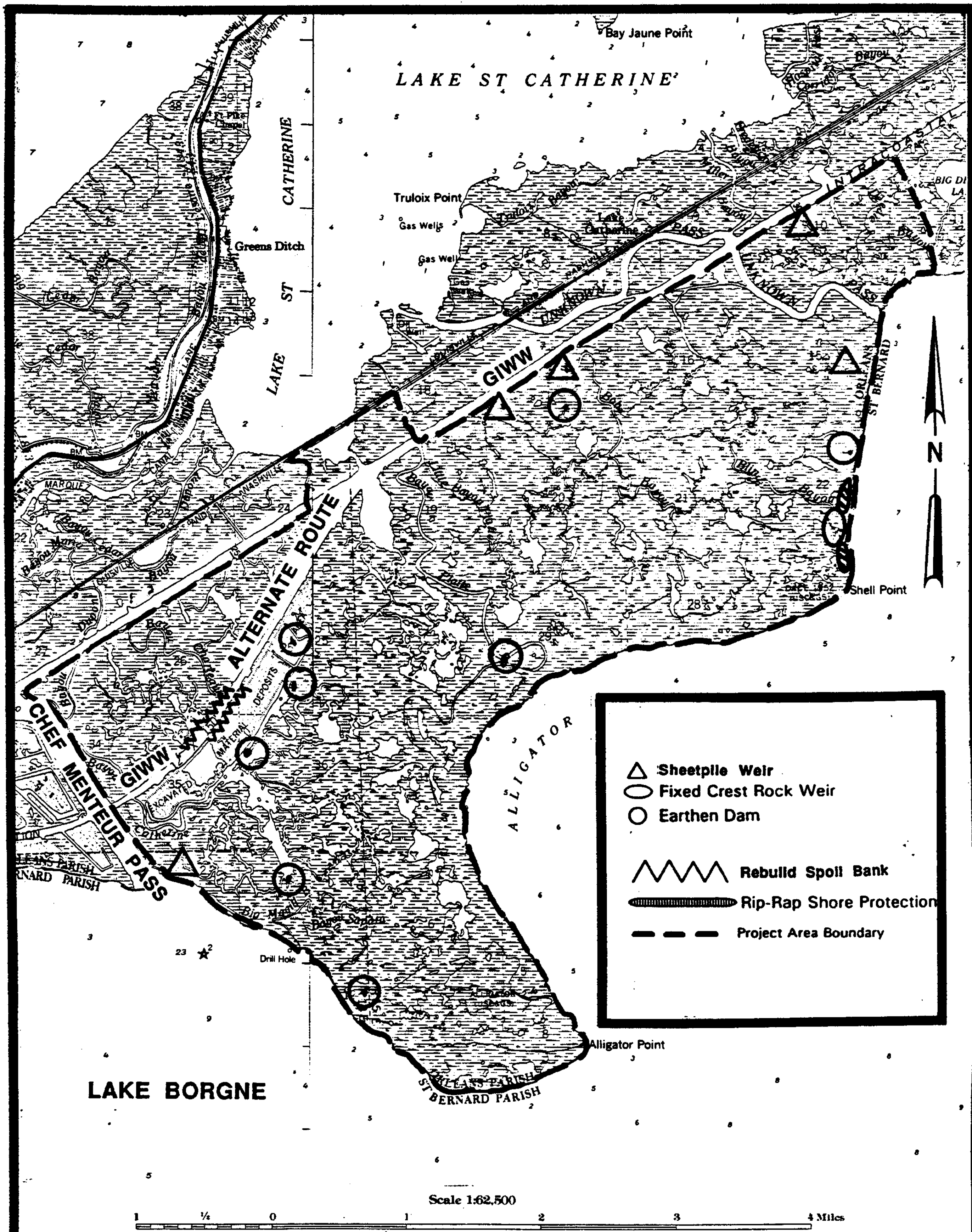
The management plan calls for active water level management, through the use of the existing drainage pumps, to maintain a controlled level of -1.0 foot NGVD. However, the key in determining the final and best water level elevation will be the monitoring program.

Cost:

First Cost	$2,131,000
Average Annual Cost	$363,500
Fully Funded Cost	$5,019,000

Benefits:

Average Annual Habitat Units	1,253
Average Annual Acres	934
Acres Created, Protected, or Restored	1,454



PO-15 ALLIGATOR POINT MARSH MANAGEMENT

Alligator Point Marsh Restoration (PPO-15)

Location:

The project is located in eastern Orleans Parish, Louisiana. The project area boundaries, which encompass approximately 11,800 acres of brackish marsh and open water (9,400 and 2,400 acres respectively), are Lake Borgne to the south, the GIWW to the north, Chef Menteur Pass to the east, and Deedie Bayou to the west.

Justification:

The natural hydrology of the project area was disrupted by the construction of the GIWW and the alternate route to the GIWW, along with minor alternations from trapping trainasses and cutoffs, and the construction of a railroad north of the project area. The result has been a reduction in freshwater input into the area from the Pearl River basin. This has caused marsh loss and a shift in habitat type from an intermediate wetland to a deteriorating brackish marsh. In addition, shoreline erosion on Lake Borgne has been measured at approximately 5 feet per year with Lake Borgne threatening to blow out several critical areas on the eastern portion of the project area.

Objective:

The objective of the project is to restore the area to a more natural hydrologic regime by installing weirs and spoil banks to reduce tidal fluctuations and the loss of fresh water from local precipitation. A portion of the eastern shoreline will be stabilized to prevent shoreline erosion in critical areas.

Project Features:

Structural components of the plan include:

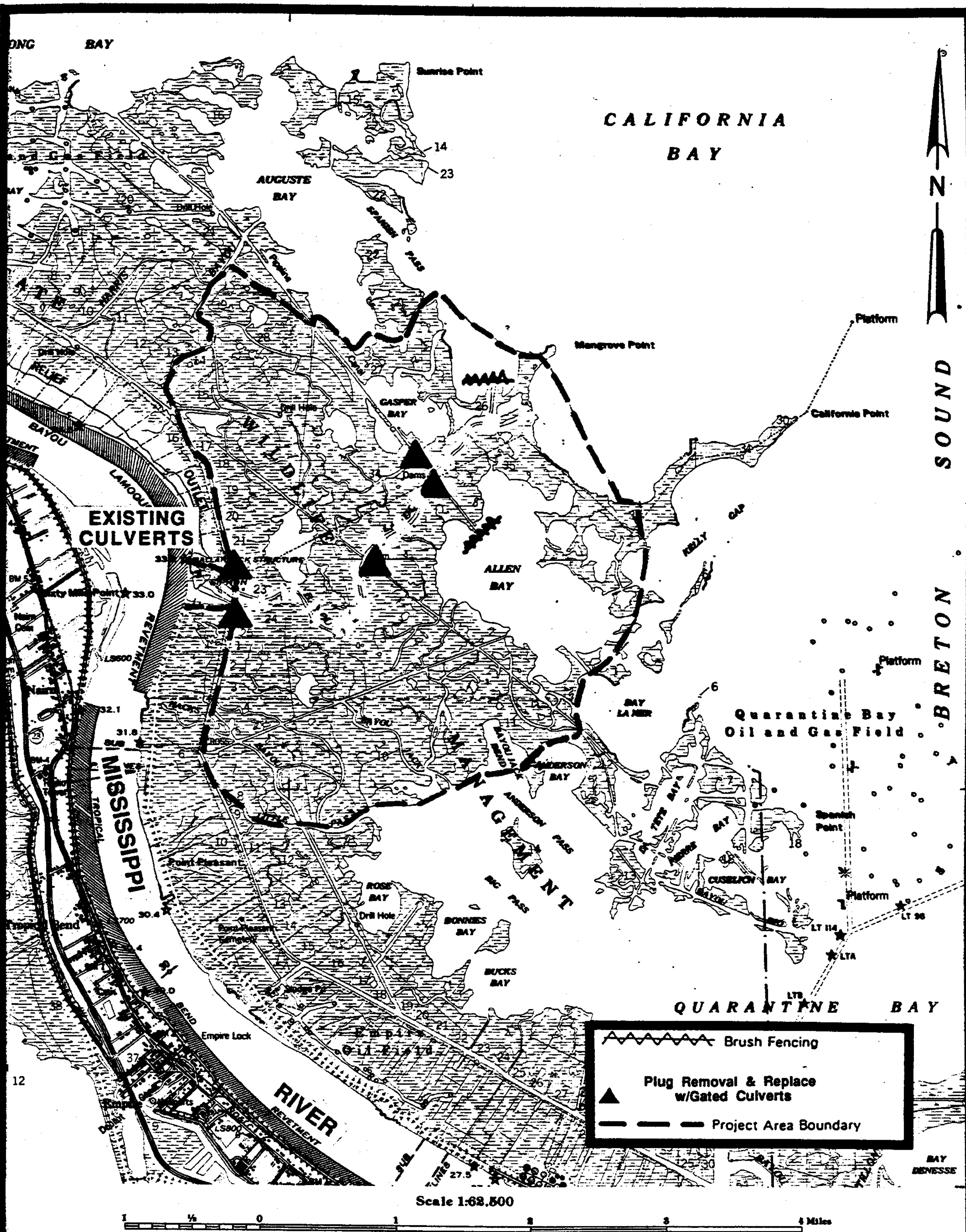
1. eight shell armored earthen dams;
2. 1,200 feet of shoreline stabilization along the portion of the eastern shoreline;
3. 4,000 feet of spoil bank repair;
4. five timber or steel sheetpile fixed crest weirs; and
5. one fixed crest rock weir on Blind Bayou.

Cost:

First Cost	$1,464,000
Average Annual Cost	$190,300
Fully Funded Cost	$2,555,000

Benefits:

Average Annual Habitat Units	73
Average Annual Acres	30
Acres Created, Protected, or Restored	58



BS-5 BAYOU LAMOQUE OUTFALL MANAGEMENT

Bayou Lamoque Diversion Outfall Management (BS-5)

Location:

The Bayou Lamoque Diversion Outfall Management area is located on the east bank of the Mississippi River east of Nairn, Louisiana, in Plaquemines Parish. The project area is bounded by the Mississippi River to the west, California Bay to the east, Auguste Bayou to the north, and Anderson Bay to the south. The area encompasses 6,267 acres of saline marsh and open water habitat.

Justification:

The existing Bayou Lamoque structures consist of four 10- by 10-foot and four 12- by 12-foot box culverts. The structures are operated by the Louisiana Department of Wildlife and Fisheries and are open between the months of January and August.

Outfall management of the diverted waters provides an opportunity to realize the full benefits of the fresh water and sediments available through the existing diversion. Management involves the control of water levels and direction of flow to increase dispersion and retention time of fresh water, nutrients, and some sediment in the marsh.

Project Features:

Structural components of the plan are as follows:

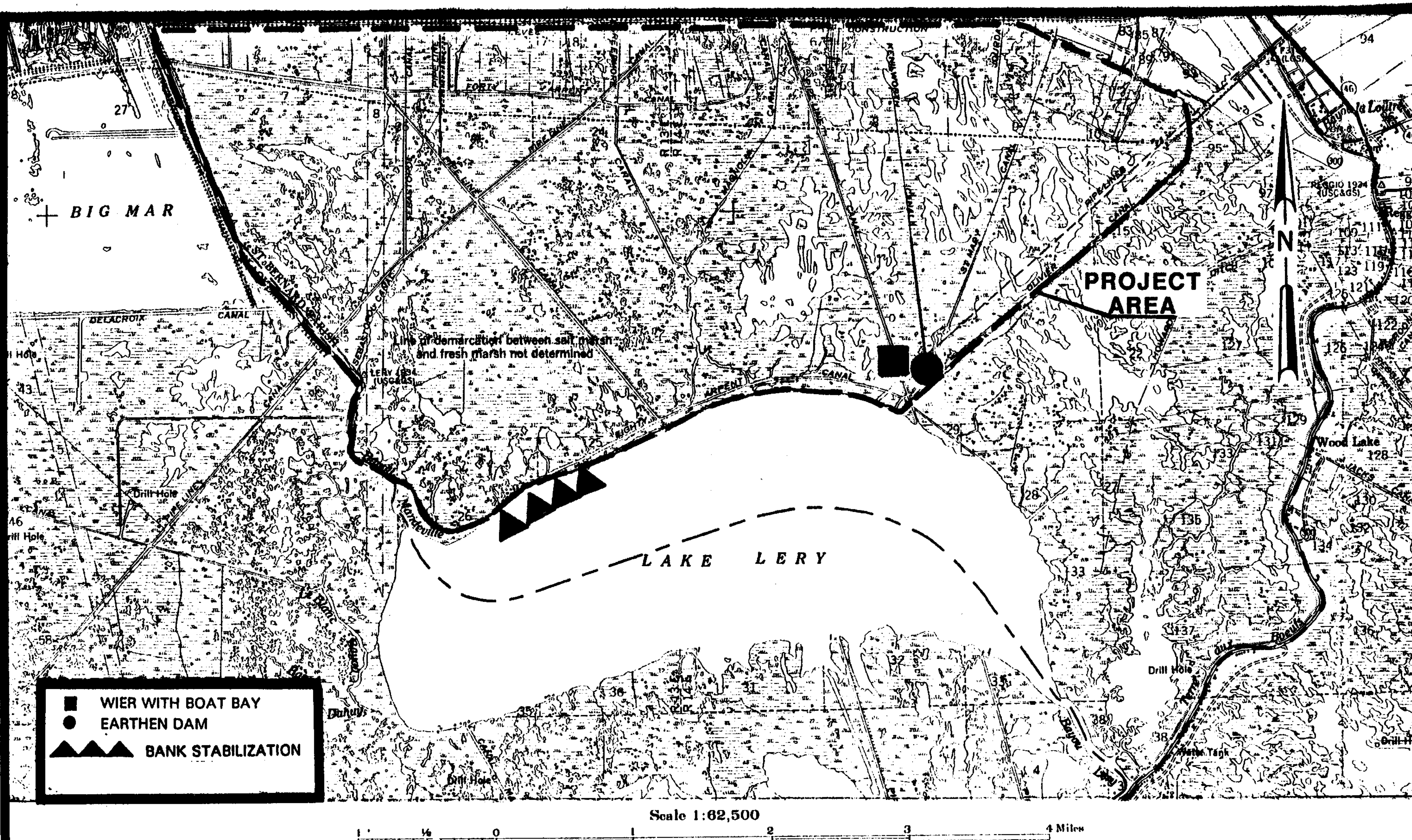
1. remove five pipeline canal plugs and place rock liners, flap-gated culverts or screw-gated culverts for freshwater introduction;
2. construct 4,000 feet of brush fencing at two locations; and
3. provide a hydraulic gate-operating power tool to reduce the effort required to manually open or close all screwgates.

Cost:

First Cost	$735,000
Average Annual Cost	$95,700
Fully Funded Cost	$1,048,000

Benefits:

Average Annual Habitat Units	39
Average Annual Acres	31
Acres Created, Protected, or Restored	59



BS-6 LAKE LERY HYDROLOGIC RESTORATION

Lake Lery Hydrologic Restoration (BS-6)

Location:

This project is located in St. Bernard Parish, Louisiana, encompassing 6,500 acres of intermediate marsh between the St. Bernard Ridge and Lake Lery. The project encompasses two distinct subareas: the western portion (Area 1) includes 1,000 acres of intermediate marsh and open water habitat, and the eastern portion (Area 2) includes 5,500 acres of intermediate marsh and open water habitat.

Justification:

By construction of the Mississippi River levee, man has effectively stopped annual flooding that served to nourish the surrounding marshes with sediments, nutrients, and fresh water. Construction of the Mississippi River Gulf Outlet in 1963 breached the La Loutre ridge and accelerated saltwater intrusion into Bayou Terre aux Boeufs, Lake Lery, and numerous canals in the project area. As a result, this area is currently suffering marsh loss at a rate of approximately 8 acres per year.

The Caernarvon Freshwater Diversion structure is located in close proximity to the project area, and field observations suggest that the marsh is benefiting from fresh water, sediment, and nutrients passing through the structure. However, wetland benefits to this area from Caernarvon may be reduced upon implementation of the Caernarvon Outfall Management Plan (BS-3a) authorized for funding under the CWPPRA second priority list. For this reason, additional measures are necessary to help protect this area from continued land loss.

Objective:

This plan has the dual objective of stabilizing a blowout on Lake Lery and restoring a more natural hydrologic regime where the marsh has been adversely impacted by canal dredging (area near Kenilworth, St. Mary, and Olivier Canals). The objectives would be achieved by installing structures to reduce tidal exchange, promote freshwater retention, and halt shoreline erosion.

Project Features:

Structural components of the project are:

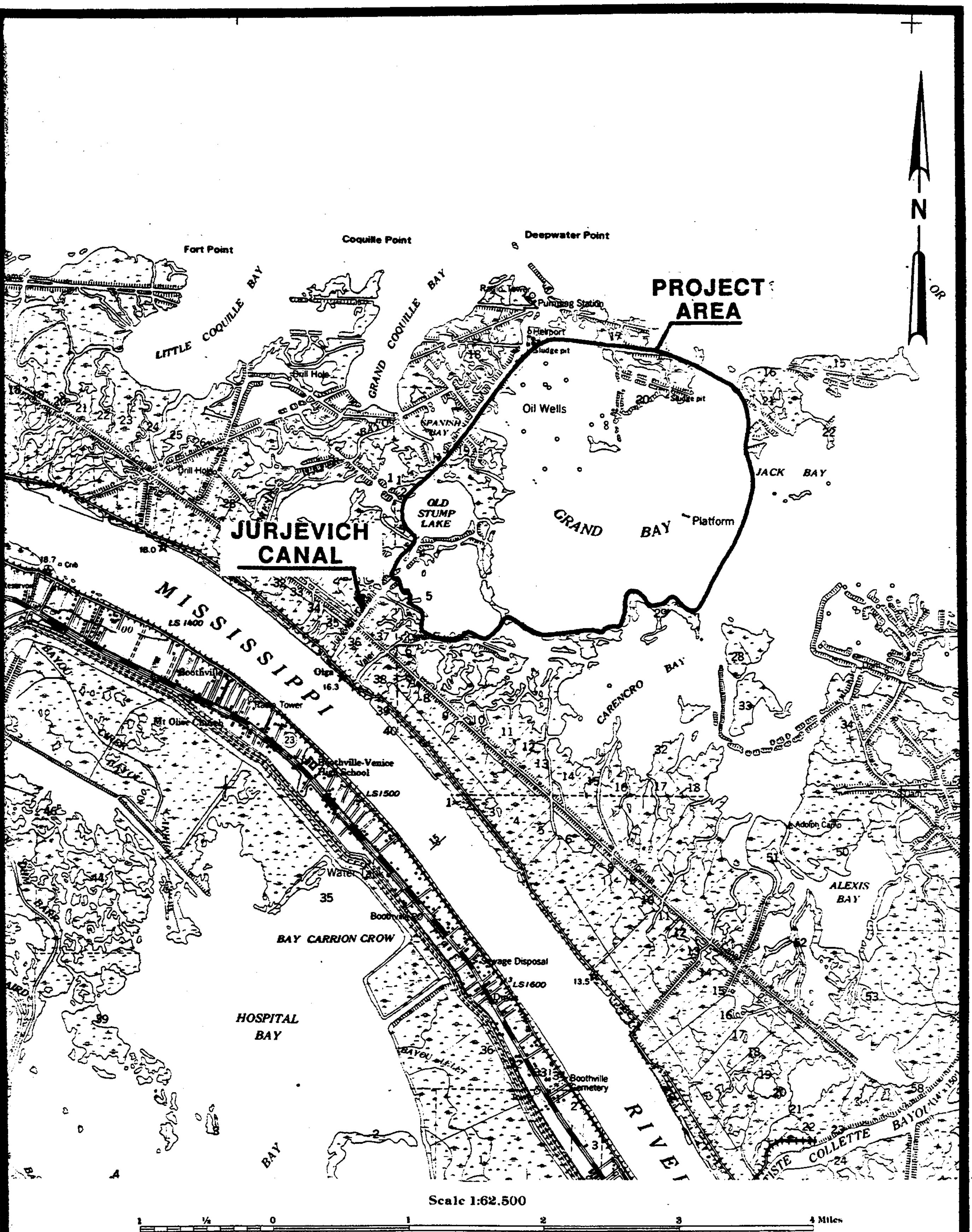
1. approximately 3,700 feet of rip-rap stone revetment to repair a blowout on the north shore of Lake Lery;
2. a slotted weir with a boat bay on the eastern pipeline canal; and
3. a rock weir at the confluence of the Kenilworth, St. Mary, and Olivier Canals.

Cost:

First Cost	$1,267,000
Average Annual Cost	$158,500
Fully Funded Cost	$1,904,000

Benefits:

Average Annual Habitat Units	26
Average Annual Acres	22
Acres Created, Protected, or Restored	37



PBS-6 CREVASSE DEVELOPMENT AT GRAND BAY

Crevasse Development at Grand Bay (PBS-6)

Location:

The project is located at the Jurjevich Canal near Mississippi River Mile 16.3 Above Head of Passes, in Plaquemines Parish, Louisiana. The project area consists of 3,150 acres of brackish marsh and 3,150 acres of saline marsh.

Justification:

Grand Bay and adjacent marshes experienced significant freshwater and sediment input with annual Mississippi River flooding until artificial levees were constructed along the river bank. Subsequently, rocks were placed along the river banks to stabilize the channel. Construction of a rock lined opening through the rocks would reestablish a pathway for fresh water and sediment into Grand Bay and the adjacent marshes. Grand Bay is a semi-enclosed body of water which will maximize sediment retention and marsh creation.

Objectives:

The object of the project is to create, restore, and enhance wetlands in the area of Grand Bay by constructing a lined cut through the rocks at the head of the Jurjevich Canal. Sediment from the Mississippi River will eventually create a delta splay in Grand Bay.

Project Features:

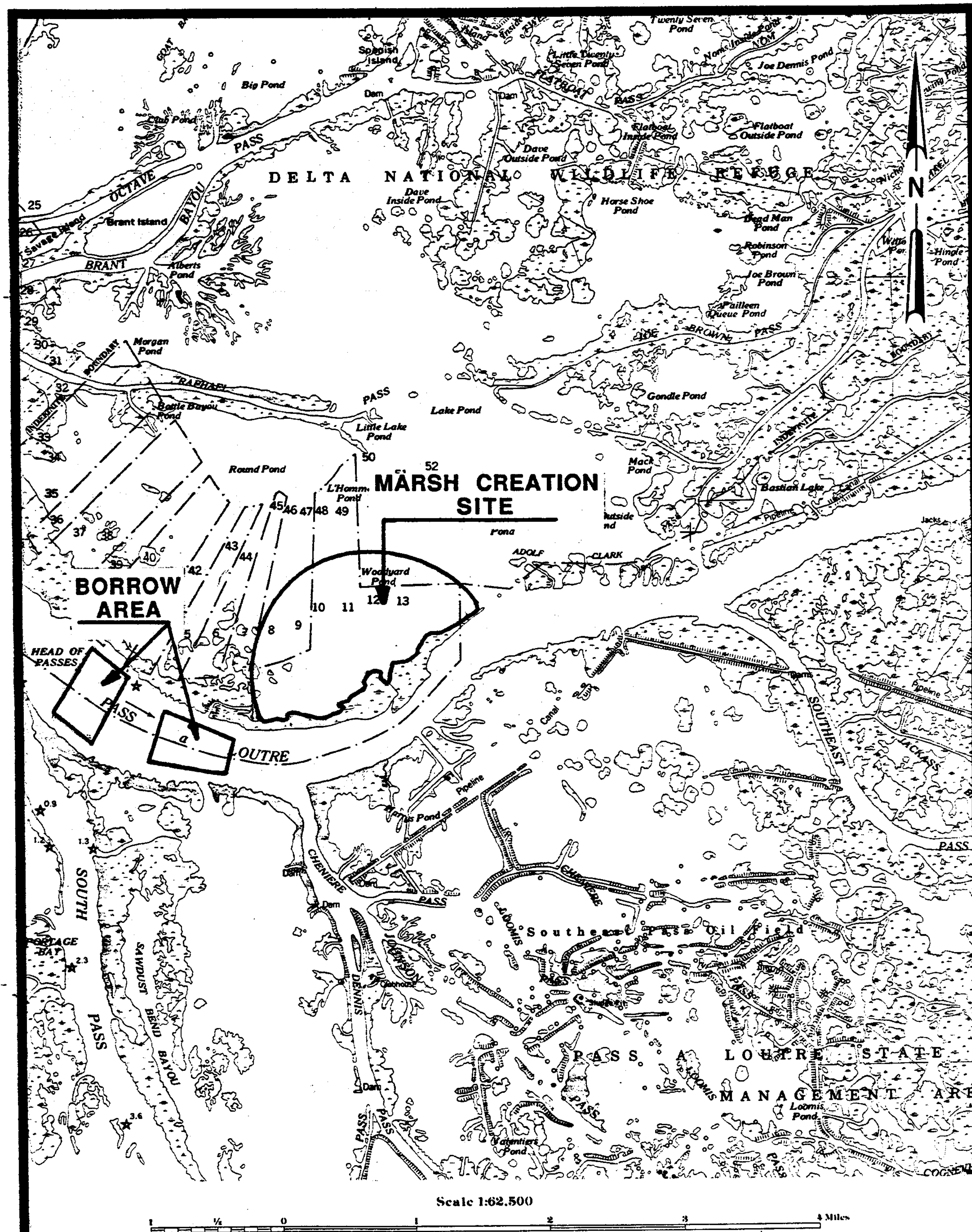
The project will consist of rearranging approximately 1,500 tons of rock at the head of the Jurjevich canal, allowing an estimated maximum of 20,000 cubic feet per second (cfs) of Mississippi River water into the canal, Grand Bay, and adjacent wetlands. The entrance of the canal will be lined with additional rock to prevent scouring of the canal. In addition, two pipelines crossing the Jurjevich Canal will be relocated.

Cost:

First Cost	$2,080,000
Average Annual Cost	$256,800
Fully Funded Cost	$2,469,000

Benefits:

Average Annual Habitat Units	257
Average Annual Acres	333
Acres Created, Protected, or Restored	634



PMR-8 PASS-A-LOUTRE SEDIMENT MINING

Pass-a-Loutre Sediment Mining (PMR-8)

Location:

The project is located in Pass-a-Loutre of the Mississippi River bird's foot delta in Plaquemines Parish, Louisiana. The project area consists of 300 acres of fresh/intermediate marsh and open water.

Justification:

Material dredged from the Mississippi River at Head of Passes is deposited in Pass-a-Loutre and South Pass. Although this material has historically travelled through the passes and contributed to marsh creation, Pass-a-Loutre has recently lost depth and is decreasing in size. However, this material can be dredged and deposited along the pass to create wetlands in open water areas.

Objectives:

The objective of the project is to create wetlands utilizing dredged material from Pass-a-Loutre. Concurrently, the removal of the material from Pass-a-Loutre will increase its flow carrying capability.

Project Features:

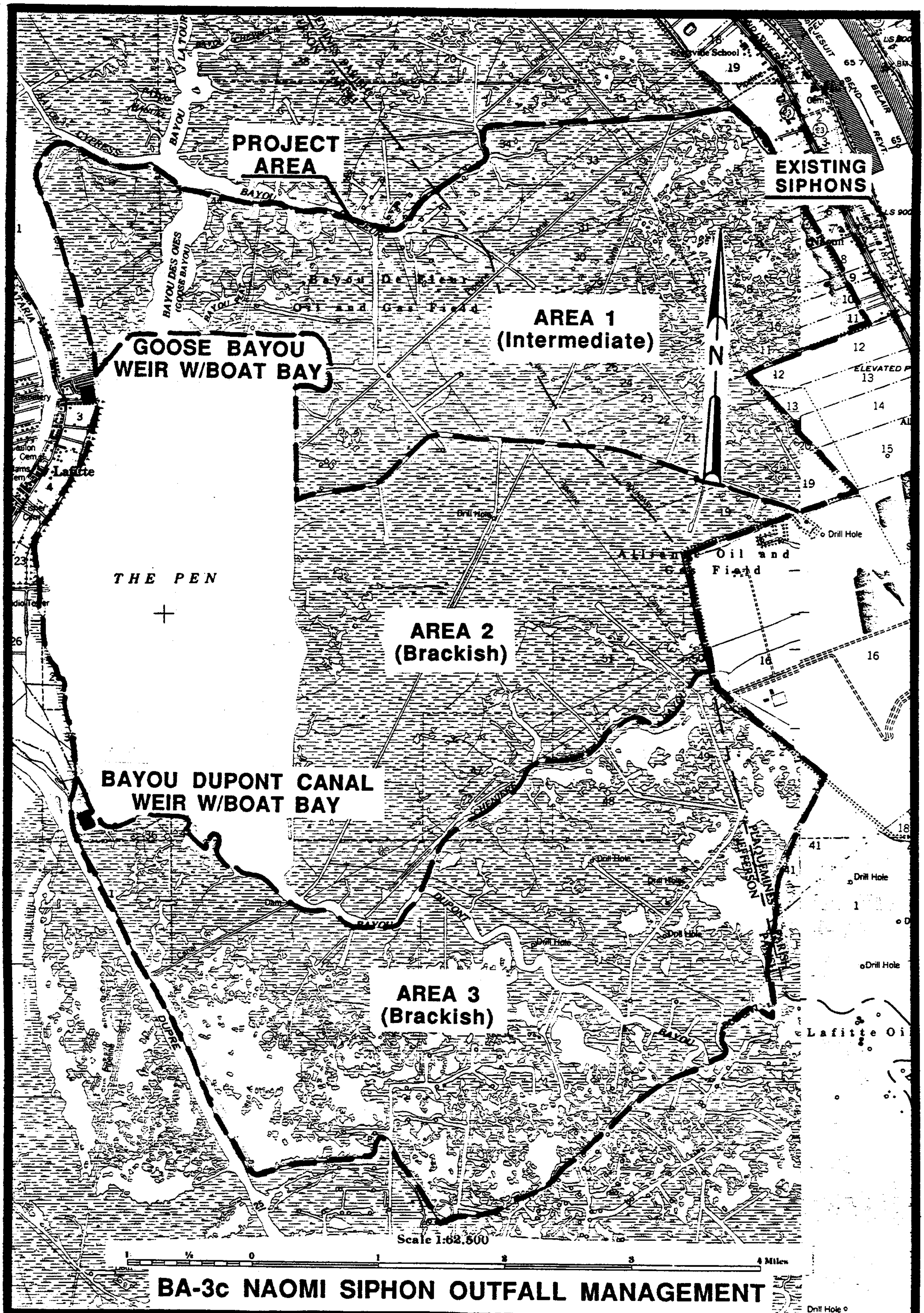
Approximately 800,000 cubic yards of dredged material will be excavated from the designated borrow areas within Pass-a-Loutre and will be deposited unconfined in the shallow open water area behind the left descending bank of the pass to create wetlands. The material will be deposited into 3 mounds to a maximum elevation of +3.0 feet mean low gulf (MLG). After consolidation the material will settle to a final elevation between +2.0 and +2.5 feet MLG. No dredged material will be deposited upon existing wetland above an elevation of +2.0 feet MLG. The project will create approximately 35 acres of emergent fresh/intermediate marsh and 80 acres of subaerial wetland. The total area benefited, including minor deposition, is 380 acres.

Cost:

First Cost	$1,425,000
Average Annual Cost	$162,800
Fully Funded Cost	$1,633,000

Benefits:

Average Annual Habitat Units	125
Average Annual Acres	132
Acres Created, Protected, or Restored	120



PROJECT AREA
EXISTING SIPHONS
AREA 1 (Intermediate)
GOOSE BAYOU WEIR W/BOAT BAY
THE PEN
AREA 2 (Brackish)
BAYOU DUPONT CANAL WEIR W/BOAT BAY
AREA 3 (Brackish)
N
Scale 1:62,500
4 Miles
BA-3c NAOMI SIPHON OUTFALL MANAGEMENT

Naomi Siphon Outfall Management (BA-3c)

Location:

The project area is located in Plaquemines and Jefferson Parishes, Louisiana, and encompasses 26,000 acres of intermediate and brackish wetland. The existing Naomi (Lareussite) Siphon is located near the community of Naomi along the west bank of the Mississippi River.

Justification:

Construction of the Mississippi River levee effectively stopped annual flooding that served to nourish the surrounding marshes with sediments, nutrients, and fresh water. Dredging of oilfield and pipeline canals in conjunction with construction of major navigation channels such as the Barataria Bay Waterway has provided avenues for salt water from the Gulf of Mexico to intrude into low salinity brackish and intermediate marshes in the central Barataria Basin.

The existing diversion consists of eight 72-inch-diameter siphons, a discharge pond, and a single outfall channel. These siphons have a maximum combined discharge of 2,144 cfs. The siphons divert sediment-laden water from the Mississippi into the west bank wetlands to retard saltwater intrusion and enhance wetland productivity. The siphons have been operating since February 1993. The operational schedule calls for all eight pipes to be open from May through February, with two pipes remaining open during the months of March and April.

Outfall management of the diverted waters provides an opportunity to realize the full benefits of the fresh water and sediments available through the existing siphons.

Objective:

The objective of the project is to manage the outfall of the existing siphons by controlling the movement of the diverted waters.

Project Features:

The outfall management plan calls for the following structural components.

1. Constructing a weir with a boat bay on the Goose Bayou Canal. The estimated weir dimensions are 425 feet by 11 feet. The weir will be set six inches below marsh level with a 20-foot-wide by 6-foot-deep boat bay.
2. Constructing a weir with a boat bay on the Bayou Dupont Canal. The estimated weir dimensions are 300 feet by 21 feet. The weir will be set six inches below marsh level with a 20-foot-wide by 6-foot-deep boat bay.

Cost:

First Cost	$1,026,000
Average Annual Cost	$139,700
Fully Funded Cost	$1,857,000

Benefits:

Average Annual Habitat Units	379
Average Annual Acres	334
Acres Created, Protected, or Restored	633