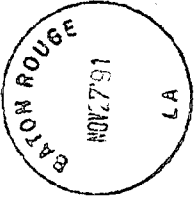
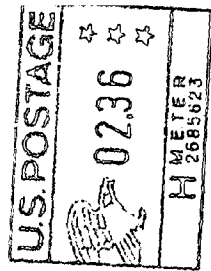


STATE OF LOUISIANA
DEPARTMENT OF NATURAL RESOURCES
Coastal Management Division
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BATON ROUGE, LOUISIANA 70804-4487

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RESOURCE MGMT.
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**PRELIMINARY ASSESSMENT
OF THE LOUISIANA
COASTAL MANAGEMENT PROGRAM**

Prepared under the
Coastal Zone Enhancement Grants Program

Section 309
Coastal Zone Management Act

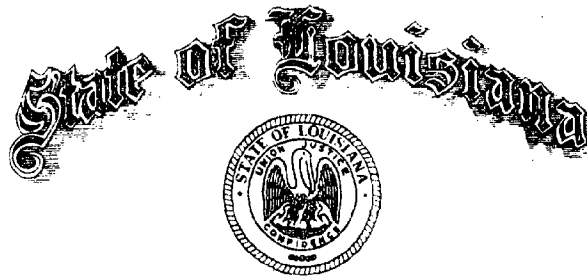
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PREPARED BY
The Coastal Management Division
Louisiana Department of Natural Resources

Rodney E. Emmer & Associates, Inc.
Baton Rouge, La.

November 25, 1991

BUDDY ROEMER
GOVERNOR



MARTHA A. SWAN
SECRETARY

DEPARTMENT OF NATURAL RESOURCES

November 27, 1991

Dear Preliminary Assessment Recipient:

The 1990 reauthorization of the federal Coastal Zone Management Act (CZMA), as amended, established under Section 309 a new voluntary Coastal Zone Enhancement Grants Program which encourages federally-approved state coastal management programs to seek to achieve one or more of eight coastal management objectives. The states are encouraged to achieve these objectives through changes to their coastal management programs. Louisiana has a federally approved coastal management program, the Louisiana Coastal Resources Program (LCRP), which is administered by the Coastal Management Division of the Department of Natural Resources (CMD/DNR).

As a first step in this process, CMD/DNR is seeking to identify priority needs for improvement. The CMD/DNR is requesting public input regarding Louisiana's most pressing coastal issues related to the following Section 309 objectives:

1. Protection, enhancement, or creation of coastal wetlands;
2. Preventing or significantly reducing threats to life and property by controlling coastal development and redevelopment in hazardous areas, and anticipating and managing the effects of sea level rise;
3. Attaining increased opportunities for public access;
4. Reducing marine debris by managing uses and activities that contribute to marine debris;
5. Development and adoption of procedures to address the cumulative and secondary impacts of coastal growth and development;
6. Preparing and implementing special area management plans;
7. Planning for the use of ocean resources; and
8. Adoption of procedures and policies to facilitate the siting of energy facilities and government facilities and energy-related activities and government activities which may be of greater than local significance.

The attached document, the "Preliminary Assessment of the Louisiana Coastal Management Program", has been produced by CMD/DNR in order to address the above enhancement areas. It has been provided to the public so that they may review it and comment on the state's assessment of its priority needs for

improvement in the eight enhancement areas. From the Assessment, CMD/DNR will develop a Strategy for addressing the identified high priority areas. The Assessment and Strategy will provide the basis by which CMD/DNR will apply for grant funds from the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration. The final Assessment will be completed by January 10, 1992, and the Strategy will be completed by February 28, 1992.

The CMD/DNR will hold public meetings about the Assessment document on the following days in the following locations:

1. Tuesday, December 17, 1991, 7:00 PM - Lake Charles, Louisiana, Courtroom A, Calcasieu Parish Courthouse, 1000 Ryan St.;
2. Wednesday, December 18, 1991, 7:00 PM - Morgan City, Louisiana, Morgan City Council Chamber, City Court Building, Corner of Myrtle St. and U.S. Highway 90; and
3. Thursday, December 19, 1991, 7:00 PM - LaPlace, Louisiana, Woodland Room, Holiday Inn, 3900 Main Street, immediately south of the LaPlace Exit of I-10 (Exit 209) and the LaPlace Exit of I-55 (Exit 1).

The CMD/DNR invites you to attend one or more of the meetings and/or to submit written comments about the attached Assessment document. If you would like to provide written comments, please send them to me at the address listed on the front sheet of this packet. Additionally, if you have questions about the Assessment process, please call Jim Rives at (504) 342-7591.

Sincerely yours,

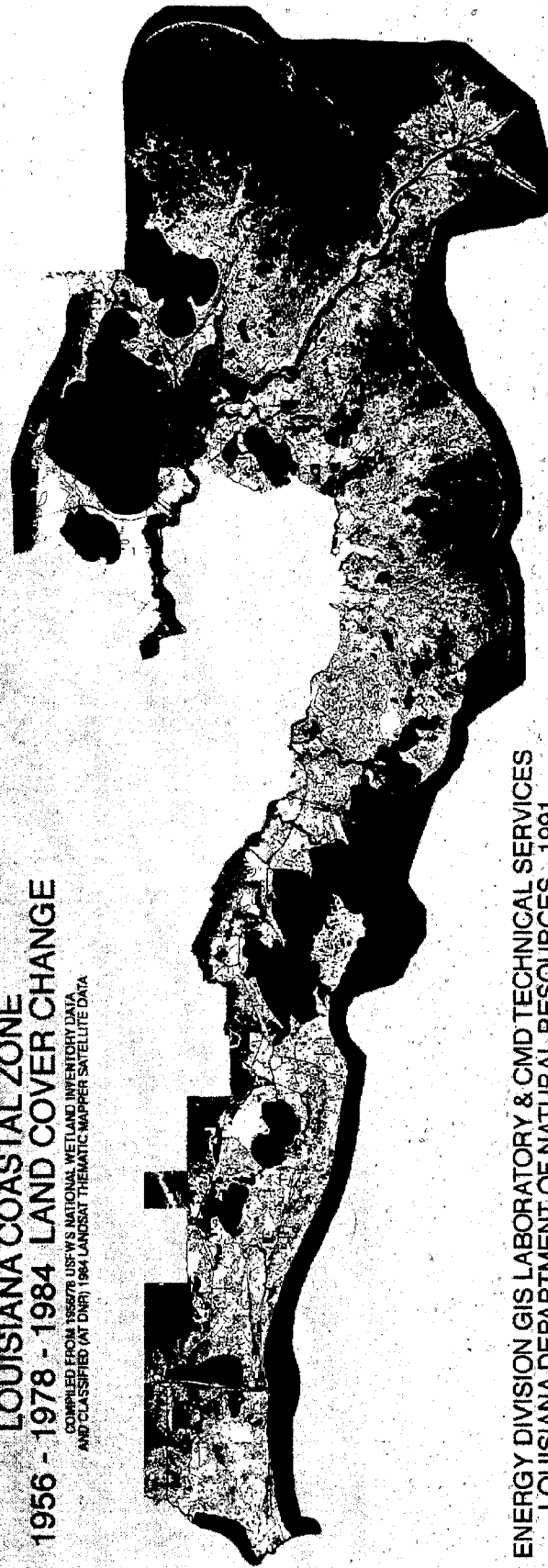


Terry Howey
Director

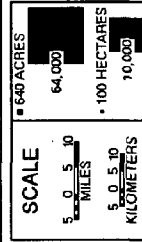
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LOUISIANA COASTAL ZONE 1956 - 1978 - 1984 LAND COVER CHANGE

COMPILED FROM USFWS NATIONAL WETLAND INVENTORY DATA
AND CLASSIFIED (AT DNR) 1984 LANDSAT THEMATIC MAPPER SATELLITE DATA



ENERGY DIVISION GIS LABORATORY & CMD TECHNICAL SERVICES
LOUISIANA DEPARTMENT OF NATURAL RESOURCES - 1991



LEGEND

- CONTIGUOUS AREAS OF CHANGE**
- LAND OR MARSH LOSS, 1956 TO 1978
 - LAND OR MARSH LOSS, 1978 TO 1984
 - LAND OR MARSH GAIN, 1956 TO 1978
 - LAND OR MARSH GAIN, 1978 TO 1984
- ONLY UNITS > 6 ACRES**
- UNITS OF ALL SIZES**

- FRESH MARSH IN 1978
- INTERMEDIATE MARSH IN 1978
- BRACKISH MARSH IN 1978
- SALINE MARSH IN 1978
- BROKEN MARSH IN 1984
- NATURAL WATER IN 1978-84
- ARTIFICIAL WATER IN 1978
- NO NET LAND OR MARSH GAIN/LOSS DURING 1956-78 OR 1978-84

- SWAMP IN 1978
- SHRUB-SCRUB AND FOREST IN 1978
- AGRICULTURE AND URBAN IN 1978
- UNVEGETATED SOIL AND BEACH IN 1978



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INTRODUCTION

The Louisiana Coastal Resources Program (LCRP) became a fully functioning, federally-approved coastal management program on October 1, 1980. This beginning was the culmination of a process that began in Washington in 1972 with the passage of the Coastal Zone Management Act and which continued in Baton Rouge with the passage of the State and Local Coastal Resources Management Act (SLCRMA) in 1978. Between 1978 and 1980 the Louisiana Coastal Commission, which has since been abolished, developed the Coastal Use Guidelines (Guidelines), which serve as performance standards for proposed coastal uses and activities. The state also established the Guidelines and certain other procedures as regulations.

The basic policies of the SLCRMA call for a balancing of development and resource utilization with conservation, preservation, and restoration of the coastal zone (Figure 1). The focus of the program is primarily on combating wetland loss, which is now at an annual rate of between 35 and 60 mi². Other aspects of the program relate to regulating activities in open water and on elevated natural features such as sand dunes and chenier ridges, as well as activities which have direct and significant impact on coastal waters.

Further, the SLCRMA provided for state and local coastal management and that local management would be on the parish level. Under the SLCRMA, prior to receiving its local coastal management authority, a parish must develop a coastal management program, which must in turn be approved on the state and federal levels. The state has full coastal management authority in those parishes which do not have approved local programs and retains authority over certain uses (uses of state concern) in parishes which do have approved programs. Nineteen parishes are at least partially within the coastal zone boundary, and seven now have approved programs.

The Coastal Management Division (CMD) of the Office of Coastal Restoration and Management of the Department of Natural Resources (DNR) is the agency responsible for regulating uses of state concern, and approving and overseeing local coastal management programs. The local program review and oversight function is carried out by the Local Program Section of CMD. The CMD carries out its regulatory mandate through the efforts of the Permit, Consistency, and Enforcement Sections. The Permit Section is responsible for regulating all the proposed coastal uses in the coastal zone except those by federal agencies or deep-water port commissions. Examples of the types of activities regulated by the Permit Section include the dredging or filling of wetlands or open water areas, modification of water flow patterns, and alteration of barrier islands and beaches. The Permit Section receives about 1,500 permit applications per year. To expedite the process, the CMD has a Joint Public Notice process with the New Orleans District Corps of Engineers. The Consistency Section is responsible for evaluating the activities of federal agencies and deep water port commissions for consistency with the LCRP. It is also responsible for commenting on activities taking place on federal lands within the coastal zone and the federal waters off of the Louisiana coast. Examples of the types of activities evaluated by the Consistency Section include offshore oil and gas development, flood control and navigation projects, and coastal uses on federal wildlife refuges. The Enforcement Section is responsible for investigating possible violations of the LCRP. Such violations include incidents of permit noncompliance, as well as uses conducted without permits. The LCRP also mandates that the state must create and maintain an information base, perform necessary research, and monitor the coastal zone. The CMD carries out these functions with the Technical Resources Section, the Wetland Resources Section, and the Field Investigations Section.

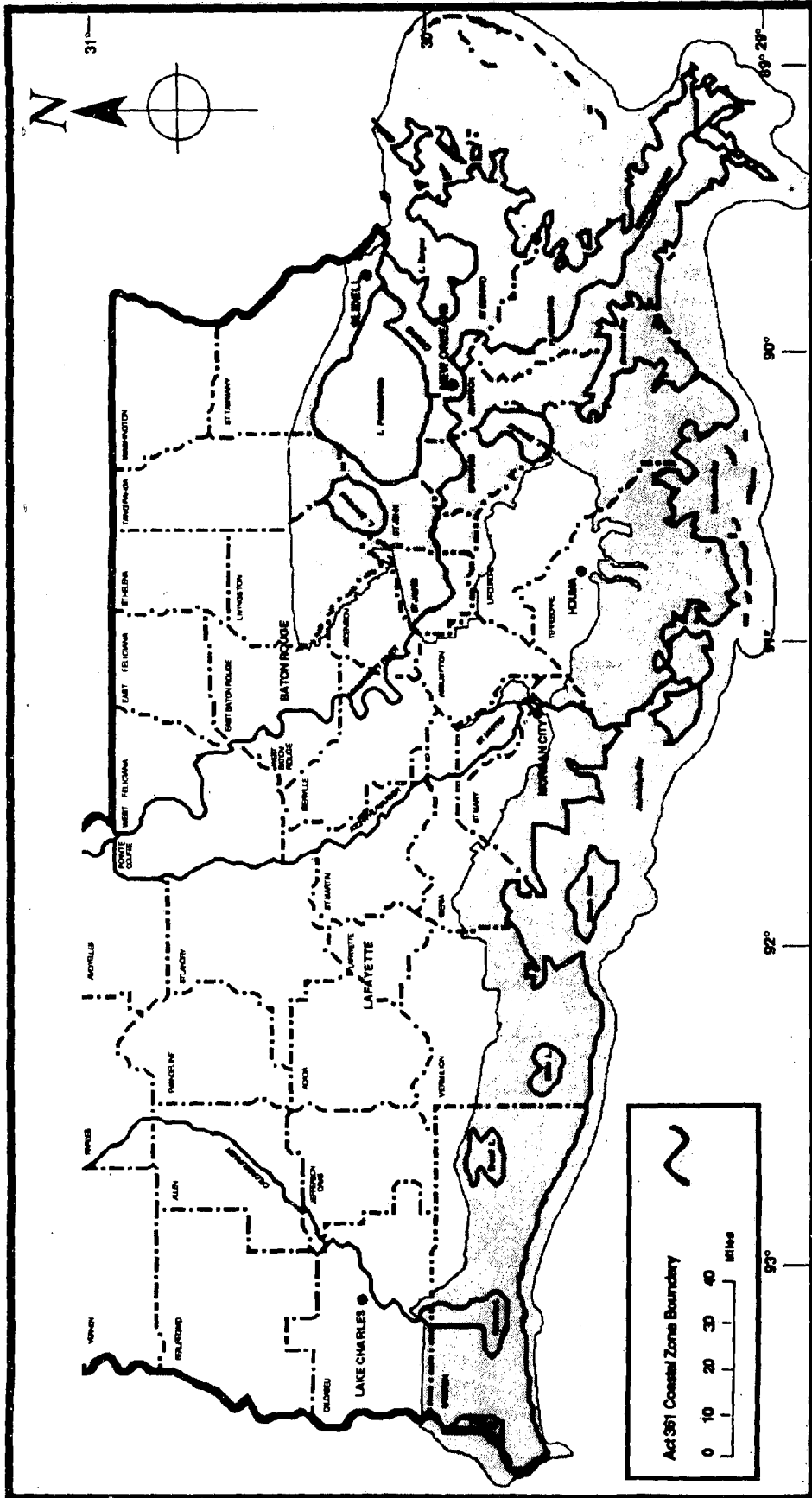


Figure 1. South Louisiana parishes and the Act 361 Coastal Zone Boundary.

In 1990, Congress reauthorized the Coastal Zone Management Act (CZMA) for five years. A new voluntary enhancement grant was established by Section 309 of the CZMA, a mechanism that encourages states to develop changes in any of eight areas. The results will lead to a more effective state coastal zone program. The eight areas to receive attention include:

- Section 309(a)(1) - Wetlands
- Section 309(a)(2) - Coastal Hazards
- Section 309(a)(3) - Public Access
- Section 309(a)(4) - Marine Debris
- Section 309(a)(5) - Cumulative and Secondary Impacts
- Section 309(a)(6) - Special Area Management Planning
- Section 309(a)(7) - Ocean Resources
- Section 309(a)(8) - Energy and Government Facility Siting and Activities.

To assist the public during the 309 process the CMD staff offers this assessment of the enhancement areas. The purposes of the assessment are:

To determine whether coastal problems exist within each of the eight Section 309 enhancement areas, and, where they do exist, to evaluate their future, the extent to which they are already being addressed, and their relative importance;

To provide the factual basis for the Office of Ocean and Coastal Resource Management (OCRM), in consultation with Louisiana, to determine the priority needs for improvement of state coastal management programs; and

To provide the public with an opportunity to comment on the state's identification and justifications of priority needs, as well as possible means that Louisiana is considering in addressing the identified needs.

A section on each enhancement area is divided into five parts: an introduction; a discussion of the issue; a description of the existing programs that address that issue; an evaluation of the effectiveness of each of these programs; and CMD's recommendations for improving Louisiana's coastal zone management program. In compliance with OCRM's guidelines, the assessment contains text, figures, tables, and appendix. More technical material and extensive data are incorporated by reference. A bibliography directs the reader to many documents that contain more detailed information.

All comments and suggestions should be sent to:

Dr. Terry Howey
Director
Coastal Management Division
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P.O. Box 44487
Baton Rouge, La. 70804-4487
504-342-7591

Section 309(a)(1) -- WETLANDS

INTRODUCTION

Wetlands are "open water areas or areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support (and) ...do support a prevalence of vegetation typically adapted for life in saturated soil conditions" (La. R. S. 49: 214.3 (3), and subsection 731 (a), Chapter 7, Title 43 La. Administrative Code). Wetlands, according to the state, are areas that support aquatic vegetation or lands that are capable of supporting wetland vegetation under "normal circumstances." This definition includes areas that were once wetlands but now are open water as a result of wetland loss caused by various natural or human factors. Coastal wetlands include bottomland hardwoods, swamps, shrub/scrub, and fresh, intermediate, brackish, and saline marsh habitats.

Bottomland hardwoods are important habitats for wildlife such as squirrel and white tail deer. Swamps are essential for wildlife and nonmigratory freshwater fisheries such as catfish, largemouth bass, and bluegill. Fresh and intermediate marshes are especially valuable for alligators, waterfowl, nutria, deer, wading birds, and other wildlife. Marshes also provide habitat for fisheries species such as the freshwater catfish and largemouth bass, and the estuarine migratory species, menhaden and white shrimp. Brackish and saline marshes are prime nursery areas for estuarine organisms, including white and brown shrimp, blue crab, and various finfish (redfish and spotted sea trout). Some waterfowl, furbearers (muskrat), and wading birds use the more saline environments, but their prime habitat occurs in fresher marshes.

This section describes Louisiana's coastal wetlands, presents the institutional programs now in place, analyzes the effectiveness of these programs, and suggests changes that may occur in the CMD sphere of responsibility for addressing wetland issues.

WETLANDS

The Louisiana coastal zone provides a wealth of both renewable (fisheries, furs, and agricultural products) and nonrenewable (mineral) natural resources. Louisiana's coastal wetlands contribute over 30% of the U.S. commercial fisheries harvest and 66% of the Mississippi Flyway's wintering waterfowl. Louisiana produces the greatest amount of furs of any state in the nation (Turner 1985). These renewable coastal resources are significant to the state and the nation (Louisiana Coastal Resources Program 1980; Gosselink et al. 1979; Gagliano et al. 1981; Costanza et al. 1983; Turner 1985; and Day et al. 1986). Louisiana's coastal wetlands, which represent approximately 41% of the Nation's total coastal wetlands (Turner and Gosselink 1975), contain 60% of the estuaries and marshes along the Gulf of Mexico (Lindstedt 1989). It has been estimated that the Louisiana coastal zone contains 3,233,000 ac of wetlands (Mossa et al. 1990).

Despite these statistics, Louisiana's coastal zone presently experiences the serious problems of wetland loss, wetland alteration to more saline habitat, and water quality degradation. Land loss in the coastal zone has been documented in the range of 0.8% per year (35,558 ac/yr) (Gagliano et al. 1981; Turner 1985; Walker et al. 1987; Turner and Cahoon 1987). These rates have increased from 6.7 mi²/yr in 1913, to 50.1 mi²/yr in 1980 (Gagliano et al. 1981), and decrease to 30.7 mi²/yr in 1983 (Dunbar and Kemp 1990). At the rate of 0.8% per year, the entire coastal zone will be converted to open water by the year 2116 (or 125 years). Wetland losses translate to losses in renewable resources such as commercial and recreational fishing, hunting, trapping, and recreational coastal pursuits. Tables 1, 2, and A-1 through A-4 (Appendix) show the amounts of

Table 1. Land cover in each basin between 1978 and 1984, in acres (percentages in parentheses). Numbers between 1978 and 1984 may not match because of map registration problems and the differences in the nature of data types.

	Chenier Plain										Delta Plain Total	Coastal Zone Total		
	Sabine	Calcasieu	Mermentau	Vermilion	Chenier Plain Total	Achafalaya	Terrebonne	Bayou Lafourche	Mississippi River	Pontchartraine			Breton	Pearl River
1978 water to 1984 water	108,106 (34)	144,233 (44)	279,892 (35)	411,960 (48)	944,190 (41)	255,642 (65)	676,866 (49)	537,157 (47)	428,593 (69)	1,517,106 (68)	416,468 (58)	1,021 (3)	3,832,873 (59)	4,777,063 (54)
1978 marsh to 1984 water	10,720 (3)	7,584 (2)	23,648 (3)	8,435 (1)	50,388 (2)	9,433 (2)	67,862 (5)	50,651 (4)	16,457 (3)	23,467 (1)	17,920 (2)	528 (2)	186,298 (3)	236,686 (3)
1978 land to 1984 water	5,427 (2)	1,763 (2)	5,936 (1)	2,273 (1)	15,399 (1)	1,732 (<1)	1,985 (<1)	3,668 (<1)	8,572 (1)	4,121 (<1)	653 (<1)	85 (<1)	20,615 (<1)	36,015 (<1)
1978 water to 1984 marsh	5,607 (2)	7,577 (2)	13,641 (2)	16,413 (2)	43,238 (2)	6,410 (2)	45,432 (3)	30,672 (2)	15,979 (3)	26,669 (1)	27,834 (4)	827 (2)	153,802 (2)	197,040 (2)
1978 marsh to 1984 marsh	92,304 (29)	75,071 (23)	342,345 (42)	257,555 (30)	767,274 (33)	89,617 (23)	375,183 (27)	249,348 (22)	53,674 (9)	332,686 (15)	179,940 (25)	18,065 (54)	1,298,713 (20)	2,065,987 (23)
1978 land to 1984 marsh	8,749 (3)	14,586 (4)	16,420 (2)	14,802 (2)	54,557 (2)	2,809 (1)	31,516 (1)	20,421 (2)	4,906 (1)	16,981 (1)	6,559 (1)	719 (2)	63,910 (1)	118,467 (1)
1978 water to 1984 broken marsh	11,015 (4)	13,690 (4)	10,245 (1)	6,113 (1)	41,063 (2)	1,389 (<1)	42,916 (3)	38,178 (3)	5,700 (1)	7,720 (<1)	13,052 (2)	111 (<1)	109,066 (2)	150,128 (2)
1978 marsh to 1984 broken marsh	50,128 (16)	29,756 (9)	67,726 (9)	26,120 (3)	171,940 (7)	7,721 (2)	121,458 (9)	115,988 (10)	7,740 (1)	28,218 (1)	25,608 (4)	715 (3)	30,448 (5)	479,388 (5)
1978 land to 1984 broken marsh	3,047 (1)	3,750 (1)	4,220 (1)	1,387 (1)	12,415 (1)	185 (<1)	1,629 (<1)	2,145 (<1)	671 (<1)	657 (<1)	493 (<1)	10 (<1)	5,789 (<1)	18,204 (<1)
1978 water to 1984 land	392 (<1)	421 (<1)	922 (<1)	1,818 (<1)	3,552 (<1)	4,561 (1)	2,114 (<1)	3,069 (<1)	15,886 (3)	10,550 (<1)	1,643 (<1)	63 (<1)	37,886 (1)	41,439 (<1)
1978 marsh to 1984 land	9,573 (3)	7,847 (2)	7,836 (1)	7,565 (1)	32,771 (1)	8,465 (2)	15,134 (1)	14,670 (1)	14,326 (2)	33,979 (2)	6,286 (1)	723 (2)	93,284 (1)	126,555 (1)
1978 land to 1984 land	9,062 (3)	22,287 (7)	35,121 (4)	110,637 (13)	377,086 (16)	7,457 (2)	17,017 (1)	71,215 (6)	50,191 (8)	236,046 (11)	24,977 (3)	10,386 (3)	417,288 (6)	594,374 (7)
Area compared	314,080 (33)	328,545 (26)	807,970 (19)	863,278 (10)	2,313,873 (18)	395,619 (11)	1,379,092 (22)	1,137,182 (25)	677,636 (14)	2,238,200 (27)	771,431 (14)	33,253 (11)	6,327,473 (13)	8,861,346 (16)

Land Loss per Hydrologic Basin 1956-1978-1983

Habitats	Hydrologic Units												Breton area %/yr	Deltaic Plain area %/yr	Coastal Zone total area %/yr
	Sabine/Catahoula area(%)/%yr	Mémorial area %/yr	Techou/Vermillion area %/yr	Chenier Plain area %/yr	Atchafalaya area %/yr	Terrebonne area %/yr	Barataria area %/yr	Mississippi Rvr. area %/yr	Ponchartraine area %/yr	Deltaic Plain area %/yr	Breton area %/yr	Coastal Zone total area %/yr			
Fresh marsh	95535	357042	31220	484897	24188	340560	260840	145033	41084	854753	40168	1339450			
1978	217718	238601	48512	207031	54983	189857	51063	38872	32288	348605	2842	853036			
% loss/gain/50/78	-5.2%	-1.54%	2.50%	-1.64%	4.89%	-2.20%	3.85%	-3.20%	-1.04%	-4.26%	-2.70%	-2.32%			
78/83	-0.86%	2.05%	3.56%	-0.98%	5.28%	-1.88%	-3.14%	-0.78%	-0.86%	-6.05%	-1.76%	-1.46%			
Non-tresh marsh	281088	127270	242408	850883	40018	338122	273212	3648	235892	1101812	213120	1750875			
1978	248358	190184	187770	836284	0	399254	340820	32224	218287	1154818	207024	1780911			
% loss/gain 56/78	-0.83%	2.25%	-0.80%	-0.10%	0	-4.53%	0.31%	32.224	35.60%	-0.13%	-0.16%	0.10%			
78/83	-0.14%	1.51%	-0.40%	-0.06%	-4.30%	0.40%	1.28%	62.55%	-0.32%	-0.16%	0.36%	0.14%			
Forest	1373	7361	14832	23585	1003	15525	32246	5611	109869	178817	15282	203183			
1978	1897	8814	17651	26882	2089	18788	28483	7444	108511	173715	12398	189577			
% loss/gain 56/78	0.74%	0.48%	0.86%	0.44%	0.37%	4.02%	-0.52%	7.444	1.49%	-0.85%	-0.15%	-0.08%			
78/83	1.28%	-0.61%	-0.49%	0.83%	5.18%	0.47%	-0.46%	2.82%	-0.12%	-1.21%	-0.10%	-0.05%			
Swamp	0	203	40013	40217	49732	46840	33131	13658	203673	14090	361123	401340			
1978	0	169	37032	37201	63387	34237	23688	12000	180152	1751	305225	342425			
% loss/gain 56/78	0%	-0.70%	-0.34%	-0.34%	0.33%	-0.20%	-1.23%	-1.30%	-0.55%	-3.98%	-0.70%	-0.67%			
78/83	0%	-1.01%	-0.19%	-0.20%	0.35%	-0.89%	-1.12%	-0.13%	-0.43%	-5.85%	-0.46%	0.42%			
Shrub/crub	1411	928	10233	12572	382	441	2254	3840	3547	939	11415	23986			
1978	2781	3527	10193	16471	2012	12178	5703	2330	8350	1454	32028	46497			
% loss/gain 56/78	4.52%	12.71%	-0.62%	1.41%	0.79%	121%	6.85%	7.82%	-1.86%	0.15%	3.32%	4.50%			
78/83	7.47%	8.58%	-0.01%	2.00%	19.78%	155%	7.82%	7.22%	-0.45%	1.82%	11.04%	6.26%			
Total	378405	493714	328706	1211914	117333	739488	601683	171880	594845	289478	2508720	3720634			
1978	274424	437277	311158	1022888	112471	589312	449767	93870	642888	225170	2012189	3033046			
% loss/gain 56/78	-1.20%	-0.52%	-0.37%	-0.71%	-0.19%	-0.87%	-1.15%	-0.99%	-2.05%	-0.93%	-0.93%	-0.83%			
78/83	-0.34%	-0.07%	-0.21%	-0.41%	-0.18%	-0.87%	0.88%	0.32%	-6.50%	1.32%	-0.59%	-0.33%			

*Adopted from Dunbar et al (1980)

mi2/yr	-3.013	6.33	1.11	-7.74	-0.32	-7.73	-8.28	-1.33	3.083	5.83	-22.97	-30.7
acres loss/yr	1288ac	3409ac	712ac	4954ac	265ac	4947ac	5938ac	891ac	1980ac	3731ac	14701ac	10648ac
% loss/gain/yr	-0.34%	-0.89%	-0.21%	-0.41%	-0.18%	-0.87%	-0.99%	-0.50%	0.33%	-1.32%	0.59%	-0.53%
% change 1978-83	73%	35.69%	43.20%	42.30%	5.26%	27.98%	13.50%	75.70%	17.50%	41.84%	34.44%	38.14%
Multipier X 56/78	0.27	1.33	0.57	0.56	0.82	0.72	0.86	0.24	0.83	0.59	0.65	0.63

*Notes

Mims, J. D., Lindstedt, D., Cahoon, and J. Barma. 1980. Environmental Characteristics and Habitat Change for the Louisiana Coastal Zone pp 187-204. In: D. Cahoon and C. Gray (eds.) A Study of Marsh Management Practices in Coastal Louisiana. Final Report
Dunbar, J. L., Brink, and E. Kemp et al. 1980. Land Loss Rates. Report 2 L. Chenier Plain, US Corps of Engineers, New Orleans, La. 27 pp. - Appendix.
Habitat figures for 56/78 changes do not include waterbodies or other non-vegetated wetland areas.
Forest habitat category includes all forest types from upland pines to bottomland hardwoods.
Non-tresh marsh includes the combination of intermediate, brackish, and saline marsh types.
Multiply the 56/78 and loss values by 0.838 (83.8%) overall or by the specific basin multipliers (except for land gain, for land gain, multiply by % change and add or sub) in order to arrive at an approximation of the 1980 Dunbar et al land loss values

Table 2. Land loss per hydrologic basin 1956, 1978, 1983. (Clark 1990)

wetland habitat and habitat loss from 1956 through 1984 within each habitat and hydrologic unit of the Louisiana coastal zone (Mossa et al. 1990).

Some areas of the Louisiana coastal zone are losing land at a greater rate than the average. The Barataria Basin in the Deltaic Plain is one example. From 1956 to 1978, a land loss of 18% (216,000 ac) was noted. From 1978 to 1984, there was a 25% change in land cover, with 4% (50,651 ac) consisting of marsh converting to open water (Mossa et al. 1990). Out of a total of 1,150,000 ac, 287,912 ac (25%) of Barataria Basin wetlands were lost during the period 1956 to 1984 (Mossa et al. 1990). Sasser et al. (1986) reported a 77.4% loss in wetland area in the southwestern Barataria Basin from 1945 to 1980 (a decrease from 130,560 ac in 1945 to only 29,455 ac in 1980).

In analyzing changes in wetland habitats from 1956 to 1978, certain areas along the coastal zone had high wetland loss rates (Frontispiece). Most land loss occurred in the interior marshes of Cameron Parish east and west of Black Lake; in the interior marshes between Sabine and Calcasieu Lakes; east of Lake Calcasieu; south of White Lake in Vermilion Parish; in the interior marshes near the northern portion of Marone Point in southwest St. Mary Parish; northwest Terrebonne Parish; central Terrebonne, Lafourche, and Jefferson Parishes; the mouth of the Mississippi River; areas adjacent to the MRGO; and the northeast shoreline of Lake Pontchartrain (Frontispiece). Coastal swamp and marsh losses are occurring throughout the Louisiana coastal zone except for the Atchafalaya Bay region where land is actively being built by the prograding Atchafalaya Deltaic system.

The areas of greatest fresh marsh loss from 1956 to 1978 were in the Breton Sound (-4.3%/yr, 94.6%), Barataria (-3.7%/yr, 81% in 22 yrs), and Sabine-Calcasieu (-3.5%/yr, 77%) Hydrologic Units (Figure 2). The Breton (-6%/yr, 36%), Barataria (-3.1%/yr, 18.6%), and Mermentau (-2.1%/yr, 12.6%) hydrologic units had large fresh marsh losses from 1978 to 1984 (Table 1). Non-fresh marsh habitats (intermediate, brackish, and saline marshes) increased in most hydrologic units from 1978 to 1983, except for the Atchafalaya (-4.3%/yr), Teche/Vermilion (-0.5%/yr), and Pontchartrain (-0.3%/yr) hydrologic units (Dunbar and Kemp 1990). Swamp habitats experienced an average decrease of 0.4%/yr over all the coastal zone hydrologic units, with the Breton Sound Hydrologic Unit experiencing a 5.7% annual swamp loss. Swamp building is occurring in the Atchafalaya Delta Hydrologic Unit (+0.35%/yr) because of willow tree development on the recent delta deposits. Shrub/scrub habitat gained in every hydrologic unit in the coast, with the exception of the Teche/Vermilion and the Mississippi River units, at an average rate of +6.3% annually from 1978 to 1983. Overall, however, wetland habitats experienced a net 0.53% annual loss of area from 1956 to 1983 (Table 2) (Mossa et al. 1990; Dunbar and Kemp 1990).

Land loss is caused by natural and human actions. Natural causes include sea-level rise, subsidence, lack of sedimentation, saltwater intrusion, muskrat and nutria "eat outs," tidal scour, and wave action (Turner 1985; Walker et al. 1987). Man-made hydrologic alterations of the coastal wetlands have accelerated these losses (Davis 1973; Gosselink et al. 1979; Craig et al. 1980; Turner et al. 1982; Scaife et al. 1983; Day et al. 1986). Human actions include canal construction, dredging and filling, total impoundments, levees, and toxic discharges.

Two major coastal wetland problems in Louisiana's coastal zone are: (1) wetland losses or the conversion of wetlands to open water, uplands, and other habitat types; and (2) wetland change to more saline habitat types. Sasser et al. (1986) used the term "submergence rates" to refer to all factors that combine to raise water levels and thereby increase "land sinking" in coastal Louisiana. These factors are true sea-level rise, lack of sedimentation, and subsidence resulting from both compaction and coastal downwarping (Sasser et al. 1986). Saltwater intrusion, storms, and human-induced impacts also cause wetland loss and habitat changes. Furthermore, saltwater intrusion is caused by human-induced hydrological changes such as leveeing the Mississippi River

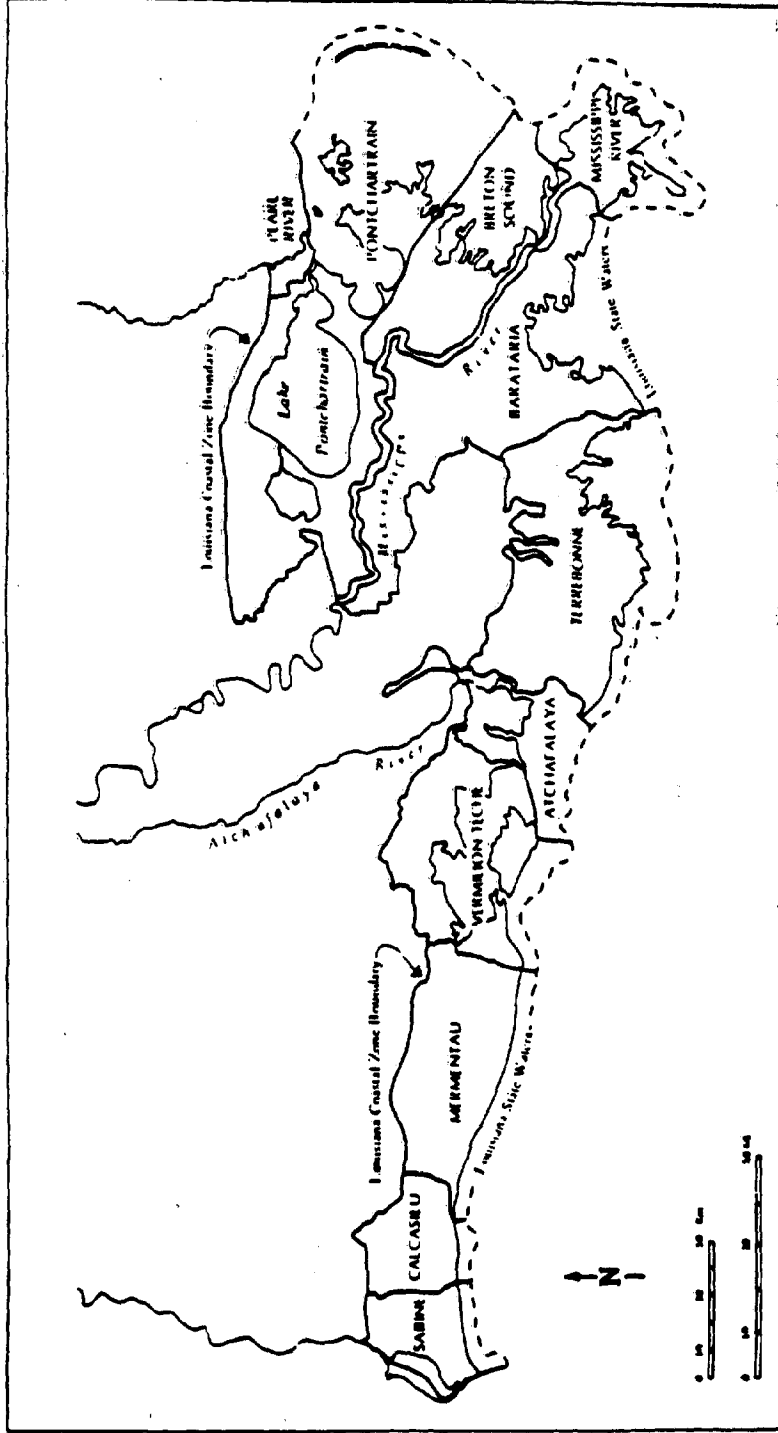


Figure 2. Coastal zone boundary of Louisiana (Cahoon and Groat 1990).

and its tributaries, construction of canals and navigation channels, and by subsidence and sea-level rise. Shoreline erosion caused by increased water levels, wave action, and boat wakes also contributes to wetland loss. Pollutants from petroleum exploration and production often contribute to wetland losses through oil spills, brine discharges, produced waters, and other chemical spills. Animal "eat outs" may denude areas of vegetation, leading to eventual conversion of the site to open water. Turner and Cahoon (1988) separate the causes of wetland loss into the following: direct habitat change or alteration caused by human development activities; sea-level rise; subsidence; hydrologic changes, which, in turn, are caused by saltwater intrusion; the leveeing of coastal rivers; reduction in sediment sources; canalization; spoil banks; hurricanes/storms; increase in fetch and boat wakes; major flood events; brine, drilling fluids, and oil discharges and spills; and animal "eat outs."

Seven causes of submergence, or sea-level rise, that is, the vertical relationship between land and water surfaces, are: eustacy (true sea-level rise); geosyncline downwarping; compaction of tertiary and Pleistocene deposits; Holocene deposit compaction; localized consolidation; tectonic activity; and subsurface fluid withdrawal (Kolb and van Lopik 1958; Adams et al. 1976 in Mossa et al. 1990). Human activities may aggravate some of the above, resulting in accelerated submergence. The leveeing of the Mississippi River and subsequent channeling of sediments off the continental shelf may be increasing the rate of geosyncline downwarping. Human-induced subsurface fluid withdrawal results from either forced drainage activities which remove water just below the surface or by petroleum or other mineral operations extracting products from below the surface (i. e., oil, gas, and sulphur). As the water is removed, sediments compact because of the oxidation of organics and the physical elimination of water and its supporting ability.

The average subsidence/submergence rates in the coastal zone are approximately 0.39 in/yr (3.3 ft/100 yrs). Louisiana subsidence rates are approximately six times the world average rate of 0.065 in/yr. Subsidence rates along the Louisiana coast have ranged from a low of 0.048 in/yr (0.4 ft/100 yrs) to a high of 0.75 in/yr (6.3 ft/100 yrs) (Gagliano and van Beek 1970; Ramsey and Moslow 1987). Local subsidence rates could be as high as 4.7 in/yr (39 ft/100 yrs) or 12 times the average coastal subsidence rates (Turner and Cahoon 1988).

Superimposed on all the factors contributing to land sinking is the degree of sedimentation or vertical accretion. Average sedimentation rates are approximately 10 to 30% lower than "submergence" rates, especially in the interior marshes. Baumann (1980) and Hatton (1981) found sedimentation rates of 0.59 in/yr in riparian salt marshes, with only 0.26 in/yr to 0.36 in/yr for inland salt marshes of the Barataria Basin. Turner and Cahoon (1988) calculated mean coastal subsidence rates at 0.45 in/yr and sedimentation rates of 0.28 in/yr, creating a deficit or submergence rate of 0.17 in/yr (1.4 ft/100 yrs).

Sasser et al. (1986) indicated that "submergence rates" in the area of southwestern Barataria Bay were 0.11 in/yr from 1945 to 1956, and 0.5 in/yr from 1956 to 1980. This latter figure represents a 430% increase in the rates of water-level rise in the southwestern Barataria Bay area. Since the sedimentation rates are only 0.3 to 0.35 in/yr, the southwestern Barataria Basin marshes have a sedimentation deficit of 0.14 in/yr to 0.22 in/yr (14 to 22 in/100 yrs) (Sasser et al. 1986).

Submergence causes increased water levels, which may lead to saltwater intrusion. The dredging of canals may increase the movement of saltwater from saline to fresher wetlands, thereby contributing to saltwater intrusion. If the salinity increases suddenly in a fresh marsh or swamp, the fresh vegetation may be killed; if salinity increases gradually, the fresh vegetation may change through time to a more salt-tolerant group of species. With alteration of habitats, i.e., to more saline wetland types, changes in wildlife and fisheries assemblages occur. Plant and animal diversity has been found to decrease when fresher wetlands convert to more saline conditions. As a result, the habitat value for wildlife decreases over that previously found under fresher conditions. Of course, fresh marsh may convert to open water, resulting in decreased productivity

and diversity of the area's plants, wildlife, and fisheries. When the habitat maps produced by O'Neil (1949), and Chabreck and Linscombe (1978, 1991) are compared, a general trend of the increasing brackish and saline marshes, and the retreat of fresh and intermediate marshes can be observed.

Major hurricanes and storms may accelerate wetland loss by increasing flooding and saltwater intrusion in fresher areas. Muller and Fielding (1987) describe the hurricanes that struck the coast from 1900 to 1986. Major floods can affect coastal vegetation by causing vegetation stress similar to that which occurs in impoundment situations. Major flood events occurred in 1940, 1953, 1977, 1979, and 1983 (Mossa et al. 1990). In the past, some leveed areas have caused an aggravation of hurricane impacts because high salinity waters trapped behind levees killed the fresher wetland vegetation. Impoundments and semi-impoundments, with the proper design and operation of structures, can expedite drainage after hurricanes and thereby reduce hurricane impacts to the marshes.

Muskrat and nutria are the prime animal causes of wetland losses in coastal Louisiana because they eat all of the vegetation within a specific area when their populations reach critical levels. The nutria is an introduced species that is particularly prone to overpopulation. Ponds may form in the unvegetated areas created by the animals which, if water levels remain high, may not revegetate. The Alligatorweed Flea Beetle, by eating alligatorweed (*Alternanthera philoxeroides*), has denuded large coastal areas of this plant, which is a valuable animal food providing a basis for the formation of flotant (floating) marshes. Both alligatorweed and the Alligatorweed Flea Beetle are also introduced species.

Human-induced impacts in the form of levees along the Mississippi River, canals, dredge and fill activities, urban and agricultural expansion, and urban and agricultural point and nonpoint pollutants also are responsible for wetland loss and habitat change in coastal Louisiana. The dredging of petroleum and navigation canals causes direct wetland losses and leads to increased tidal input and physical erosion of area soils and wetlands. These canals, with their associated spoil banks, alter the natural hydrology by stopping or hindering the "sheet flow" of water over the marsh and causing impoundments or the accumulation of too much water in the marsh (Craig et al. 1979; Scaife et al. 1983; Deegan et al. 1984; Sasser et al. 1986; SCS 1987; van Beek 1989). Canals increased from 1% of area to 10% in southwestern Barataria Bay or from 42 mi in 1945 to 312 mi in 1980 (Sasser et al. 1986).

Turner and Cahoon (1988) stated that canals and spoil banks in coastal Louisiana, which included petroleum access canals, were responsible for 239,048 ac (8,877 mi) of direct impacts by 1978, two years prior to the beginning of the LCRP. It was estimated that by 1985 the direct impacts of pipeline and petroleum access canals and spoil banks in coastal Louisiana covered 192,000 ac (7,130 mi) (Lindstedt and Nunn 1985 and Lindstedt et al. 1991). There may therefore be over 10,000 mi of navigation canals at the present time. The CMD has no data concerning the indirect impacts of these or other activities with the exception of Scaife et al. (1983), who indicated that generally the indirect to direct impact ratio was 7.69 to 1. Craig et al. (1980) stated that canals enlarge from 2 to 15% per year or may double every 5 to 35 years. Scaife et al. (1983) also postulated that 89% of the total land loss in coastal Louisiana was due to canals of all types, and of this 89%, 6.5% was direct loss and 50% was indirect loss resulting from petroleum canals (Scaife et al. 1983). Unfortunately, this information is of little use in determining what secondary and indirect impacts occur as a result of canals regulated by the LCRP because the studies are based on research done on canals dredged prior to the implementation of the LCRP (and some even before the Section 404 permitting process of the Corps of Engineers). Through its regulatory program, CMD has required that canal and spoil bank widths be standardized and that canals be plugged on abandonment. The program has also regulated the siting of canals to avoid hydrologic, salinity, and erosion impacts, but there has been no research on the indirect impacts of canals that were so constructed. In any event, the major contributors to wetland losses are the large navigation canals,

such as the Mississippi River Gulf Outlet (MRGO), the Gulf Intracoastal Waterway (GIWW), the Freshwater Bayou Canal, the Houma Navigation Canal, and the Calcasieu Ship Channel.

Oil spills destroy wetland vegetation as well as wildlife and fisheries resources, and brine discharges may cause coastal wetland losses if spilled or leaked into adjacent wetlands. Oil spills and brine discharges contribute directly to coastal wetland loss and habitat change by covering vegetation, coating beaches and shorelines, and changing the water quality. The extent of the threat of these types of activities on wetland loss and habitat change in Louisiana is relatively low. Dredging and filling, sea-level rise, and submergence are the major threats to coastal wetlands.

CHARACTERIZATION OF EXISTING PROGRAMS ON WETLANDS

The Louisiana response to coastal wetland loss, habitat change, and pollution includes the following regulatory and restoration activities and programs. The Department of Natural Resources, Office of Coastal Restoration and Management, administers the Louisiana coastal management and restoration programs. In the LCRP (La. R.S 49: 214.21-214.41) within the CMD, coastal use permit applications are reviewed for projects that may cause significant impacts on the coastal zone. The LCRP depends on existing Coastal Use Guidelines and rules for the review of permit applications. For example, in the case of developments, CMD determines if the project is of minimal size, if alternative locations have been considered, whether restoration is practical and mitigation is necessary, or when the best practical techniques should be employed. The purpose is to have a project with minimal adverse impacts on the surrounding wetlands.

The LCRP also has enforcement and federal consistency programs that complement the permitting program. Other CMD programs provide support for the regulatory aspects of the program. These include the technical services, wetland resources, public information, field investigations, local coastal programs, special area management plans, and administrative programs.

The CMD receives approximately 1,500 Coastal Use Permit (CUP) applications annually. Only 50% of these applications require coastal use permits. The majority of the applications that do not require permits are for uses exempted from the state program. Examples of activities that are exempt are uses located outside of the coastal zone boundary, in fastlands, on areas above 5 ft MSL, or are single family residences or camps. Some of the other activities which do not require permits have been determined by the CMD to have no direct and significant impact on coastal waters or are covered by a Corps of Engineers general permit found to be concurrently consistent with the LCRP. The impact of those projects which are exempt, or for which permitting is not required, is not known at this time because the CMD has not been keeping records of the area disturbed by these projects. However, most of these exempt projects have very little adverse effect on coastal waters because they are located in areas separated from tidal influence (i. e., fastlands) or they do not involve any dredging or filling of coastal wetlands. In 1990, the total area disturbed or altered by permitted adverse projects was one-tenth of that in 1982 (196 ac in 1990 vs 1925 ac in 1982) (Figure 3), partly because of regulatory activities and partly because of a reduction in applications due to a downturn in the state's economy.

The United States Army Corps of Engineers regulates activities affecting wetlands through the Section 404 permitting process. In conjunction with the Corps' Section 404 and Section 10 permitting program, the overall adverse impacts of many of these activities have been minimized by the CMD requiring the reduction in the size of projects, the use of best practical techniques, and mitigation. In addition to regulatory protection, annual congressional appropriations support large Corps' restoration projects, such as freshwater diversions, shoreline protection, and marsh creation. The Corps is able to do more restoration projects in conjunction with maintenance dredging projects for navigation. The Caernarvon Freshwater Diversion project and marsh creation along the Houma Navigation Canal are examples of two recently completed projects of

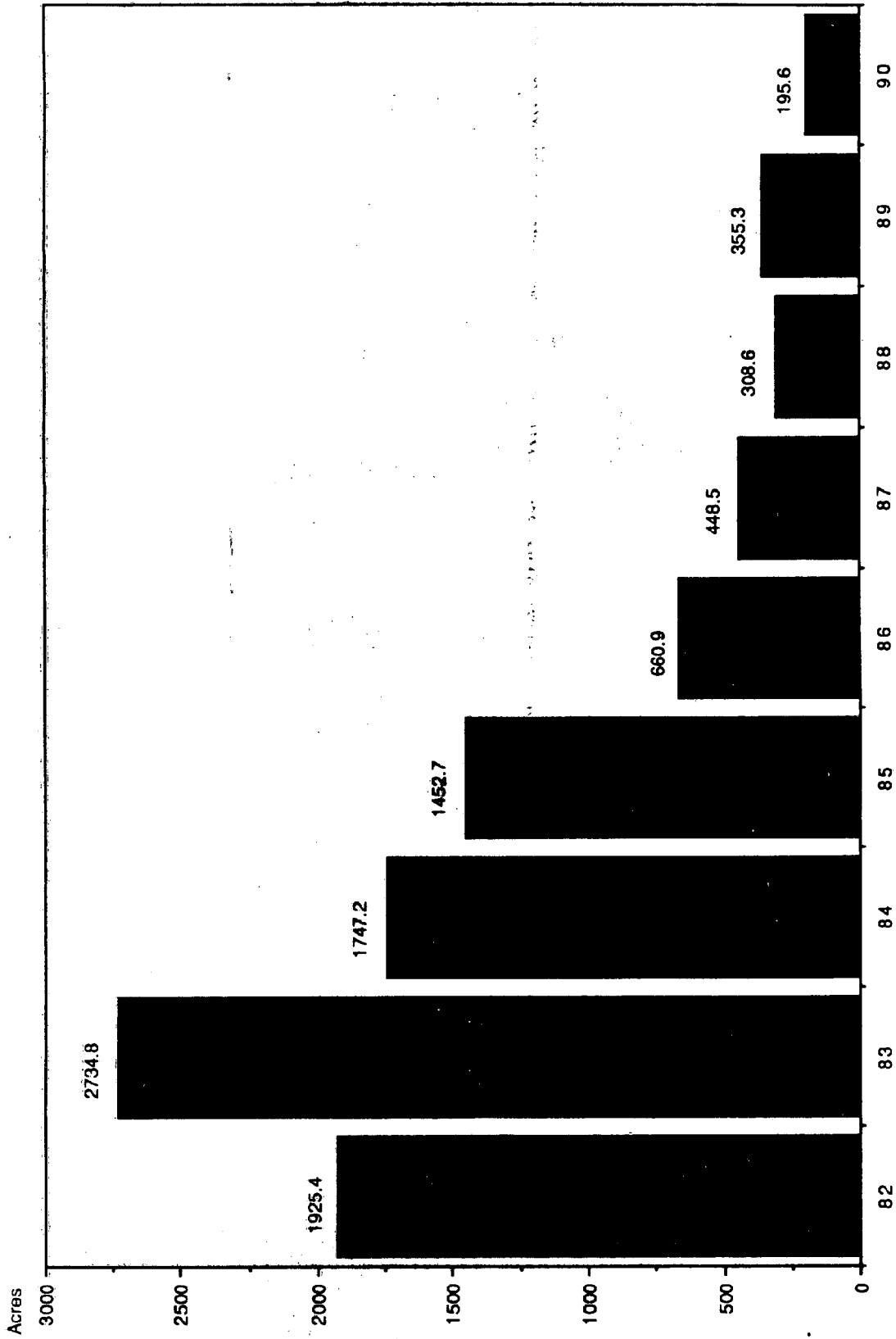


Figure 3. Disturbed acres for permits issued for vegetated wetlands.

this nature. In the near future, the Corps and other federal agencies will have additional coastal restoration funding from the Breaux Act (see below).

In addition to the regulatory solutions, state, federal, and local agencies have been increasingly involved in the implementation of various types of coastal restoration projects. The state's Coastal Restoration Program operates on a maximum of \$25 million annually for these projects. The federal Coastal Wetland Planning, Protection and Restoration Act (Breaux Act), currently in its first year, will provide up to \$32 million annually in restoration projects for coastal Louisiana. Additionally, coastal research concerning the causes of wetland problems, special wetland interagency projects, and public relations and exchange of information all assist these other programs in helping to solve or reduce Louisiana's coastal wetland problems by acquiring and disseminating more scientific information.

Louisiana's Coastal Restoration Program is called the "Coastal Wetlands Conservation and Restoration Plan" (La. R.S. 49:214.1-214.20). The plan includes the establishment of the Coastal Restoration Authority within the governor's office, a Coastal Restoration Task Force, and the "Wetlands Conservation and Restoration Fund." Funding of the Restoration plan is derived from oil and gas revenues and can be no higher than \$25 million per year. Four basic projects may be funded through the coastal restoration program: (1) freshwater, sediment, and nutrient diversion projects; (2) wetland management projects; (3) marsh restoration, sediment, and low-cost shoreline protection projects; and (4) gulf shoreline protection projects. In 1990/91, the legislature approved 35 projects, and in 1991/92, 50 projects. Completed projects or those presently under construction include: the Caernarvon Freshwater Diversion; LaReussite Freshwater Diversion; West Point a la Hache Freshwater Diversion; Holly Beach Shoreline Protection; Lake Salvador Shoreline Protection; Yellow Bayou Shoreline Protection; Central Wetlands Pump Outfall; Soil Conservation Service Vegetative Plantings; Falgout Canal Marsh Management; Bayou LaCache Marsh Management; Queen Bess Island Restoration; Wine Island Restoration; Violet Siphon; Bohemia Siphon; Cameron Creole Watershed Project; Sabine Vegetative Planting; Pecan Island Freshwater Introduction; LaBranche Shoreline Protection; Barrier Island Sediment Capture; and Pass a Loutre Sediment Diversion Projects (Coastal Restoration Division 1991). This program also provides state matching funding for Corps of Engineers' restoration projects. The above coastal restoration projects totaled \$25,579,730, with the Corps of Engineers providing \$4,700,000 (18.5%) or most of the funding for large diversion projects. Louisiana, with the passage of the 1981 Coastal Restoration Trust Fund, has attempted to begin some state-sponsored projects involving barrier island restoration, Mississippi River Freshwater Diversion Projects, vegetative plantings, and wetland management (Chambers and Clark 1986; Spicer et al. 1986; deMond et al. 1985).

The Breaux Act (PL-101-646; Title III), which passed Congress in November 1990, provides annual funding of up to \$32 million for coastal restoration efforts in Louisiana and should result in the development of the "Comprehensive Coastal Restoration Plan" at the end of three years (by 1993). Currently, a Task Force comprised of federal and state agencies is developing a list of projects to submit to Congress by November 1991.

Special interagency teams, composed of personnel from state, federal, and local agencies with coastal expertise, have been and continue to be effective in conceiving, implementing, and evaluating various special wetland projects that may have contributed to a reduction in the rates of coastal wetland losses. Some of these projects include the Bayou Penchant Working Group, the Soil Conservation Service Sabine-Calcasieu River Basin Study, the Cameron-Creole Watershed Advisory Committee, the EPA Non-Point Source Pollution Committee, the Terrebonne-Barataria National Estuary Program, and the Gulf of Mexico Initiative.

The Department of Natural Resources and the LCRP do not have any coastal land acquisition programs by which special areas in the coast can be preserved. However, mitigation funds are

sometimes directed towards the Louisiana Nature Conservancy, which does use these funds to acquire coastal wetlands and other special habitats.

The CMD is involved in several coastal research projects to determine the causes and effects of various coastal wetland processes that may relate to future coastal protection activities and the avoidance of adverse impacts from permitted projects. Some of the more recent studies include the Mitigation Project Study; Fastland Delineation Study; Spoil Island Vegetation Study; Study of the Use of Run-off Discharges in Coastal Louisiana for Wetland and Water Quality Enhancement; Spoil Bank Management Study; A Study of Marsh Management Practice in Coastal Louisiana; five staff marsh management fisheries studies; three contract wetland management fisheries studies; Marsh Management Sedimentation Study; Vegetational Analysis of the AVOCA Island Management Plan; Parish Mitigative Projects List; Lake Pontchartrain Basin Special Management Area Environmental Management Unit Mapping Project; Oil Spill Contingency Planning Review and Outer Continental Shelf (OCS) Planning; and other staff reports and studies.

The Louisiana Legislature passed Act 1040 of 1990, which provides for mandatory compensatory mitigation for projects permitted under the coastal use permitting program. The Act requires mitigation for any impacts to vegetated wetlands and establishes that mitigation banks may be created. Once implemented, the Act will have uniform standards for determining impacts and mitigation, and mitigation costs should become less variable; but its rules have not yet been promulgated. However, the CMD has been requiring mitigation for the unavoidable impacts of most uses on a case-by-case basis since the beginning of the coastal use permitting process, and this has not been limited to impacts to vegetated wetlands.

EFFECTIVENESS OF EXISTING PROGRAMS

In 1990, the total area disturbed or altered by permitted adverse projects was one-tenth of that in 1982 (196 ac in 1990 vs. 1,925 ac in 1982), and one-fourteenth (196 ac vs 2,735 ac) of that permitted to be disturbed in 1983. The highest permitted disturbed area was 2,735 ac in 1983. The reasons for this decrease in permitted disturbed area are the Geologic Review Program, decline in activity in the petroleum industry after 1983, permit review procedures, and mitigation programs. The permitted disturbed area fell from 2,735 ac to 1,747 ac in 1984, the first full year after the directional drilling review.

Of a total of 1,069 (119/yr) investigations by CMD during the period from 1983 to 1991, 61% were determined to be violations. There is no existing information to provide an analysis of the relative impacts in terms of area disturbed by these unpermitted activities. Most cases involved non-compliance with permit conditions. The disturbed area for these projects is confounded with the permitted area discussed above. Violation cases are frequently resolved by complete or partial restoration of the area or by the performance of mitigation activities which equal or exceed the violation's adverse impacts. A strong enforcement program within the CMD helps to ensure a strong permitting program.

A total of 85 coastal wetland restoration, creation, and enhancement projects (listed individually in the previous subsection) have been approved from 1990 to 1992 for implementation through the Coastal Restoration Program. These projects, begun in the 1990/1991 fiscal year, are projected to benefit coastal wetlands by preservation, enhancement or creation activities (over 306,275 ac), the equivalent of 9.5% of the present coastal wetlands, or 3.7% of the total coastal zone. The Corps of Engineers has provided most of the funding (see previous subsection) for large freshwater diversion projects such as Caernarvon. The Caernarvon, LaReussite, and West Point a la Hache freshwater diversions are projected to help preserve and enhance over 62,800 ac of coastal wetlands. This figure is part of the above total for the Coastal Restoration Program. Thus, a

significant amount of coastal wetlands may be protected by these state, federal, and local restoration programs.

POTENTIAL CHANGES TO CMD's WETLANDS PROGRAM

The possible methods to address the Wetland issue are as follows:

Strengthen the present permit and enforcement regulations to make them less ambiguous and clearer to understand;

Promulgate and implement the Mitigation Act Rules for Act 1040 entitled "Mitigation of Coastal Wetland Losses," which was approved by the state legislature in 1990;

Revise the Coastal Use Guidelines to reduce ambiguous and unclear language, and add new guidelines in areas such as wetland management where additional guidelines may be needed;

Draft federal consistency regulations which would include wetland standards;

Evaluate the present "fastland" and "Coastal Zone Boundary Definitions," and other exemptions under the present program to determine whether exempt activities are causing impacts to coastal resources;

Increase the number of general permits to make their processing more efficient by shortening the review time for these types of activities and by freeing the staff to work on projects with significant impacts;

Increase cooperation with other state, federal, and local agencies in joint projects which assist in the preservation, enhancement, or restoration of coastal wetlands;

Develop regulations based on research programs concerning coastal wetland losses and habitat changes; and

Develop regulations based on research concerning alternative technologies for the mitigation of adverse impacts caused by permitted activities.

Section 309(a)(2) -- COASTAL HAZARDS

INTRODUCTION

Coastal hazards manifest themselves as either natural phenomena or human-related incidents. Natural hazards are those extreme or rare geologic, atmospheric, and hydrologic events that adversely impact human life, property, or activity (Lander et al. 1979; Organization of American States 1987). Natural hazards, by definition, cannot exist apart from human activities and the choices in adjustments to the events (White 1974). Because of this interaction between the social and natural systems, humans may modify the location, occurrence, and magnitude of natural processes and in turn the vulnerability of an area. Development through its implementation (drainage, dredging, extraction, construction) modifies the forms and processes that compose the coastal systems. Change in itself is not always detrimental; but unwise use of the coastal zone can result in a short- and long-term commitment of resources that may be better allocated to more productive programs. This section identifies the natural and human-related hazards that exist in the Louisiana coastal zone, describes the location and magnitude of these hazards and the communities placed at risk, summarizes the interrelationships among natural hazards and people, identifies government programs dealing with these hazards, and finally, suggests changes to the existing CMD program. Through this analysis CMD hopes to develop parts of its program that contribute to the prevention or significant reduction of threats to life and destruction of property. Such an undertaking can be achieved by eliminating development and redevelopment in high hazard areas, managing development in other hazard areas, and anticipating and managing the effects of potential sea level rise.

COASTAL HAZARDS

Of the 15 most common natural hazards in the United States (Table 3) the Louisiana coastal zone is seriously affected by eight.

Table 3. Occurrence* and Severity of Natural Hazards in Louisiana.

<u>Significant Occurrence</u>		<u>Rare to Never</u>
Hurricane	Greatest impact	Avalanche
Storm surge		Drought
Flood		Earthquake
Unstable soil		Landslide
Coastal Erosion		Tsunami
Tornado		Volcano
Windstorm		Winter storm
Wildfire	Least impact	

*Source: The Council of State Governments 1979; Gale and Cortner 1987.

All of the hazards that occur in Louisiana are described because it is only through a complete understanding of the issues that an effective program can evolve. At this time Coastal Management Division guidelines apply to those actions that contribute to the protection of the public health, safety, and welfare. The hazards to which the CMD can most effectively apply its authority

include: hurricane damage; storm surge; floods; unstable soils; and coastal erosion. Tornadoes, windstorms, and wildfires are discussed to inform the public of the problem.

Hurricane season extends from June through November with the greatest number of storms expected during the first two weeks of September. Hurricane force winds exceed 74 mph and may extend 100 mi from the center. Extreme gusts may exceed 200 mph at a distance of 20 to 30 mi from the eye (Louisiana Office of Emergency Preparedness 1985). Figure 4 shows the vulnerability of the Louisiana coast to hurricanes. Southwest Louisiana between the Calcasieu River and Freshwater Bayou and Southeast Louisiana between Southwest Pass of the Mississippi River and the Orleans - St. Bernard parish line have the highest recurrence interval for a hurricane along the Louisiana coast. It must be recognized that these sections of the coast are arbitrary and do not confine or limit the zone of impact or extent of damages from any storm. Most hurricanes approach the Louisiana coast from the south or southeast and cross the shoreline at a high angle before moving inland. Thus, the worst damage can be expected in the right front quadrant, normally the northeast quadrant, and out approximately 50 mi. Occasionally, however, a storm will parallel the shoreline, lingering for days and causing unexpected damages. Such was the case in 1985 when Hurricane Juan looped twice south of Morgan City before paralleling the shoreline and crossing the mouth of the Mississippi River and continuing to the east.

General destruction of the physical, biological, and cultural elements follows the path of a hurricane. Eroded barrier islands and beaches may retreat over 100 ft under the pounding of storm waves. Rising water and high winds destroy wetlands resulting in open water bodies and toppled trees. Camps that are not demolished float from their foundations and may be found miles from their original location. Levees are topped and highways, bridges, and infrastructure (water, sewage, and power lines) require extensive repair or replacement. The aftermath of a hurricane means the despoilment of the natural systems and a cost of billions of dollars in property damage of residential and commercial damage.

Several storms have become milestones when discussing the impacts of hurricanes on Louisiana (U.S. Army Corps of Engineers 1972). The 1915 storm pushed water levels to 13 ft at Fernier Beach and 12 ft at Pointe a la Hache. Over 25,000 homes or structures were damaged or destroyed in New Orleans when the City flooded to a depth between 1 to 8 ft. Four decades later, the 1947 storm flooded almost all of southeast Louisiana. Many parts of Jefferson Parish were under 6 ft of water, and Moisant Airport (now New Orleans International Airport) had 6 in of water on the runway and could not operate. After a much shorter hiatus, Hurricane Audrey, probably the most tragic, occurred in June 1957. Audrey crossed the Cameron coast placing 12.4 ft of water in the town of Cameron and 8.5 ft of water in Morgan City over 100 mi to the east. Many people could not escape the rising water, and 556 died. Water from Hurricane Betsy (1965) covered 2.5 million ac; fatalities numbered 81; and damages exceeded \$2 billion. Although Hurricane Camille (1969) expended most of its fury on the Mississippi coast, Louisiana east of the Mississippi River was heavily damaged by a storm surge of over 11 ft.

Hurricanes can not be discussed without reference to storm surge, as they are inseparable. Storm surge is the rapid rise of water above mean sea level produced by a hurricane (Strahler and Strahler 1984). Surge is the result of low barometric pressure in the eye, wind setup, and wave setup. Most of the damages and loss of life are directly attributable to storm surge and the failure of individuals to evacuate in a timely fashion. Figure 4 is a composite that shows the inland extent and maximum inundation along the Louisiana coast as a result of hurricane flooding. No part of the study area is immune from hurricanes. Within the 19 parishes in the Louisiana Coastal Zone live an estimated 2,050,000 people. Like the other parts of the country, the Louisiana population is getting older, a significant issue if evacuation is required before a storm.

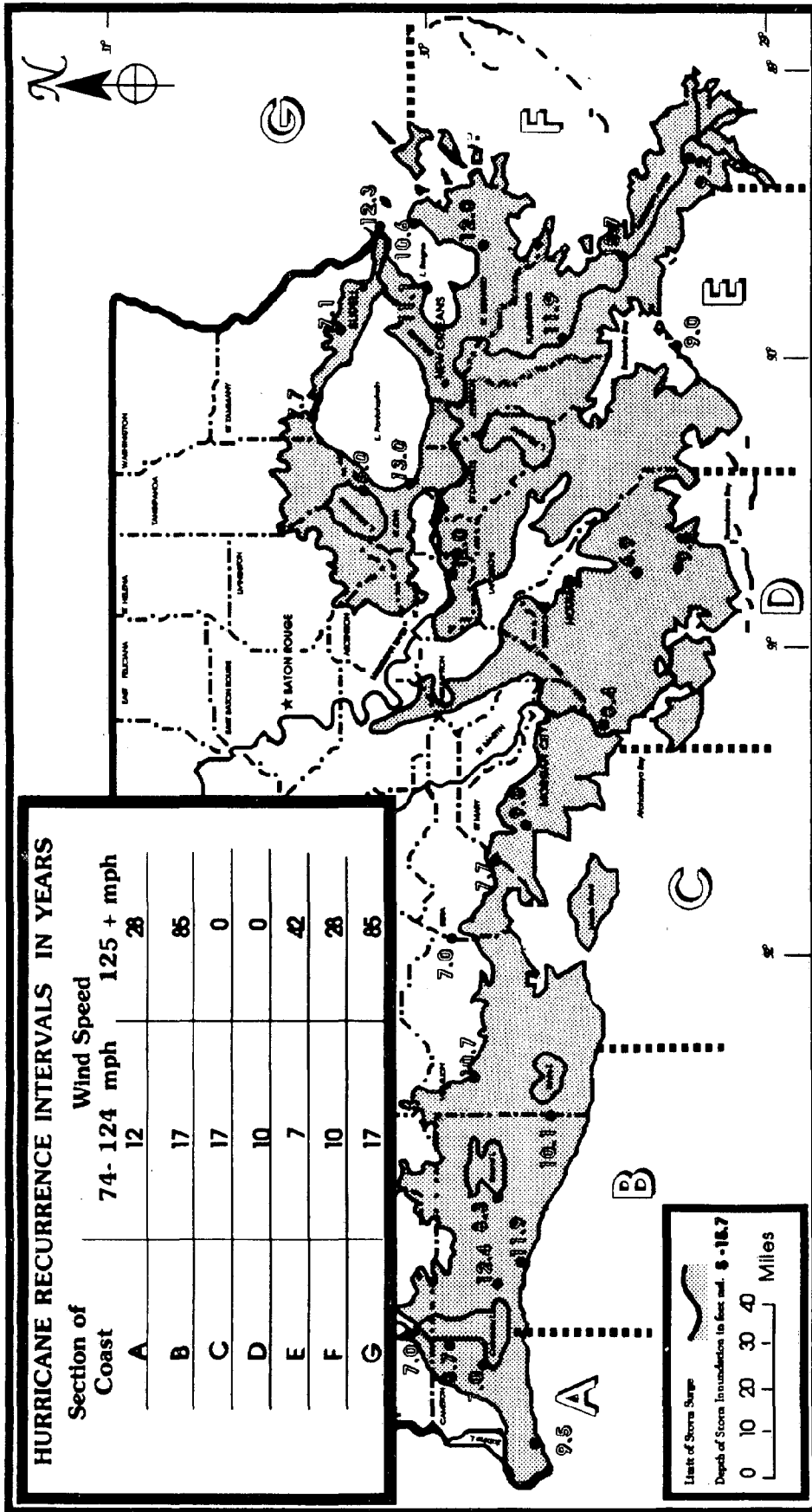


Figure 4. Hurricane recurrence intervals and historic inland storm-surge limit with depths of inundation (Sources: USACE 1972; Carter 1988).

Gulf surges can occur during other times of the year, directly affecting the low intertributary wetlands and impinging onto the more populated natural levees of the Mississippi River and its abandoned distributaries. Along the entire coast, persistent onshore winds contribute to flooding. South and southeast winds in the spring and summer build water elevations in the estuaries. In the case of Lakes Maurepas and Pontchartrain, upland runoff is prevented from entering the lakes, a particularly regular problem in the lower Amite River Basin to the west of Lake Maurepas. In the Spring of 1991, the low-lying coastal areas south of Houma flooded, as did the Barataria Basin and the area around Lake Palourde. Strong and unrelenting south winds caused backwater flooding by preventing runoff from heavy precipitation or pushed Gulf waters into the bays and estuaries, flooding roads, yards, and fields.

Floods (Figure 5) in the coastal zone may be the result of hurricanes, storms, onshore winds, or heavy precipitation either in the wetlands or on adjacent uplands. The first three are discussed above. This section focuses on precipitation and runoff either in the state or in the watersheds that directly affect the coastal zone. Spring floods from the Mississippi River are contained by the U.S. Army Corps of Engineers flood control levees and spillways. The levees work so well that they prevent annual introduction of freshwater and sediment into the low-lying intertributary basins, a primary cause for wetland loss throughout the coastal zone (Turner and Cahoon 1987). However, concern has been expressed about the causes of flooding in Terrebonne Parish, as flow on the Lower Atchafalaya River increases, and about the need or advisability of constructing a levee at Avoca Island. Interested parties are meeting on this project and may eventually arrive at an acceptable solution. Another example of flooding in the coastal zone is the problem in east Cameron Parish. This part of Cameron receives water from the Mermentau River watershed, the Gulf Intracoastal Waterway, the Bell City Drainage Ditch south of La. Hwy. 14, and the Calcasieu River. When the water is high in these four tributaries, the lowlands are flooded (GSRI 1986).

Precipitation in Louisiana results from storms commonly associated with polar fronts, squall lines and tropical fronts, tropical weather systems, and showers and thunderstorms (Muller and Willis 1983). Heaviest rains accompany thunderstorms; for example, on February 5, 1955, 1 in of precipitation fell in five minutes in New Orleans, a rate of 12 in/hr. Fortunately, thunderstorms are of short duration and never approach this total even though flooding may result. Occasionally thunderstorms produce high winds which contribute to the damage within a community.

A final meteorological phenomenon, the tornado, that can cause problems in coastal Louisiana. Tornadoes are small (300 to 1500 ft in diameter at its lower end) but very intense low pressure centers. Their winds circulate in a counterclockwise direction and may reach speeds in excess of 250 mph. Tornadoes form in advance of cold fronts or in association with hurricanes, and are most frequent during the spring and summer; however, they may occur at any time. Although tornadoes only occasionally penetrate the coast, they can be very destructive when they do occur. Winds uproot trees, demolish trailer parks, and damage structures.

The term "unstable soils" in Louisiana refers to land subsidence or "the loss of surface elevation due to removal of subsurface support" (National Research Council 1991). Subsidence is caused by crustal deformation; sediment compaction; withdrawal of groundwater, petroleum, and geothermal fluids; and dewatering of organic soils. Natural movement along faults and human caused fault movement have occurred in the coastal zone, but they are rare events. Most subsidence problems result from unstable soils. Subsidence in this regard refers to the lowering of surface elevation as a result of the drainage of wetlands soils, that is, those characterized as very poorly drained, having mucky surface and underlying material, and low strength. Unstable soils are most commonly found in the intertributary basins and the Chenier Plain. When these soils are drained the surface subsides because of "(1) shrinkage caused by desiccation, (2) consolidation from loss of the buoyant force of groundwater or from loading, (3) compaction, and (4) biochemical oxidation" (SCS 1983). Initial subsidence takes place during the three years after

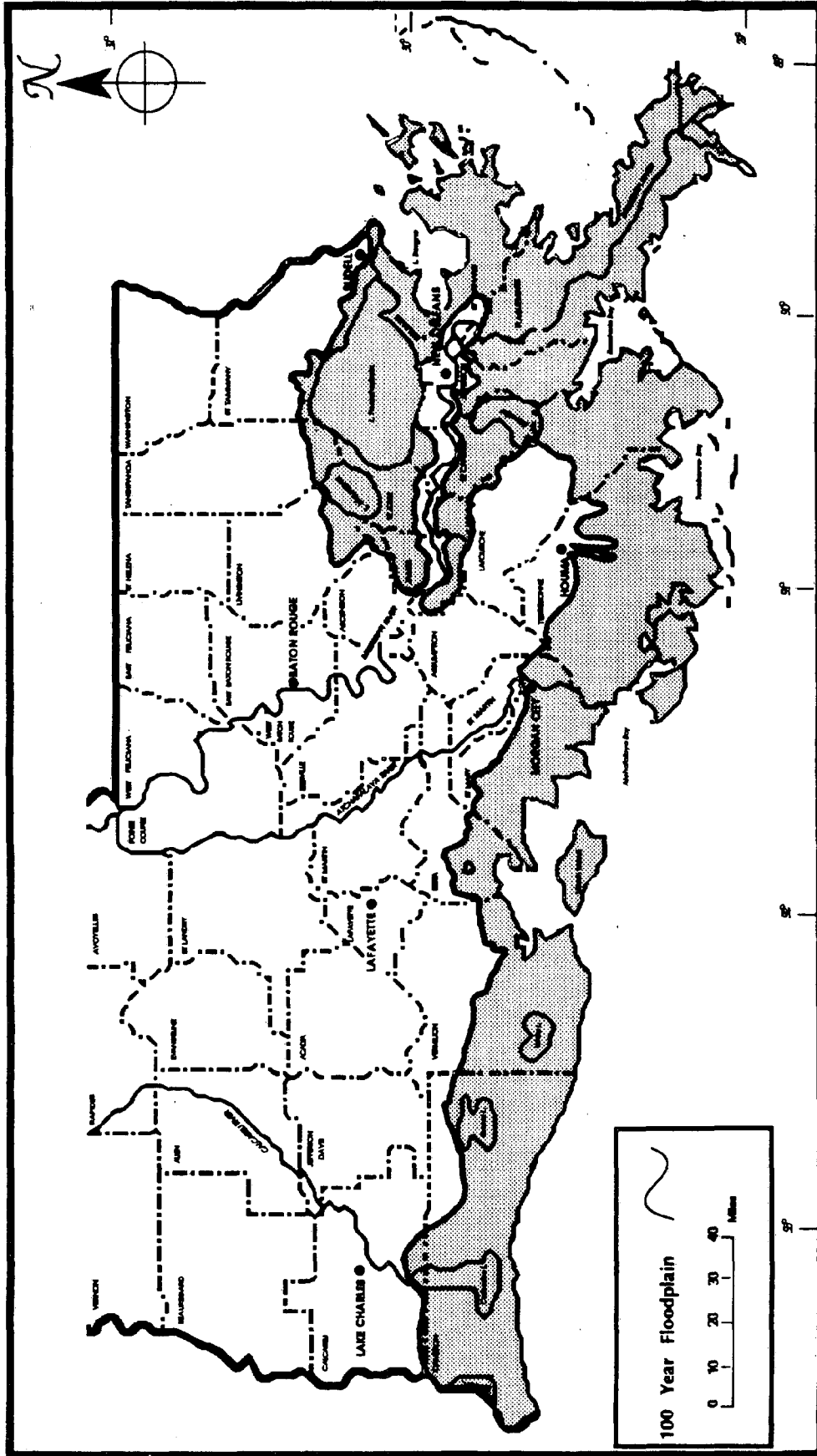


Figure 5. The 100-year flood plain (Source: Emmer et al. 1983)

drainage. Approximately 50% of the thickness of the organic material above the groundwater will be lost. Shrinkage continues after initial subsidence at a rate of 0.5 in to 2 in/yr. For example, in Jefferson Parish the total subsidence potential in some areas is 144 in (SCS 1983). Subsidence places severe limitations on urban uses. Pilings must be used to support foundations so that slabs will not crack and/or tilt; however, this does not help the utility lines, patios, sidewalks, and driveways which are not supported. They may be displaced to the extent that they are no longer serviceable or must be replaced. Most of the Louisiana coastal zone is affected by unstable soils.

Sea-level rise contributes to the relative rate of subsidence. Estimates for the global rate of sea-level rise by the year 2100 range from 22 to 144 in (Titus 1989). Such a significant rise in sea level when combined with the many factors that contribute to subsidence (geosyncline downwarping, compaction of sediments, consolidation of materials, tectonic activity, and fluid withdrawal) will have a devastating effect on the low-lying coastal zone (Penland et al. 1989; Ramsey and Penland 1990). Several problems expected as a result of sea-level rise include community inundation, an increase in the frequency and severity of storms and storm surge, accelerated shoreline erosion, inundation of wetlands and wetland loss, modification of coastal processes, and damage to shoreline structures and land uses (Klarin and Hershman 1990). Coastal communities, particularly outside levee systems, will be affected (Figure 6).

Coastal erosion is a dominant process along the Louisiana shoreline (Figure 6). Several studies have investigated the history and causes of erosion (Coleman 1966; Frazier 1967; Mendelssohn et al. 1987; Morgan et al. 1958; Nummedal et al. 1984; van Lopik 1955; Wicker et al. 1989a and 1989b). Causes include: diminishing sand supplies; relative sea level rise; storms; human actions, such as jetties and navigation canals; tides; and mean annual nearshore wave energy. Barrier island degradation is a common phenomenon as deltas shift from one course to another. The barrier islands and beaches from the Mississippi state line to Atchafalaya Bay are eroding except for two sections, one at the eastern end of Grand Isle and the second at the western end of Timbalier Island. Along the Chenier Plain, accretion is occurring from the vicinity of Marsh Island west approximately 25 mi into Vermilion Parish and in Cameron Parish from the Mermantau River to west of the Calcasieu River. Rates of erosion range from almost 57 ft/yr in the Fourchon region to 10 ft/yr in sections of Grand Isle. Where accretion does occur it is significantly less, that is, from a high of 30 ft/yr on eastern Grand Isle to 8.5 ft/yr in Cameron Parish. Accretion is in response to the progradation of the Atchafalaya River and the ready supply of sediment to be swept along the Vermilion and Cameron shoreline.

Finally, wildfires are a sign of late fall and winter, when trappers traditionally burn the marsh to encourage new growth of vegetation. These fires usually do not directly impact communities, as in the burning of homes or other structures; however, smoke contributes to the presence of smog. One of the most infamous regions was the eastern end of the Lake Pontchartrain estuary, primarily in Orleans and St. Bernard Parishes. Several major accidents found their origin in the thick smog that blinded drivers on Interstate Hwy. 10. In addition, smoke adds to air pollution, particularly in an area where air quality is already low. The practice of burning is on the decline because of a loss of wetlands serving as habitat for furbearing animals, stricter enforcement by state and local authorities, and the acquisition of most of eastern Orleans Parish for the Bayou Sauvage National Wildlife Area.

The impact of natural hazards on the population and economy of the Louisiana coastal zone, as defined by Act 361 of 1978, as amended, is minimal. At first it appears that Louisiana is in a very fortunate position until the reality of the situation is understood. The inland boundary of the Louisiana coastal zone is drawn in a manner that excludes, for the most part, cities, towns, and industrial complexes, except for metropolitan New Orleans and the river parishes between Baton Rouge and New Orleans. These two areas, however, are little affected by the CUP process, and subsequently the coastal guidelines, because most industries and much of the commercial and residential developments are on lands above 5 ft in elevation or are within fastlands. Only when

projects have a direct and significant effect on coastal waters will the CMD initiate the CUP process.

CHARACTERIZATION OF EXISTING PROGRAMS ON COASTAL HAZARDS

Coastal hazards are addressed by the federal, state, and local levels of government. Several federal programs influence the presence of projects in coastal high hazard areas. The Federal Emergency Management Agency (FEMA) and the Flood Insurance Administration oversee the National Flood Insurance Program (NFIP). The NFIP sets requirements for structures and activities within the 100-year floodplain in participating communities. For example, habitable structures must have their first floor at or above the 100-year flood level. In lower Plaquemines Parish some structures may be as much as 18 ft above ground level. Commercial structures may be flood-proofed to prevent or reduce damages from inundation. The Community Rating System (CRS) is a second program within the purview of FEMA that encourages governments to directly confront development in flood prone areas. A community can take actions that result in up to a 50% reduction of premiums paid by flood insurance policy holders. Selected actions a community may undertake include: maintenance of elevation certificates; advising people of the flood hazard, the availability of flood insurance, and/or flood protection measures; advising prospective property purchasers of the flood hazard; having local libraries maintain and publicize documents on flood insurance, flood protection, and floodplain management; and implementing higher regulatory standards than required by the NFIP.

The U.S. Army Corps of Engineers has constructed an extensive hurricane levee protection system, particularly in southeastern Louisiana. Levees are constantly monitored and have been upgraded. Today some levees may be 17 ft MSL or more. The Lower Mississippi River flood control network of diversions, levees, and flood water retention areas is one of the most massive public works projects in the nation. Levees effectively keep freshwater and sediment from entering the intertributary basins. The Corps also studies coastal erosion to determine whether a project is feasible and possible. When Congress appropriates funds and a local sponsor is identified, the Corps will help stabilize a shoreline. In the case of Grand Isle, the Corps' dune restoration and beach enhancement project reestablished the shoreline and provided a buffer against storm surge. Attempts are being made to stabilize the barrier islands and beaches through hard and soft engineering practices. In the summer of 1991, the U.S. Army Corps of Engineers completed its dune creation and beach restoration project along the Grand Isle shoreline.

Under the Coastal Barrier Resources Act (CBRA) of 1982, as amended, the U.S. Department of the Interior has identified the development status of coastal barriers. The purpose of the CBRA is to: minimize loss of life; reduce/eliminate wasteful expenditure of federal revenues; and minimize damage to natural resources (fish and wildlife) that results from development of barriers. The Act prohibits federal flood insurance for new construction or substantial improvements on undeveloped barriers. In addition, federal financial assistance (loans, grants, guarantees, subsidies, and other assistance) and expenditures (U.S. Army Corps of Engineers structural development projects; highways; bridges; and housing) are prohibited on undeveloped barrier islands.

The last programs to affect development in coastal areas are federal regulatory activities. The Corps of Engineers administers the Clean Water Act, Section 404 (33U.S.C.A.1251-1376), a program that regulates the discharge of dredged or fill material into the waters of the United States, including coastal waters, wetlands, and navigable waters. Common activities requiring permits are beach nourishment, boat ramps, bulkheads, dams, dredge spoil disposal, fill levees, piers, and roadfill. The Rivers and Harbors Act of 1899 (33U.S.C.A.401-406) authorizes the Corps to protect navigable waters from obstruction and pollution. Permits must be obtained from the Corps for dredge and fill activities in navigable waterways. Through the Clean Water Act, Section 404(c) (40C.F.R.231) the Environmental Protection Agency has the authority to veto a Corps Section 404

permit if the adverse impacts on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas are unacceptable. Under Section 401 of the Clean Water Act (33U.S.C.A.1341) Louisiana may deny a certification if the applicant does not demonstrate to the state's satisfaction that a project complies with state water quality standards for effluent limitations on discharges. When the state denies certification of a project, then federal agencies cannot issue permits or licenses. States can place conditions on certificates to protect wetlands and thereby minimize the use of these areas for intensive development subject to coastal hazards. The review and comment authority granted the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service through the Fish and Wildlife Coordination Act. By protecting habitat and discouraging the modification of wetlands, these two agencies help reduce encroachment of development onto high-hazard areas.

At the state level, the SLCRMA of 1978, as amended, is the program that comes closest to addressing the many aspects of coastal hazards. The SLCRMA has as its declared policies:

- (1) To protect,...the resources of the state's coastal zone.
- (5) To develop and implement a coastal resources management program which is based on consideration of our resources, the environment, the needs of the people of the state,...

These two goals allow the CMD a degree of latitude for considering coastal hazards through its permit application review process. The first goal applies to programs designed to confront shoreline erosion, the protection and enhancement of wetlands to buffer storm surge and serve as storage areas for floodwaters. Goal 2 addresses the importance of the environmental components to the CMD, which considers unstable soils, earthquakes, and meteorological events as part of its decision-making procedures. The CMD presently addresses natural hazards through the implementation of specific Coastal Use Guidelines. The most applicable Guidelines include: 1.6a, b, c, l, r, and s; Guideline 1.7i, s, and t; Guidelines 5.2, 5.9, 6.1b, 6.2a, and 6.4 (Appendix). These guidelines authorize CMD to evaluate construction of project, the effect it will have on barrier islands, and on the value of wetlands.

Other state agencies, such as the Louisiana Department of Wildlife and Fisheries (LDWF), through its review and comment authority, strives to protect wetlands, thus buffering storm surge and reducing coastal erosion. Parishes and municipalities learned that unregulated construction on unstable soils is not in the public's best interest. Mitigation is now required for construction; for example, Jefferson Parish requires pile foundations to support the load of the building and flexible connectors for gas lines. The Louisiana Department of Transportation and Development has attempted to control erosion along the Cameron Parish coast to protect La. Hwy. 82 between Holly Beach and Peveto Beach. Jetties and groins are examples of hard practices found along the coast that inevitably cause erosion in the downdrift direction. The Office of Emergency Preparedness plays its part in its program through the coordination of civil defense and emergency evacuation plans and hurricane preparedness activities.

Some local governments actively consider coastal hazards. Terrebonne Parish used spoil from the Houma Navigation Canal to build part of the Isles Dernieres at Wine Island Pass. To the east sand has been placed along the Fourchon shoreline to restore dunes and the beach. To help retard erosion the Fourchon Port Commission sponsored the construction of cement-filled tubes, the boudan bags (Edgerton 1991). But many attempts by human intervention in natural processes are not successful. It is estimated that 10% of the total barrier island area was directly lost, as a result of unsuccessful projects (Mendelssohn et al. 1987). A third example of local involvement is Jefferson Parish and its requirements for flexible utility connections to structures on unstable soils. Most parishes follow the Southern Building Code which standardizes protection of the public health and safety.

EFFECTIVENESS OF EXISTING PROGRAMS

No detailed studies of the effectiveness of existing programs on coastal hazards is known to exist. However, some generalizations about federal and state hazard-related programs can be made based only on observations. In order to receive flood insurance new structures must be elevated or flood-proofed. All of the parishes and communities in the coastal zone participate. In some cases housing units have been raised to 18 ft above the ground surface, causing unhappy responses from residents. Informants from lower Plaquemines Parish say the NFIP has severely retarded development, but this does not seem to be the case in other parts of the coastal zone. The National Flood Insurance program seems to be a very effective method of reducing coastal flooding damages by causing buildings to be raised. But the NFIP has apparently not significantly restricted development. Residences and camps are under construction throughout the coastal zone. The Community Rating System is in its first year of full implementation. Many communities in the coastal zone have submitted applications for a rate reduction, but to date no evaluation on the effectiveness of the CRS has been completed.

The U.S. Army Corps of Engineers hurricane protection levee system has for the most part kept hurricane storm surge from entering populated areas. The present levee and pump system has not really been tested since 1969 and 1965, dates of the two most recent large storms. But at that time the Plaquemines Parish levees were topped as were portions of the levees in Orleans, St. Bernard, and other coastal parishes. Mainline Mississippi River flood control levees have not been topped or failed for more than 50 years. The 1973 flood came very close to overwhelming the system when the Old River Control Structure nearly failed and bank slumping required several levee set backs. The levee system has prohibited annual overflow, thus reducing the quantity and quality of water and sediment into the interdistributary basin. This issue is discussed in more detail in the sections on cumulative/secondary impacts and wetlands.

The Coastal Barrier Resources Act seems to be one of the contributing factors in slowing, if not stopping, development on barrier islands and beaches. The CBRA will have minimal effect in Louisiana because of the absence of access routes to barriers. No study is known to analyze the impact of CBRA on Louisiana.

The Corps of Engineers Section 404 permit process has reduced the encroachment of development onto coastal high-hazard areas because both programs focus on wetlands and coastal waters. The effect of Section 10 actions is not known. The EPA Section 404c responsibility has been applied to coastal Louisiana and proved very effective. For example, EPA declared the Bayou au Carpe wetlands of significance and under Section 404(c) protected the estuarine wetlands from drainage. Water quality certification (Section 401) can delay a project, but is not known to have stopped any. The USFWS, the National Marine Fisheries Service, and the LDWF review and comment on federal and state permit applications. All three agencies have been effective in protecting wetlands by requiring mitigation (avoidance of wetlands, reduction in scope of a project, and compensation). Thus, development has been restricted from the most flood prone and dangerous areas of the coastal zone. But agency actions are undertaken primarily to conserve and protect wetlands from the discharge of dredge and fill material, and to reduce dredging, not protect the public health and safety.

Four major constraints inhibit the CMD's application of its coastal use guidelines to all parts of the legislatively defined coastal zone, thus limiting the effectiveness of the whole program. First, activities on land 5 ft or more above sea level or within fastlands do not require a permit unless they have a direct and significant impact on coastal waters. Second, some uses may occur on lands below 5 ft MSL but are exempt from the permitting process. Examples include agricultural, forestry, and aquaculture activities on lands consistently used in the past for such activities; construction of residences or camps; and activities that do not have a direct and significant impact

on coastal waters whether inside or outside the coastal zone boundary. The CMD only becomes involved with potential uses that are not within the coastal zone if these activities have a "direct and significant impact on coastal water." The meaning of "direct and significant impact on coastal water" is not clear and no standards or other criteria have been established for implementing this part of the CMD jurisdiction. The coastal document uses the phrase "to the maximum extent practicable" in 44 of 94 provisions for evaluating projects (Houck 1983). Houck (1983) makes a case for the tendency of this phrase to be used for maintaining a development posture in the coastal zone rather than equitably considering conservation during analysis.

The Louisiana Department of Wildlife and Fisheries has review and comment responsibilities on federal and state permits. The negative impacts of coastal hazards are reduced because the LDWL protect wetlands and coastal waterbodies.

Floods continue to plague cities throughout the coastal zone. Runoff from heavy rains collect in low-lying sections of New Orleans, Jefferson Parish, and most parishes because the pumps are too small to handle the intense precipitation. South and east winds prevent riverine flood waters from discharging into lakes and estuaries, thus causing backwater flooding along the lower reaches of water courses. As many studies have concluded, structural solutions for flood damage are not the complete answer. Nonstructural programs must be part of a package for reducing flood damage, a philosophy that is only partly accepted by decision-makers and coastal residents.

Across the state several deficiencies remain. Neither state agencies, parishes, nor local governments are known to consider geologic hazards (faulting or regional subsidence) when considering development. Setback limits on eroding shorelines (canals, bayous, rivers, lakes, or beaches) are unknown. Burning the marsh is restricted, but still occurs.

POTENTIAL CHANGES TO CMD'S COASTAL HAZARDS PROGRAM

Some possible methods to address the Coastal Hazards issue are as follows:

Initiate a closer working relationship with the FEMA through the Flood Insurance Administration by developing a MOU with the Louisiana Floodplain Management Section, Louisiana Department of Transportation and Development;

Initiate a public education program concerning coastal hazards, the nature of coastal hazards, and the means to avoid or prevent them;

Assure that natural and human-related hazards are incorporated into the review process on CUP applications. This would involve permit applicants completing a form attesting to the presence or absence of natural hazards within their project location and describing in writing how impacts of hazards would be eliminated or reduced to an acceptable level. These plans would be reviewed by the state agencies with whom they have Memoranda of Understanding or Agreement;

Prepare an analytical report on the issues and problems of restricting direct permitting authority to those activities that occur below the 5-ft contour and outside fastlands and develop appropriate management practices;

Initiate a public and agency review of the existing state guidelines and their application to coastal hazards. If it determines it is necessary for better protecting the public health and safety, changes could be recommended to the guidelines;

Investigate the effects of sea-level rise on the coastal zone to develop a method for confronting the issue of sea-level rise as it may affect permitting of activities in the coastal zone; and

Coordinate with the Louisiana Office of Emergency Preparedness to assure that projects seeking coastal use permits would have minimal susceptibility to coastal hazards and would not have a negative effect on hurricane evacuation plans.

Section 309(a)(3) -- PUBLIC ACCESS

INTRODUCTION

In coastal Louisiana (Figure 1), the public access refers to the ability of the average individual to use shorelines, coastal waters, and coastal wetlands. Shorelines are the interface between land and water, as represented by sand beaches (the area between high and low tide) and wetlands (Burk and Associates, Inc. 1978). Wetlands are:

Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (EPA 1980; USACE 1986).

Beaches offer the opportunity for traditional activities, such as walking, surf fishing, and swimming. Wetland shorelines are not suitable for these activities, but can be used for fishing and crabbing. Coastal waters and wetlands are used for hunting, crabbing, fishing, trapping, and boating. The purpose of this section is to describe the way people use coastal beaches, waters, and wetlands, to determine the effectiveness of existing programs, and to propose possible changes to the existing coastal program. Through this analysis CMD hopes to attain increased opportunities for public access, taking into account current and future public access needs to coastal areas of recreational, historical, aesthetic, ecological, and cultural value.

PUBLIC ACCESS

Within the top ten ranked recreational undertakings the one consumptive use is fishing, a sport enjoyed 61,508,445 times in 1985, the most recent year for which information is available (Office of State Parks 1989). During the summer of that year an estimated 45.5% of Louisiana citizens went fishing. Louisiana's coastal waters and wetlands provide the resource base for most of these trips.

In many parts of the country the concept of public access is usually limited to thoughts of beaches and how vast interior populations can reach and use these ribbons of sand. The Louisiana situation is significantly different because of the state's geologic history as a deltaic plain.

Louisiana has an abundance of natural shoreline; however, the majority of this shoreline is marsh, as is the area behind the shore. The marsh terrain, more than any other factor, hinders public access to the coastal shorefront and discourages the use of the shorefront for typical beach activities (i.e., bathing, wading, sun bathing, walking, and surf fishing). To a lesser extent, the small number of public beach areas and conflicting development along the shorefront discourage public use of the coastal shore. Both public and private shorefront recreational development is hindered by the marsh terrain which limits the amount of useable beach and access to it (Burk and Associates 1978, p. 10).

Nothing has changed since this report was prepared in 1978.

Recreation in Louisiana is furnished by both the public and private sectors of the economy. Several large federal and state recreational areas devoted to hunting, fishing, and related uses. Statewide, local governments supply less than 8% of the campsites and less than 2% of the hunting acreage. Non-profit groups that furnish some access to the outdoors include the YMCA, church camps, and hunting clubs. Commercial facilities concentrate on those activities that are profitable, such as tent and trailer camping facilities. The federal and state facilities are fewer in number, but

have greater acreage and are directed toward the more primary types of recreations, such as hunting and camping.

The public accesses the coastal waters and wetlands in several ways. First, federal, state, local, levee board, and private boat launches are found throughout the coastal zone. Government launches are improved ramps with parking areas, sometimes with sanitary facilities and piers, and almost always with trash barrels. Commercial launches, in addition to ramps and usually parking (many times very limited), include electric hoists, bait, groceries, restaurants, and sanitary facilities (occasionally primitive). To supplement these access points numerous federal, state, and local highway crossings of major waterways have unofficial boat launches, that is, tracks cleared of vegetation, rutted banks, and parking next to the highway. For example, along Interstate Hwy. 10 between the La. Hwy. 22 Exit in Ascension Parish and the U.S. Hwy. 51 Exit in St. John Parish every intersection with a major bayou or canal is accessible by small boat carried on either the back of a pickup truck or on a small trailer.

Second, state and parish roads that cross the wetlands provide opportunities for using the wetlands and coastal waters. Seasonally, favored spots attract crowds of families and individual recreationists who fish, shrimp, and crab for an entire day. Selected examples of the more heavily utilized locations include La. Hwy. 27 south of Hackberry in Cameron Parish; La. Hwy. 82 north of Pecan Island in Vermilion Parish; La. Hwy. 1 south of Leesville in Lafourche Parish; the Fourchon area at the terminus of La. Hwy. 3090; and along La. Hwy. 434 south of Lacombe in St. Tammany Parish. These areas are for the most part inadequate. Highway locations are unsafe because cars park within the right-of-way on very narrow shoulders, or, in some instances, on the roadway; individuals fish and crab from bridges that were not designed for such uses and are not wide enough to accommodate the conflicting uses of recreation and vehicular travel; children play near and on the roadway; and no sanitary facilities exist. It can be said without reservation that people will fish and crab anywhere in the coastal zone where there is access to water, whether or not it is safe.

Third, the public benefits from the coastal zone when they construct camps and permanent homes on leased land or on parcels they own (Figure 7). Camps are "seasonally occupied recreational dwellings" (Gary and Davis 1979, p.2) that are used by a significant population for day or overnight use of the coastal wetlands. Gary and Davis (1979) counted 10,220 camps; 17% are in the Chenier Plain, mostly in clusters such as Holly, Rutherford, and Constance beaches, and the remainder in the Deltaic Plain, of which approximately 3,500 are accessible only by water. Figure 7 shows the distribution of the largest clusters of dwellings. Structures range from single rooms that serve all functions to larger multistory buildings having several rooms, including a kitchen and bathroom. Along the roads water is for the most part from a central treatment system, while in the marsh freshwater is from cisterns. Sanitary facilities may only be a pipe leading into the marsh or adjacent water body behind the camp. Camps have been cited as a major contributor to estuarine water pollution problems and the necessity to close shellfish beds. Pilings raise the living area above anticipated storm-surge levels because of concern for the threat or as mandated by the NFIP. Some buildings may be as high as 18 ft above the parking area and lawn, which flood during high tides, for example in south Terrebonne Parish. These units provide important access to coastal Louisiana when they serve as bases for fishing and hunting.

CHARACTERIZATION OF EXISTING PROGRAMS ON PUBLIC ACCESS

Federal, state, and local agencies furnish public access. Federal agencies have taken specific actions to provide public access of selected holdings. The U.S. Fish and Wildlife Service has boat ramps, interpretative walks, and allows bird watching, nature study, walking, hunting, fishing, and crabbing on most of its property (Figure 7). On the Sabine Wildlife Refuge is a one-mile walkway into the marsh. The Jean Lafitte National Park, composed of several satellite units,

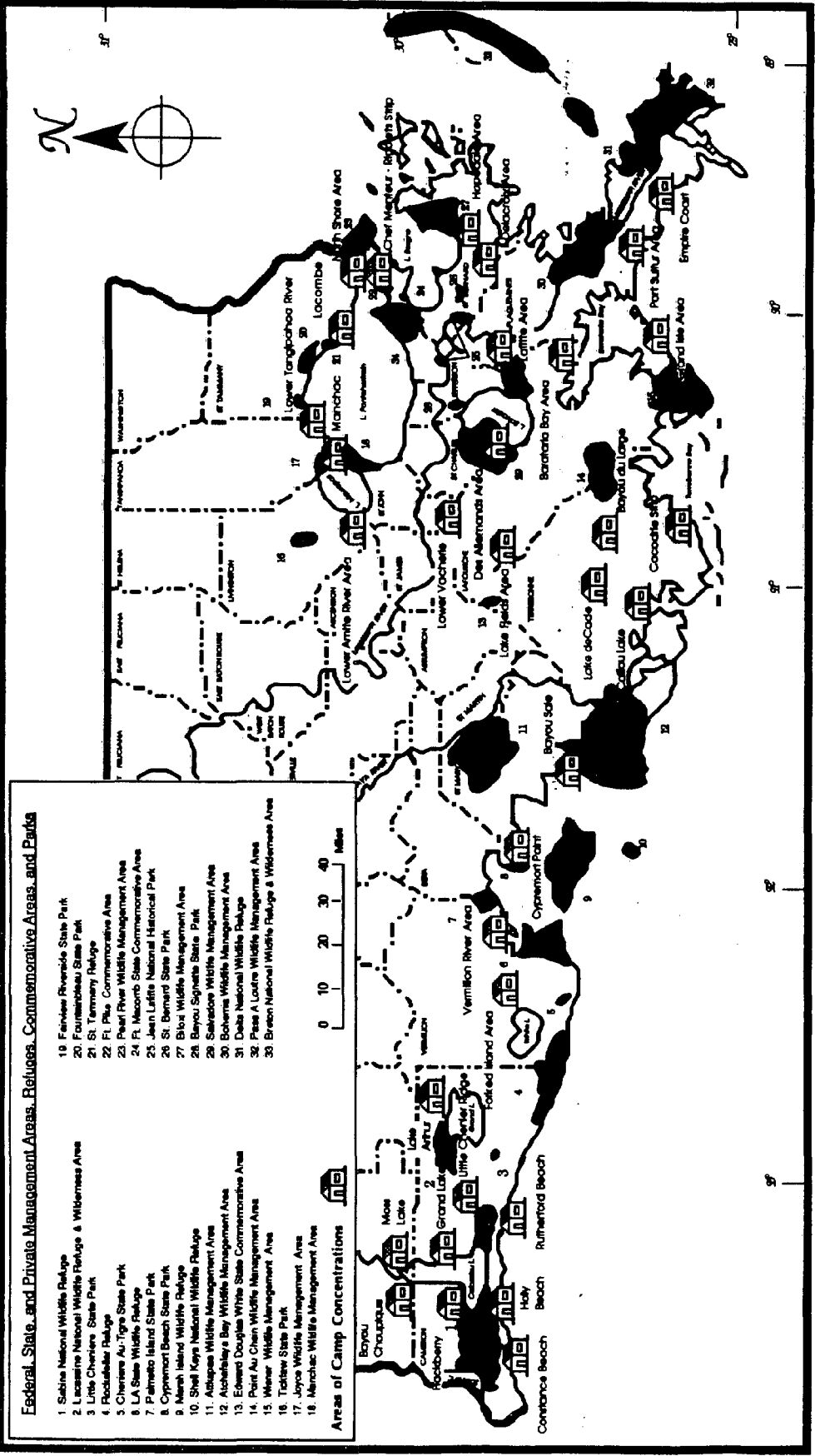


Figure 7. Public recreation lands and camp concentrations (Sources: Gary and Davis 1979; Reinhart, Rouse and Reggio 1986).

provides access to the wetlands along interpretative walks, canoe trails, and a visitors' information center. The U.S. Army Corps of Engineers, in cooperation with St. Charles Parish, is developing a master recreation plan of the Bonnet Carre Spillway just west of New Orleans. The plan will include shooting zones, fishing areas, camping sites, and an improved boat ramp.

At the state level, the Louisiana Department of Wildlife and Fisheries builds and maintains boat ramps on its management areas, has interpretative walks into the wetlands, such as in the Joyce Wildlife Management Area (Tangipahoa Parish), has cabins for rent, and allows camping, trailer hookups (Grand Isle State Park), hunting, fishing, and crabbing on much of its property. The Louisiana Department of Culture, Recreation and Tourism oversees the state parks and commmerative areas. Several of these have furnished cabins for rent to the general public (Bayou Signette in Jefferson Parish), campgrounds (Cypremort Point State Park), boat launches (Fort Pike Commerative Area), comfort stations, and picnicing facilities. The Louisiana Department of Transportation and Development in cooperation with the Federal Highway Administration incorporates boat launches into the interstate highway rights-of-way. Two large launches are along Interstate Highway 55, one in St. John Parish and one in Tangipahoa Parish. Unfortunately, neither have comfort stations. Local governments in conjunction with levee boards support parks and build and maintain boat launches. Orleans and Jefferson Parishes best exemplify this relationship.

Distributed throughout the coastal zone are examples of projects that, although not primarily designed for public access, still furnish a chance to use the coastal zone. The Corps of Engineers' beach restoration program on Grand Isle, although primarily for hurricane protection, serves the public for swimming, walking, fishing, and crabbing. A similar cases occurs in the Fourchon area at the mouth of Bayou Lafourche. The Port Commission has a beach restoration program for the protection of inland development. This is one of the few stretches of sandy shoreline that is accessible by automobile. As a consequence the beach is heavily used by campers, surf fishers, and crabbers throughout the year. A recreationist must travel to Cameron Parish before again being able to access approximately 26 mi of barrier beach shoreline by automobile. Along the Cameron Parish shoreline the Louisiana Department of Transportation and Development is trying to restore the beach to prevent erosion of La. Hwy. 82 west of Holly Beach.

One of the most significant recreational issues confronting the state is protecting the natural environment from destruction (Office of State Parks 1989). The CMD does not build, operate, or maintain facilities for public access into the coastal zone. It assesses areas for public access and recreation based on the following considerations: the need and priority of islands; the provision of increased physical and visual access; the natural and cultural features; the needs of urban residents; and the present supply versus future demand for public facilities (Louisiana Coastal Resources Program 1980).

The role of the CMD is the protection of the renewable resource base, one of the most significant recreation issues confronting the state (Office of State Parks 1989). The CMD undertakes its responsibilities through the implementation of the following Coastal Use Guidelines: 1.6 l; n; p; q; 1.7 e; p; q; 1.9; 3.7; 3.8; 5.2; 5.3; 5.6; 6.5; 6.8; and 6.9 (Appendix). Most of the Coastal Use Guidelines are applicable to the conservation, preservation, and/or rehabilitation of wetlands. The ones referenced above seem most directly applicable to this report.

EFFECTIVENESS OF EXISTING PROGRAMS

The present programs do not provide adequate access to the coastal wetlands, coastal waters, or shorelines. According to the State Comprehensive Outdoor Recreation Plan (SCORP) (Office of State Parks 1989) Louisiana does not have sufficient boat launches. Acreage for public hunting should be increased. An insufficient number of beaches are accessible by automobile. During the summer Grand Isle State Park is usually filled to capacity.

Effective programs providing access to the coastal zone include the Corps of Engineers' hurricane protection program for Grand Isle, which relies on beach restoration, and by coincidence is effective in providing public access. In the Fourchon area the Port Commission's beach program also is designed for protection of inland development, but, by its very existence, provides public access. The Cameron shoreline maintenance program allows for limited public access. Erosion is a primary problem in each in these areas. As a result public access exists only for that period of time that the sand remains as a beach.

The CMD's permit procedure and implementation of coastal use guidelines are effective mechanisms for protecting wetlands, although there is some conflict of opinion (Houck 1983). The wetlands section and cumulative/secondary impacts section of this report describes the accomplishment of CMD in addressing these two issues to the benefit of the public.

POTENTIAL CHANGES TO CMD's PUBLIC ACCESS PROGRAM

Some possible methods to address the Public Access issue are as follows:

Develop and implement a plan to improve public access to the coastal wetlands, water bodies, and shorelines through the Louisiana regulatory, statutory, and legal system;

Develop policies that would require public access be made a part of any mitigation measures applicable to a permitted project which threatened to reduce access;

Update the 1978 public access document;

Designate public access sites as Areas of Particular Concern, Areas for Preservation or Restoration, or special management areas;

Develop and incorporate into the LCRP an education program on public access by developing maps, brochures, and other written materials as well as a slide presentation and script that could be distributed to schools, fraternal organizations, service groups, and the general public;

Advise other agencies on incorporation of public access facilities into their coastal projects so the state derives unanticipated benefits such as those associated with the Department of Transportation and Development coastal erosion program; and

Work with the Department of Culture, Recreation, and Tourism to determine where access needs are greatest and then work within the limits of the coastal program to encourage greater access.

Section 309(a)(4) -- MARINE DEBRIS

INTRODUCTION

The people of Louisiana use the coastal zone and nearshore waters for recreation year around. In the winter, redfish are in the marsh and ducks are in ponds. In the spring fishing takes over with boating and skiing entering in June. By the time summer arrives camping, swimming, boating, and crabbing bring people into the water and onto the marsh. In the fall people are fishing and hunting. Commercial fishing and trapping and oil and gas extraction, both onshore and offshore, occur throughout the year. As a result of these activities, a tremendous amount of trash is generated and unfortunately not brought back to land for proper disposal. Marine debris is the litter and trash that accumulates along the beaches and waterways of the coastal zone. This section describes the problem, then characterizes the existing programs, discusses the effectiveness of existing programs, and finally, proposes the changes the CMD could make to its program.

MARINE DEBRIS

The presence of marine debris on Louisiana's beaches and in coastal waters has economic, health and safety, and ecological impacts. Loss of tourist dollars from visitors finding debris-strewn beaches unappealing; expenditure of scarce tax dollars for beach cleaning; fouling of cooling intakes and propellers of recreational and commercial vessels; potential injury to beach users who encounter broken glass, rusting metal, or containers of toxic, hazardous, or unknown chemicals; and the injury and death of marine life are all impacts of marine debris.

An 18-month study of marine debris in coastal Louisiana has determined that from 2590 to 23,154 items/mi litter the beaches (Lindstedt and Holmes 1988a). Plastic items constitute 47% of the items, polystyrene 16%, glass 10%, metal 7%, rope 7%, paper 7%, and other items 6%. These amounts vary by season, location, and accessibility to the beach. By grouping identifiable marine debris into waste types, possible origins may be inferred. Beverage-related items constitute 40% of identifiable (groupable) waste items; operational wastes 21%; galley wastes 15%; personal items 11%; and fishing items 6%. About 25 to 55% of all litter could be categorized in this way.

Except for the contributors of drink-related wastes, which is potentially everyone, the main contributors of marine debris appear to be offshore users, including recreational and commercial fishermen, the oil and gas industry and their service industries, and the maritime shipping industry. These groups may be individually accountable for only a small number of items specific to them, but galley, operational, and cargo wastes, and personal items probably come from all three sources.

CHARACTERIZATION OF EXISTING PROGRAMS ON MARINE DEBRIS

Nationally, marine debris has been attacked by federal legislation, particularly the Ocean Dumping Act, part of the Marine Protection, Research, and Sanctuaries Act of 1972, and the Marine Plastic Pollution Research and Control Act of 1987. The Ocean Dumping Act provides for domestic implementation of the London Dumping Convention. Among provisions outlawed are the common practice of transporting wastes for disposal in the high seas--beyond the 3-mi limit. The Marine Plastic Pollution Research and Control Act implemented Annex V of the International Convention for the Prevention of Pollution from Ships Treaty--commonly called MARPOL. This treaty and the resulting federal legislation prohibit vessels from disposing of plastics, and regulate the distance from shore that other types of garbage may be dumped. The United States Coast Guard is responsible for enforcing Annex V in U.S. waters.

Within the Gulf of Mexico marine debris has received additional attention. Federal legislation applicable to federal waters is applicable, plus the U.S. Department of the Interior, Minerals Management Service (MMS), which regulates oil and gas activities in the federal waters of the U.S., has a regulatory role. The MMS has issued OCS Orders on trash and debris to all lessees and operators of federal oil and gas leases in the Gulf of Mexico OCS region. The OCS Orders prohibit deliberate discharge of containers and other similar solid waste materials in the marine environment and require identifying marks on material weighing more than 40 pounds. Minerals Management personnel have been active in organizing and participating in beach cleanup activities and have adopted a mile of beach for periodic cleaning in Lafourche Parish.

In 1988, the EPA initiated its Gulf of Mexico Program to devise a strategy for protecting and enhancing environmental quality within the gulf. The program has identified issues that are pervasive and need immediate attention. Among them is marine debris.

At present the LCRP does not specifically address marine debris nor the impacts of marine debris through the Coastal Use Guidelines, which were established pursuant to the SLCRMA of 1978.

The CMD lacks the jurisdiction to enforce existing state anti-litter laws and has no regulatory authority over permitted sanitary or hazardous landfills. Nevertheless, it has funded research to quantify the presence of marine debris on Louisiana's coast and has cooperated with other state and federal agencies in supporting beach cleanups and publishing summary reports on cleanup results. The CMD has also funded publication of technical reports on the presence of marine debris on Louisiana beaches and a public information brochure on the problem of marine debris. And, finally, the CMD has sponsored speakers to address private groups and attend and make presentations at regional and national meetings dealing with marine debris.

Several state agencies are also involved with public education about litter and marine debris. The Adopt-A-Beach program, sponsored and coordinated by the Louisiana Litter Control and Recycling Commission (LLCRC), Department of Culture, Recreation and Tourism, encourages private groups to periodically clean selected stretches of Louisiana's beaches. The LLCRC also has been the lead state agency in coordinating state participation in the national annual beach cleanups in 1987, 1988, 1989, 1990 and 1991.

The Louisiana law (La. R.S. 25:1101-1116) that created the LLCRC also requires that it coordinate the various government and private organizations that deal with litter control and recycling, and encourage, organize, and coordinate voluntary campaigns to focus public attention on litter control and recycling. This statute established fines for littering, including littering from water vessels, and requires that owners of parking lots provide and maintain litter receptacles, which must be maintained by the state or local agency having jurisdiction. Public and private boat launches, and marinas both inside and outside the coastal zone are also included under the requirement.

The LDWF also promotes public education about litter, trash, and marine debris aimed specifically at recreational fishermen and boaters. The Enforcement Division of the LDWF is the primary state agency mandated to enforce the anti-litter laws on the state's waterways. Post certified agents may issue citations to anyone littering or discarding material into state waters. This restriction also applies on public lands and private property not owned by the individual. The Louisiana Department of Public Safety and Corrections, Office of State Police, may also issue citations for littering as may any parish sheriff.

The Louisiana Department of Environmental Quality (DEQ), Office of Solid and Hazardous Wastes, regulates the disposal of wastes in sanitary landfills and hazardous waste disposal sites. Marine debris collected during beach cleanups and not separated for recycling becomes solid waste and must be disposed of in accordance with regulations administered by this office. Some items that wash ashore in coastal Louisiana, such as 55-gallon drums with petroleum products,

chemicals, or unidentified contents, are considered hazardous and, if reported, are removed by the DEQ Hazardous Waste Emergency Response group. The Local Programs and Public Participation Division of DEQ promotes public education of the waste disposal problem and the need to recycle to reduce the waste stream. The Division works with parishes to establish local recycling programs. Although it is not directly related to marine debris, recycling in the coastal parishes could reduce the waste stream and consequently the amount that becomes marine debris.

EFFECTIVENESS OF EXISTING PROGRAMS

Marine debris, litter, and recycling are currently under the jurisdiction of at least three other state agencies. These agencies have funding and staff whose jobs are to promote waste reduction and recycling efforts, promote and coordinate anti-litter campaigns and cleanups, and to enforce existing state and federal anti-litter laws. The CMD has no staff available for such activities nor the jurisdiction to be involved in any capacity other than continuing the role of cooperating with the other state agencies and user groups.

The data collected from four years of voluntary beach cleanups along coastal Louisiana shows no conclusive trends that marine debris is either diminishing or increasing (Table 4). The percentage of plastic items collected has decreased since 1988. The percentage of collected items identified as galley wastes and operational wastes has decreased. Such trends may reflect the implementation of the MARPOL Treaty and resulting federal legislation. All data derived from voluntary beach cleanups should be viewed with extreme caution. Numerous factors such as meteorological conditions, accessibility of beaches, dedication of volunteers, and sampling and recording procedures are all problems that plague accurate data collection. Nevertheless, the statewide beach cleanups and Adopt-A-Beach program have contributed to public awareness of the marine debris problem.

The enforcement of Annex V of MARPOL and the Marine Plastic Pollution Research and Control Act of 1987 should significantly reduce the deliberate disposal of plastics and other materials at sea. Designation of the Gulf of Mexico as a "special area" -- a provision of MARPOL -- could further reduce disposal of wastes in the gulf. The MMS OCS Orders regulating oil and gas activities should eliminate all debris disposal from that industry in the gulf; of course, there will always be some accidental loss. The desire of the Offshore Operators Committee to eliminate their industry as a source of marine debris and their worker education efforts have and will continue to be effective. Public education of the problem and a resulting change in attitude about the social acceptability of litter will provide the most effective solution. User industries, and environmental and sportsmen groups all have sponsored education efforts within their ranks. Such education will eventually increase awareness and change attitudes. The enforcement of existing state laws that fine persons convicted of littering in the marine environment could significantly affect attitudes and consequently reduce marine debris.

POTENTIAL CHANGES TO CMD's MARINE DEBRIS PROGRAM

The CMD does not have a formal Marine Debris Program and proposes no changes to this status.

Table 4. Data Collected from Four Years of Voluntary Beach Cleanup.

	1 1987	2 1988	3 1989	4 1990
Volunteers	3251+	2700	3450	4414
Data Cards used for analysis	412	?	?	582
Pounds of debris	400,000	180,000	110,000	250,000
Miles cleaned	60+	77	67	76
% of plastic items	42	74.42 (4th)	70.53 (3rd)	66.04 (6th) nationally
% of Galley wastes	19	15.31 (1st)	13.97 (1st)	9.39 (2nd) nationally
% Operational wastes	11	3.24 (3rd)	3.3 (2nd)	3.42 (3rd) nationally
% Fishing/Boat & Commercial Fishing wastes	4	7.55	11.4	8.7

Based on standard
indicator items

Source: Lindstedt and Holmes 1988b; O'Hara 1989; O'Hara 1990; Bierce and O'Hara 1991.

Section 309(a)(5) -- CUMULATIVE AND SECONDARY IMPACTS

INTRODUCTION

The Louisiana coastal zone is the site of many and varied uses, ranging from conservation projects, such as wildlife management areas, to intensive development, such as platform building yards or industrial complexes. Each of these actions occurs in a specific place and time, which may be limited in scope and extent, and thus not appear to have much of an impact on the natural and cultural systems. However, when individual uses are considered in total, they may actually have heretofore unrecognized adverse impacts that build until they become significant. In addition, any activity may be accompanied by associated development or elements that have an impact on the coastal zone. The term "cumulative impacts" describes the former issue, while the term "secondary impacts" denotes the latter. For purposes of this report cumulative impacts are "impacts increasing in significance due to the collective effects of a number of activities." (Louisiana Administrative Code Section 701, Chapter 7, Volume 17). "Secondary impacts" are "those impacts that result from uses ancillary to, or as a consequence of, an initial development " (Louisiana Coastal Resources Program [LCRP] 1980, Appendix m). In this section, cumulative and secondary impacts are considered together as the term "cumulative/secondary impacts." The following subsections discuss the types of cumulative/secondary impacts existing in the coastal zone. Then, the existing programs that address these impacts are presented and then evaluated for their effectiveness. Finally, the CMD proposes several ways for improving the state's coastal zone program.

CUMULATIVE AND SECONDARY IMPACTS

Cumulative/secondary impacts are the result of many of the common activities in the Louisiana coastal zone. The primary focus of the CMD has been to address these impacts to wetlands and those causing water pollution. These activities include, but are not limited to:

- Navigation and flood control projects
- Hydrocarbon extraction
- Interaction of two or more unrelated activities, and
- Single family residences and homes.

Each of these activities is discussed in more detail below.

Navigation and flood control projects result in the most severe cumulative/secondary impacts on the wetlands. Construction of major navigation canals, such as the Mississippi River Gulf Outlet (MRGO), the Houma Navigation Canal, and Freshwater Bayou cause direct conversion of thousands of acres of wetlands to open water, cover thousands of acres with spoil, isolate wetlands from historic hydrologic interchange, and allow for the introduction of saltwater into freshwater areas (Turner and Cahoon 1987; Wicker et al. 1989). Jetties constructed to restrict channels through the nearshore shoals result in deposition on the updrift side and significant erosion of beaches and wetlands on the downdrift side (Wicker et al. 1989). Navigation channels stimulate port developments, which in turn require filling of wetlands. The most easily recognized areas are along the Houma Navigation Canal, at the southern extent of Bayou Lafourche (Port Fourchon), and in the vicinity of Morgan City and Bayou Boeuf. Finally, canals allow for saltwater intrusion, a significant problem in St. Bernard Parish where the MRGO allowed saltwater to penetrate into a cypress swamp. The swamp has since been replaced by broken marsh and open water.

Flood protection projects have historically converted wetlands to drained lands for residential, commercial, and industrial development. All of Orleans Parish, except for the eastern extreme, is

surrounded by hurricane protection levees. East Jefferson Parish is completely enclosed. Many drainage districts and levee districts throughout the coastal zone, such as those existing and proposed in Terrebonne Parish, eventually lead to the destruction of wetlands. By building levees, flow and migration routes are blocked, reducing the habitat available for estuarine-dependent species. Levees and spoil banks also cover wetlands and shallow water bottoms, reducing even further the needed habitat.

Extraction of hydrocarbons usually requires the drilling of several wells, the installation of pipelines, and the construction of support and production facilities. Historically, oil and gas fields looked like a "spider web" of canals or roads, following only a master plan for accessing the resource. Pipelines, whether from well to production facility or from the field to the refinery, ran directly from one point to another without regard for surface features (Emmer 1989). In addition, competitors showed little, if any, cooperation for sharing pipelines, pipeline corridors, access canals, or production facilities. The overall consequences were cumulative/secondary impacts that devastated many areas of the coastal zone (Turner and Cahoon 1987). Saltwater migrated far into the estuaries that were originally fresh. Flow was blocked and migratory fish routes dammed. Spoil and development covered wetlands and lakes.

Because so many users are in the coastal zone operating without regard to or knowledge of what others have done or will do, projects do not, many times, operate in isolation. When seen as a single element, detrimental impacts may not result, but when intersecting with other actions, significant problems may result. For example, an access road constructed for a new oil well may link to a levee that is part of a wetlands management area. The access road can cause unintended impoundment of wetlands and in the long term an evolution of the area from vegetation to open water.

Finally, the expansion of residential, commercial, industrial, and recreational areas into wetlands usually results in the filling of wetlands. Runoff from intensive development may adversely impact wetlands by introducing sediment during construction; chemicals from lawns, roadways, parking lots, and vehicle washing stations; and solid waste, such as dumps and landfills. With these types of development arises the need for the treatment of sewage. Camps and structures in more rural areas rely on either septic tanks, which do not work as designed or are not maintained, or simply discharge water and solids into the bayou or onto the wetlands. Untreated or under treated sewage has become such a problem in Terrebonne, Lafourche, and Plaquemines Parishes that oyster beds have been closed.

As stated in the beginning of this section, there are activities other than those specifically listed above which cause or contribute to cumulative/secondary impacts.

CHARACTERIZATION OF EXISTING PROGRAMS ON CUMULATIVE AND SECONDARY IMPACTS

Cumulative/secondary impacts are evaluated when individual activities are reviewed for compliance with the CMD's regulatory standards in permit, consistency, and enforcement cases. The CMD relies on staff experience (Regional Coordinators in the Permit and Enforcement Sections maintain an overview of activities in their areas) and data from the Geographic Information Systems (GIS), the Permit Tracking System, permit records, and field inspections (if appropriate) to provide the information needed to evaluate the cumulative/secondary impact potential of a proposed use. Additionally, the staff coordinates activities with other regulatory agencies, thereby assuring that these impacts are considered on a project-by-project basis rather than on a regional basis. The process involves applying the Coastal Use Guidelines in concert with staff expertise. For example, the CMD would require a change in the orientation of a proposed oil and gas canal project to avoid creating an impoundment by preventing its spoil levees from connecting to existing levees.

The CMD arrives at its position because Guidelines 1.7 1, 2.2, 3.1, 3.9, 4.1, 4.3, and 10.4 (Appendix) provide information concerning disruption of water movement. The staff's regulatory experience and the CMD's database are used to evaluate alternative measures. Consistency of results is overseen by the Section Managers, who are involved in the review process as well.

Special management area designation provides for the planning of long-term cumulative impact avoidance or abatement on a regional basis. The Maurepas-Pontchartrain Basin is under consideration as a special area, and cumulative impact avoidance has been raised as an issue. The two existing Special Management Areas, Marsh Island and the Louisiana Offshore Oil Port, are managed under plans developed prior to the approval of the LCRP. Thus, uses within both areas are regulated primarily by their respective management agencies, the Louisiana Department of Wildlife and Fisheries (LDWF), and the Louisiana Offshore Terminal Authority. The CMD is considering using special management to develop long-term management strategies for dredged material disposal areas associated with Corps of Engineers' navigation projects. The existing methods used by the CMD to control the impacts referred to in the preceding section are summarized below.

Navigation and flood control projects are addressed through the consistency review process. The Consistency Section undertakes a thorough review of each proposed new project and evaluates the way in which it will interact with existing activities, and it engages in pre-project planning with the agencies constructing the project. However, frequently, the Army Corps of Engineers has been unwilling to consider impact reduction techniques which would either increase the cost of a project or delay its implementation. The small staffing level of the Consistency Section has contributed to planning difficulties.

Oil and gas field development projects are handled through the permit process. The Permit Section undertakes a thorough review of each proposed new project and evaluates the way in which it will interact with existing activities. One area of special emphasis that is encouraged and required in some cases is the sharing of existing access routes and the pooling of facilities.

Directional drilling from existing disturbed areas is not the only method to reduce impacts. By applying the Geologic Review Procedure, the CMD has been quite successful in reducing direct impacts as a result of oil and gas access (Johnston et al. 1989) from an average of about 5 ac per canal in 1982 to about 2.5 ac in 1988. Although the CMD has used this process to reduce cumulative/secondary impacts, there are no available quantitative data to verify this statement.

Construction of single-family residences and camps are exempted from the CUP requirements. This exemption does not apply to dredging or filling activities extending beyond the construction of the home foundation and driveway. No available quantitative data exist on the extent of impacts caused by these exempted uses.

EFFECTIVENESS OF EXISTING PROGRAMS

Based upon its regulatory experience of eleven years, the CMD believes that its use of the existing Coastal Use Guidelines is successful in regulating cumulative/secondary impacts; however, as previously stated, the Army Corps of Engineers has not been fully cooperative with the CMD in addressing the cumulative/secondary impacts of navigation and flood-control projects.

For oil and gas activities, the Geologic Review Procedure is used not only to evaluate individual projects, but also to insure that long-term field development is planned in a manner that will minimize cumulative impacts. This planning is done by requiring applicants to pick centralized locations for field development, and by conditioning permits to require that subsequent development activities be located in the corridor so established. The continued exploitation of "mature" oil fields that were developed prior to the regulatory process remains a problem, as does

the continued industrial impact on wetlands, because impact avoidance apparently was not a component of the original planning process.

Interconnections of two or more unrelated activities, particularly if they are handled by different sections of the CMD, are among the most difficult to control. Information sharing between sections is a problem because each section keeps its own data base, and the loss of experienced staffers has resulted in a loss of institutional memory. Identifying interaction among uses is not difficult if these uses are subject to the review of just one section. However, they still may be difficult to regulate because applicants may not wish to cooperate with each other to reduce impacts.

Because they are exempted activities, the CMD's ability to deal with cumulative/secondary impacts resulting from the construction of camps and residences or the interaction of them with other activities is limited. Subdivisions, or multi-family construction, are not exempt. Unfortunately, there have been some instances in which large-scale developments have been initiated one house at a time in order to avoid the permit requirement. Further, much development that affects water quality occurs in areas outside of the Coastal Zone and is consequently outside of the jurisdiction of the LCRP.

POTENTIAL CHANGES TO CMD'S CUMULATIVE AND SECONDARY IMPACTS PROGRAM

Some possible methods to address the cumulative/secondary impact issues are as follows:

Develop a Long-Term Management Strategy (LTMS) for dredged material disposal for each individual project which would deal with some of the cumulative/secondary impacts and consider the development of special management area status for certain navigation and flood control activities;

Evaluate the Geologic Review Procedure and the feasibility of requiring the use of innovative technology as part of the state's strategy in dealing with this issue (it may be necessary to provide incentives to get industry cooperation in the latter);

Because construction of single-family residences and camps are exempted from coastal use permitting, it is not likely that regulatory authority over such uses will be obtained. However, evaluate present agreements between the CMD and the Department of Health and Human Resources. (This could determine whether closer cooperation between their respective agencies would alleviate the problem); and

Evaluate data gaps identified in the Assessment and determine whether further study of the effects of cumulative/secondary impacts is warranted, and, if so, develop techniques to manage them.

Section 309(a)(6) -- SPECIAL AREA MANAGEMENT PLANNING

INTRODUCTION

A Special Management Area is a definitive portion of the coastal zone that can be shown to possess unique and valuable characteristics that need special management (Louisiana State and Local Coastal Resources Management Act of 1978, as amended). The act establishes two Special Management Areas (Figure 8): Marsh Island and the Louisiana Offshore Oil Port (LOOP) complex. Special area management is a vehicle for resolving conflicts among competing users in the coastal zone while at the same time protecting the renewable resources. With implementation of a special area management plan, multiple use of the coastal resources may be possible. The purpose of this section is to summarize historic attempts at Special Area Management Planning (SAMP), to describe similar efforts at regional planning because of their potential conflict with the SAMPs, to discuss the effectiveness of these programs, and to present the CMD's proposals for enhancing the state's program.

SPECIAL AREA MANAGEMENT PLANNING

Since 1978 two attempts have been made by the CMD to establish SAMPs. The first began in the early 1980s when the CMD initiated a SAMP for the Lakes Maurepas-Pontchartrain Basin of southeast Louisiana. After the preparation of background information, a series of meetings began in 1984 when Governor Edwards appointed a task force of representatives from the eight parishes in the basin that were in the coastal zone, plus representatives of federal and state agencies, special interest groups, and the private sector. The Task Force functioned as an advisor to the Secretary of the Department of Natural Resources. The process was designed to encourage resource use planning beyond the parochial realm of particular groups or agencies and to place the more important issues in their regional context. After meeting for approximately five years the process lost momentum and was not reconstituted by Governor Roemer. No decisions have been made on SAMP for the Lakes Maurepas-Pontchartrain Basin.

In the late 1980s the Barataria Basin received consideration for a SAMP. Governor Roemer appointed a working group of representatives from parishes within the basin, federal and state agencies, special interest groups, and the private sector. A facilitator was retained to oversee the meetings during the one year allowed for the process. A draft document with recommendations was prepared within the time allocated, but the decision was made by the CMD to withdraw this effort in favor of the National Estuary Program (NEP) which was designated for this area during the SAMP process.

In addition to the attempt at two new SAMPs, there have been three other initiatives to create regional coordination of activities within the coastal zone. The NEP is an EPA-funded effort applied to develop a regional plan for the Terrebonne-Barataria Estuarine Complex. National estuaries are systems that are considered to be nationally significant and that are threatened by pollution, development, and overuse. An NEP is designed to promote the development of comprehensive plans to protect and improve water quality and enhance living resources within the defined area; in other words, the NEP ensures the ecological integrity of the estuarine system. This process is in the first year of the five-year effort. Policy and Management Committees have met on several occasions and are preparing the schedule of events for the process. Nominations are being made to the Scientific/Technical, Citizens Advisory, and Local Governments Committees.

A regional coordination effort is ongoing in southwest Louisiana. The Calcasieu Estuary Environmental Task Force was established by Executive Order No. ER 89-35, which was signed

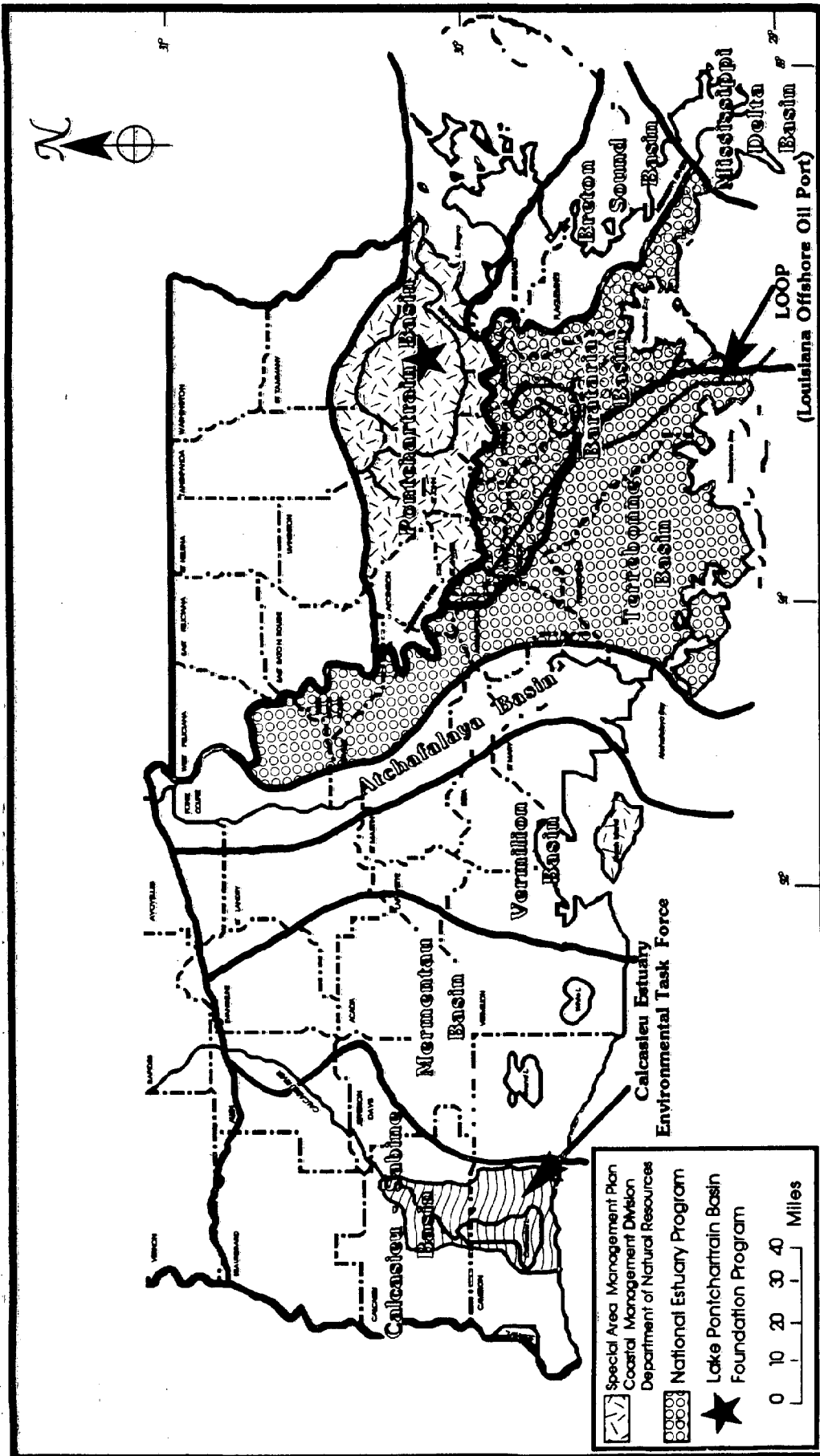


Figure 8. Nine hydrologic basins in coastal Louisiana as they are frequently used in environmental management and planning (Source: Boesch et al. 1989).

by Governor Roemer on November 3, 1989. The Task Force is an advisory panel on pollution in the Calcasieu River estuary. The responsibilities of the Task Force are (Section 2) to:

- A. Act as a liaison between the general public and state agencies regarding the pollution of the Calcasieu River estuary system by holding public hearings and receiving public input regarding public concerns, sources of pollution, and possible solutions.
- B. Meet and work with the state agencies regarding the scope and effect of their actions, the concerns and ideas of the citizens; and generally advise such agencies concerning the environmental integrity of the system.
- C. Monitor the actions of the state agencies and advise the general public with regard to those actions.

Seventeen members representing local governments and special interest groups compose the Task Force. An advisory group is composed of one member of the southwest Louisiana Legislative Delegation; one representative from each of the Departments of Environmental Quality, Health and Hospitals, Wildlife and Fisheries, and Justice; and Region VI, the Environmental Protection Agency. Annual reports are submitted to the Governor. Interestingly, neither the Governor's Office nor the Department of Natural Resources is represented in the advisory group.

Finally, the Lake Pontchartrain Basin Foundation is about to begin a coordination and planning effort for Lake Pontchartrain and the surrounding uplands. By Act 716 the 1989 Louisiana Legislature authorized the Greater New Orleans Expressway Commission (the Commission) to undertake activities for the restoration and preservation of the environmental and ecological balance of the Lake Pontchartrain Basin. In response to this act the Commission prepared for the establishment of the Lake Pontchartrain Basin Foundation (the Foundation) located in Jefferson Parish. The Foundation, a nonprofit corporation that became active in September 1989, is governed by a 13-member Board of Directors composed of representatives from the Departments of Natural Resources, Wildlife and Fisheries, Environmental Quality, and Health and Hospitals; and representatives from Orleans, Jefferson, St. Charles, St. Tammany, Tangipahoa, and St. John Parishes. Each member who serves a three-year term has some technical, ecological, or environmental expertise related to the Lake Pontchartrain Basin.

The purpose of the Foundation's project is to bring the decision-makers (federal, state, and local governments) and special interest groups within the basin together to develop a comprehensive basinwide resource conservation and enhancement plan. The suggested strategy will establish a philosophy for a conservation and rehabilitation program for the waters, adjacent uplands, and wetlands. Realistic long-term goals for the next 20 years will guide the development and implementation of a short-term strategy for the next five years. Setting a 5-year strategy allows for periodic evaluation of program accomplishments and provides the opportunity for adjusting the goals and directions of the program as needed so the effort is completed in a timely fashion. Initial public meetings were held in October 1991. Decision-makers will have their first meeting in January 1992. The final plans should be completed by the fall of 1992.

CHARACTERIZATION OF EXISTING PROGRAMS ON SPECIAL MANAGEMENT AREA PLANNING

The State and Local Coastal Resources Management Act of 1978, as amended, has as its declared policies:

- (1) To protect, ... the resources of the state's coastal zone.

- (3) To support and encourage multiple use of coastal resources consistent with the maintenance and enhancement of renewable resource management and productivity, ...
- (4) To employ procedures and practices that resolve conflicts among competing uses within the coastal zone ...

Section 213.10 of Act 361 of 1978, as amended, provides for the creation of special area management. The LOOP and Marsh Island are existing special management areas; the Maurepas - Pontchartrain Basin is still being considered for SAMP; and, as stated previously, continued action on the Barataria Basin SAMP has been terminated in favor of the NEP.

EFFECTIVENESS OF EXISTING PROGRAMS

Planning is a process that begins with determining the basic goals for the community; second, presenting an analysis of the physical, cultural, and institutional characteristics of the community and the trends related to each element; third, presenting policies indicating how and in what direction the community could develop and at what pace; fourth, proposing effective methods for implementing the plan; and finally, monitoring the plans and making suggestions for improving the plan as necessary. Numerous articles review the authority of Louisiana and local governments to control land use in Louisiana (Conner 1977; Forman 1980; Hershman and Mistic 1975-76; Hershman and Fontenot 1976; Livaudais 1982; Marcel and Bockroth 1980; and Midboe et al. 1976) and discuss and describe environmental regulations that apply to the coastal zone (Emmer 1984; Houck 1983). The CMD evaluated the status of the local-state coordination process for managing coastal development (Emmer and Thayer 1989). Planning is possible in Louisiana and is required when planning commissions exist. Emmer et al. (1990), after evaluating the planning process in coastal Louisiana, concluded that planning is reactionary rather than anticipatory. When mandated by federal and state governments, some form of planning follows, such as with the NFIP. However, planning is not a high priority item among local decision-makers; more pressing day-to-day issues, such as schools, roads, and landfills, demand their attention. The general public believes planning tells them what to do with their land. Local planning is not universally accepted by the general public. Regional planning, such as a SAMP, is even less likely to be effective in its existing format.

The LOOP and Marsh Island Special Management Areas appear to be functioning as designed. The Maurepas-Pontchartrain Basin SAMP procedure never seemed to attract widespread support among the parishes and special interests in the basin. Unfortunate timing also contributed to the demise of the effort. During the organizational phase a dispute over the impact of shell dredging in the lakes developed. The protraction of that issue, the concern of some interests about excessive regulation, personal animosities with roots in past contacts, and an underlying distrust of the process and each other by many of the task force representatives contributed to less than satisfactory results. Processing of the Maurepas-Pontchartrain Basin SAMP is ongoing, and the CMD has made no decision whether to designate the basin as a SAMP. The Barataria SAMP effort learned from the Maurepas-Pontchartrain SAMP. A facilitator was retained; the meetings were structured and conducted in a formal manner; personal clashes were eliminated or contained to an acceptable professional level; and accountability was stressed and achieved. More was happening in the basin that would affect the Barataria SAMP process and the process was terminated in favor of the NEP.

At this time it appears that SAMP when applied to a large watershed such as the Maurepas-Pontchartrain Basin does not work. However, when the SAMP procedure is used to address specific issues and a particular area, its chances for success are enhanced. The future of SAMP seems to be in the narrower realm of individual projects.

**POTENTIAL CHANGES TO CMD'S SPECIAL AREA
MANAGEMENT PLANNING PROGRAM**

Some possible methods to address the Special Area Management issue are as follows:

Actively support the planning effort by the Lake Pontchartrain Basin Foundation and incorporate it into the LCRP when complete; and

Seek specific projects that could be designated as SAMPs, for example, the shorelines of navigation channels for the management of dredged material, and incorporate them into the LCRP.

Section 309(a)(7) -- OCEAN RESOURCES

INTRODUCTION

This section describes the non-fuel mineral resources and the hydrocarbon resources within the nearshore water and on the Federal OCS. Based on available information, areas of important concentrations include sand, shell, sulphur, salt, and hydrocarbons. The following characterizes the mineral resource activities that exist, in addition to any potential reserves that may be present in adjacent areas. Most of the information is provided by industry (oil & gas) and much remains classified; however, sufficient data allows for a basic understanding of the resources within the region. Second, this section reviews the effectiveness of existing programs over the resources, and finally presents activities CMD could undertake.

OCEAN RESOURCES

Sand (recurved spit and spit platform deposits, distributary and tidal channels, ebb and flood tidal deltas, beach ridges, and inner shelf shoals) is the most abundant aggregate mineral resource within the study area (John et al. 1989). Deposits near the Mississippi River are approximately 13 mi wide, while those off the western Louisiana coast are more than 113 mi across. Areas considered as potential sand resources include: Ship Shoal, Trinity Shoal, Cat Island Pass and associated tidal deltas, and the tide channels of Barataria Pass/Grand Terre area (Figure 9).

These areas could serve as long-term sand resources for beach restoration programs, depending on both transportation and dredging costs. Presently, both the Ship (up to 3,937,007,874 ft³ of fine sand), and Trinity Shoals (over 6,561,679,790 ft³ of fine sand) are considered the largest and most feasible sand resources available within the Louisiana Coastal Zone. Trinity Shoal, the westernmost member of the Holocene group of inner shelf shoals, parallels Marsh Island and is 25 mi offshore. Deposits are 19 mi long and 3 to 6 mi across in 23 to 33 ft of water. Even though the Trinity Shoal is a potential sand resource, some of the channels may be covered by more than 65 ft of overburden. The deposits, therefore, are considered an unlikely sand source for extraction (John et al. 1989). On the other hand, the Ship Shoal has the highest potential for extraction because no overburden needs removal. Ship Shoal, the largest and easternmost member of the Holocene group of inner shelf shoals, is about 31 mi long and 3 to 8 mi wide. Water depths range from 23 to 29.5 ft on the eastern side to 6.5 to 23 ft on the western perimeter. The sands are 13 mi south of and parallel to Isles Dernieres. Cat Island Pass and associated tidal deltas (6,561,679,790 ft³ of sand) are located within Terrebonne Bay between the Isles Dernieres and Timbalier Island. The area is 13 mi long and 8 mi wide. The Barataria Pass/Grand Terre Tidal Channels (over 1,148,293,963 ft³ of sand) are south of Grand Isle and Grand Terre. Deposits begin along the eastern end of Grand Isle and parallel the shoreline to the western end of Grand Terre. Deposits are up to 6 mi long and just over 2 mi wide (John et al. 1989).

Historically, clam and oyster shells constituted a valuable mineral resource. Shells served as aggregate in construction and as a source of calcium carbonate in lime manufacture, acid neutralization, water purification, petrochemical production, filter media, pharmaceutical needs, poultry feed, and as cultch material for oyster production. However, resulting adverse ecological effects associated with the dredging operation forced industry closure (USACE 1987a; 1987b). Even though operations ceased, the shell industry has identified reserves in the East Cote Blanche/Atchafalaya/Four League Bay estuarine system covering about 40 mi within the Mississippi Deltaic Plain Region. These concentrations of shell reserves appear as scattered pockets generally paralleling the shoreline. To the east Lake Pontchartrain could be reopened for shell dredging operations if the pending lawsuit would be lifted (USACE 1987a; 1987b).

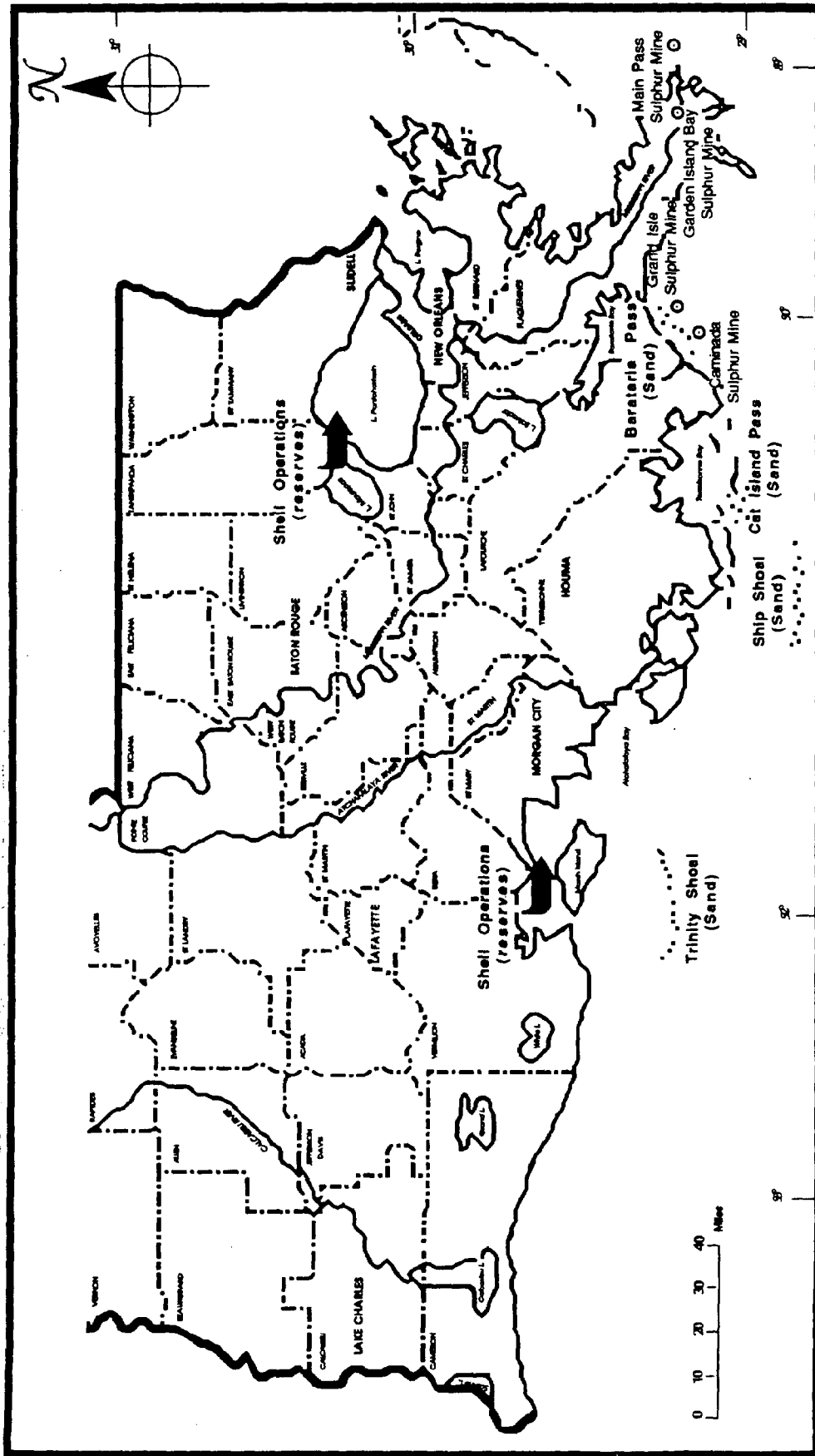


Figure 9. Mineral resources off the Louisiana coast (Sources: John et al. 1989; USACE 1987a and 1987b; Freeport McMoran 1990; 1991).

Sulphur or brimstone, is a highly versatile element. Its applications are so widespread that they contribute and are utilized in such products as fertilizer, paper-making, pigments, petroleum refining, pharmaceuticals, metallurgy, fibers, and the list goes on. In the United States, about 11 million tons are consumed annually, about 100 pounds per person. The Frasch process, the use of super-heated water to liquify the sulfur for extraction (Carpenter et al. 1988), is the method by which sulphur is mined within these areas. Nearly 90% is converted to sulfuric acid, the remaining is used in elemental form or in various chemical compounds (Freeport McMoRan 1990a). During 1985, Louisiana and Texas accounted for 43% of all sulphur production (Carpenter et al. 1988).

Freeport Sulphur Company currently has two active sulphur mines. The Grand Isle and Caminada sulphur mines are near Grand Isle. The Grand Isle mine has been in operation since 1960 and has produced more than 25,000,000 long tons. The Caminada mine began in 1968; however, operations ceased in 1969 due to economic conditions. Mining operations were reactivated in 1988 and operations continue (Freeport McMoRan 1990b). In 1992 when operations begin, the Main Pass Mine in 210 ft of water east of the Mississippi River will produce more sulphur than the Garden Island Bay and Grand Isle Mines combined. Basically, it is the largest existing Frasch sulphur reserve in North America and one of the largest oil and natural gas discoveries in the Gulf of Mexico (Freeport McMoRan 1990c). Freeport Sulphur Company and its joint venturers have six other sulphur leases in the Gulf which will be explored (Freeport McMoRan 1990a). The other active participant in offshore sulphur development is the Pennzoil Sulphur Company, which is exploring three active leases.

The economic impact on Louisiana from the Main Pass Sulphur Mine as pertains to the life of the mine will be more than \$31 billion. During the 30-year span, an estimated tax revenue of over \$800 million will be provided to the state, as another \$1.3 billion will be given to the federal government. Total employment for construction will be 21,274 workers. The payroll generated over the life of the mine will be more than \$1.5 billion. Construction alone will account for more than 5 million man hours, which is stated by Freeport to have the equivalent of 1,330 people working two years (Freeport McMoRan 1990c). As of now, three Louisiana engineering companies are the principal contractors (Freeport McMoRan 1991).

There are two active salt operations offshore. Freeport McMoRan owns both mines--the Grand Isle and Caminada Sulphur Mines. However, the salt extracted is not utilized and distributed for sale, but rather used internally in the Frasch process for extracting sulphur.

Finally, heavy mineral placers of commercial value may have potential in the western Louisiana inner continental shelf as well as in the eastern Louisiana shelf near the Chandeleur Islands. More information is needed to evaluate correctly the opportunities that may exist off the Louisiana coast.

There is estimated 1.78 billion barrels of oil and 28.57 trillion cubic feet of natural gas in proven hydrocarbon reserves in the outer continental shelf (OCS) off Louisiana. Reserve estimates change from year to year because of new discoveries, revised estimates of producing fields, new forecasting techniques, computer models, and production. Since 1953, there has been 7.5 billion barrels of oil produced in the Louisiana OCS, with a market value of \$91.8 billion and a royalty value, to the U. S. Government, of \$14.9 billion. For the same period of time, OCS gas production was 72.8 trillion Mcf's (e.g., thousand cubic feet) with a market value of \$89.5 billion and a royalty value of \$14.5 billion. OCS oil production peaked in 1984 and OCS gas production peaked in 1983. There is a trend toward exploration and development in deeper waters. Figure 10 shows oil and gas fields in the coastal zone as well as the OCS.

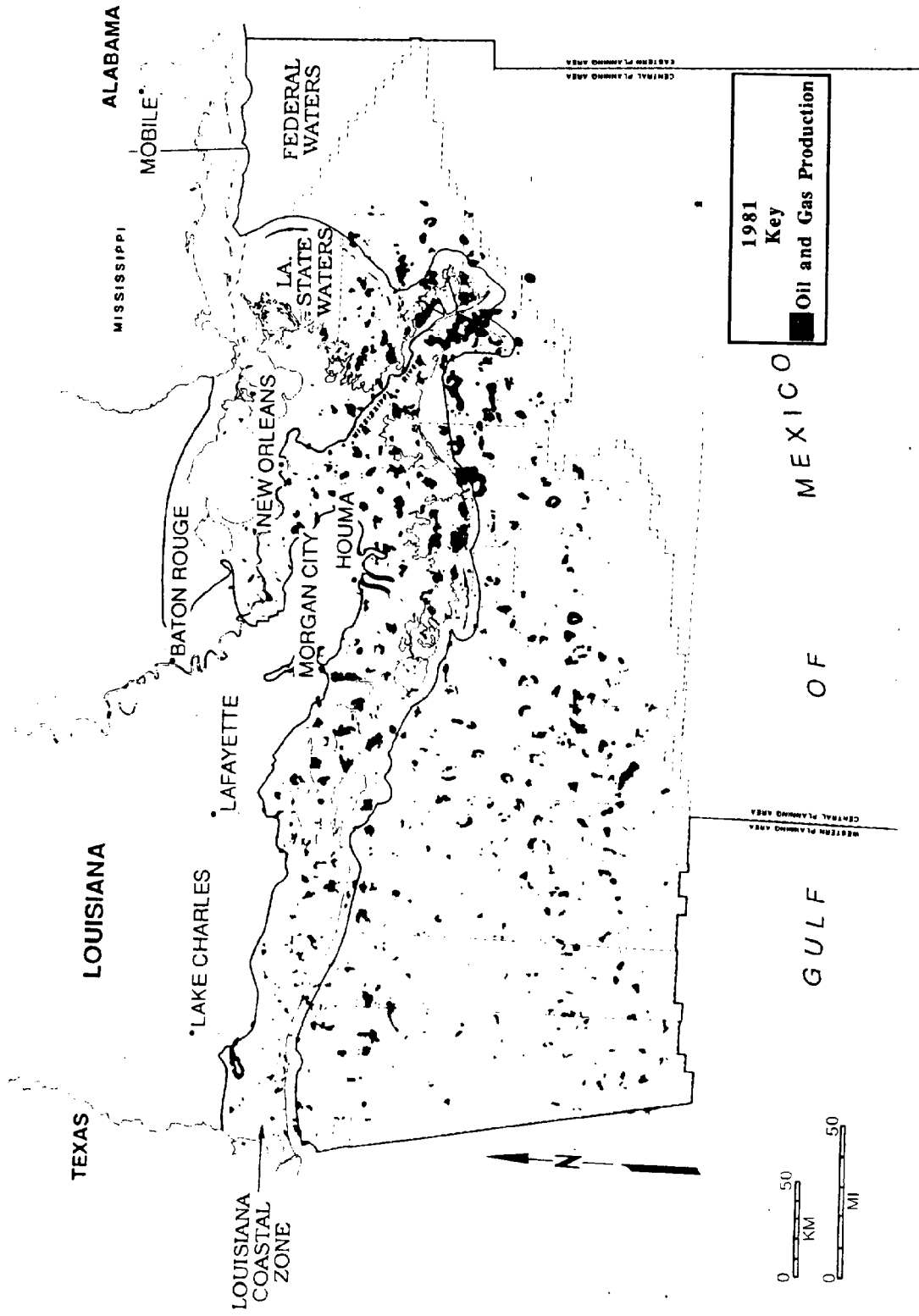


Figure 10. Louisiana coastal and offshore oil and gas fields (Source: Lindstedt et al. 1991)

CHARACTERIZATION OF EXISTING PROGRAMS ON OCEAN RESOURCES

At the Federal level, the MMS is the primary federal representative overseeing activities in federal waters off the Louisiana coastal zone.

The State and Local Coastal Resources Management Act of 1978, as amended, has as its declared policies:

- (1) To protect,....the resources of the state's coastal zone.
- (5) To develop and implement a coastal resources management program which is based on consideration of our resources, the environment, the needs of the people of the state,....

The CMD does not have direct control over activities in federal waters. However, it can address environmental concern through the consistency review process and where activities related to programs in federal waters come onshore, such as where they cross barrier islands or beaches. In addition, the CMD can influence the location and installation of transportation networks where they cross the coastal zone as well as the placement and operations of onshore support facilities. The CMD undertakes its responsibilities through the implementation of the following Coastal Use Guidelines: 1.6 j; l; m; q; and r; 1.7 e; p; q; and s; 3.4; 3.5; 3.7; 3.8; 3.12; 3.15; 5.5; 6.5; 6.7; and 6.13 (Appendix).

Other state agencies involved with offshore minerals include the Office of Mineral Resources of the Department of Natural Resources which leases hydrocarbons in state waters, the Louisiana Geological Survey (LGS), which evaluates potential areas for gravel, shell; and other mineral deposits, and the LDWF with responsibilities for shell dredging.

EFFECTIVENESS OF EXISTING PROGRAMS

The existing MMS program does not adequately consider the onshore impacts of OCS mineral extraction on coastal Louisiana. The MMS should be more responsive to local needs and desires.

The CMD program addresses impacts in offshore waters through the federal consistency review process.

POTENTIAL CHANGES TO CMD's OCEAN RESOURCES PROGRAM

Other than those measures already listed in the energy portion of Section 309(a)(8), CMD could develop a plan for the use of existing onshore infrastructure (platform fabrication yards, supply bases, heliports, pipe storage yards, pipeline corridors, and industries) to support ocean-resource activities.

SECTION 309(a)(8) ENERGY AND GOVERNMENT FACILITY SITING AND ACTIVITIES

INTRODUCTION

The Louisiana coastal zone and the OCS are two of the most productive hydrocarbon areas in the world. As a result of intensive activity beginning earlier in this century, the industry has had a significant economic, physical, and cultural impact on the state. Debate continues on the exact extent of negative environmental impacts that can be traced to the exploitation of hydrocarbons. Everyone does, however, acknowledge that canals, spoil banks, and pipelines do impact coastal areas and that associated support bases, commercial enterprises, and residential developments do also. In addition to oil- and gas-related activities, government contributes also to the modification of coastal systems. Presently, the LCRP addresses energy and government-facility siting activities as two separate issues. Thus, they are treated separately in this section. Each issue is described, then existing programs that address the issue are discussed, the effectiveness of the programs is evaluated, and finally, CMD's proposed changes to the state's program are presented.

ENERGY

The development of the oil and natural gas resources occurring in the Louisiana Coastal Zone plays a critical role in the economic viability of both coastal communities and the state as a whole. Louisiana is one of the top three states in terms of energy exploration and production. The exploration for and production of these resources has required the siting of an extensive array of energy-related facilities in the coastal zone. Such facilities include drilling and production platforms, an offshore oil port, Strategic Petroleum Reserve facilities, onshore facilities, assembly yards, storage depots, crew bases, tank farms, refining complexes, gasification facilities, and a vast network of pipelines.

A CMD study determined that approximately 68% of all CUP applications received during a typical year are related to the oil and gas industry. Oil- and gas-related permits account for approximately 92% of all industrial CUP applications. Oil- and gas-related activities, including those in the OCS, account for about 60% of the consistency determinations made by the CMD. Since the inception of the program, the CMD has reviewed 5,307 applications involving drilling rigs. Of these, 2,398 required the dredging of a canal and/or slip, and 786 required the construction of a boardroad and/or drilling pad. Installation of pipelines was a component activity of 3,859 permit applications. Production and heater platforms were proposed in 1,227 applications. These numbers should be considered to be conservative estimates of the total number of energy facilities authorized, as many of the applications were for more than one well site, multiple flowlines, etc.

CHARACTERIZATION OF EXISTING PROGRAMS ON ENERGY

Energy activities are specifically addressed in the Coastal Use Guidelines, which were established pursuant to the SLCRMA of 1978, in the "Guidelines for Oil, Gas and Other Mineral Activities" (Guidelines 10.1-10.13). These guidelines generally call for allowing energy extraction, production, transmission, and refining activities provided that appropriate steps are taken to reduce environmental impacts and conflicts with other uses. Other guidelines (for example, the generally applicable guidelines (Guidelines 1.1 - 1.10), the linear facility guidelines (Guidelines 3.1 - 3.16), and the dredged spoil guidelines (Guidelines 4.1 - 4.6) are applied to individual energy activities as applicable. The SLCRMA (Sec. 214.31) intended that certain aspects of energy extraction, production, and transmission in the Coastal Zone would not require CUPs, but instead would be regulated by the Office of Conservation, Louisiana Department of Natural Resources, through the "in-lieu" permit process. The CMD reviews and makes consistency determinations for oil and gas

activities on "Federally excluded lands." These activities are considered as Federal Licence and Permit (FLP) activities (Subpart D of 15 CRR 930.50-.66). These areas are primarily in wildlife refuges operated by the USFWS.

The determination of whether the construction of an energy facility is consistent with the Coastal Use Guidelines, and thus permissible, follows a systematic process. The CMD staff evaluates and balances the probable benefits of the proposed facility and its associated activities against potential adverse impacts on the environment and the socioeconomic characteristics of the surrounding area. Consideration of feasible alternative sites and techniques is a major component of the permitting process, with a general philosophy of "avoid impacts where possible, minimize impacts as much as practicable and mitigate for unavoidable impacts." Since mid-1982, the CMD has employed the "Geologic Review Process" to reduce environmental impacts associated with the siting of new oil and gas wells. This process normally consists of a meeting with representatives from the company proposing the activity, the CMD, various state and federal agencies, and the CMD contract personnel (a geologist and a petroleum engineer from the Louisiana Geological Survey) who independently assess the geologic, engineering, legal, and economic factors relating to the proposed site and any available alternative locations. Generally, a Geologic Review meeting is only held when the proposed activity will impact vegetated wetlands. A CMD study found that approximately 13% of the permit applications for drilling oil and/or gas wells undergo the Geologic Review Process.

The CMD has developed four General Permits to expedite the permitting of energy-related activities. These allow for the installation of pipelines in spoil banks and road berms, the construction of minimum-sized parallel slips off of existing oil and gas access canals, the construction of minimum-sized ring levees adjacent to existing board roads, and the removal of existing pipelines. The General Permits authorizing parallel slips and ring levees require that Geologic Review meetings be held prior to project authorization if the proposal will impact vegetated wetlands. The CMD also has determined that under certain known conditions several energy-related activities have "No Direct and Significant Impact" to coastal waters. These activities and conditions are summarized in the Appendix.

Consistency determinations are reviewed for oil and gas activities on "Federally excluded lands." These activities are considered as FLP activities (Subpart D of 15 CFR 930.50-.66). These areas are primarily in wildlife refuges operated by the USFWS. For FLP consistency review on federally excluded lands, the Division participates in geologic review meetings for these projects, which are called at the NODCE's discretion and review is coordinated with the refuge manager to insure that his concerns are satisfied by the applicant. The CMD's concerns focus primarily on impacts to Louisiana waters, however, CMD does review OCS Plans of Development and Exploration, Mineral Lease Sales, and pipeline siting.

EFFECTIVENESS OF EXISTING PROGRAMS

As indicated in Section 309(a)(1), CMD has seen a reduction in the amount of wetland area disturbed by permitted activities from 1983 to 1990 (Figure 3). Much of this reduction is related to the Geologic Review Procedure which has resulted in a reduction in the size of the average oil and gas canal from more than five acres in 1982 to about two and a half acres in 1988 (Johnston et al. 1989). Further, in order to facilitate energy activities that cause little or no environmental impact, the CMD has developed four general permits for energy activities. Also the In-Lieu Permitting procedure that CMD has developed with the Office of Conservation provides for expeditious interagency processing of oil and gas drilling activities.

With respect to energy activities in federal waters, the State has recently initiated a more aggressive program to insure the protection of coastal resources. The recent law suit concerning Lease Sale 135 and the multi-agency effort to assess MMS's proposed 5-Year Leasing Plan are examples of

the increased interest in the OCS energy related activities. However, it is the position of CMD that the existing MMS Program does not adequately address the adverse onshore impacts of OCS energy related activities. CMD has requested that MMS give additional consideration to the adverse socioeconomic, physical and ecological impacts that result from the boom-bust cycles of OCS energy related activities. Also, MMS should recognize the potential adverse impacts caused by the installation of pipelines in the OCS.

POTENTIAL CHANGES TO CMD's ENERGY PROGRAM

The CMD's existing policies and programs related to this issue are adequate. Consequently, CMD recommends that it continue to address, through studies, the specific impacts resulting from energy-related activities, to find new and innovative ways to avoid and reduce such impacts, to find suitable mitigation measures to offset unavoidable losses, to develop additional general permits, and to evaluate the success of both impact minimization and mitigation techniques.

GOVERNMENTAL FACILITIES

State and local governmental facilities over which the CMD exercises some type of oversight include such things as highways and roadways, governmental buildings, flood protection levees, sewerage treatment facilities, some landfills, airports, port facilities, state parks and state wildlife management areas.

CHARACTERIZATION OF EXISTING PROGRAMS ON GOVERNMENT FACILITIES

The SLCRMA, in Sec. 214.32 B, deals with the issue of governmental activities:

Any governmental body undertaking, conducting, or supporting activities directly affecting the coastal zone shall ensure that such activities shall be consistent to the maximum extent practicable with the state program and any affected approved local program having geographical jurisdiction over the action.

The CMD reviews the construction of new and the expansion of existing Federal installations, pursuant to the CZMA and as Direct Federal Action consistency determinations (Subpart C of 15 CFR 930.30-.44). Of the 74 Direct Federal Actions (DFAs) reviewed from April 1990 through March 1991, nearly all were related to federal installations of one form or another. Federal facilities of significance are the possessions of the U.S. Coast Guard, National Aeronautics and Space Administration (NASA), U.S. Navy, U.S. Department of Energy, U.S. Park Service, USFWS, and the U.S. Army Corps of Engineers. Although some acreage is for installations and their potential expansion (e.g. U. S. Coast Guard, U.S. Navy, NASA), most acreage is for habitat/wildlife preservation and recreation. In addition, substantial acreages have been obtained for easements associated with U.S. Corps of Engineers flood control, hurricane protection, and freshwater diversion projects.

Proposed construction activities associated with state and local governmental facilities are treated as standard CUP applications and are reviewed pursuant to the permitting requirements of the SLCRMA and the applicable Coastal Use Guidelines (Appendix). Some of these guidelines are applicable to all uses (Guidelines 1.1 - 1.10), guidelines for levees (Guidelines 2.1 - 2.6), guidelines for linear facilities (Guidelines 3.1 - 3.16), guidelines for dredged spoil disposal (Guidelines 4.1 - 4.6), guidelines for surface alterations (Guidelines 6.1 - 6.14), and the guidelines for waste disposal (Guidelines 8.1 - 8.9). These projects are reviewed in a manner similar to the CUPs review process, in which the impacts of the proposed activity are examined in relation to the Coastal Use Guidelines. Virtually all guidelines are applicable with the possible

exception of Guideline 6.11 (surface mining and shell dredging). The term "Maximum Extent Practicable" (MEP) qualifier is applied to federal projects [15 CRF 930.39(c)] of the National Oceanic and Atmospheric Administration (NOAA) consistency regulations.

Close coordination exists among CMD, the sponsoring agency, and state and federal resource agencies. Any dredge and fill activity associated with a facility siting must obtain a Section 401 "Water Quality Certification" from the Water Resources Division of DEQ. This program is understaffed and overloaded, and existing 401 certification regulations are weak. The DEQ is in the process of developing regulations that should give the program firm direction. The State's Scenic Streams Program, administered by the LDWF, designates waterways as waters of special significance. This designation is recognized under the Clean Water Act. Under the 404 permitting process various state agencies such as Wildlife and Fisheries; Environmental Quality; Human Resources; Transportation and Development; and Culture, Recreation and Tourism have the opportunity to comment in response to public notices. These comments are often coordinated with CMD's consistency determination. The CMD has MOU's with most other State agencies.

EFFECTIVENESS OF EXISTING PROGRAMS

The review of civil works projects, particularly water resources development projects, are among the greatest challenges for the CMD. These projects, inclusive of maintenance, often are multimillion-dollar projects, involving dredging and deposition of millions of cubic yards of material, and impacting hundreds to thousands of acres of coastal habitats (Water Resources Development in Louisiana 1989). Consistent with other Division regulatory policy, the Division seeks a sequence of avoidance and minimization of adverse impacts resulting from these projects. Strong emphasis is placed on developing beneficial use and resource enhancement components for these projects. Beneficial use aspects are often more feasible, given the typically broad scope of these projects. Although the CMD has made considerable advancement in this area, additional programmatic development is called for. Participation in planning at a stage in which the nature of the design of the project can still be influenced is the key to managing these Direct Federal Action projects. To this end, the CMD is pursuing early involvement in the reconnaissance phase of planning; participation in advanced review of navigation maintenance projects, particularly Long Term Management Strategy (LTMS) for dredged material; and participation in steering/advisory committees for comprehensive basin management and estuary management plans. Unfortunately, at present, the CMD's involvement in many projects is limited to review of consistency determinations just prior to the time of implementation by the federal agency rather than earlier in the planning process.

POTENTIAL CHANGES TO CMD's GOVERNMENTAL PROGRAM

Some possible methods to address the Government Siting of Facilities issue are as follows:

Increase involvement in federal navigation projects during the review and consistency determination, with emphasis on the use of Long Term Management Strategies for the creation of wetlands and bank stabilization with dredged material;

Update agreements with other State agencies to assure a more unified response to proposed facility siting;

Formally develop a state interagency review committee; and

Include Federal facility siting in the development of SAMPs and watershed/estuary plans.

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APPENDIX

Table A-1. Aerial extent of habitat types on the Chenier Plain, delta plain, and coastal zone of Louisiana in 1956, in acres (percentages in parentheses).

	Chenier Plain Total											Delta Plain Total	Coastal Zone Total	
	Sabine	Calcas	Mermentau	Vermilion	Atchafalaya	Terrebonne	Barataria	Mississippi	Pontchartraine	Breton	Pearl River			
Inland water (natural)	34,664 (13)	70,271 (26)	129,703 (19)	310,156 (41)	544,795 (27)	181,100 (58)	442,220 (37)	304,683 (31)	144,374 (38)	1,358,196 (65)	397,968 (56)	1,616 (5)	2,832,159 (50)	3,376,934 (44)
Water (artificial)	1,368 (1)	3,507 (1)	8,358 (1)	6,039 (1)	19,273 (1)	3,026 (1)	8,586 (1)	21,401 (2)	5,967 (2)	13,411 (1)	5,324 (1)	54 (<1)	57,769 (1)	77,042 (1)
Fresh marsh	51,054 (20)	44,481 (15)	337,942 (34)	31,220 (4)	484,697 (24)	76,188 (8)	340,560 (28)	260,840 (26)	145,033 (39)	33,661 (2)	40,168 (6)	8,303 (23)	854,753 (15)	1,339,450 (17)
Non-fresh marsh	150,146 (58)	130,940 (45)	127,279 (19)	242,498 (32)	650,863 (33)	40,018 (13)	336,122 (28)	273,212 (28)	3,648 (1)	232,136 (11)	213,120 (30)	3,556 (11)	1,101,812 (19)	1,752,675 (23)
Forest	1,032 (<1)	341 (<1)	7,361 (1)	14,832 (2)	23,565 (1)	1,003 (<1)	15,525 (1)	32,246 (3)	5,611 (1)	105,079 (5)	15,262 (2)	4,890 (15)	179,417 (3)	203,183 (3)
Swamp	0 (0)	0 (0)	203 (<1)	40,013 (5)	40,217 (2)	49,732 (16)	46,840 (4)	33,131 (3)	13,658 (4)	195,005 (9)	14,090 (2)	8,668 (26)	361,123 (6)	401,340 (5)
Shrub/scrub	976 (<1)	435 (<1)	929 (<1)	10,233 (1)	12,572 (1)	392 (<1)	441 (<1)	2,754 (1)	3,940 (1)	3,547 (<1)	839 (<1)	0 (0)	11,415 (<1)	23,986 (<1)
Shrub/scrub (spoil)	840 (<1)	1,864 (1)	3,710 (1)	2,023 (<1)	8,437 (<1)	2,629 (1)	4,842 (<1)	3,002 (<1)	598 (<1)	62 (<1)	295 (<1)	0 (0)	11,429 (<1)	19,866 (<1)
Agric/pasture	17,905 (7)	35,099 (12)	26,992 (4)	97,122 (13)	177,118 (9)	4,670 (1)	7,781 (1)	25,557 (3)	19,646 (5)	81,626 (4)	11,400 (2)	5,588 (17)	156,308 (3)	333,426 (4)
Developed	816 (<1)	2,809 (1)	3,036 (<1)	5,392 (1)	12,053 (1)	1,382 (<1)	1,365 (<1)	14,162 (1)	25,954 (7)	55,819 (3)	5,644 (1)	563 (2)	104,869 (2)	116,922 (2)
Aquatic vegetation	0 (0)	0 (0)	2 (<1)	10 (<1)	12 (<1)	0 (0)	312 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	312 (<1)	324 (<1)
Unvegetated	712 (<1)	3,461 (1)	1,618 (<1)	2,713 (<1)	8,904 (<1)	2,660 (1)	2,706 (<1)	3,897 (<1)	7,575 (2)	3,053 (<1)	1,114 (<1)	44 (<1)	21,049 (<1)	29,934 (<1)
Beach	731 (<1)	799 (<1)	1,212 (<1)	701 (<1)	2,943 (<1)	0 (0)	2,163 (<1)	2,438 (<1)	292 (<1)	3,927 (<1)	491 (<1)	0 (0)	9,310 (<1)	12,253 (<1)
TOTAL AREA	260,244	293,908	668,343	762,950	1,985,447	316,801	1,209,463	976,823	376,336	2,085,524	705,714	33,264	5,701,927	7,687,374

Figures do not include 1,179,471 acres of offshore state waters within the coastal zone.

Table A-2. Aerial extent of habitat types on the Chenier Plain, delta plain, and coastal zone of Louisiana in 1978, in acres (percentages in parentheses).

	Chenier Plain										Delta Plain		Coastal Zone	
	Sabine	Calca	Herren	Verrill	Total	Acchaf	Terre	Baratar	Miss. R.	Pont.	Breton	Pearl	Total	Total
Inland water (natural)	58,249 (22)	121,328 (41)	161,871 (24)	323,604 (42)	665,002 (33)	179,259 (57)	544,210 (65)	348,640 (37)	206,999 (55)	1,107,874 (61)	427,596 (61)	1,808 (5)	2,816,387 (52)	3,481,388 (47)
Water (artificial)	9,427 (4)	9,369 (3)	13,458 (2)	11,642 (2)	43,897 (2)	5,232 (2)	20,956 (2)	36,477 (6)	8,520 (2)	14,658 (1)	15,138 (2)	198 (1)	101,179 (2)	145,075 (2)
Fresh marsh	14,279 (6)	4,939 (2)	736,801 (35)	48,312 (6)	307,031 (13)	54,983 (17)	165,857 (16)	51,063 (3)	39,872 (11)	29,685 (2)	2,542 (<1)	2,603 (8)	346,605 (6)	653,636 (9)
Intermediate marsh	63,374 (23)	41,901 (14)	75,781 (11)	42,397 (6)	223,403 (11)	0 (0)	66,880 (6)	76,421 (8)	25,025 (7)	15,902 (1)	8,701 (1)	8,254 (23)	200,981 (4)	426,386 (6)
Brackish marsh	70,939 (27)	60,990 (21)	99,098 (15)	148,984 (19)	380,010 (19)	0 (0)	140,172 (12)	107,472 (12)	5,052 (1)	128,056 (7)	148,129 (21)	591 (2)	529,471 (10)	909,481 (12)
Saline marsh	4,498 (2)	4,706 (2)	15,287 (2)	6,389 (1)	30,881 (2)	0 (0)	152,402 (13)	156,927 (17)	2,147 (1)	62,494 (3)	50,194 (7)	0 (0)	424,164 (8)	455,064 (6)
Forest	813 (<1)	784 (<1)	6,614 (1)	17,651 (2)	25,862 (1)	2,089 (1)	16,788 (1)	28,483 (3)	7,444 (2)	101,263 (6)	12,399 (2)	5,248 (16)	173,715 (3)	199,577 (3)
Swamp	0 (0)	0 (0)	169 (<1)	37,032 (5)	37,201 (2)	53,387 (17)	34,237 (3)	23,698 (3)	12,000 (3)	171,637 (10)	1,751 (<1)	8,515 (26)	305,275 (6)	342,425 (5)
Shrub/scrub	1,935 (1)	816 (<1)	3,527 (<1)	10,193 (1)	16,471 (1)	2,012 (1)	12,176 (1)	5,703 (1)	2,330 (1)	8,277 (<1)	1,654 (<1)	73 (<1)	32,026 (1)	48,497 (1)
Shrub/scrub (epoil)	3,200 (1)	7,017 (2)	11,030 (2)	4,653 (1)	25,701 (1)	5,138 (2)	19,244 (2)	17,454 (2)	5,836 (2)	3,675 (<1)	17,124 (2)	0 (0)	68,272 (1)	93,973 (1)
Agric/pasture	14,370 (6)	32,990 (11)	43,053 (6)	98,985 (13)	189,398 (9)	5,506 (2)	10,940 (1)	29,767 (3)	12,942 (3)	46,758 (3)	6,229 (1)	1,662 (5)	113,804 (2)	303,202 (4)
Developed	1,942 (1)	4,486 (2)	4,912 (1)	10,665 (1)	22,025 (1)	2,143 (1)	4,416 (<1)	38,416 (4)	32,411 (9)	106,579 (6)	11,717 (2)	4,269 (13)	199,931 (4)	221,976 (3)
Aquatic vegetation	3,575 (1)	420 (<1)	1,694 (<1)	2,217 (<1)	7,905 (<1)	2,520 (1)	18,810 (2)	8,236 (1)	3,844 (1)	3,881 (<1)	366 (<1)	17 (1)	37,674 (1)	45,580 (1)
Unvegetated	8,465 (3)	3,849 (1)	6,186 (1)	1,511 (<1)	20,012 (1)	2,463 (1)	1,167 (<1)	3,603 (<1)	11,741 (3)	1,773 (<1)	2,792 (<1)	77 (<1)	23,066 (<1)	43,078 (1)
Beach	675 (3)	292 (<1)	994 (1)	578 (<1)	2,539 (<1)	37 (<1)	1,398 (<1)	1,098 (<1)	124 (<1)	1,930 (<1)	173 (<1)	0 (0)	4,761 (<1)	7,299 (<1)
TOTAL AREA:	260,212	293,887	680,425	764,814	1,999,336	316,370	1,209,434	931,458	376,286	1,804,243	705,807	33,265	5,177,282	7,176,619

Figures do not include 1,179,671 acres of offshore state waters within the coastal zone.

Table A-3. Aerial extent of habitat types on the Chenier Plain, delta plain, and coastal zone of Louisiana in 1984, in acres (percentages in parentheses).

	Chenier Plain										Delta Plain		Coastal Zone	
	Sabine	Calca	Herman	Verrell	Total	Atchaf	Terre	Baratar	Miss. R	Pont.	Braton	Pearl	Total	Total
Inland water	58,470 (22)	110,015 (37)	171,594 (25)	324,932 (42)	565,011 (33)	184,624 (38)	569,111 (47)	455,402 (37)	214,973 (54)	1,474,709 (61)	418,983 (59)	5,276 (12)	3,323,078 (53)	3,988,089 (48)
Broken marsh	64,205 (26)	47,256 (16)	82,254 (12)	31,833 (4)	225,550 (11)	9,302 (2)	166,077 (14)	180,975 (13)	14,135 (4)	36,836 (2)	39,164 (6)	1,149 (3)	427,640 (7)	653,190 (8)
Marsh	105,137 (40)	95,380 (32)	367,423 (54)	238,773 (31)	806,713 (40)	35,951 (11)	381,582 (32)	287,020 (23)	69,766 (17)	223,283 (9)	206,796 (29)	17,418 (40)	1,221,797 (19)	2,028,509 (26)
Forest	788 (<1)	710 (<1)	4,898 (1)	14,744 (2)	21,139 (1)	1,390 (<1)	14,040 (1)	48,792 (4)	14,576 (4)	240,107 (10)	13,042 (2)	5,199 (12)	337,166 (5)	358,285 (6)
Swamp	0 (0)	0 (0)	44 (<1)	33,004 (4)	33,051 (2)	52,573 (17)	22,514 (2)	117,611 (10)	4,237 (1)	201,844 (8)	1,227 (<1)	7,817 (18)	407,874 (6)	440,875 (5)
Shrub/acrub	1,559 (1)	1,915 (1)	4,968 (1)	17,173 (2)	25,615 (1)	10,418 (3)	28,341 (2)	18,656 (2)	2,861 (1)	8,728 (1)	6,380 (1)	134 (<1)	75,517 (1)	101,132 (1)
Agric/pasture	16,327 (6)	25,713 (9)	34,641 (5)	102,397 (13)	179,077 (9)	6,621 (2)	12,250 (1)	92,379 (7)	30,192 (8)	77,909 (3)	6,409 (1)	1,169 (3)	226,928 (4)	406,005 (5)
Developed	252 (<1)	1,092 (<1)	657 (<1)	3,257 (<1)	5,258 (<1)	1,854 (1)	1,200 (<1)	32,918 (3)	27,219 (7)	93,863 (4)	10,902 (2)	3,012 (7)	170,969 (3)	176,227 (2)
Unvegetated	1,491 (1)	2,050 (1)	2,356 (<1)	649 (<1)	6,364 (2)	5,652 (2)	699 (<1)	487 (<1)	21,913 (5)	6,664 (<1)	619 (<1)	86 (1)	36,102 (1)	42,648 (1)
Beach	132 (<1)	64 (<1)	931 (<1)	159 (<1)	1,285 (<1)	22 (<1)	862 (<1)	833 (<1)	66 (<1)	1,594 (<1)	160 (<1)	13 (<1)	3,530 (<1)	4,816 (<1)
Obscured by clouds	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5,671 (<1)	10,909 (1)	0 (0)	3,360 (<1)	210 (<1)	0 (0)	20,129 (<1)	20,129 (<1)
Floating vegetation	15,208 (6)	8,708 (3)	10,399 (2)	1 (<1)	34,315 (2)	1,198 (<1)	2,107 (<1)	349 (<1)	0 (0)	37 (<1)	0 (0)	0 (0)	3,690 (<1)	36,005 (<1)
Mixed vegetation	0 (0)	927 (<1)	413 (<1)	384 (<1)	1,726 (<1)	6,092 (2)	5,722 (<1)	6,725 (1)	1,239 (<1)	30,476 (1)	1,783 (<1)	1,846 (4)	53,882 (1)	55,608 (1)
Unclassified	0 (0)	0 (0)	0 (0)	140 (<1)	145 (<1)	68 (<1)	0 (0)	862 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	930 (<1)	1,074 (<1)
TOTAL AREA:	263,349	231,830	880,387	767,247	2,005,232	315,765	1,210,176	1,233,916	401,157	2,399,332	703,676	43,120	6,209,162	8,314,394

Figures do not include 1,179,431 acres of offshore state waters within the coastal zone.

	Chemlar Plateau										Delta Platte Total	Cumulal Zone Total		
	Sabine	Galica	Marman	Vernal	Atchaf	Terre	Bezebar	Miss. R.	Pont.	Breton			Peart.	
1956 water to 1978 water	88,050 (28)	104,394 (32)	254,342 (32)	400,064 (47)	854,493 (37)	258,473 (44)	618,879 (64)	481,912 (42)	385,710 (42)	1,510,703 (67)	465,548 (4)	1,304 (4)	3,642,498 (56)	4,319,391 (31)
1956 marsh to 1978 water	36,111 (32)	59,260 (18)	64,482 (6)	23,883 (3)	163,734 (7)	7,847 (2)	163,003 (16)	118,731 (10)	77,096 (12)	43,915 (2)	30,217 (7)	393 (2)	441,262 (7)	604,938 (7)
1956 land to 1978 water	914 (<1)	2,410 (1)	3,382 (<1)	4,270 (1)	10,976 (<1)	2,014 (1)	7,172 (1)	10,954 (1)	6,517 (1)	8,799 (<1)	3,461 (<1)	127 (<1)	39,044 (1)	50,022 (1)
1956 water to 1978 marsh	996 (<1)	1,544 (<1)	6,094 (1)	5,034 (1)	13,647 (1)	16,448 (1)	12,930 (1)	10,052 (2)	12,063 (1)	10,163 (1)	339 (1)	65,378 (1)	79,045 (1)	
1956 marsh to 1978 marsh	152,787 (49)	104,701 (32)	409,378 (31)	283,128 (33)	951,494 (41)	549,894 (39)	397,510 (33)	71,627 (11)	396,210 (18)	197,559 (27)	19,343 (58)	1,734,934 (26)	2,486,428 (30)	
1956 land to 1978 marsh	5,491 (2)	5,464 (2)	7,287 (1)	4,116 (<1)	2,701 (1)	7,178 (1)	10,789 (1)	4,737 (1)	7,644 (<1)	5,025 (1)	352 (1)	37,940 (1)	40,431 (1)	
1956 water to 1978 land	783 (<1)	2,749 (1)	3,414 (<1)	2,033 (<1)	8,999 (<1)	2,839 (<1)	6,090 (1)	4,495 (1)	4,555 (<1)	3,798 (1)	29 (<1)	25,191 (<1)	34,190 (<1)	
1956 marsh to 1978 land	13,272 (4)	10,192 (3)	32,490 (4)	16,918 (2)	73,092 (3)	31,023 (2)	53,176 (3)	17,540 (3)	24,082 (1)	20,414 (3)	591 (2)	152,709 (2)	225,401 (3)	
1956 land to 1978 land	15,431 (5)	16,256 (11)	33,239 (4)	114,237 (13)	199,172 (9)	20,002 (1)	59,554 (3)	48,453 (8)	233,048 (10)	25,719 (4)	10,587 (32)	405,508 (4)	604,640 (7)	
Area compared	314,034 (16)	378,933 (35)	796,168 (13)	961,715 (7)	2,308,730 (13)	1,394,387 (15)	1,151,444 (18)	626,226 (13)	2,741,079 (15)	721,924 (13)	31,746 (4)	6,544,416 (12)	8,045,143 (12)	
Percentage change														

Table A-4. Land cover in each basin between 1956 and 1978, in acres (percentages in parentheses) (Cahoon and Groat 1990).

Appendix
Energy-related Activities in Louisiana's Coastal Zone
Not Requiring Coastal Use Permits.

Pursuant to La. R.S. 49:214.34.A.10., determinations of no direct and significant impact (NDSIs) should be made for the activities listed under the categories below, **provided that no environmentally or administratively sensitive areas are impacted:**

- I. Oil and gas drilling and production activities.
 - a. Office of Conservation In-lieu determinations will be made for drilling rigs in open water, in existing oil/gas canals and on existing drilling pads provided that:
 1. no dredging (including propeller washing) for access, is required
 2. they will not impact any active oyster lease, seed oyster ground, or public oyster area (may be waived with approval of LDWF)
 3. no environmentally sensitive areas (rookeries, eagle nests, submerged vegetation beds, etc.), scenic streams, or wildlife refuges (the latter may be waived with approval of LDWF) will be impacted
 4. the activity is not located in the Marsh Island/Rainey Refuge Area
 - b. Ring levees and road dumps in non-wetland areas other than those on unaltered cheniers, salt domes, barrier islands, beaches, and similar isolated, raised land forms.
 - c. Fill for shell pads in open waters when the work is not authorized by the Corps general permit NOD-3, but meets all standards provided therein.
 - d. Fill for shell pads in existing oil and gas canals.
 - e. Oil and gas platforms, extensions thereof, and appurtenant structures 150' or less in cumulative length, which do not obstruct navigation and are located in open water and do not require any dredging or fill. Applicant must agree to provide as-built plats within 30 days of installation and to remove the structures within 120 days of site abandonment. Structures must also be marked/lighted in accordance with U.S. Coast Guard regulations.
 - f. Oil and gas platforms, extensions thereof, and appurtenant structures and activities in man-made oil and gas canals or on the spoil banks of such canals. A combination of spoil bank and canal siting is acceptable if no wetland is impacted. Canal maintenance dredging, site leveling and minor earth work is permitted provided no more than 125 cubic yards of material are involved and no wetlands, oyster leases, or other environmentally or administratively sensitive features are impacted. Minor canal maintenance and minor earth work, involving no more than 125 cubic yards of material, is also allowed for removal of structures and for plug-and-abandonment activities under this determination. Applicant must agree to provide as-built plats within 30 days of installation and to remove the structures within 120

days of site abandonment. Structures must also be marked/lighted in accordance with U.S. Coast Guard regulations.

- g. Installation of piles and pile clusters for the placement of a production barge in open water areas provided that the production barge facility (barge and appurtenant structures) is no more than 350' in total length. This determination will not apply in oyster lease areas, seed oyster grounds, or other public oyster harvesting areas without the approval of LDWF. It will also not apply if other environmentally or administratively sensitive areas will be impacted. Applicant must agree to provide as-built plats within 30 days of installation and to remove the barge and all related structures within 120 days of site abandonment. The barge and structures must also be marked/lighted in accordance with U.S. Coast Guard requirements.

II. Pipelines.

- a. Pipelines laid on the surface of the ground (burial at levee and canal crossings is acceptable) provided that wheeled or tracked vehicles are not used in any phase of the installation process across vegetated, wetland areas (pulling pipe, people or equipment movement, etc.). Applicant must agree to provide as-built plats within 30 days of installation and remove the line(s) within 120 days of abandonment of the authorized use.
- b. Pipelines laid in trenches in open water bottoms and canal crossings, provided that the trench will be backfilled or the pipe is installed by jetting. Pipeline must be placed a minimum of 3 ft below the mudline. Applicant must agree to provide as-built plats within 30 days of installation and remove the line(s) within 120 days of abandonment of the authorized use.

NOTE: For items a. and b. above, if a pipeline application is to replace an existing line, the CMD requires that the old line be removed unless such removal will cause extensive environmental impacts or other significant problems.

- c. Placement of up to 125 cubic yards of rip-rap or other erosion controlling material at pipeline crossings of canal and waterway (bayous, bays, etc.) shorelines. This authorization allows for the placement of 125 cubic yards of material per crossing (62.5 cubic yards on each side of a canal or bayou); it does not restrict the number of crossings which can be authorized under each determination.

- III. Activities occurring on the Mississippi River levees or on the batture areas of such such levees provided the activity does not pose a hazard to navigation or result in the discharge of hazardous or toxic materials into the river and that no vegetated wetlands are impacted.
- IV. Activities occurring wholly in areas designated as UDV1 or UDV2 under the Cowardian classification system and which do not result in the discharge of hazardous, toxic or other habitat degrading materials into coastal waters and wetlands.
- V. Other activities which, after thorough technical review, are determined to have no direct and significant effects on coastal waters. Such determinations will apply to

exceptional cases and must document: 1) the justification for the NDSI determination, 2) any necessary coordination with other interested state or federal agencies (examples might include LDWF, the State Land Office, etc.), 3) the activity's consistency with all applicable Coastal Use Guidelines, and 4) possible future impacts to the program. This type of determination is subject to case-by-case approval by the Secretary or his designee.

COASTAL USE GUIDELINES
AS APPROVED BY THE HOUSE NATURAL RESOURCES
COMMITTEE ON JULY 9, 1980, THE SENATE NATURAL
RESOURCES COMMITTEE ON JULY 11, 1980 AND
THE GOVERNOR ON JULY 24, 1980

LOUISIANA DEPARTMENT OF NATURAL RESOURCES
LOUISIANA COASTAL RESOURCES PROGRAM

GUIDELINES APPLICABLE TO ALL USES

Guideline 1.1 The guidelines must be read in their entirety. Any proposed use may be subject to the requirements of more than one guideline or section of guidelines and all applicable guidelines must be complied with.

Guideline 1.2 Conformance with applicable water and air quality laws, standards and regulations, and with those other laws, standards and regulations which have been incorporated into the coastal resources program shall be deemed in conformance with the program except to the extent that these guidelines would impose additional requirements.

Guideline 1.3 The guidelines include both general provisions applicable to all uses and specific provisions applicable only to certain types of uses. The general guidelines apply in all situations. The specific guidelines apply only to the situations they address. Specific and general guidelines should be interpreted to be consistent with each other. In the event there is an inconsistency, the specific should prevail.

Guideline 1.4 These guidelines are not intended to nor shall they be interpreted so as to result in an involuntary acquisition or taking of property.

Guideline 1.5 No use or activity shall be carried out or conducted in such a manner as to constitute a violation of the terms of a grant or donation of any lands or waterbottoms to the State or any subdivision thereof. Revocations of such grants and donations shall be avoided.

Guideline 1.6 Information regarding the following general factors shall be utilized by the permitting authority in evaluating whether the proposed use is in compliance with the guidelines.

- a) type, nature and location of use.
- b) elevation, soil and water conditions and flood and storm hazard characteristics of site.
- c) techniques and materials used in construction, operation and maintenance of use.
- d) existing drainage patterns and water regimes of surrounding area including flow, circulation, quality, quantity and salinity; and impacts on them.
- e) availability of feasible alternative sites or methods for implementing the use.
- f) designation of the area for certain uses as part of a local program.

- g) economic need for use and extent or impacts of use on economy of locality.
- h) extent of resulting public and private benefits.
- i) extent of coastal water dependency of the use.
- j) existence of necessary infrastructure to support the use and public costs resulting from use.
- k) extent of impacts on existing and traditional uses of the area and on future uses for which the area is suited.
- l) proximity to and extent of impacts on important natural features such as beaches, barrier islands, tidal passes, wildlife and aquatic habitats, and forest lands.
- m) the extent to which regional, state and national interests are served including the national interest in resources and the siting of facilities in the coastal zones as identified in the coastal resources program.
- n) proximity to, and extent of impacts on, special areas, particular areas, or other areas of particular concern of the state program or local programs.
- o) likelihood of, and extent of impacts of, resulting secondary impacts and cumulative impacts.
- p) proximity to and extent of impacts on public lands or works, or historic, recreational or cultural resources.
- q) extent of impacts on navigation, fishing, public access, and recreational opportunities.
- r) extent of compatibility with natural and cultural setting.
- s) extent of long term benefits or adverse impacts.

Guideline 1.7 It is the policy of the coastal resources program to avoid the following adverse impacts. To this end, all uses and activities shall be planned, sited, designed, constructed, operated and maintained to avoid to the maximum extent practicable significant:

- a) reductions in the natural supply of sediment and nutrients to the coastal system by alterations of freshwater flow.
- b) adverse economic impacts on the locality of the use and affected governmental bodies.
- c) detrimental discharges of inorganic nutrient compounds into coastal waters.

- d) alterations in the natural concentration of oxygen in coastal waters.
- e) destruction or adverse alterations of streams, wetland, tidal passes, inshore waters and waterbottoms, beaches, dunes, barrier islands, and other natural biologically valuable areas or protective coastal features.
- f) adverse disruption of existing social patterns.
- g) alterations of the natural temperature regime of coastal waters.
- h) detrimental changes in existing salinity regimes.
- i) detrimental changes in littoral and sediment transport processes.
- j) adverse effects of cumulative impacts.
- k) detrimental discharges of suspended solids into coastal waters, including turbidity resulting from dredging.
- l) reductions or blockage of water flow or natural circulation patterns within or into an estuarine system or a wetland forest.
- m) discharges of pathogens or toxic substances into coastal waters.
- n) adverse alteration or destruction of archaeological, historical or other cultural resources.
- o) fostering of detrimental secondary impacts in undisturbed or biologically highly productive wetland areas.
- p) adverse alteration or destruction of unique or valuable habitats, critical habitat for endangered species, important wildlife or fishery breeding or nursery areas, designated wildlife management or sanctuary areas, or forestlands.
- q) adverse alteration or destruction of public parks, shoreline access points, public works, designated recreation areas, scenic rivers, or other areas of public use and concern.
- r) adverse disruptions of coastal wildlife and fishery migratory patterns.
- s) land loss, erosion and subsidence.
- t) increases in the potential for flood, hurricane or other storm damage, or increases in the likelihood that damage will occur from such hazards.

- u) reductions in the long term biological productivity of the coastal ecosystem.

Guideline 1.8 In those guidelines in which the modifier "maximum extent practicable" is used, the proposed use is in compliance with the guideline if the standard modified by the term is complied with. If the modified standard is not complied with, the use will be in compliance with the guideline if the permitting authority finds, after a systematic consideration of all pertinent information regarding the use, the site and the impacts of the use as set forth in guideline 1.6, and a balancing of their relative significance, that the benefits resulting from the proposed use would clearly outweigh the adverse impacts resulting from non-compliance with the modified standard and there are no feasible and practical alternative locations, methods and practices for the use that are in compliance with the modified standard and:

- a) significant public benefits will result from the use, or;
- b) the use would serve important regional, state or national interests, including the national interest in resources and the siting of facilities in the coastal zone identified in the coastal resources program, or;
- c) the use is coastal water dependent.

The systematic consideration process shall also result in a determination of those conditions necessary for the use to be in compliance with the guideline. Those conditions shall assure that the use is carried out utilizing those locations, methods and practices which maximize conformance to the modified standard; are technically, economically, environmentally, socially and legally feasible and practical; and minimize or offset those adverse impacts listed in guideline 1.7 and in the guideline at issue.

Guideline 1.9 Uses shall to the maximum extent practicable be designed and carried out to permit multiple concurrent uses which are appropriate for the location and to avoid unnecessary conflicts with other uses of the vicinity.

Guideline 1.10 These guidelines are not intended to be, nor shall they be, interpreted to allow expansion of governmental authority beyond that established by La. R.S. 49:213.1 through 213.21, as amended; nor shall these guidelines be interpreted so as to require permits for specific uses legally commenced or established prior to the effective date of the coastal use permit program nor to normal maintenance or repair of such uses.

GUIDELINES FOR LEVEES

Guideline 2.1 The leveeing of unmodified or biologically productive wetlands shall be avoided to the maximum extent practicable.

Guideline 2.2 Levees shall be planned and sited to avoid segmentation of wetland areas and systems to the maximum extent practicable.

Guideline 2.3 Levees constructed for the purpose of developing or otherwise changing the use of a wetland area shall be avoided to the maximum extent practicable.

Guideline 2.4 Hurricane and flood protection levees shall be located at the non-wetland/wetland interface or landward to the maximum extent practicable.

Guideline 2.5 Impoundment levees shall only be constructed in wetland areas as part of approved water or marsh management projects or to prevent release of pollutants.

Guideline 2.6 Hurricane or flood protection levee systems shall be designed, built and thereafter operated and maintained utilizing best practical techniques to minimize disruptions of existing hydrologic patterns, and the interchange of water, beneficial nutrients and aquatic organisms between enclosed wetlands and those outside the levee system.

GUIDELINES FOR LINEAR FACILITIES

Guideline 3.1 Linear use alignments shall be planned to avoid adverse impacts on areas of high biological productivity or irreplaceable resource areas.

Guideline 3.2 Linear facilities involving the use of dredging or filling shall be avoided in wetland and estuarine areas to the maximum extent practicable.

Guideline 3.3 Linear facilities involving dredging shall be of the minimum practical size and length.

Guideline 3.4 To the maximum extent practicable, pipelines shall be installed through the "push ditch" method and the ditch backfilled.

Guideline 3.5 Existing corridors, rights-of-way, canals, and streams shall be utilized to the maximum extent practicable for linear facilities.

Guideline 3.6 Linear facilities and alignments shall be, to the maximum extent practicable, designed and constructed to permit multiple uses consistent with the nature of the facility.

Guideline 3.7 Linear facilities involving dredging shall not traverse or adversely affect any barrier island.

Guideline 3.8 Linear facilities involving dredging shall not traverse beaches, tidal passes, protective reefs or other natural gulf shoreline unless no other alternative exists. If a beach, tidal pass, reef or other natural gulf shoreline must be traversed for a non-navigation canal, they

shall be restored at least to their natural condition immediately upon completion of construction. Tidal passes shall not be permanently widened or deepened except when necessary to conduct the use. The best available

restoration techniques which improve the traversed area's ability to serve as a shoreline shall be used.

Guideline 3.9 Linear facilities shall be planned, designed, located and built using the best practical techniques to minimize disruption of natural hydrologic and sediment transport patterns, sheet flow, and water quality, and to minimize adverse impacts on wetlands.

Guideline 3.10 Linear facilities shall be planned, designed, and built using the best practical techniques to prevent bank slumping and erosion, saltwater intrusion, and to minimize the potential for inland movement of storm-generated surges. Consideration shall be given to the use of locks in navigation canals and channels which connect more saline areas with fresher areas.

Guideline 3.11 All non-navigation canals, channels and ditches which connect more saline areas with fresher areas shall be plugged at all waterway crossings and at intervals between crossings in order to compartmentalize them. The plugs shall be properly maintained.

Guideline 3.12 The multiple use of existing canals, directional drilling and other practical techniques shall be utilized to the maximum extent practicable to minimize the number and size of access canals, to minimize changes of natural systems and to minimize adverse impacts on natural areas and wildlife and fisheries habitat.

Guideline 3.13 All pipelines shall be constructed in accordance with parts 191, 192, and 195 of Title 49 of the Code of Federal Regulations, as amended, and in conformance with the Commissioner of Conservation's Pipeline Safety Rules and Regulations and those safety requirements established by La. R.S. 45:408, whichever would require higher standards.

Guideline 3.14 Areas dredged for linear facilities shall be backfilled or otherwise restored to the pre-existing conditions upon cessation of use for navigation purposes to the maximum extent practicable.

Guideline 3.15 The best practical techniques for site restoration and revegetation shall be utilized for all linear facilities.

Guideline 3.16 Confined and dead end canals shall be avoided to the maximum extent practicable. Approved canals must be designed and constructed using the best practical techniques to avoid water stagnation and eutrophication.

GUIDELINES FOR DREDGED SPOIL DEPOSITION

Guideline 4.1 Spoil shall be deposited utilizing the best practical techniques to avoid disruption of water movement, flow, circulation and quality.

Guideline 4.2 Spoil shall be used beneficially to the maximum extent practicable to improve productivity or create new habitat, reduce or compensate for environmental damage done by dredging activities, or prevent environmental damage. Otherwise, existing spoil disposal areas or upland disposal shall be utilized to the maximum extent practicable rather than creating new disposal areas.

Guideline 4.3 Spoil shall not be disposed of in a manner which could result in the impounding or draining of wetlands or the creation of development sites unless the spoil deposition is part of an approved levee or land surface alteration project.

Guideline 4.4 Spoil shall not be disposed of on marsh, known oyster or clam reefs or in areas of submersed vegetation to the maximum extent practicable.

Guideline 4.5 Spoil shall not be disposed of in such a manner as to create a hindrance to navigation or fishing, or hinder timber growth.

Guideline 4.6 Spoil disposal areas shall be designed and constructed and maintained using the best practical techniques to retain the spoil at the site, reduce turbidity, and reduce shoreline erosion when appropriate.

Guideline 4.7 The alienation of state-owned property shall not result from spoil deposition activities without the consent of the Department of Natural Resources.

GUIDELINES FOR SHORELINE MODIFICATION

Guideline 5.1 Non-structural methods of shoreline protection shall be utilized to the maximum extent practicable.

Guideline 5.2 Shoreline modification structures shall be designed and built using best practical techniques to minimize adverse environmental impacts.

Guideline 5.3 Shoreline modification structures shall be lighted or marked in accordance with U.S. Coast Guard regulations, not interfere with navigation, and should foster fishing, other recreational opportunities, and public access.

Guideline 5.4 Shoreline modification structures shall be built using best practical materials and techniques to avoid the introduction of pollutants and toxic substances into coastal waters.

Guideline 5.5 Piers and docks and other harbor structures shall be designed and built using best practical techniques to avoid obstruction of water circulation.

Guideline 5.6 Marinas, and similar commercial and recreational developments shall to the the maximum extent practicable not be located so as to result in adverse impacts on open productive oyster beds, or submersed grass beds.

Guideline 5.7 Neglected or abandoned shoreline modification structures, piers, docks, mooring and other harbor structures shall be removed at the owner's expense, when appropriate.

Guideline 5.8 Shoreline stabilization structures shall not be built for the purpose of creating fill areas for development unless part of an approved surface alteration use.

Guideline 5.9 Jetties, groins, breakwaters and similar structures shall be planned, designed and constructed so as to avoid to the maximum extent practicable downstream land loss and erosion.

GUIDELINES FOR SURFACE ALTERATIONS

Guideline 6.1 Industrial, commercial, urban, residential, and recreational uses are necessary to provide adequate economic growth and development. To this end, such uses will be encouraged in those areas of the coastal zone that are suitable for development. Those uses shall be consistent with the other guidelines and shall, to the maximum extent practicable, take place only:

- a) on lands five feet or more above sea level or within fast lands;
or
- b) on lands which have foundation conditions sufficiently stable to support the use, and where flood and storm hazards are minimal or where protection from these hazards can be reasonably well achieved, and where the public safety would not be unreasonably endangered; and
 - 1) the land is already in high intensity of development use, or
 - 2) there is adequate supporting infrastructure, or
 - 3) the vicinity has a tradition of use for similar habitation or development

Guideline 6.2 Public and private works projects such as levees, drainage improvements, roads, airports, ports, and public utilities are

necessary to protect and support needed development and shall be encouraged. Such projects shall, to the maximum extent practicable, take place only when:

- a) they protect or serve those areas suitable for development pursuant to Guideline 6.1; and
- b) they are consistent with the other guidelines; and
- c) they are consistent with all relevant adopted state, local and regional plans.

Guideline 6.3 BLANK (Deleted)

Guideline 6.4 To the maximum extent practicable wetland areas shall not be drained or filled. Any approved drain or fill project shall be designed and constructed using best practical techniques to minimize present and future property damage and adverse environmental impacts.

Guideline 6.5 Coastal water dependent uses shall be given special consideration in permitting because of their reduced choice of alternatives.

Guideline 6.6 Areas modified by surface alteration activities shall, to the maximum extent practicable, be revegetated, refilled, cleaned and restored to their predevelopment condition upon termination of the use.

Guideline 6.7 Site clearing shall to the maximum extent practicable be limited to those areas immediately required for physical development.

Guideline 6.8 Surface alterations shall, to the maximum extent practicable, be located away from critical wildlife areas and vegetation areas. Alterations in wildlife preserves and management areas shall be conducted in strict accord with the requirements of the wildlife management body.

Guideline 6.9 Surface alterations which have high adverse impacts on natural functions shall not occur, to the maximum extent practicable, on barrier islands and beaches, isolated cheniers, isolated natural ridges or levees, or in wildlife and aquatic species breeding or spawning areas, or in important migratory routes.

Guideline 6.10 The creation of low dissolved oxygen conditions in the water or traps for heavy metals shall be avoided to the maximum extent practicable.

Guideline 6.11 Surface mining and shell dredging shall be carried out utilizing the best practical techniques to minimize adverse environmental impacts.

Guideline 6.12 The creation of underwater obstructions which adversely affect fishing or navigation shall be avoided to the maximum extent practicable.

Guideline 6.13 Surface alteration sites and facilities shall be designed, constructed, and operated using the best practical techniques to prevent the release of pollutants or toxic substances into the environment and minimize other adverse impacts.

Guideline 6.14 To the maximum extent practicable only material that is free of contaminants and compatible with the environmental setting shall be used as fill.

GUIDELINES FOR HYDROLOGIC AND SEDIMENT TRANSPORT MODIFICATIONS

Guideline 7.1 The controlled diversion of sediment-laden waters to initiate new cycles of marsh building and sediment nourishment shall be encouraged and utilized whenever such diversion will enhance the viability and productivity of the outfall area. Such diversions shall incorporate a plan for monitoring and reduction and/or amelioration of the effects of pollutants present in the freshwater source.

Guideline 7.2 Sediment deposition systems may be used to offset land loss, to create or restore wetland areas or enhance building characteristics of a development site. Such systems shall only be utilized as part of an approved plan. Sediment from these systems shall only be discharged in the area that the proposed use is to be accomplished.

Guideline 7.3 Undesirable deposition of sediments in sensitive habitat or navigation areas shall be avoided through the use of the best preventive techniques.

Guideline 7.4 The diversion of freshwater through siphons and controlled conduits and channels, and overland flow to offset saltwater intrusion and to introduce nutrients into wetlands shall be encouraged and utilized whenever such diversion will enhance the viability and productivity of the outfall area. Such diversions shall incorporate a plan for monitoring and reduction and/or amelioration of the effects of pollutants present in the freshwater source.

Guideline 7.5 Water or marsh management plans shall result in an overall benefit to the productivity of the area.

Guideline 7.6 Water control structures shall be assessed separately based on their individual merits and impacts and in relation to their overall water or marsh management plan of which they are a part.

Guideline 7.7 Weirs and similar water control structures shall be designed and built using the best practical techniques to prevent "cut arounds," permit tidal exchange in tidal areas, and minimize obstruction of the migration of aquatic organisms.

Guideline 7.8 Impoundments which prevent normal tidal exchange and/or the migration of aquatic organisms shall not be constructed in brackish and saline areas to the maximum extent practicable.

Guideline 7.9 Withdrawal of surface and ground water shall not result in saltwater intrusion or land subsidence to the maximum extent practicable.

GUIDELINES FOR DISPOSAL OF WASTES

Guideline 8.1 The location and operation of waste storage, treatment, and disposal facilities shall be avoided in wetlands to the maximum extent practicable, and best practical techniques shall be used to minimize adverse impacts which may result from such use.

Guideline 8.2 The generation, transportation, treatment, storage and disposal of hazardous wastes shall be pursuant to the substantive requirements of the Department of Natural Resources adopted pursuant to Act 334 of 1978 and approved pursuant to the Resource Conservation and Recovery Act. of 1976 P. L. 94-580, and of the Office of Conservation for injection below surface.

Guideline 8.3 Waste facilities located in wetlands shall be designed and built to withstand all expectable adverse conditions without releasing pollutants.

Guideline 8.4 Waste facilities shall be designed and constructed using best practical techniques to prevent leaching, control leachate production, and prevent the movement of leachate away from the facility.

Guideline 8.5 The use of overland flow systems for non-toxic, biodegradable wastes, and the use of sump lagoons and reservoirs utilizing aquatic vegetation to remove pollutants and nutrients shall be encouraged.

Guideline 8.6 All waste disposal sites shall be marked and, to the maximum extent practicable, all components of waste shall be identified.

Guideline 8.7 Wastes facilities in wetlands with identifiable pollution problems that are not feasible and practical to correct shall be closed and either removed or sealed, and shall be properly revegetated using the best practical techniques.

Guideline 8.8 Waste shall be disposed of only at approved disposal sites.

Guideline 8.9 Radioactive wastes shall not be temporarily or permanently disposed of in the coastal zone.

GUIDELINES FOR USES THAT RESULT IN THE ALTERATION OF WATERS DRAINING INTO COASTAL WATERS

Guideline 9.1 Upland and upstream water management programs which affect coastal waters and wetlands shall be designed and constructed to preserve or enhance existing water quality, volume, and rate of flow to the maximum extent practicable.

Guideline 9.2 Runoff from developed areas shall to the maximum extent practicable be managed to simulate natural water patterns, quantity, quality and rate of flow.

Guideline 9.3 Runoff and erosion from agricultural lands shall be minimized through the best practical techniques.

GUIDELINES FOR OIL, GAS AND OTHER MINERAL ACTIVITIES

Guideline 10.1 Geophysical surveying shall utilize the best practical techniques to minimize disturbance or damage to wetlands, fish and wildlife and other coastal resources.

Guideline 10.2 To the maximum extent practicable, the number of mineral exploration and production sites in wetland areas requiring floatation access shall be held to the minimum number, consistent with good recovery and conservation practices and the need for energy development, by directional drilling, multiple use of existing access canals and other practical techniques.

Guideline 10.3 Exploration, production and refining activities shall, to the maximum extent practicable, be located away from critical wildlife areas and vegetation areas. Mineral operations in wildlife preserves and management areas shall be conducted in strict accordance with the requirements of the wildlife management body.

Guideline 10.4 Mineral exploration and production facilities shall be to the maximum extent practicable designed, constructed and maintained in such a manner to maintain natural water flow regimes, avoid blocking surface drainage, and avoid erosion.

Guideline 10.5 Access routes to mineral exploration, production and refining sites shall be designed and aligned so as to avoid adverse impacts on critical wildlife and vegetation areas to the maximum extent practicable.

Guideline 10.6 Drilling and production sites shall be prepared, constructed, and operated using the best practical techniques to prevent the release of pollutants or toxic substances into the environment.

Guideline 10.7 All drilling activities, supplies, and equipment shall be kept on barges, on drilling rigs, within ring levees, or on the well site.

Guideline 10.8 Drilling ring levees shall to the maximum extent practicable be replaced with smaller production levees or removed entirely.

Guideline 10.9 All drilling and production equipment, structures, and storage facilities shall be designed and constructed utilizing best practical techniques to withstand all expectable adverse conditions without releasing pollutants.

Guideline 10.10 Mineral exploration, production and refining facilities shall be designed and constructed using best practical techniques to minimize adverse environmental impacts.

Guideline 10.11 Effective environmental protection and emergency or contingency plans shall be developed and complied with for all mineral operations.

Guideline 10.12 The use of dispersants, emulsifiers and other similar chemical agents on oil spills is prohibited without the prior approval of the Coast Guard or Environmental Protection Agency on-Scene Coordinator, in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan.

Guideline 10.13 Mineral exploration and production sites shall be cleared, revegetated, detoxified and otherwise restored as near as practicable to their original condition upon termination of operations to the maximum extent practicable.

Guideline 10.14 The creation of underwater obstructions which adversely affect fishing or navigation shall be avoided to the maximum extent practicable.

GUIDELINE DEFINITIONS

Levees - any use or activity which creates an embankment to control or prevent water movement, to retain water or other material, or to raise a road or other lineal use above normal or flood water levels. Examples include levees, dikes and embankments of any sort.

Linear Facilities - those uses and activities which result in creation of structures or works which are primarily linear in nature. Examples include pipelines, roads, canals, channels, and powerlines.

Shoreline Modifications - those uses and activities planned or constructed with the intention of directly or indirectly changing or preventing change of a shoreline. Examples include bulkheading, piers, docks, wharves, slips and short canals, and jetties.

Spoil Deposition - the deposition of any excavated or dredged material.

Surface Alterations - those uses and activities which change the surface or usability of a land area or water bottom. Examples include fill deposition, land reclamation, beach nourishment, dredging (primarily areal), clearing, draining, surface mining, construction and operation of transportation, mineral, energy and industrial facilities, and industrial, commercial and urban developments.

Hydrologi: and Sediment Transport Modifications - those uses and activities intended to change water circulation, direction of flow, velocity, level, or quality or quantity of transported sediment. Examples include locks, water gates, impoundments, jetties, groins, fixed and variable weirs, dams, diversion pipes, siphons, canals, and surface and ground-water withdrawals.

Waste Disposal - those uses and activities which involve the collections, storage and discarding or disposing of any solid or liquid material. Examples include littering; landfill; open dumping; incineration; industrial waste treatment facilities; sewerage treatment; storage in pits, ponds or lagoons; ocean dumping and subsurface disposal.

Alterations of Waters Draining in Coastal Waters - those uses or activities that would alter, change, or introduce polluting substances into runoff and thereby modify the quality of coastal waters. Examples include water control impoundments, upland and water management programs, and drainage projects from urban, agricultural and industrial developments.

Oil, Gas and Other Mineral Activities - those uses and activities which are directly involved in the exploration, production, and refining of oil, gas and other minerals. Examples include geophysical surveying, establishment of drill sites and access to them, drilling, on site storage of supplies, products and waste materials, production, refining, and spill cleanup.

Coastal Water Dependent Uses - those which must be carried out on, in or adjacent to coastal water areas or wetlands because the use requires access to the water body or wetland or requires the consumption, harvesting or other direct use of coastal resources, or requires the use of coastal water in the manufacturing or transportation of goods. Examples include surface and subsurface mineral extraction, fishing, ports and necessary supporting commercial and industrial facilities, facilities for the construction, repair and maintenance of vessels, navigation projects, and fishery processing plants.

Best Practical Techniques - those methods or techniques which would result in the greatest possible minimization of the adverse impacts listed in Guideline 1.7 and in specific guidelines applicable to the proposed use. Those methods or techniques shall be the best methods or techniques which are in use in the industry or trade or among practitioners of the use, and which are feasible and practical for utilization.

Water or Marsh Management Plan - a systematic development and control plan to improve and increase biological productivity, or to minimize land loss, saltwater intrusion, erosion or other such environmental problems, or to enhance recreation.

Impoundment Levees - those levees and associated water control structures whose primary purpose is to contain water within the levee system either for the prevention of the release of pollutants, to create fresh water reservoirs, or for management of fish or wildlife resources.

Hurricane or Flood Protection Levees - those levees and associated water control structures whose primary purpose is to prevent occasional surges of flood or storm generated high water. Such levee systems do not include those built to permit drainage or development of enclosed wetland areas.

Development Levees - those levees and associated water control structures whose purpose is to allow control of water levels within the area enclosed by the levees to facilitate drainage or development within the leveed areas. Such levee systems also commonly serve for hurricane or flood protection, but are not so defined for purposes of these guidelines.

Feasible and Practical - those locations, methods and/or practices which are of established usefulness and efficiency and allow the use or activity to be carried out successfully.

Minerals - oil, gas, sulfur, geothermal, geopressured, salt, or other naturally occurring energy or chemical resources which are produced from below the surface in the coastal zone. Not included are such surface resources as clam or oyster shells, dirt, sand, or gravel.

Sediment Deposition Systems - controlled diversions of sediment-laden water in order to initiate land building or sediment nourishment or to minimize undesirable deposition of sediment in navigation channels or habitat areas. Typical activities include diversion channels, jetties, groins or sediment pumps.

Radioactive Wastes - Wastes containing source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923).

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