The National Marine Fisheries Service Habitat Conservation Efforts in Louisiana, 1980 Through 1990

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Introduction

The Louisiana coastal zone includes about 1.5 million hectares of extremely valuable wetland habitat, approximately 41% of all remaining coastal wetlands in the United States. Louisiana waters contributed about 15% of the total U. S. fisheries harvest in volume in 1989, representing over $264 million in dockside value (NMFS, 1990). Dockside landings may generate at least three times this value as the product moves through processing stages and wholesale and retail markets within the state (Jones et al., 1974; Penn, 1974). Approximately 98% of the commercial harvest is comprised of estuarine-dependent fishery species (i.e., species that spend at least a part of their life cycle in coastal waters and wetlands). In addition, the annual contribution of licensed saltwater anglers to the state's economy has been conservatively estimated to exceed $600 million (Bertrand, 1984).

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ABSTRACT—Data quantifying various aspects of the Corps of Engineers wetland regulatory program in Louisiana from 1980 through 1990 are presented. The National Marine Fisheries Service (NMFS) habitat conservation efforts for this time period are described and averages involved delineated. From 1980 through 1990, NMFS reviewed 14,259 public notices to dredge, fill, or impound wetlands in Louisiana and provided recommendations to the Corps on 962 projects which proposed to impact over 600,000 acres of tidally influenced wetlands. NMFS recommended that impacts to about 279,000 acres be avoided and that more than 150,000 acres of compensatory mitigation be provided. During this period, marsh management projects proposed impounding over 197,000 acres of wetlands. On a permit by permit basis, 43% of NMFS recommendations were accepted, 34% were partially accepted, and 23% were rejected.

Louisiana coastal wetlands converted to open water at an average annual rate of 0.86 percent from 1955 to 1978. This amounted to an estimated loss of nearly 290,000 hectares of marsh for the entire 23 year period (Turner, 1990). Although Louisiana was losing about 130 km^2 of marsh per year in the mid 1980's to various land loss processes (Cowan et al., 1987), it appears as if this land loss rate may be slowing (Britsch and Kemp, 1990; Dunbar et al., 1990).

Wetland losses in Louisiana are caused by a variety of factors. In a comprehensive evaluation, Turner and Cahoon (1987) estimated that 26% of all wetland losses between 1955 and 1978 were directly attributable to some specific, identifiable coastal development activity. They attributed 56% of this direct wetland loss to canal dredging and the conversion of wetland to upland habitat by spoil placement. Most of the remaining direct causes of wetland loss were attributed to urban development and agricultural activities.

Indirect impacts are those wetland alterations resulting from direct impacts that occur at a different time or place. The wetland loss attributed to indirect impacts by Turner and Cahoon (1987) is primarily caused by saltwater intrusion, tidal scouring, subsidence, sea level rise, shoreline erosion, and sediment deprivation. Turner and Cahoon (1987) estimated 20–60% of all indirect wetland losses between 1955 and 1978 from identifiable causes were attributable to canal dredging and spoil bank construction, and 4–13% to outer continental shelf oil and gas activities (primarily pipeline construction).

Boesch and Turner (1984) emphasize that the key to management of estuarine-dependent species is coastal habitat protection and enhancement. Production of some estuarine-dependent fishery species has been shown to be proportional to the area of nearby wetlands (Turner, 1977), or to the length of the land-water interface (Browder et al., 1989). Because the National Marine Fisheries Service (NMFS) is the Federal agency responsible for the management of our Nation's living marine resources, the conservation of habitat supporting these resources is of prime importance to the agency. Within the NMFS, this responsibility is fulfilled by the Habitat Conservation Division (HCD).

The U.S. Army Corps of Engineers (Corps) is responsible for the Federal permitting of dredge and fill activities in wetlands under Section 404 of the Clean Water Act. They also regulate alteration of navigable waters under Section 10 of the Rivers and Harbors Act. Each year thousands of requests are made to the New Orleans District Corps of Engineers for Section 10 or 404 permits pertaining to wetland development in southern Louisiana. Once an application pertaining to Section 10 or 404 activities is received, the Corps may issue a public notice describing the proposed activities and geographic location of the project area. Because wetland alterations can adversely impact marine fishery resources, the HCD provides recommendations to the Corps concerning pro-

posed activities. These recommendations are designed to avoid, minimize, or offset adverse project effects on marine, estuarine, and anadromous fishery resources and their habitats.

Since May 1980, the HCD has maintained a database for public notices issued by the Corps for Section 10 and 404 activities and our responses to those wetland alteration proposals. This report summarizes data from May 1980 through December 1990 on public notices and permits issued by the Corps for Section 10 and/or 404 activities in Louisiana, HCD recommendations concerning those proposed activities, and Corps actions on HCD recommendations.

Methods

A computerized system to track HCD permit recommendations and proposed habitat alterations in the southeast was instituted in 1980 and was preliminarily reported on by Lindall and Thayer (1982) and summarized for 5 years by Mager and Thayer (1986). Since 1985, annual publications have been prepared to report and discuss coastal development activities in the southeast (Mager and Keppner, 1987; Mager and Hardy, 1988; Mager and Ruebsamen, 1988; Mager, 1990a,b).

Data entered into the system were acquired directly from public notices and field investigations by HCD staff and contractors. These data were entered into one of two primary databases pertinent to Corps public notices. The largest database contains administrative information and tracks variables obtained from each public notice. Variables in this database describe the geographic location of, type of activity applied for (Table 1), and HCD response to the proposed activity.

The second database contains data pertinent to only those public notices for which the HCD recommended project alterations or permit denial. This database contains variables which, in general, describe the area (acres) of all habitats proposed by the applicant to be altered, the HCD recommendations in regard to proposed habitat alterations, and the Corps' response to HCD recommendations as contained in issued permits and statements of finding.

Table 1.—National Marine Fisheries Service, Habitat Conservation Division, activity type codes and descriptions.

Code	Description
BA	Barriers and impoundments (e.g., dams, dikes, fences, flood control structures, levees, weirs)
BE	Beach restoration
BR	Bridges and highways
DO[1]	Docks, dolphins, piers, wharves, mooring piles
EL	Electrical generating plants
HO	Housing developments (including residential modifications, house pads, septic tanks)
IN	Industrial or commercial development
IR	Irrigation, drainage, or mosquito control
MD[2]	Maintenance dredging
MI	Mining and mineral dredging (e.g., commercial sand dredging)
MM	Marsh management
NA	Navigation channels and marinas
OI	Oil and gas activities
OT	Other (not described by other codes)
PI	Pipelines
SH	Shoreline activities (e.g., bulkheads, groins, jetties, ramps, rip-rap)
TR	Transmission lines (e.g., telephone cables)
WR[3]	Wetlands restoration

[1]Prior to 1986 identified as SH.
[2]Prior to 1986 identified as NA.
[3]Not used prior to 1990.

Data from both files were merged for those public notices for which the HCD recommended permit denial or project revision. This combined data set was used to determine acreages of each habitat type for which the HCD made recommendations, the percentage of HCD recommendations accepted by the Corps for each activity type and year, the area of each habitat type conserved by HCD recommendations, and the acreage of all habitats in the HCD database permitted by the Corps for alteration.

Results and Discussion

Total Public Notices

Over 11,500 public notices for wetland alteration activities in southern Louisiana were received by the HCD between May 1980 and 31 December 1990 (Table 2). Most (8,170 or 71%) described activities requiring permits under both Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Alterations to navigable waters (Section 10 activities) were proposed in 25%, and dredged material disposal and fill activities requiring only Section 404 review were identified in about 3% of all public notices.

Oil and gas activities were the most numerous project types identified in public notices during this period, followed by shoreline activities and pipelines (Table 3). When the number of public notices for oil and gas are combined with those for pipelines, at least 52 percent of all Section 10/404 public notices issued by the Corps involved petroleum exploration and production activities. In addition, an unquantified number of public notices in the barriers and impoundments, docks, maintenance dredging, navigation channels, and shoreline activities project type categories described activities related to petroleum development. Several thousand minor oil and gas activities requiring Section 10/404 review, autho-

Table 2.—Number of public notices issued for each kind of activity and the number of permit NOD-22's issued from May 1980 through December 1990, by year.

	Public notice					
Year	Sect. 10	Sect. 404	Sect. 10/404	Total	NOD-22	Total
1980	NA[1]	NA	1,035	1,035	NA	1,035
1981	NA	NA	1,611	1,611	NA	1,611
1982	678	25	942	1,645	NA	1,645
1983	484	22	783	1,289	52[2]	1,341
1984	338	13	735	1,086	431	1,517
1985	323	19	666	1,008	598	1,606
1986	272	40	534	846	292	1,138
1987	201	19	594	814	324	1,138
1988	174	44	450	668	376	974
1989	174	59	485	718	358	983
1990	234	141	415	790	486	1,271
Total	2,878	382	8,250	11,510	2,917	14,259

[1]N/A = Data not available.
[2]26 September–31 December, 1983 only.

Table 3.—Number of New Orleans District Corps of Engineers public notices issued from May 1980 through December 1990, by project type, and the number and percent of the total (in parenthesis) of each project type involved in NMFS habitat conservation recommendations.

Project type[1]	Number of public notices	Number of recommended revisions	
BA	365	76	(21)
BE	4	1	(25)
BR	115	9	(8)
DO	318	0	(0)
EL	5	0	(0)
HO	139	34	(24)
IN	290	40	(14)
IR	125	12	(10)
MD	272	61	(22)
MI	104	15	(14)
MM	131	91	(69)
NA	587	122	(21)
OI	4,678	697	(15)
OT	228	28	(12)
PI	1,360	73	(5)
SH	2,622	106	(4)
TR	131	1	(1)
WR	3	1	(33)
N/A[2]	33	14	(45)
Total	11,510	1,381	(12)

[1]See Table 1 for code descriptions.
[2]Project type not identified.

rized under general permits and areawide maintenance dredging permits are not included in these figures.

Oil and gas exploration and production was the most frequent project type for all years combined, and for each year from 1980 through 1988. However, in 1989 and 1990, shoreline activities such as bulkheads, riprap, and jetties became the most common project type advertised in public notices. Oil and gas activities and barrier/impoundment construction were the second and third most common project types in 1989 and 1990. Decreases in oil and gas, shoreline activities, pipeline, and navigation project types are one primary reason for the overall annual decrease in public notices issued between 1982 and 1988 (Table 2). Much of the decrease in public notice numbers also can be attributed to the establishment of general permits.

General Permits

General permits authorize Section 10/404 activities that are similar and cause minimal individual environmental impacts. During our study period, the Corps issued permits in 16 general permit categories. These general permits cover a wide range of activities and the number of general permits issued yearly varies widely among categories. The Corps normally notifies only the NMFS, U.S. Fish and Wildlife Service (FWS), and U.S. Environmental Protection Agency (EPA) of activities proposed for authorization, or already authorized under a general permit.

General permit NOD-22, established in 1983, authorizes "minor" activities in the Louisiana coastal zone, is the most frequently used of 16 general permits, and is the only general permit for which resource agencies have comment authority. The NOD-22 authorized several hundred Section 10/404 projects annually during the study period (Table 2). If the agencies believe the anticipated impacts of a project are greater than allowed for under NOD-22 special conditions, they may request the project be advertised under standard public review procedures.

The majority of NOD-22 permits pertain to oil and gas activities. NOD-22 permits, along with several other general permits and numerous areawide maintenance dredging permits have greatly reduced the number of individual public notices issued for oil and gas activities. Total general permit authorization in 1985, 1989, and 1990, the only years for which data are available, totalled 852, 657, and 824 respectively. Therefore, general permit authorizations in Louisiana were issued almost as frequently as public notices in 1985 and 1989 and were more numerous in 1990.

Area-wide maintenance dredging permits, first authorized in 1987, allow maintenance of existing canals within a developed oil and gas field, with Federal agency review only. The NMFS, FWS, and EPA are notified by the Corps for each specific maintenance dredging application and are allowed a 20-day comment period. This type of permit has reduced the number of public notices issued for the 1987 through 1990 period. For example, approximately 200 general permits for specific maintenance dredging events (called maintenance dredging determinations) were issued in 1989 alone. The few recommendations made by the resource agencies in response to maintenance dredging determinations were related to using dredged material to nourish subsiding wetlands, or to create soil elevations conducive to the establishment of marsh vegetation in eroded shallow water areas. Because of the already impacted nature of the areas, the brief review period, and the large number of such applications, HCD recommendations on NOD-22 and maintenance dredging determinations generally were based solely on the review of readily available resource information (primarily aerial photographs).

NMFS Recommended Revisions

During the study period, the HCD recommended plan revisions or permit denial for 1,380 or 12% of all proposed Section 10/404 projects advertised in Corps' public notices (Table 3). The annual percent of public notices for which the HCD provided substantive comments changed little, varying from a low of 10% in 1983, 1984, 1986, and 1990, to a high of 15% in 1985 and 1988. The HCD, therefore, did not object to, or did not provide substantive comments on, the majority of public notices issued each year. This was primarily because: 1) Projects were minor and expected to have little or no adverse impacts on marine fishery resources or 2) projects were in areas not supportive of marine fishery resources, such as nontidal wetlands, leveed fastlands, or previously impounded areas.

The HCD categorizes recommendations made on a project into three different levels: 1) Denial with no alternatives recommended, 2) permit denial unless less damaging alternatives are incorporated into the project, and 3) permit requires relatively minor revisions. Only 3% of all projects receiving substantive comments were recommended for denial without alternative designs. Projects in this category are usually not water-dependent or do not appear to be in the public interest, and no alternative designs or locations are feasible which would minimize adverse impacts to fishery resources while allowing the applicant to achieve the project objectives.

The HCD recommended project revisions in 97% of the substantive comments provided to the Corps. The HCD recommended revision of certain project categories because they are not water-dependent, less damaging alternatives were available, or mitigation to offset impacts was necessary. Housing and industrial development are project types where the HCD often recommends project denial or requests revision. The cumulative effects of many, generally small, projects on wetland habitats can be extremely large, especially when large housing concentrations are used to justify flood protection in the form of levees and forced drainage projects. Direct loss of wetlands caused by levee construction and indirect impacts caused by the release of untreated sewage from camps, runoff from housing and industrial development projects, and industrial discharge degrade aquatic habitats and fishery productivity. HCD comments for housing/industrial projects generally

involve recommending the project be relocated to a non-wetland area, that the project be revised to minimize and offset wetland impacts, or that the project incorporate measures to reduce the potential for water pollution from the site.

Although the proportion of oil and gas projects for which the HCD recommended revisions is relatively small (15%), the large number of public notices issued for this activity makes it the project type on which NMFS most frequently commented (Table 3). Of all the projects for which the HCD has recommended revision or denial, 56% (770 of 1,380) concern petroleum exploration and production activities (oil and gas activities and pipelines). The HCD most frequently recommends minimization of the length of well access canals and roads or relocation of ring levee sites to nonwetland areas. Our review often includes a geologic review process (described in Johnson et al., 1989) to determine alternative surface locations from which the desired geological target could be reached. After determining the area from which a well could be drilled, the least environmentally damaging access route to the well site is recommended based on review of aerial photographs and other resource information. In addition, the HCD often recommended: 1) The use of a containerized system when drilling fluids or cuttings associated with drilling fluids contain oil base fluids, heavy metal additives, asbestos viscosifiers, corrosion inhibitors, chlorinated phenol biocides, or any other substances classified as priority pollutants by the EPA; and 2) all produced waters from production operations be held in closed storage containers until they can be reinjected or be transported to and disposed of at a state approved upland site. The HCD also seeks compensatory mitigation for lost or degraded wetlands for projects where adverse impacts cannot be avoided.

When the HCD provided recommendations on pipeline activities, it was usually to request that the pipeline be routed to follow spoil-bank contours, the pipeline be laid on the marsh without burial, the pipeline right-of-way be restored, or that pipeline/waterway intersections be armored with riprap to prevent erosion. The few shoreline activities the HCD commented on generally involved construction of a bulkhead along a waterway and filling of wetlands behind the bulkhead. In these cases, the HCD generally recommended the bulkhead be constructed at, or landward of, the mean high water line and that project area wetlands not be filled or dredged.

Marsh Management

The HCD recommended revisions to 69% of all marsh management projects advertised in public notices (Table 3). Although the HCD often objected to and recommended revision of marsh management projects, the frequency of objections fluctuated a great deal annually. For example, the HCD recommended revision to 45% of marsh management projects in 1982 but objected to issuance, without project revisions, to 100% of all marsh management projects in 1988.

Marsh management projects normally employ water control structures and levees to hydrologically isolate marshes from adjacent water-bodies and to manipulate water flows and levels to achieve some expected benefit. Such projects generally have a goal of reducing land loss or saltwater intrusion, or increasing wildlife harvest from managed areas (Cahoon and Groat, 1990). Although marsh management can concentrate waterfowl, especially by retaining water during winter low water periods, there is no scientific documentation that it reduces land loss or controls saltwater intrusion. To the contrary, recent research in Louisiana (Cahoon and Groat, 1990; Reed and McKee, 1991) reported decreased sediment and nutrient import, reduced vertical accretion, and in the deltaic plain, decreased plant health, in managed as compared to unmanaged marsh systems. Cahoon and Groat (1990) and research reported in Herke (1968, 1979), Herke et al. (1987a;b), Herke et al. (1992), Konikoff and Hoese (1989), and Pittman and Piehler (1989) have shown significantly reduced standing crops and production of commercially and recreationally important marine fishery resources as a result of marsh management practices. Considering the total wetland acreage proposed for marsh management (over 200,000 acres); the approximately 400,000 acres proposed in the state of Louisiana's 1990–92 coastal restoration plans; the thousands of acres already under management; and the impact of water control structures and dams on fishery migrations, it is evident that marsh management may have significant adverse impacts on the production of a vast commercially and recreationally important marine fishery resource base in Louisiana.

HCD responses to marsh management projects in the early 1980's were influenced by the paucity of scientific knowledge that existed on the impacts of marsh management. During the 1980–85 period, the HCD recommended revisions to an average 54% of all marsh management projects. This rose to 78% for the 1986–90 period. It was during the latter period that most studies detailing the significant adverse impacts of water control structures on fisheries production were published. As this new information became available, the HCD approach toward permitting marsh management projects became more conservative.

Based on site-specific conditions, HCD recommendations related to marsh management and barrier/impoundment projects varied considerably among projects. The HCD did not recommend permit denial for those projects proposing to maintain already impounded areas or that had both a well documented need and public benefit, and which minimized adverse impacts to marine fishery resources. However, many projects have been proposed that would impound wetlands without adequate justification, or manage marshes for a single resource at the expense of marine fisheries production. For these projects, the HCD recommended project revisions or permit denial.

When a management plan could be implemented without significantly impacting marine fishery resources and wetland processes (e.g., in nontidal and some freshwater, tidal wetlands), we usually recommended monitoring of

various environmental parameters to determine the effectiveness and need for modification of the marsh management plan. In coastal wetlands that support marine fishery resources, we often recommended project design alterations or changing the timing of structural operation to allow greater access by fish and shellfish or nutrient/sediment exchange. In addition, since 1986, we have routinely recommended that, prior to authorization of new plans, an environmental impact statement be prepared to assess cumulative and long-term impacts of marsh management on Louisiana's coastal resources. While more than 600,000 acres are proposed for or under management in Louisiana's coastal zone, an environmental impact statement to evaluate impacts and alternatives has not been prepared. This demonstrates the immediate need for a comprehensive environmental document that examines all aspects of marsh management in Louisiana.

Acreage Data

The NMFS acreage database contains information from only those public notices for which the HCD recommended permit denial or project revision. The database therefore contains acreage data for 10–15% of the public notices issued annually by the New Orleans District Corps of Engineers.

Acreage data were recorded on 962 public notices during the 1980–90 period (Table 4). During this period, the HCD recommended conservation of 44% (4,738 of 10,704 acres) of those acres proposed for dredging by permit applicants. The greatest amount of acreage proposed for dredging and included in HCD conservation efforts was recorded during the 1980–85 period. Since 1985, only 35% of the total dredging acreage was proposed. The decrease in proposed dredging since 1985 probably reflects a downturn in the state's economy, increased utilization of general permits, and a greater use of directional drilling techniques for petroleum exploration.

The HCD opposed filling 27,798 acres of Louisiana's coastal wetlands and waterbodies between 1980 and 1990, which represents 81% of the fill acreage proposed by applicants. Of the acreage proposed for filling and included in HCD detailed recommendations, 55% is from one 1985 public notice—a proposed ship channel across Vermilion Bay to the Port of Iberia which entailed dredging and filling 1,045 and 18,770 acres, respectively. The HCD recommended the permit for the proposed ship channel not be issued, and the Corps, in denying the permit, concurred. Excluding that project, the HCD recommended conservation of 59% of the total proposed fill acreage.

The impound category contains the largest total acreage values in the database. Over 560,000 acres of marsh were proposed for impounding via levees and/or water control structures during the 1980–90 time period. Projects having acreage in this category include forced and gravity drainage flood control projects, hurricane protection levees, and marsh management projects. These projects range in scope from areas where several water control structures and miles of levees completely control the hydrology of thousands of acres to those projects containing one small structure which affects the hydrology of only a few acres.

HCD recommended that over 157,000 acres of Louisiana coastal wetlands be mitigated to offset adverse fishery impacts (Table 4). This mitigation figure reflects only those wetland compensation acreages requested for creation, restoration, or enhancement after project impacts had been minimized to the extent practicable. During the 1980–90 period, most of the mitigation recommended by NMFS involved habitat enhancement or preservation rather than creation. Relatively few recommendations were made during this period to require applicants to replace what was altered; most efforts were made to restore, preserve, or enhance wetlands through canal plugging, water management, or constructing erosion control structures.

Mitigation for wetland alterations varied among project types. For oil and

Table 4.—Number of proposed projects in Louisiana, and acreage, subject to NMFS habitat conservation recommendations for each year from May 1980 through December 1990.

	Proposed projects and acreage											
	1980[1]	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Total
Number of public notices	3	135	160	113	97	107	65	69	76	70	67	962
Acreage proposed by applicant												
Dredge	10	1,022	950	744	1,198	2,997	575	394	444	999	1,371	10,704
Fill	26	1,847	2,282	1,269	2,929	20,352	1,043	448	394	2,942	635	34,167
Impound	0	2,717	12,219	35,914	47,086	23,806	52,808	10,971	340,860	17,409	16,879	560,669
Acreage accepted by NMFS												
Dredge	4	640	662	418	971	1,754	237	177	258	402	443	5,966
Fill	16	977	1,269	630	635	846	283	127	156	1,143	287	6,369
Impound	0	2,200	3,219	32,213	41,975	804	51,481	4,737	168,800	5,464	3,400	314,293
Mitigate	16	1,039	2,650	28,567	41,944	14,673	48,725	6,250	338	6,777	6,782	157,761
Potential acreage conserved												
Dredge	6	382	288	326	227	1,243	338	217	186	597	928	4,738
Fill	10	870	1,013	639	2,294	19,506	760	321	238	1,799	348	27,798
Impound	0	517	9,000	3,701	5,111	23,002	1,327	6,234	172,060	11,945	13,479	246,376
Mitigate	16	1,039	2,650	28,567	41,944	14,673	48,725	6,250	338	6,777	6,782	157,761

[1]Records for 1980 are incomplete.

gas activities, the HCD often recommended restoring a canal or ring levee upon abandonment. Restoration might include plugging and backfilling oil and gas canals, placing gaps or openings in spoil banks, tearing down ring levees and returning the material to borrow pits, or using dredged material to create or restore wetlands in open water areas (Moore et al., 1985). Typically, for marsh management or barrier project types, the HCD recommended methods to maintain or increase fishery access to impounded wetlands and then recorded mitigation acreage equal to that impounded.

When we look at Section 10/404 activities by hydrologic basins, four of the seventeen basins account for approximately 50% of all public notices issued (Table 5). More Section 10/404 activities were proposed for Barataria Basin than any other. This is due primarily to a combination of the relatively large wetland acreage of the basin, the large number of oil and gas fields found there, and the large population base in the vicinity of the basin. While the Barataria Basin was only third in number of oil and gas activities (Atchafalaya Bay and Gulf of Mexico were first and second, respectively), more public notices for shoreline, navigation, dock, maintenance dredging, and marsh management projects were advertised for the Barataria Basin than any other, and it was among the top two basins in frequency of the remaining project types.

The Vermilion Bay drainage basin contained the largest area proposed for dredging and filling for the 1980–90 period in Louisiana (Table 5). Of the acreage in Vermilion Bay, 54% proposed for dredging and 95 percent proposed for filling were attributable to one public notice for a ship channel across Vermilion Bay. Barataria Bay and the Mississippi Delta contain the second and third largest proposed dredge acreage, respectively.

After Vermilion Bay, the basins having the most acreage proposed for filling in decreasing order, are Terrebonne Bay, Barataria Bay, and the Mississippi Delta (Table 5). Twenty-three percent of the acreage proposed for impounding is not identified with a specific basin. This comes from four public notices for repair and maintenance of several hundred fixed-crest weirs and plugs in the Barataria, Caillou, and Terrebonne Bay basins. Because these public notices included water control structures in more than one basin, it was placed in the "not identified" basin category. Excluding this category, Barataria Bay, Terrebonne Bay, and the Lake Pontchartrain basins, in decreasing order, have the greatest acreage proposed for impoundment.

Table 5.—Total number of New Orleans District Corps of Engineers public notices and the number of public notices and associated acreage subject to NMFS habitat conservation recommendations (Code I notices) for activities proposed in each drainage basin from May 1980 through December 1990.

Drainage basin	Total public notices	Number commented on	Code I public notices: Acreage proposed by applicant		
			Dredge	Fill	Impound
Atchafalaya Bay	1,617	51	337	674	4,460
Barataria Bay	1,812	245	1,567	2,526	200,775
Breton Sound	523	48	573	1,059	8,700
Caillou Bay	250	30	270	396	27,150
Calcasieu Lake	407	46	378	345	23,674
Chandeleur Sound	188	6	12	92	0
Grand Lake	707	96	492	802	11,701
Gulf of Mexico	1,048	17	909	426	0
Lake Borgne	100	29	93	213	10,142
Lake Pontchartrain	789	55	302	853	32,380
Mississippi Delta	287	36	1,466	2,083	0
Mississippi River	588	7	529	33	0
Terrebonne Bay	1,206	174	1,090	4,556	83,150
Timbalier Bay	119	11	61	63	1,150
Vermilion Bay	666	93	2,383	19,760	17,225
White Lake	102	16	190	254	10,759
Not identified[1]	1,101	2	49	33	129,400
Total	11,510	962	10,701	34,168	560,666

[1]Most public notices in this category described projects located far inland from the coastal basins; a few projects impacted more than one basin.

The habitat proposed most frequently for alteration is mud. This classification was utilized for 991 public notices and includes unvegetated mud waterbottoms, intertidal flats, and those areas of mixed or unknown sediment composition. Other habitats frequently involved in HCD conservation efforts and the number of projects impacting each habitat (in parenthesis) are *Spartina patens* marsh (544), freshwater marsh (314), "other" marsh (289), *Spartina alterniflora* marsh (242), hardwood swamp (121), and *Distichlis spicata* marsh (100).

The project type having the most proposed dredge and fill acreage in the NMFS database is the navigation channels and marinas category (Table 6). Thirty percent of the dredging acreage and 87 percent of the fill acreage in the navigation channels category are from the proposed channel across Vermilion Bay.

HCD acceptance of project impacts varied with project type (Table 6). Dredge and fill acreage for bridges/highways, irrigation, and pipeline projects had the highest HCD acceptance rate while housing, commercial development, shoreline activities, and navigation project types had relatively low acceptance rates. The reasons for the relatively low acceptance of wetland dredge and fill acreage proposed for those project types have been discussed previously, and include the lack of water dependency, poor project designs, impacts to NMFS trust resources, availability of less damaging alternatives, and poor suitability of wetlands for the purposes of projects in those categories.

Of the impound acreage, 63% is for projects in the barrier and impoundment category and 35% is for marsh management projects (Table 6). Most of the impound acreage (90%) in the barrier project type category is for the four public notices by a single landowner proposing the replacement, repair, or maintenance of hundreds of weirs and plugs. The remaining 45 barrier/impoundment projects impacted 36,633 acres. The 61 marsh manage-

Table 6.—Applicant proposed and NMFS recommended acreages by project type for coastal Louisiana from May 1980 through December 1990. (Numbers in parenthesis represent the proportion of the area recommended to the area proposed.)

Project type[1]	No. of public notices	Acreage									
		Proposed by applicant			Recommended by NMFS						
		Dredge	Fill	Impound	Dredge		Fill		Impound		Mitigate
BA	48	2,318	799	353,538	941	(41)	549	(69)	174,630	(49)	7,281
BE	1	134	0	0	0	(0)	0		0		0
BR	3	40	8	0	32	(80)	0	(0)	0		47
HO	32	129	578	20	36	(28)	205	(35)	0	(0)	0
IN	34	206	529	106	63	(31)	7	(1)	0	(0)	41
IR	9	101	95	4,460	69	(69)	82	(86)	0	(0)	162
MD	37	505	2,727	0	407	(80)	917	(34)	0		888
MI	5	140	0	0	0	(0)	0		0		0
MM	61	425	306	197,131	284	(67)	199	(65)	139,664	(71)	139,558
NA	74	3,223	21,526	739	1,756	(54)	573	(3)	0	(0)	1,838
OI	531	3,133	6,485	927	2,108	(67)	3,428	(53)	0	(0)	4,364
OT	17	136	615	744	106	(78)	142	(23)	0	(0)	178
PI	47	160	327	0	136	(85)	220	(67)	0		221
SH	58	35	70	4	11	(31)	11	(16)	0	(0)	179
WR	1	7	7	3,000	7	(100)	7	(100)	0	(0)	3,000
Not ID[2]	4	10	95	0	10	(100)	28	(29)	0		2
Total	962	10,702	34,167	560,669	5,966	(56)	6,368	(19)	314,294	(56)	157,759

[1]See Table 1 for code descriptions.
[2]Not identified.

ment projects proposed the impoundment of almost 200,000 acres, an average of 3,232 acres for each management area.

The HCD did not object to proposals affecting 56% of the total area to be impounded. Although the HCD did not recommend permit denial for much of the proposed impoundment area, structural and management alteration recommendations often were made to maximize marine fishery access to impounded marshes. These measures are reflected as mitigation for the barrier and marsh management project types. The HCD did recommend against permit issuance for all of the acreage proposed for impoundments associated with housing development, irrigation and drainage, navigation, oil and gas activities, and "other" project types (Table 6). This is because impounding wetlands is usually unnecessary and avoidable for many of these types of projects.

Corps Final Action

The NMFS did not begin determining the Corps' final action on HCD recommendations until 1982. Once begun, the HCD recorded the dredge, fill, and impound acreage authorized, and determined whether the Corps had accepted, partially accepted, or rejected HCD recommendations by comparing the issued permit with the public notice and HCD letters of recommendation.

The Baton Rouge HCD office has permits for 544 of the 962 public notices (57%) for which the HCD provided recommendations to the Corps to reduce habitat loss and alteration (Table 7). An additional 162 applications advertised through public notices and proposing to dredge, fill, and impound 23,752 acres were withdrawn due, at least in part, to HCD objections. About 250 public notices in the NMFS habitat conservation database have no final action recorded. Of this amount, 138 are from 1980 and 1981 when the NMFS did not determine Corps acceptance of HCD recommendations. The majority of the remaining public notices await final Corps action.

A comparison of the acreage proposed for alteration by applicants and permitted by the Corps, for permitted projects only, reveals that 79% of the dredging acreage, 21% of the proposed fill acreage, and 96% of the proposed impound acreage involved in HCD habitat conservation efforts was permitted by the Corps (Table 7). Approximately 1,200 acres were protected from dredging, 20,200 from filling (18,880 of which can be attributed to the Corps' denial of the proposed ship channel across Vermilion Bay), and 18,700 acres were preserved from impounding. Combining the

Table 7.—Number of permits issued, acres permitted, and acres conserved and withdrawn, involved in NMFS habitat conservation recommendations for Louisiana from 1982 through 1990, by year.[1]

	Permits, applications, and acreage by year[1]									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	Total
Number of permits issued	81	103	64	72	43	50	48	54	29	544
Number of applications withdrawn	14	32	19	31	12	21	16	10	7	162
Acreage proposed by applicant										
Dredge	431	513	433	1,296	439	200	214	1,589	484	5,599
Fill	1,159	1,018	663	1,375	736	249	231	19,104	853	25,388
Impound	3,190	13,999	52,801	23,724	3,450	7,151	17,209	340,875	18,839	481,238
Acreage recommended by NMFS										
Dredge	307	381	297	1,159	273	84	157	292	252	3,202
Fill	722	583	389	947	158	114	116	128	309	3,466
Impound	2,677	9,214	47,191	16,166	1,765	6,794	16,184	176,000	4,991	280,982
Mitigate	1,011	10,301	41,474	19,329	13,278	6,877	12,872	8,235	4,911	118,288
Acreage permitted by Corps										
Dredge	410	496	378	1,272	402	175	193	769	320	4,415
Fill	1,066	917	584	1,090	523	164	209	219	401	5,173
Impound	3,001	7,405	52,766	23,321	2,201	6,964	12,464	340,194	14,206	462,522
Mitigate	946	4,316	45,868	26,025	12,992	6,923	7,950	8,098	4,424	117,542
Acreage conserved										
Dredge	21	17	55	24	37	25	21	820	164	1,184
Fill	93	101	79	285	213	85	22	18,885	452	20,215
Impound	189	6,594	35	403	1,249	187	4,745	681	4,633	18,716
Acreage withdrawn by applicant										
Dredge	107	178	203	727	90	205	601	75	39	2,225
Fill	359	405	296	391	119	230	1,366	96	2,363	5,625
Impound	0	101	0	1,897	760	6,430	252	6,920	302	16,662

[1]Year permit issued or application withdrawn.

acreage conserved with that withdrawn shows that about 3,400 wetland acres were not dredged, 35,840 were not filled, and 34,600 were not impounded due, at least in part, to NMFS recommendations.

Further comparison of acreage recommended by the HCD with that permitted by the Corps (Table 7) reveals that the Corps did not accept HCD recommendations to avoid impacts associated with 1,213 acres of dredging, 1,707 acres of filling, and 18,540 acres of impoundment. In addition, the HCD recommended 741 acres of mitigation more than the 117,542 acres required by the Corps.

Seventy percent of the wetland acreage proposed for dredging, filling, and impounding for marsh management during the 1980–90 period, and in the NMFS database, had been permitted by the Corps by the end of 1990 (Table 8). HCD has been notified of an additional 11,462 acres (6%) proposed for marsh management which were withdrawn by the applicant. Much of the area permitted for marsh management is located, in decreasing order, in the Barataria Bay, Terrebonne Bay, Calcasieu Lake, and Vermilion Bay basins (Table 8). The Barataria Bay basin has the greatest number of marsh management projects (14), followed by Grand Lake and Vermilion Bay with 10 each.

As of 31 December 1990, the HCD had not been notified of final action (permit issuance or denial, application withdrawn or returned) on almost 44,000 acres that have been proposed for marsh management in Louisiana (Table 8). Most of the marsh management acreage pending Corps action entails the impoundment of waterbottoms (mud habitat), *S. patens* marsh, and freshwater marsh.

It should be noted that the HCD database contains only those marsh management projects for which public notices were issued between 1980 and 1990, and for which the HCD recommended modifications. It does not contain the 100,000+ acre Cameron-Creole marsh management project which was proposed prior to 1980 and implemented in 1988, the 123,000 acre Lafourche Parish plan proposed in February 1991, the thousands of acres managed on state and Federal wildlife refuges, or the hundreds of thousands of acres impounded and placed under management prior to implementation of wetland regulatory legislation and guidelines. Many of these "grandfathered" marsh management projects are located in the Grand, White, and Calcasieu Lake drainage basins of the Chenier plain and the Terrebonne and Caillou Bay basins of the deltaic plain. The habitats most impounded in those management areas are *S. alterniflora* and *S. patens* marshes which are managed to control human access and enhance wildlife harvest.

Most of the acreage conserved from impacts associated with dredging and filling was unvegetated mud bottom habitat (resulting primarily from Corps denial of the ship channel in Vermilion Bay). Other habitats having significant acreages preserved include *S. patens* marshes, hardwood swamps, *Ruppia* sp. vegetated waterbottoms, and "other" marsh (Table 9).

In some cases, a larger acreage of dredging or filling was permitted than was proposed by an applicant. This generally occurred when a natural resource agency recommended altering a project to conserve what was judged to be an important habitat (such as freshwater or *S. patens* marsh) at the expense of a less important habitat (such as mud or sand waterbottoms). Moving the project site may have resulted in a larger area being impacted, but if the new project site was determined to have a much lower habitat value, such recommendations are justified.

The term "withdrawn" is somewhat misleading in that it includes projects withdrawn by the applicant and those returned to the applicant by the Corps because of lack of response to their request for additional information or clarification. While the NMFS cannot claim credit for all 125,000 acres conserved from dredging, filling, and impounding by permit withdrawal (Table 10), comments made by the HCD to the Corps caused the Corps to delay permitting and request more detailed information from applicants on some projects. Although most of the acreage conserved was unconsolidated mud waterbottoms (Table 10), large acreages of sand, freshwater marsh, and *S. patens* marsh were also protected. Approximately half of the acreage conserved from impounding by withdrawal

Table 8.—Acreage of marsh management plans applied for, permitted, and pending in coastal Louisiana between May 1980 and December 1990, by drainage basin.

Drainage basin	No. of public notices	Acreage proposed by applicant[1]			Number of permits	Acreage permitted by Corps[2]				Acreage pending		
		Dredge	Fill	Impound		Dredge	Fill	Impound	Mitigate	Dredge	Fill	Impound
Atchafalaya Bay	3	24	8	4,460	2	15	4	800	1,200	9	4	3,160
Barataria Bay	14	84	80	63,670	10	51	65	56,295	45,515	3	5	1,970
Breton Sound	3	45	27	8,700	1	14	3	2,660	0	18	5	2,960
Caillou Bay	4	42	97	32,087	3	17	9	11,677	7,222	25	88	20,410
Calcasieu Lake	6	30	16	19,024	5	26	15	7,700	13,420	4	1	7,224
Grand Lake	10	39	39	9,814	5	15	11	4,604	4,702	6	6	2,050
Lake Borgne	4	26	23	12,858	3	23	23	7,988	4,825	3	0	2,762
Lake Pontchartrain	2	2	2	12,760	1	1	1	12,460	7,858	0	0	0
Terrebonne Bay	6	23	30	18,043	5	48	65	16,796	16,798	0	0	1,000
Timbalier Bay	1	1	1	534	1	1	1	534	0	0	0	0
Vermilion Bay	10	21	22	15,910	8	9	10	13,343	11,895	3	9	2,200
White Lake	5	129	1	10,759	4	124	0	10,759	6,070	5	1	0
Total	68	466	346	208,619	48	344	207	145,616	119,505	76	119	43,736

[1]Includes acreage from all public notices describing marsh management activities issued between May 1980 and December 1990.
[2]Includes data from only those public notices having a final action by the Corps (permit issued or denied or application withdrawn).

Table 9. Acres of each habitat involved in NMFS habitat conservation recommendations in Louisiana, for which permits were issued from 1982 through 1990.

	Acreage proposed by applicant			Acreage permitted by Corps				Acreage conserved			
Major habitat	Dredge	Fill	Impound	Dredge	Fill	Impound	Mitigate	Dredge	Fill	Impound	Mitigate
Avicennia germinans	6	15	0	0	3	0	0	6	12	0	0
Distichlis spicata	37	135	5,210	19	44	5,167	3,492	18	91	43	3,492
Juncus roemerianus	19	49	31	17	37	31	61	2	12	0	61
Scirpus sp.[1]	12	59	0	11	14	0	12	1	45	0	12
Spartina alterniflora	129	518	10,233	79	272	8,064	6,484	50	246	2,169	6,484
Spartina patens	523	1,375	46,429	396	990	40,002	28,184	127	385	6,427	28,184
Ruppia sp.	79	114	2,490	45	92	656	3,868	34	22	1,834	3,868
Hardwood swamp	103	357	8,162	84	153	8,022	8,137	19	204	140	8,137
Freshwater marsh	321	873	40,906	320	743	40,488	31,620	1	130	418	31,620
Other marsh	125	425	165,240	102	347	164,316	4,881	23	78	924	4,881
Freshwater nonvegetated bottom	12	4	3,555	12	4	3,555	0	0	0	0	0
Freshwater submerged vegetation	133	116	190	69	64	61	3,541	64	52	129	3,541
Clay	9	7	0	0	0	0	0	9	7	0	0
Sand	297	163	0	578	128	0	0	–281	35	0	0
Shell	3	9	0	3	12	0	3	0	–3	0	3
Silt	150	78	797	146	68	775	2	4	10	22	2
Mud	3,614	20,855	197,997	2,515	1,967	191,382	27,256	1,099	18,888	6,615	27,256
Oysters	0	6	0	0	6	0	0	0	0	0	0
Miscellaneous	25	231	0	25	231	0	2	0	0	0	2
Total	5,597	25,389	481,240	4,421	5,175	462,519	117,543	1,176	20,214	18,721	117,543

[1]Prior to 1987 *Scirpus* sp. was grouped with "other marsh."

of permit applications was *S. patens* marsh.

A review of permits issued from 1982–90 reveals that the Corps accepted HCD recommendations 43% of the time (Table 11). Acceptance of HCD comments requires that the Corps deny issuance of a permit if so recommended by the HCD, or that the applicant agree to all HCD recommendations prior to permit issuance.

The Corps partially accepted HCD recommendations 34% of the time (Table 11). Partial acceptance means that the applicant agreed to some, but not all, of the HCD recommendations and the issued permit reflected partial implementation of HCD recommendations. Rejection of HCD comments, which occurred 23% of the time during the 1982–89 period, means that the Corps issued a permit when the HCD recommended denial, or that the applicant was not required to implement the HCD habitat protection recommendations. While there was no trend among years in the acceptance or partial acceptance of HCD comments, it appears as if rejection of HCD recommendations was higher in recent years (1988 and 1989). Many activities advertised in public notices issued in 1990, on which the HCD recommended revisions, are still being processed, and final action would not occur until 1991 or later.

It should be noted that during the period of record, the percentages of acceptance and partial acceptance are more accurately a reflection of the decision of individual applicants to agree, or partially agree, to HCD recommendations rather than the Corps' determination that applications should be revised or permits conditioned. On the other hand, rejection of HCD comments can be directly attributed to the Corps not requiring applicants to avoid, minimize, or mitigate adverse environmental impacts to what we believe to be the maximum practicable extent. Furthermore, compensatory mitigation was rarely required by the Corps and implementation of mitigation was often at the will of the permittee.

We anticipate increasing emphasis by the Corps on requiring permit modification or mitigation to minimize and offset adverse impacts associated with Section 10/404 activities. A memorandum of agreement between the Environmental Protection Agency and the Corps, dated 6 February 1990, requires the Corps to ensure that permit-associated impacts be avoided, minimized, and mitigated, in this sequence. The agreement further states that mitigation requirements and follow-up monitoring are to become legally enforceable conditions of Section 404 permits.

Table 10.—Acres of each habitat involved in NMFS habitat conservation efforts in Louisiana from 1982 through 1990 which were withdrawn.

	Acreage		
Habitat	Dredge	Fill	Impound
Avicennia germinans	9	13	0
Distichlis spicata	10	37	2
Juncus roemerianus	4	17	0
Scirpus sp.	1	0	232
Spartina alterniflora	47	164	3,844
Spartina patens	101	531	7,548
Ruppia sp.	16	42	0
Hardwood swamp	11	73	400
Freshwater marsh	97	412	1,162
Other marsh	48	115	346
Freshwater submerged vegetation	43	25	13
Sand	621	169	0
Shell	11	44	0
Silt	23	16	0
Mud	1,180	3,933	3,756
Oysters	4	33	0
Miscellaneous	1	0	0
Total	2,227	5,624	17,303

Table 11.—Annual frequency and percent (in parenthesis) of New Orleans District Corps of Engineers final actions (accept, partially accept, or reject) on NMFS recommendations concerning proposed Section 10/404 activities.

Year	Accept		Partially accept		Reject		Total
1982	30	(37)	23	(29)	27	(34)	80
1983	43	(42)	45	(44)	15	(14)	103
1984	23	(36)	33	(51)	8	(12)	64
1985	38	(53)	23	(32)	11	(15)	72
1986	21	(49)	13	(30)	9	(21)	43
1987	22	(44)	16	(32)	12	(24)	50
1988	18	(37)	12	(25)	18	(37)	48
1989	27	(50)	10	(18)	17	(31)	54
1990	13	(45)	10	(34)	6	(21)	29
Total	235	(43)	185	(34)	123	(23)	543

Summary

Between 1980 and 1990, the NMFS reviewed about 14,000 proposals for various coastal development activities in Louisiana. During this period, more than 600,000 acres of wetlands and adjacent water bodies were proposed for dredging, filling, or impounding. In an effort to protect valuable habitats that support the production of liv-

ing marine resources, HCD recommended that impacts to about 279,000 acres be avoided and that more than 150,000 acres of compensatory mitigation be provided. Based on data gathered between 1982 and 1990, the Corps accepted NMFS recommendations on 45% of those activities for which detailed comments were offered. Rejection or partial acceptance of NMFS recommendations resulted in the authorization of the loss or adverse modification of about 184,000 acres of wetland/aquatic habitat and approximately 7,000 fewer acres of compensatory mitigation than recommended. In addition, NMFS recommendations to the Corps were at least partially responsible for the preservation of over 63,800 acres of coastal wetlands from dredging, filling, or impounding.

Data contained in this report reflect the need for greater awareness of coastal wetland loss through the Corps' Section 10/404 permitting program. Although permitted wetland losses are only a portion of the great overall rate of wetlands lost annually in coastal Louisiana, they can be avoided, reduced, or fully offset through the Federal regulatory process. Without an accurate and continued accounting of permitted wetland alterations and mitigation measures, permitting policies are unlikely to change and the national goal of "no overall net loss of wetlands" will not be achieved.

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