



U.S. Army Corps of Engineers
New Orleans District

Bonnet Carré Spillway Master Plan

Final
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Section 1 - Introduction

1.1. Purpose and Scope

The purpose of this document is to provide a comprehensive guide for use and development of the natural and man-made resources of the Bonnet Carré Spillway. The master plan provides resource objectives, an overall land and water management plan, and associated design and management concepts.

The Bonnet Carré Spillway is an integral flood control feature of the Mississippi River and Tributaries (MR&T) project. It consists of a massive concrete weir structure, upper and lower guide levees, and a 7,623 acre floodway that stretches from the Mississippi River to Lake Pontchartrain. The spillway is located approximately 30 miles above New Orleans in St. Charles Parish, Louisiana. Project construction was completed in 1936.

The project was constructed to reduce flood damage and loss of life in the New Orleans metropolitan area, and other downstream communities, caused by high flood stages along the Mississippi River. The project is designed to function like a valve that can be opened to divert a portion of the river's flow into Lake Pontchartrain, helping to relieve stress on the levees downstream. First opened during the 1937 flood, it has also been used in the floods of 1945, 1950, 1973, 1975, 1979, 1983 and 1997.

Although the Bonnet Carré Spillway has never been operated as a dedicated Federal recreation area, it has developed into an extensively used, albeit unofficial, outdoor recreation area. Use estimates from the years 1959 through 1972 ranged from 250,000 to over 400,000 visitors annually. Recreation use surveys performed in 1994 indicate that visitation is approximately 250,000 per year. Visitors to the spillway engage in a variety of outdoor recreation activities including boating, skiing, fishing, crawfishing, swimming, hunting, shooting, dog training, camping, picnicking, birding, operating off-road motorcycles, all-terrain vehicles (ATV's), and four-wheel drive (4WD) trucks, etc.

For three decades, outgrants for recreation activities in small portions of the project lands have been issued to several state and local government agencies. Limited facilities have been constructed by local interests as part of their recreation leases; however, most of the spillway's grounds and waterways are in a primitive condition. In addition to the designated recreation areas, the public has been allowed virtually unlimited access to project lands

provided their activities do not interfere with operation and maintenance of the project.

The uncontrolled nature of the recreation activity occurring in the Bonnet Carré Spillway has led to numerous conflicts between users, and problems between users and neighboring residential areas. Conflicts between users are usually the result of incompatible activities occurring in the same or adjacent locale. An example is waterskiing activities occurring in the same areas as boat- or bank-fishing. In addition, several activities that occur in the vicinity of residential areas on the project edge are problematic. These include riding of motorcycles and other off-road vehicles, and the discharge of firearms.

Beyond the concern over these conflicts, uncontrolled usage of the spillway has resulted in public health and safety problems as well as degradation of the project's recreational and natural resource values.

This master plan is intended to:

- address and resolve conflicts between existing users in the spillway,
- address public health and safety issues related to current activities,
- establish guidelines for the protection, conservation and enhancement of natural, cultural and man-made resources, and
- provide guidance for the review and management of existing and proposed leases, easements, and permits for various activities in the spillway,
- provide a comprehensive plan for future use and development.

1.2. Master Plan Process

Policy and guidance for the preparation of master plan documents are provided in Engineer Regulation and Pamphlet No. 1130-2-550, Chapter 3. In accordance with this regulation, the plan was developed by an interdisciplinary team representing planning, operations, engineering and real estate elements of the New Orleans District (NOD). The study began with collection and analyses of available data on the natural, cultural and social resources of the project lands and region by the study team. Numerous field visits were also performed to familiarize team members with the project's physical setting and to observe recreational

activities occurring on project lands. Another key element of the planning process was the solicitation of input from current project management personnel and the visiting public.

The planning process focused on three primary objectives:

- the plan should address regional needs, particularly the goal of providing a high degree of recreational diversity;
- the plan should take advantage of the particular qualities and potentials of the project's natural and cultural resources; and
- the plan should be responsive to expressed public interests and desires.

The primary goal of the master plan process is to develop the best possible combination of project features responsive to the above-listed objectives, consistent with authorized project purposes and Federal laws and directives.

1.3. Public Input and Agency Coordination

1.3.1. Bonnet Carré Citizens Advisory Committee. In order to provide the New Orleans District with recommendations and guidance from the local perspective, the St. Charles Parish Council formed a citizen advisory committee on 1 July 1991 (Resolution No. 3662). The committee membership was broad-based and included representatives of all the major user groups active on project lands. Parish government was also represented; the committee was chaired by the Parish CZM Planner, Mr. Earl J. Matherne, and Mr. Rusty Rebowe, the Director of the St. Charles Parish Recreation Department, was also a member. The New Orleans District was represented as an advisory, non-voting member of the committee.

The citizens' committee met numerous times between 25 September 1991 and 20 January 1994. The meetings focused on problems with the current public use situation in the spillway and discussions of potential solutions. After several early meetings, the committee members reached consensus that the sources of the problems were a lack of zoning of uses and the absence of on-site management. The outcome of the committee's work is a report listing the final recommendations of the group. On 24 January 1994, the St. Charles Parish Council unanimously adopted the recommendations of their citizens committee (Resolution No. 4003). A copy of the resolution and report are provided in Appendix 1.

1.3.2. U.S. Fish and Wildlife Service (USFWS). The USFWS has been involved in the master plan process from the early stages. Both informal and formal coordination has been maintained through out the process. A planning-aid letter of 20 October 1993 provided a list of preliminary recommendations for the management of fish and wildlife resources in the development of the master plan. A copy of this letter is provided in Appendix 2.

The USFWS also provided comments on the preliminary draft version of this master plan. Those comments are contained in a letter dated 21 October 1994; a copy is provided in Appendix 3.

1.3.3. Public and Agency Review. In addition to internal Corps of Engineers review, including the NOD and the Mississippi Valley Division (MVD), a public review phase was implemented between September and December 1996. Included in this phase was:

- coordination with the elected officials and administrative offices of St. Charles Parish;
- a public meeting on October 29, 1996 at Destrehan High School in Destrehan, Louisiana to obtain comments from the users of project lands and its neighbors; and
- congressional notifications.

Comments received during the public and agency review period were generally positive and resulted in a few minor changes to the master plan. One significant change to the plan resulted from the public review. Numerous individuals and groups commented that the designated off-road vehicle areas in the draft plan were too limited in size and physical characteristics. As a result, the final master plan provides for a potential expansion of ATV and motorcycle use into the wooded area adjacent to the Lower Borrow Canal.

The final decision on the potential expansion of ATV and motorcycle use areas rests upon the results of an environmental assessment(EA) to be completed in fiscal year 1998. This assessment will examine all impacts of ATV and motorcycle use in the potential expansion area to the project's natural resources as well as conflicts with other visitor use activities. The EA will determine how much, if any, of the potential expansion area will be designated as an additional off-road use area.

A complete summary of comments received from agencies and the public is provided in Appendix 6.

1.4. Pertinent Memoranda and Reports

1.4.1. Bonnet Carré Spillway Public Use, Health and Safety: Quality Circle Study Report, September, 1986. This report presented an analysis of public use, health and safety issues on the project lands. The liability exposure revealed by three lawsuits resulting from serious injuries and deaths in the spillway during 1980 and 1982 spurred the formation of the Quality Circle to study the problems and develop alternative solutions. The lawsuits alleged negligence by the Government in not providing adequate protection for visitors to the project.

The basic problem identified by the study team is the hazardous nature of much of the public use activity occurring in the spillway. This problem is compounded by the lack of official (NOD or other government entity) supervision or control over user activities. Only minimal public safety features have been constructed at the Bonnet Carré Spillway and on-site project staff are limited to maintenance activities.

Finding that Alternative A., the "no action" alternative, was not acceptable, the study team recommended three responses to the problem, listed below in descending order of preference:

- Alternative B. Joint Development with Local Sponsor(s)
- Alternative C. Federal Development
- Alternative D. Closure to the Public

In a 16 October 1986 first endorsement to the study team's recommendations, MVD agreed that Alternative B. [Joint Development with Local Sponsor(s)] should be pursued first. MVD also concluded that Alternatives C. and D. were not viable options and recommended the consideration of two additional alternatives. These included the interim measures proposed in the study report that would limit unsanctioned and dangerous activities throughout the spillway. The other alternative to be considered was disposal of the fee title interest in the project lands.

NOD responded to MVD's comments in a December 1987 second endorsement. Although initial interest in local sponsorship was expressed by several state and parish agencies, NOD reported that no agency was willing to commit to joint recreational development (Alternative B.). NOD also found that disposal of the fee title interest in the Bonnet Carré Spillway was not a viable solution. Having exhausted the recommended alternatives contained in the Quality Circle

study report, NOD suggested implementation of the interim action plan contained in that report. This plan included the prohibition of certain hazardous activities (boating, swimming, off-road vehicle use, etc.), empowerment of the project maintenance foreman with Federal citation authority, termination of the St. Charles Parish recreation lease along the Lower Guide Levee near US Highway 61, signage and a public information program.

Although a team from MVD made an on-site visit to view the problem and gather information, no response to the second endorsement was received from MVD. Consequently, no action has been taken by NOD. The problematic conditions on the project lands remain as described in the Quality Circle report.

1.4.2. Mississippi River and Tributaries Design Memorandum No. 1A Preliminary Master Plan for Public Access and Recreation, September 1964. This document presented a preliminary master plan for recreational development on the Mississippi River within the New Orleans District. The report was approved for planning purposes by the Chief of Engineers on 19 January 1966. This approval, however, required that implementation be deferred until adequate assurance is obtained from local sponsor(s) to participate on a 50 percent basis in the costs of development proposed in the plan. A copy of the preliminary master plan and approvals is provided in Appendix 4.

The plan stated that recreational use in the Bonnet Carré Spillway exceeded 400,000 annual visitors and projected that, with adequate facilities, the visitation would exceed 1,000,000 annually. Facility development recommended in the plan consisted of roads, boat ramps, parking areas, trails, comfort stations, landscaping, information signs, and picnicking and camping areas. Construction of the proposed facilities was estimated to cost \$1,584,300 in 1964 dollars.

1.4.3. Bonnet Carré Spillway Operation and Maintenance Manual, September 1962. This document provides general instructions for the inspection, operation and maintenance of the Bonnet Carré Spillway. The manual directs the superintendent to maintain all structures, plant, equipment, property, and grounds in a state of readiness for spillway operation as required.

Paragraphs 14 and 15 of the manual explicitly address the handling of visitors to the project. Visitors are not permitted on the spillway structure during operations. However, small groups of visitors accompanied by a NOD employee may be permitted on the structure when not in operation. Spillway personnel are directed to contact local law enforcement authorities when visitors become "unruly to the extent of endangering the welfare of others." The

manual further directs that "trespassers" and those who violate laws at the project will be arrested and prosecuted utilizing "established procedure."

1.4.4. Bonnet Carré Spillway Water Control Manual, undated. The purpose of this manual is to provide information in sufficient detail to aid the water control decision-making process. In section 1-01.d. Public Facilities, the visitor control guidelines provided in the operation and maintenance manual described above are reiterated.

1.5. Master Plan Approval and Future Documents

The approved master plan serves as the definitive guide for use and development of the natural and man-made resources of the Bonnet Carré Spillway. All actions by the Corps of Engineers and outgrantees must be consistent with the approved master plan. The master plan is reviewed every five years to ensure its relevance to project conditions. Revisions and updates will be prepared as necessary.

The approved master plan serves as the basis for preparation of an Operational Management Plan (OMP). The OMP is prepared as a separate document which provides in detail the specific operation and administration requirements for natural resources and park management. These details include implementation plans, funding, staffing, and equipment needs. Essentially, the OMP is the working document that implements the objectives and concepts contained in the approved master plan. The OMP is updated annually.

Section 2 - Project Description

2.1. Authorization

The Bonnet Carré Spillway was authorized by the Flood Control Act of 15 May 1928, as amended. It is an integral part of the comprehensive Mississippi River and Tributaries (MR&T) project which was implemented in response to the Great Flood of 1927.

Construction of the spillway structure began in 1929 and was completed in 1931. The guide levees were completed in 1932; highway and railroad crossings were complete by 1936. The total project cost was \$14.2 million.

MR&T Design Memorandum No. 1A, Preliminary Master Plan for Public Access and Recreation (1964) authorizes the preparation of a separate master plan for the Bonnet Carré Spillway. This master plan is prepared in accordance with this memorandum and the guidance provided in ER 1130-2-550 dated 15 November 1996.

2.2. Location and Purpose

The Bonnet Carré Spillway is located approximately 30 miles above New Orleans in St. Charles Parish, Louisiana. Situated between New Orleans and Baton Rouge and traversed by Interstate Highway 10 and U.S. Highway 61, the project is a significant landscape feature in southeastern Louisiana.

As a component of the MR&T project, the primary purpose of the project is flood control. Specifically, it protects New Orleans and other downstream communities from Mississippi River floods by discharging excess floodwaters into Lake Pontchartrain and thence into the Gulf of Mexico. The spillway is designed to pass 250,000 cubic feet per second (cfs) of Mississippi River floodwaters. In a major or project flood, it can be operated alone or in combination with the Morganza Floodway (located on the west bank of the Mississippi River, 50 miles above Baton Rouge) and the Old River Control Structure (35 miles north of Morganza).

The authorizing legislation requires that the spillway be operated to prevent river stages from exceeding 20 feet National Geodetic Vertical Datum (N.G.V.D.) at the Carrollton Gauge in New Orleans. All other uses of the project are subordinate to keeping the spillway in a physical state of readiness to accomplish its primary purpose.

2.3. Engineering Features and Pertinent Data

The Bonnet Carré Spillway consists of a massive concrete weir adjacent to the Mississippi River, a leveed floodway stretching from the river to Lake Pontchartrain, project office and warehouse buildings, various highway and railroad crossings, and miscellaneous pipeline and utility crossings.

2.3.1. Control Structure. The weir structure is a concrete, gravity overfall dam controlled by manually operated timber needles. The weir is founded on untreated timber piling and has a steel sheet piling cutoff wall 45 to 55 feet in depth on the riverside of the weir. Immediately lakeward of the weir and integral to it is a shallow, reinforced concrete stilling basin approximately 50 feet wide with three rows of low concrete baffle piers. Beyond the lakeward row of baffle piers there is a heavy articulated concrete mat 175 to 225 feet wide, underlain by an inverted filter of gravel, spalls, and riprap.

The weir structure is 7,000 feet in length. It consists of 350 bays, each 20 feet in width, separated by reinforced concrete piers 2 feet thick which carry two I-beam and concrete operating bridges. There are 176 bays with a weir crest of 18.0 feet N.G.V.D. and the remaining 174 bays have a weir crest of 16.0 feet N.G.V.D. Each bay is closed with 20 timber needles whose actual dimensions are 8" x 11.5" to permit operation without binding. The loose fit of the needles also allows seepage of river water into the floodway during high Mississippi River stages.

The lengths of the needles are 10 and 12 feet, depending on the elevation of the weir crest. When in place, the needles are seated on the weir crest and lean against a reaction beam. When the bays are opened, the needles are stored by hooking one end of each below the upstream service bridge and resting the other end on the reaction beam. Two diesel-powered, traveling gantry cranes are provided for removing and installing the needles.

2.3.2. Floodway. The floodway conveys the floodwaters from the weir structure to Lake Pontchartrain. This flooding is confined by upper and lower guide levees. The levees in the upland portion of the floodway are of standard Mississippi River Commission cross-section, but the swamp levees closer to the lake are designed with broad bases and flat slopes for construction by hydraulic methods. The elevation of the levees is approximately 19 feet N.G.V.D.

The floodway is 5.7 miles long, 7,700 feet wide at the river end and 12,400 feet wide at the lake end. Ground elevations in the floodway range from approximately 12 feet N.G.V.D. near the river to 0 feet N.G.V.D. at the Lake Pontchartrain

shore. The area of the floodway is approximately 7,623 acres.

2.3.3. Project Buildings. The project office building is located directly adjacent to the downstream terminus of the spillway structure. It is situated on the protected side slope of the Mississippi River Levee / Lower Guide Levee and is elevated to allow full view of the structure and bordering floodway. The building includes an office for the project maintenance foreman, a reception area, a large conference room, a rest room and small kitchen area. Six parking spaces are provided in front of the building with additional space for vehicles available across the road and near the structure.

Adjacent to the office building and located on the protected side of the levee is the warehouse and fenced storage yard. Project maintenance equipment is secured in this area.

Located a few hundred feet south of the project office building is a project sign and interpretive display. The location provides a panoramic view of the Mississippi River, the forebay and the spillway structure. The interpretive displays include several plaques which combine text, graphics and photographs to provide project statistics and historical interpretation.

2.3.4. Highway and Railroad Crossings. The floodway is crossed by two highways and a local parish road. Interstate Highway 10 crosses the floodway along the Lake Pontchartrain shore. It is a divided bridge resting on concrete piers. U.S. Highway 61, also known as Airline Highway, is located in the central portion of the floodway. This crossing is also elevated on concrete piers for the majority of its length in the project area. Earthen embankments extend for some distance into the floodway from both ends of the bridge.

The remaining road crossing is Parish Road 12 immediately lakeward of the spillway structure. This is a grade level crossing which essentially is a continuation of River Road (Louisiana Highway 48). Another roadway located on project lands is Louisiana Highway 628 which connects the River Road on the upstream side of the project with U.S. Highway 61. This roadway is located on the protected side of the Upper Guide Levee.

The floodway is crossed by three railroad lines. All three lines predate the construction of the spillway and, therefore, required the construction of new bridge crossings at the time of spillway construction. All three are ballast railway beds elevated on timber trestles. Two of the lines are located between the spillway structure and U.S. Highway 61. Closest to the structure is the Illinois Central

Railroad - Baton Rouge District. The next rail line away from the structure is the Kansas City Southern Railway located just south of U.S. Highway 61. The final railroad crossing in the floodway is the Illinois Central Railroad - McComb District which is located near Lake Pontchartrain just south of Interstate 10.

2.3.5. Miscellaneous Features. In addition to the highway and railroad crossings, the Bonnet Carré Spillway contains numerous pipeline, powerline and other utility rights-of-way. Miscellaneous encroachments on project lands such as foot bridges over the outside drainage canals, radio tower locations, etc. also exist. These uses are allowed under various outgrants.

2.4. Project Operation

The estimated frequency of project operation is once every ten years. In the 66 years the project has been available for use, it has been opened eight times. First opened during the 1937 flood, it has been used also in the floods of 1945, 1950, 1973, 1975, 1979, 1983 and 1997. All 350 bays were opened except in 1937, 1975 and 1997 when 285, 225, and 298 gates were used, respectively. During the 1937 flood, the spillway was open for two months and lowered river stages at New Orleans by 3.5 feet. Dates and maximum flows for each opening are provided in table 2-1:

Table 2-1 Bonnet Carré Spillway Openings

<u>Year</u>	<u>Dates of operation</u>	<u>Bays Open</u>	<u>Maximum Flow (cfs)</u>
1937	28 Jan to 16 Mar	285	211,000
1945	23 Mar to 18 May	350	318,000
1950	10 Feb to 19 Mar	350	228,000
1973	8 Apr to 21 Jun	350	207,000
1975	14 Apr to 26 Apr	225	110,000
1979	17 Apr to 31 May	350	228,000
1983	20 May to 23 Jun	350	268,000
1997	17 Mar to 18 Apr	298	243,000

The project is operated and maintained by the NOD Operations Division. A permanent operating staff of five employees maintains the structure and floodway in a state of readiness at all times. This staff forms the nucleus of the larger operating crew necessary to open the spillway structure during a flood. Additional temporary labor may be hired during an emergency and quickly trained to assist in opening the control structure and other flood fight duties.

During the great majority of the time when the structure is not being operated during a flood, project personnel are involved in maintenance and inspection duties. Annual inspections of the spillway structure are performed and problems corrected as noted. Equipment testing and maintenance are performed on a regular schedule. The field staff maintains the floodway by mowing the levee slopes, and by clearing vegetation along range lines and in the central portion of the floodway.

2.5. Project Lands

Project lands consist of 7,623 acres of land acquired in fee in a corridor stretching from the Mississippi River to Lake Pontchartrain. The only exceptions to fee ownership in the project boundaries are the former location of Highway 61 and the three railroad rights-of-way. These road and railroad crossings were in existence at the time of project authorization in 1928. Rather than fee title, the NOD purchased flowage easements over these rights-of-way. These easements amount to 126.84 acres.

At the time of purchase (circa 1929-1931), land use on the project lands was typical of the regional landscape. Several sugar plantations existed along the Mississippi River. Houses and support buildings were concentrated along the river; agricultural fields stretched from the river to the edge of the swamps (near the present location of U.S. Highway 61). Drainage ditches ran perpendicular to the river's orientation ending at drainage machines (water wheels) which pumped excess rainwater into the swamps. The backswamps stretching to Lake Pontchartrain were the scene of extensive logging prior to Corps purchase. Several canals had been cut through the swamps including a canal paralleling the railroad crossing near the lakeshore.

After Corps purchase of the land, all the buildings were demolished and the spillway structure and guide levees were constructed. Beginning with the flood of 1937, the landscape began to change in dramatic ways. Heavy deposits of sediment obliterated previous landmarks such as field edges and vegetation corridors. Subsequent spillway openings, land clearing and sand hauling has molded the landscape to its present condition. The modern landscape shares some aspects of its historic condition, but is largely the product of project operation and maintenance practices.

2.6. Existing Land Uses

2.6.1. Sanctioned. In addition to project maintenance and operation activities, several uses of project lands occur

with the consent and approval of the NOD. These permitted uses are described below:

(a) Sand Hauling Permit Program. The most significant private use of project lands is the commercial removal of sediment from the floodway. Each time the spillway is operated, the diverted Mississippi River floodwaters deposit various amounts of sediment (mostly silt and sand) as they flow through the floodway. In a major flood, it is not unusual for the river to deposit more than 12 million cubic yards of sediment on the project lands. There is a commercial use for this sediment as landfill material for public and private development projects in the surrounding region. The NOD operates a sand hauling permit program which assigns areas to interested commercial haulers on an annual basis for no fee. This program allows an orderly and efficient removal of these deposits by private interests. Commercial removal benefits the government because it prevents a buildup of deposits that would restrict flows through the floodway and, eventually, impair the project's ability to achieve its design capacity of 250,000 cfs. In addition, the NOD derives other project benefits in the form of land clearing, drainage improvements, and road maintenance.

Based on reports submitted by sand haulers, an annual average of 285,991 cubic yards of sand were removed from the spillway during Fiscal Years 1984 through 1993 (Oct 1983 to Sep 1993). This represents a total of 2.9 million cubic yards removed since the 1983 spillway opening. In fiscal year 1996 (1 October 1995 through 30 September 1996), NOD issued sand hauling permits to eight different interests. These eight are all private companies, although in previous years permits have also been issued to local government agencies. Four of the lease areas are located between the river and U.S. Highway 61; the remaining four are located lakeward of U.S. Highway 61.

A typical sand hauling operation involves the use of an excavator to remove the deposits and stack them in linear rows. The material dries out and is then placed in truck trailers or dump trucks for transport out of the spillway to various job sites. Use of a particular lease area may require the construction and/or maintenance of haul roads. The annual letter permits require sand hauling trucks to observe a 20 mile per hour speed limit and also require them to stop at all four-way intersections within the spillway.

(b) Clay Borrow. The Bonnet Carré Spillway is also a major source of clay material for the construction of the Lake Pontchartrain Hurricane Protection Project. After removal of the top layers of sediment, the native earth material in most of the project lands is suitable for levee construction. Numerous clay borrow sites have been

designated in the lower portion of the floodway (i.e. between the structure and U.S. Highway 61). To date, only a portion of these sites have actually been excavated. More recently, a portion of the floodway has also served as a sand stockpile area for material pumped out of the Mississippi River.

(c) Oil and Gas Development. The project lands have also seen the drilling of 21 oil and gas exploratory wells over the past 40 years. A few of these were producing wells resulting in the naming of the "Norco Oil and Gas Field" within the spillway. The annual revenue generated by natural gas and oil leases are shared with St. Charles Parish. Between fiscal years 1978 and 1985, their 75 percent share ranged from \$16,514 to \$166,644. No producing wells currently exist on project lands. Sub-surface minerals in the spillway are administered by the U.S. Bureau of Land Management, subject to Corps review and approval of the outgrant land use stipulations.

(d) Recreation Outgrants. Currently there are four recreational outgrants at the project. All four agreements are with St. Charles Parish. Additionally, there is one recreational use authorized by permit on an annual basis as well as numerous use permits issued on a case-by-case basis.

(1) U.S. 61 / Lower Guide Levee Recreation Area. This is the most heavily utilized, officially designated recreational area on the project lands. Lease No. DACW29-1-81-44 was originally issued in 1981 for an area of 68 acres adjacent to the Lower Guide Levee on the north side of U.S. Highway 61. When the lease was issued, the Parish provided NOD with a four-phase plan for development of the area. The plans included facilities for camping, baseball, football, tennis, basketball, and a bait shop. The Parish eventually scaled back their plans and the lease was amended in 1986 to reduce the area to 26 acres. The recreation area currently features a two-lane concrete boat launch, paved parking for 15 vehicles with trailers, fishing docks, a metal shed pavilion, several picnic tables, primitive camping sites, and two portable toilets for visitors.

In the mid-1980's, the boat launch facility was improved with funding provided through the Sport Fish Restoration Account of the Wallop-Breaux Trust Fund. In Louisiana, this program is administered by the Louisiana Department of Wildlife and Fisheries. The program provides 75% Federal funding with a 25% state or local matching share for a variety of activities including sport fishery restoration, wetlands conservation, construction and maintenance of boat launching facilities and water control structures, and public education. The local share for this boat launch facility was provided by St. Charles Parish who is required

to maintain the facility "in reasonable repair" throughout its useful life.

Boats launched at this recreation area generally use the waterways within the floodway, particularly the lower borrow canal. The area is heavily utilized, especially on the weekends, and it is often the site of organized activities. At present, the recreation area is adequately maintained and is regularly patrolled by the St. Charles Parish Sheriff's Office. Access is provided via a paved road from U.S. 61 along the top of the Lower Guide Levee to the leased area. The lease was renewed in 1991 for an additional 10 years, and currently expires on 31 September 2001.

(2) I-10 / Lower Guide Levee Boat Launch. This facility is authorized under Easement No. DACW29-2-82-10, issued in 1981, for an area of 3.1 acres. The facility provided at this site is a two-lane concrete boat launch located on the I-10 construction access channel, between the two highway spans, adjacent to the Lower Guide Levee. An unpaved parking area is provided in the area of the boat launch. Boaters using this launch generally enter Lake Pontchartrain via a poorly marked channel. Access to the site is provided by the unpaved road atop the Lower Guide Levee. This facility is not as heavily used as the recreation area at U.S. 61. The lease expires on 1 October 2006.

(3) Montz Park / Upper Guide Levee near River. This 1.86 acre site is located outside of the spillway, next to the Upper Guide Levee near the Mississippi River. This outgrant allows St. Charles Parish to continue the use of a narrow strip of project lands along Louisiana Highway 608 as part of a public park at Montz. Montz Park, which is mostly on land owned by the parish, includes basketball courts and playground equipment. The portion on project property contains some playground equipment but is mostly undeveloped. This recreation area seems to be only lightly utilized. Lease No. DACW29-1-86-59 was originally issued in 1986 and expires on 28 July 2006.

(4) Fishing Jetty / Lower Guide Levee at Lake. This facility is authorized under License No. DACW29-3-94-73 which was issued in 1994. The facility consists of a 300-foot long jetty extending into Lake Pontchartrain from the end of the Lower Guide Levee. The jetty was constructed largely from construction debris, e.g. broken concrete from street repairs and other demolitions. The intent of the jetty is to provide enhanced fishing opportunities to the public. Access to the site is provided by the unpaved road atop the Lower Guide Levee. The lease expires in 2004.

(5) Remote Controlled Airplane Permit Area. Since 1972, the NOD Operations Division has issued annual use

permits to the Spillway Radio Control Club, Incorporated to operate radio control model airplanes from a designated site near the Spillway Structure. The permittee is required to obtain liability insurance from a reputable company acceptable to the government naming the Corps as an insured party. The club has an exemplary record in the maintenance of its designated area, its safe manner of operation, and its compliance with all permit conditions.

(6) Miscellaneous Use Permits. Numerous use permits for recreational activities are issued by NOD Operations Division on a case-by-case basis. These include permits for dog trial events, cross country running races, and similar type activities.

(e) Other Outgrants. In addition to the recreation agreements described above, there are numerous other outgrants allowing special use of project lands. These include agreements for pipeline, powerline and other utility crossings, radio station towers, highway and road crossings, a stormwater pumping station, and other minor activities. Two of these outgrants are worthy of additional comment:

(1) Combat Engineer Training. In May 1988, Permit No. DACW29-4-88-83 was issued to the Fort Worth District of the U.S. Army Corps of Engineers to allow the 429th Engineer Brigade to conduct combat engineer training within the spillway. The permit allows the operation of heavy equipment, dozers, graders, dump trucks, bucket loaders and the establishment of tactical bivouac sites. These activities are permitted without restriction in the northernmost portion of the floodway. Clearing of vegetation only is allowed in the corridor adjacent to the Upper Guide Levee which is the site of the proposed freshwater diversion outflow channel. In 1993 the permit was extended for a period of five years to 11 May 1998. Although in effect for 6 years, no combat training has yet been conducted under this permit.

(2) Law Enforcement Agencies Firing Range. License No. DACW29-3-91-46 was issued to the Kenner Police Department in May 1991 to establish a firing range for use by various law enforcement agencies. This outgrant covered 5.85 acres inside the floodway, adjacent to the upper guide levee and near Lake Pontchartrain. As designed, the firing range would be contained within levees and its use would be restricted to police officers. The lease expired on 2 May 1996; the only construction activity completed during the five-year life of the license was limited to site clearing. By letter dated 21 May 1996, the Kenner Police Department was informed of the license expiration and advised that the New Orleans District did not intend to extend the agreement.

2.6.2. Unsanctioned. A number of land use activities occurring in the Bonnet Carré Spillway are not specifically permitted or approved by the NOD. These unsanctioned activities that occur on project lands are described below:

(a) Recreation Activity Outside Lease Areas. A great deal of recreation takes place on the project lands outside of the physical boundaries of the leased or permitted recreation areas. An obvious example of this is the boating activity that occurs in the upper and lower borrow pits, the cross-cut canal, the I-10 construction access channel, and the entrance channel into Lake Pontchartrain. Although most of the boats using these waterways launch from the ramps located at the designated recreation areas along the Lower Guide Levee, the waterways themselves are not classified nor managed as recreation areas. Underwater hazards exist in these waterways and accidents to the boating public have happened in these uncleared water areas.

The most problematic, unsanctioned recreation activity in the floodway is the widespread usage of off-road vehicles. According to Federal policy (Executive Order 11644, "Use of Off-Road Vehicles on Public Lands," February 8, 1972) off-road vehicles are only allowed to operate in officially designated areas. Since the spillway is not an authorized public recreation project and no local sponsors have come forward to develop and maintain an off-road vehicle use area, no designated area exists. Therefore, Corps policy states that off-road vehicle use is prohibited on project lands. This prohibition, however, is not enforced due to the lack of adequate supervision and control of public activity on project lands. At present, the project experiences an extensive amount of off-road vehicular use including motorcycles, all terrain vehicles (ATV's), and four-wheel drive (4WD) trucks.

The basic problem with off-road vehicle use in the spillway is the totally unregulated nature of the activity. In the absence of formal, designated use areas with active enforcement of safety rules, the current users are free to ignore all reasonable safety standards. The result of this situation is a serious hazard to the off-road vehicle user and other members of the visiting public. Much of the off-road vehicle use occurs on the unsurfaced roads which exist throughout the floodway. Their use by motorcycles, ATV's and 4WD trucks (often at high speeds) creates hazards due to the heavy use of these roads by sand hauling trucks and other members of the visiting public. Another popular usage area for off-road vehicles is the levee crown, slopes and adjacent berm areas. In these areas, safety hazards are only part of the problem. Damage to the levees result from extensive use and, in some cases, the loud roar and dust created by these vehicles creates a significant disturbance for adjacent property owners.

Another significant recreational activity which causes problems is the unlawful discharge of firearms. Target shooting and hunting are subject to both state and local regulation and enforcement. Due to the lack of sufficient managerial presence, however, the spillway has become an area of extensive abuse of firearm regulations. Although the discharge of ball ammunition is prohibited by parish ordinance within the spillway, it is not uncommon to hear or witness the discharge of such weapons on project lands.

(b) Trash Dumping. Unauthorized dumping of household, construction, and miscellaneous trash and debris is a major problem on the project lands. The dumping occurs throughout the spillway but is concentrated in more secluded locales along the Upper Guide Levee. Corps maintenance personnel attempt to clean up these dumps but face a never-ending supply of freshly dumped debris.

(c) Removal of Trees. Another common problem is the indiscriminate cutting and harvesting of trees on project lands. Presumably, the purpose of this activity is to collect firewood at no cost. Again, this activity is most prevalent along the less traveled Upper Guide Levee.

2.7. Existing Management of Public Use

2.7.1. Corps of Engineers. As of January 1998, a permanent staff of five employees maintains the structure and floodway. Project personnel are devoted almost exclusively to operation and maintenance activities. No position is dedicated to visitor assistance and control nor to natural resource management. Except during periods of high water, the project staff works a daytime, Monday through Friday schedule. No Corps employees are normally on-duty at the spillway during evening hours or on weekends when public visitation is greatest.

The Bonnet Carré Spillway Operation and Maintenance Manual, dated September 1962, briefly addresses the handling of visitors to the project. Visitors are not permitted on the spillway structure unless accompanied by project personnel. Spillway personnel are directed to contact local law enforcement authorities when visitors become "unruly to the extent of endangering the welfare of others." The manual further directs that "trespassers" and those who violate laws at the project will be arrested and prosecuted utilizing "established procedure."

These guidelines are followed by the project foreman and other personnel to the maximum extent possible given their limited staffing and hours on the project site. When observed by project personnel, visitor activities that

violate these guidelines are addressed. The foreman relies heavily upon enforcement support from the St. Charles Parish Sheriff's Office as well as the police force of the Pontchartrain Basin Levee District. Unfortunately, most of the problematic activities occur outside the view of project personnel or during the majority of time when project personnel are not on-site.

In summary, New Orleans District management of public use in the spillway is best described as passive and minimal. It is limited by project staffing, staff work schedules, and vague guidance in the Operation and Maintenance Manual. At present, management of public use is not a primary duty of project staff.

2.7.2. St. Charles Parish. Through the exercise of local police authority over the spillway and the management and control over four recreation outgrants of project lands, the Parish of St. Charles has become the *de facto* local sponsor of the Bonnet Carré Spillway. Enforcement of local laws in the spillway is the responsibility of the St. Charles Parish Sheriff's Office. To accomplish this duty, the sheriff's office performs regular patrols of project lands in addition to responding to calls from project personnel and others regarding violations of local law in the spillway.

Two local ordinances specific to law enforcement problems in the Bonnet Carré Spillway have been enacted over the past few years. The first of these measures is contained in Appendix B. of Section 14-6. Discharge of weapons of the St. Charles Parish Code of Ordinances (a copy is located at the end of Appendix 1 to this master plan). This ordinance prohibits the possession or discharge of any rifle, pistol or other weapon discharging ball ammunition in the spillway. Only shotguns are allowed within the spillway and their use is prohibited within 800 feet of the spillway levees and highway crossings.

The second local ordinance specific to the spillway was passed by the parish council in April 1996 (copy provided as Appendix 5 to this master plan). Ordinance No. 96-4-8 amends Section 17 of the St. Charles Parish Code of Ordinances to restrict public visitation between the hours of 10 p.m. and 5 a.m. Specific exceptions are provided for persons authorized by the Corps or St. Charles Parish to access the spillway during the restricted hours; in particular, persons launching boats earlier than 5 a.m. The purpose of the ordinance is to address growing concerns regarding public safety and criminal activity, especially during night-time hours. The New Orleans District has concurred in this local action and the spillway thereby has been established as a "day use area."

In addition to law enforcement, St. Charles Parish has constructed and maintained several recreational developments within the spillway. These facilities are described in Section 2.6.1.(d) above and represent a significant, long-term commitment to recreation in the spillway.

2.8. Relationship to Other Projects

2.8.1. Lake Pontchartrain and Vicinity Hurricane Protection Project. As described in section 2.6.1.(b) above, a significant portion of the project lands is dedicated to providing clay borrow material for the Lake Pontchartrain project. Additionally, the spillway has served as the location of a sand stockpile area for levee construction in the St. Charles Levee reach of the project. The western terminus of the St. Charles Levee is the Lower Guide Levee approximately 4,000 feet north of U.S. 61.

2.8.2. Bonnet Carré Freshwater Diversion Structure. This project was authorized by the Water Resources Development Act of 1988. It is designed to divert up to 30,000 cfs of fresh water from the Mississippi River into Lake Pontchartrain. This diversion would reduce marsh loss by 10,500 acres over the 50-year project life and would increase annual oyster production by 5.7 million pounds in Louisiana and 1.9 million pounds in Mississippi.

The diversion structure and outflow channel would be constructed within the Bonnet Carré Spillway in a corridor along the Upper Guide Levee. The project would not significantly impact any existing user activity occurring in the spillway and, in fact, would create additional recreational opportunities such as tailwater fishing.

In July 1996, the State of Louisiana withdrew as a local sponsor for the Bonnet Carré Freshwater Diversion project. As a result, work on the project has been stopped. The likelihood of future construction of the project, as currently designed or in a modified form, is undetermined at present. Notwithstanding the indefinite status of the project, this draft master plan contains guidance in Sections 5 and 9 relative to the freshwater diversion plan. The reason for retaining these guidelines is the need for the master plan to be comprehensive in its treatment of all possible management needs on project lands and waters. The guidelines will be available if the original or modified freshwater diversion project is eventually built in the spillway.

Section 3 - Resources of the Project Area

3.1. Natural and Cultural Resources

3.1.1. Climate. The climate in the Bonnet Carré Spillway area is humid subtropical, characterized by mild winters and hot, humid summers. The area is dominated by warm, moist, maritime tropical air from the adjacent Gulf of Mexico. This maritime air is displaced frequently during winter and spring by incursions of continental polar air from Canada that usually persist no longer than three to four days. These incursions of cold air occur less frequently in autumn and only rarely in summer. Tropical storms and hurricanes are likely to affect the area three out of every ten years, with a severe hurricane causing widespread damage once every two or three decades. Annual average temperature is 70°F, with monthly normal temperatures varying from 81°F in July to 53°F in January. Average annual precipitation is 60 inches, varying from 7 inches in July to 3 inches in October. Annual average evapotranspiration varies from a maximum rate of 66.5 inches to a minimum rate of 41.6 inches. The predominant wind directions are South to South-Southeast from January through July and Northeast to East-Northeast from September through November. River fog is prevalent in the winter and spring when the temperature of the Mississippi River is cooler than the air temperature.

3.1.2. Geomorphology/Geology/Minerals. The Bonnet Carré Spillway consists of approximately 7,623 acres located on the east side of the Mississippi River in southeastern Louisiana. The lands, characteristic of an alluvial flood plain, vary in elevation from 12 feet near the river to mean sea level near Lake Pontchartrain. The water areas consisting of the Mississippi River, Lake Pontchartrain, borrow pits, drainage canals, and natural bayous form the principal physiographic features. Guide levees extend across the floodway from 7,700 feet at the river to 12,400 feet at the lake end. Two miles lakeward of the river, the swamp land extends about four miles to Lake Pontchartrain, averaging 1 to 2 feet above mean sea level. The area is similar to most deltaic plain environments in that it is of low elevation, low relief and gentle slopes. There are no obvious significant geologic features within the confines of the spillway. Two probable minor subsurface faults are located in the spillway area but cause little apparent surface displacement. Mineral deposits in the area include petroleum, sand, gravel, and clay.

3.1.3. Soils/Topography. Soils are derived from alluvial deposits and organic matter. Swamp soils consist of soft to very soft organic clays with layers of silt and peat, wood and roots, and high water content. Such soils usually

support tree growth. Marsh soils, consisting of soft to very soft organic clays of high water content and layers of silt and peat, support grasses and sedge growth. Natural levee soils derived from recent Mississippi River deposits consist of stiff to very stiff oxidized clays with layers of silts, silty sands, and sands of low water content. The Convent-Commerce soil series, widespread within the project area, consists of level to gently undulating, poorly drained soils that have a loamy surface and subsurface layer, or have a loamy or clayey surface layer and a clayey subsoil.

3.1.4. Wetlands/water. Jurisdictional wetlands comprise the entire spillway from the Mississippi River to Lake Pontchartrain (see Plate 10), and are an important habitat for fish and wildlife resources. There are also several large water bodies including the Upper and Lower Borrow Canals and numerous shallow ponds created by sand excavation activities. These are currently utilized for many recreational activities.

3.1.5. Vegetation. Plant communities in the Bonnet Carré Spillway include bottomland hardwood forests, baldcypress-tupelogum swamps, aquatics in canals and ponds, and disturbed areas. The land slopes from near the Mississippi River with elevations of 10-12 feet NGVD to Lake Pontchartrain with elevations of 1-2 feet NGVD. These elevations dictate forest types in the undisturbed wooded zones. Dry bottomland hardwood forests are located near the river and grade into baldcypress-tupelogum swamps. The forested areas were logged in the past and second-growth timber covers these arboreal areas.

The spillway acts as a catch-basin during operations when floodwaters are released from the Mississippi River into Lake Pontchartrain. The introduction of seeds, rhizomes, and other plant propagules permits establishment of new species and this ever-changing environment can be expected to continue.

(a) Previous Studies. Plant species have been recorded in the spillway by Clark (1970), Howard and Penfound (1942), Kessler (1983), Montz (1970, 1976, 1978, 1979 and 1985) and Thieret (1980). These studies provided the background for this overview of vegetation resources.

(b) Major Vegetation Types. Two major forested types and two non-forested vegetation types are recognized in the spillway. The total area of forests in the Bonnet Carré Spillway is approximately 3,020 acres, or 40% of the total project acreage. The vast majority of these forested areas (approximately 2,780 acres, or 92% of the total) are located between U.S. Hwy 61 and the lake.

(1) Bottomland Hardwoods. These wooded zones are located from the river to areas near U.S. Hwy 61 on higher ground. Abundant trees are live, water, overcup, obtusa, and Nuttall oaks; hackberry; sweetgum; green ash; boxelder; Drummond red maple; roughleaf dogwood; persimmon; tallow tree; pecan; black and sandbar willows; cottonwood and American elm. Common shrubs and vines include poison ivy, deciduous holly, green hawthorn, palmetto, eastern baccharis, climbing hempweed, trumpet creeper, elderberry, common greenbriar, rattan vine, Japanese climbing fern, peppervine, blackberry, Virginia creeper, and muscadine. Herbaceous plants in these wooded areas are diverse with the more common species including water willow, Nuttall water-hemp, southern shield fern, asters, sumpweed, seaside goldenrod, Virginia dayflower, morning glories, tall horsetail, American germander, smartweeds, false nettle, and numerous grasses, rushes, and sedges.

(2) Baldcypress-Tupelogum Swamps. The swamps in the spillway are located in the lower elevations near Lake Pontchartrain. They have a firm substrate in comparison to swamps outside the guide levees. This is due to the deposition of alluvium from each spillway operation. Dominant trees and shrubs include baldcypress, tupelogum, Drummond red maple, carolina and pumpkin ashes, palmetto, eastern baccharis, rattlebox, buttonbush, overcup oak, swamp-privet, waxmyrtle, black willow and waterelm. Abundant herbaceous cover and vines includes alligatorweed, smartweeds, pennyworts, climbing hempweed, creeping spilanthes, broadleaf panicum, frogfruit, and numerous grasses, rushes, and sedges.

(3) Aquatics in Canals and Ponds. Many various size canals and ponds are located within the spillway. Most of these are shallow and are filled with aquatics, while others are deeper and exhibit open water. Emerged, floating and submersed plants in these waterbodies are waterhyacinth, delta duckpotato, duckweeds, alligatorweed, waterpennywort, mosquito fern, carex, cyperus, juncus, floating waterprimrose, and pickerelweed.

(4) Disturbed Areas. These areas have been modified to a great extent by man. Land clearing for the spillway eliminated bottomland hardwoods and baldcypress-tupelogum swamps. Different plant communities may be found in these disturbed areas following each operation of the spillway. Sand-loving colonizers become established on the dunes formed from deposition of the river alluvium. Perennial herbs are more common in the disturbed areas following successional trends after several years without a spillway operation. Hundreds of plants may be found in these disturbed areas. Some of the abundant species are carpetweed, southern waterhemp, pigweed, mock bishopweed, ragweeds, asters, spiny thistle, yankeeweed, goldenrods,

cocklebur, peppergrass, morning glories, woolly croton, coffeeweed, clovers, polly-prin, ironweed, evening primroses, wood sorrel, bushy beardgrass, Bermuda grass, Dallis grass, smartweeds, buttercups, bedstraw, vervain, peppervine, and numerous grasses, rushes and sedges. These disturbed areas have a rich and diversified flora.

(c) Rare Species of Plants. A number of plants considered rare for the southeastern portion of the state have been collected in the Bonnet Carré Spillway. Collections by Montz (1985) recorded rare species, several of which have been published by others. The following gives a list of plants collected in the spillway which are considered rare in southeastern Louisiana:

- Apocynum cannabinum Indian hemp.
- Artemisia annua Wormwood.
- Brachiaria plataginaceae Plantain signalgrass. Reported by Allen (1992) in only two parishes in the state.
- Camelina microcarpa False flax.
- Cyperus distinctus Cyperus. Reported by Kessler (1983) as new to Louisiana.
- Echinodorus rostratus Upright burhead.
- Equisetum X ferrissii Ferris's horsetail. Reported by Thieret (1980) as a hybrid and from only two parishes in the state.
- Habenaria repens Water-spider orchid.
- Helianthus debilis var. cucumerifolius Sunflower. Reported by Gandhi and Thomas (1989) from only two parishes in the state.
- Myosurus minimus Mousetail.
- Rorippa heterophylla Yellow cress.
- Rumex paraquayensis Dock.
- Scirpus cyperinus Wool-grass.
- Sporobolus cryptandrus Gray dropseed. Reported by Allen(1992).

These rare species were collected in the forebay of the spillway near the river following high water years. A seed source or plant propagules for each species apparently floated into the area and became established. It should be noted that many of these rare species have not become permanently established in the spillway over the years.

(d) Endangered and Threatened Plant Species. No endangered or threatened plant species, according to the Federal Register, have been identified in the Bonnet Carré Spillway.

3.1.6. Wildlife. The fauna present in the spillway include inhabitants of bottomland hardwood forests, baldcypress-

tupelogum swamps, disturbed areas and water bodies. The diversity and areal extent of productive habitat types in the spillway support a wide variety of wildlife including game species, commercially important furbearers and alligators, endangered species, and numerous nongame species that are important from an ecological standpoint.

(a) Game and Commercial Species. Important game mammals include the gray squirrel, fox squirrel, swamp rabbit, and raccoon. Squirrels are found predominately in the forested habitats. The swamp rabbit and raccoon inhabit the bottomland hardwood forests, wooded swamps, and ecotone region along forest edges. Other mammalian wildlife species of commercial importance include the following fur animals: otter, mink, nutria, muskrat, raccoon, opossum, and beaver. The forested wetlands and shallow margins of permanent water bodies provide excellent feeding and resting areas for numbers of American coot and dabbling ducks, such as the wood duck, mallard and the mottled duck. Diving ducks, such as the lesser scaup, are most common in Lake Pontchartrain and adjacent open water areas of the spillway. Other game birds occasionally found in the spillway include American woodcock and common snipe. Snakes, turtles, lizards, bullfrogs, and pigfrogs are all commercially taken from the spillway.

(b) Non-game Species. Approximately 30 species of mammals have been recorded from the Bonnet Carré Spillway and vicinity (Table 3-1), the majority being non-game species. Common non-game mammals include nine-banded armadillo, southern flying squirrel, and marsh rice rat.

A great diversity of avian fauna is in the area including sea birds, waterfowl, shorebirds, wading birds, songbirds, and raptors. Seabirds include the American white pelican, herring gull, ring-billed gull, Forster's tern, laughing gull, and gull-billed tern. Waterfowl include mallards, mottled duck, green and blue-winged teal, northern pintail, and wood duck. Wading birds present include such species as the tricolored heron, great blue heron, yellow-crowned night-heron, green-backed heron, cattle egret, great egret, snowy egret, white ibis, glossy ibis, and white-faced ibis. Shorebirds common to the area include the black-necked stilt, killdeer, greater and lesser yellowlegs, and numerous sandpipers. Common raptors include red-shouldered hawk, red-tailed hawk, barred owl, and American kestrel. Other non-game birds inhabiting the area are the Carolina wren, northern cardinal, white-eyed vireo, boat-tailed grackle, common grackle, red-winged blackbird, and belted kingfisher. A complete listing of avian species can be found in Table 3-2.

Numerous species of reptiles and amphibians are found in the area. The American alligator, common snapping turtle, red-

Table 3-1 Mammals recorded from the Bonnet Carré Spillway and Vicinity (Lowery 1974, Brantley 1994, pers. obs.).

<u>Common Name</u>	<u>Species</u>
Virginia Opossum	<i>Didelphis virginiana</i>
Eastern Pipistrelle	<i>Pipistrellus subflavus</i>
Red Bat	<i>Lasiurus borealis</i>
Seminole Bat	<i>Lasiurus seminolus</i>
Northern Yellow Bat	<i>Lasiurus intermedius</i>
Evening Bat	<i>Nycticeius humeralis</i>
Rafinesque's Big-eared Bat	<i>Plecotus rafinesquii</i>
Brazilian Free-tailed Bat	<i>Tadarida brasiliensis</i>
Nine-banded Armadillo	<i>Dasybus novemcinctus</i>
Swamp Rabbit	<i>Sylvilagus aquaticus</i>
Gray Squirrel	<i>Sciurus carolinensis</i>
Fox Squirrel	<i>Sciurus niger</i>
Southern Flying Squirrel	<i>Glaucomys volans</i>
American Beaver	<i>Castor canadensis</i>
Marsh Rice Rat	<i>Oryzomys palustris</i>
Fulvous Harvest Mouse	<i>Reithrodontomys fulvescens</i>
White-footed Mouse	<i>Peromyscus leucopus</i>
Cotton Mouse	<i>Peromyscus gossypinus</i>
Hispid Cotton Rat	<i>Sigmodon hispidus</i>
Muskrat	<i>Ondatra zibethicus</i>
Roof Rat	<i>Rattus rattus</i>
Norway Rat	<i>Rattus norvegicus</i>
House Mouse	<i>Mus musculus</i>
Nutria	<i>Myocastor coypus</i>
Coyote	<i>Canis latrans</i>
Northern Raccoon	<i>Procyon lotor</i>
Mink	<i>Mustela vison</i>
Nearctic River Otter	<i>Lutra canadensis</i>
White-tailed Deer	<i>Odocoileus virginiana</i>
Domestic Hog (feral)	<i>Sus scrofa</i>

Table 3-2 Birds recorded from the Bonnet Carré Spillway and Vicinity (Lowery 1974, Purrington et al. 1987, Brantley 1994, pers. obs.).

<u>Common Name</u>	<u>Species</u>
Pied-billed Grebe	<i>Podilymbus podiceps</i>
American White Pelican	<i>Pelecanus erythrorhynchos</i>
Double-crested Cormorant	<i>Phalacrocorax auritus</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Casmerodius albus</i>
Snowy Egret	<i>Egretta thula</i>
Little Blue Heron	<i>Egretta caerulea</i>
Tricolored Heron	<i>Egretta tricolor</i>
Cattle Egret	<i>Bubulcus ibis</i>
Green Heron	<i>Butorides striatus</i>
Yellow-crowned Night-Heron	<i>Nycticorax violaceus</i>
White Ibis	<i>Eudocimus albus</i>
Glossy Ibis	<i>Plegadis falcinellus</i>
White-faced Ibis	<i>Plegadis chihi</i>
Wood Duck	<i>Aix sponsa</i>
Green-winged Teal	<i>Anas crecca</i>
Mottled Duck	<i>Anas fulvigula</i>
Mallard	<i>Anas platyrhynchos</i>
Blue-winged Teal	<i>Anas discors</i>
Northern Shoveler	<i>Anas clypeata</i>
Gadwall	<i>Anas strepera</i>
Ring-necked Duck	<i>Aythya collaris</i>
Lesser Scaup	<i>Aythya affinis</i>
Black Vulture	<i>Coragyps atratus</i>
Turkey Vulture	<i>Cathartes aura</i>
Osprey	<i>Pandion haliaetus</i>
American Swallow-tailed Kite	<i>Elanoides forficatus</i>
Mississippi Kite	<i>Ictinia mississippiensis</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
American Kestrel	<i>Falco sparverius</i>
King Rail	<i>Rallus elegans</i>
Virginia Rail	<i>Rallus limicola</i>
Sora	<i>Porzana carolina</i>
American Coot	<i>Fulica americana</i>
Killdeer	<i>Charadrius vociferus</i>
Black-necked Stilt	<i>Himantopus mexicanus</i>
Greater Yellowlegs	<i>Tringa melanoleuca</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>
Spotted Sandpiper	<i>Actitis macularia</i>
Western Sandpiper	<i>Calidris mauri</i>
Least Sandpiper	<i>Calidris minutilla</i>
Common Snipe	<i>Gallinago gallinago</i>
American Woodcock	<i>Scolopax minor</i>
Laughing Gull	<i>Larus atricilla</i>
Bonaparte's Gull	<i>Larus philadelphia</i>
Ring-billed Gull	<i>Larus delawarensis</i>

Table 3-2 continued

<u>Common Name</u>	<u>Species</u>
Herring Gull	<i>Larus argentatus</i>
Gull-billed Tern	<i>Sterna nilotica</i>
Caspian Tern	<i>Sterna caspia</i>
Royal Tern	<i>Sterna maxima</i>
Forster's Tern	<i>Sterna forsteri</i>
Rock Dove	<i>Columba livia</i>
Mourning Dove	<i>Zenaida macroura</i>
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
Eastern Screech Owl	<i>Otus asio</i>
Great Horned Owl	<i>Bubo virginianus</i>
Barred Owl	<i>Strix varia</i>
Chimney Swift	<i>Chaetura pelagica</i>
Ruby-throated Hummingbird	<i>Archilochus colubris</i>
Belted Kingfisher	<i>Ceryle alcyon</i>
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Hairy Woodpecker	<i>Picoides villosus</i>
Northern Flicker	<i>Colaptes auratus</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>
Eastern Phoebe	<i>Sayornis phoebe</i>
Great Crested Flycatcher	<i>Myiarchus crinitus</i>
Eastern Kingbird	<i>Tyrannus tyrannus</i>
Purple Martin	<i>Progne subis</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
Barn Swallow	<i>Hirundo rustica</i>
Blue Jay	<i>Cyanocitta cristata</i>
American Crow	<i>Corvus brachyrhynchos</i>
Fish Crow	<i>Corvus ossifragus</i>
Carolina Chickadee	<i>Parus carolinensis</i>
Tufted Titmouse	<i>Parus bicolor</i>
Brown Creeper	<i>Certhia americana</i>
Carolina Wren	<i>Thryothorus ludovicianus</i>
House Wren	<i>Troglodytes aedon</i>
Sedge Wren	<i>Cistothorus platensis</i>
Marsh Wren	<i>Cistothorus palustris</i>
Ruby-crowned Kinglet	<i>Regulus calendula</i>
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>
Hermit Thrush	<i>Catharus guttatus</i>
Wood Thrush	<i>Hylocichla mustelina</i>
American Robin	<i>Turdus migratorius</i>
Gray Catbird	<i>Dumetella carolinensis</i>
Northern Mockingbird	<i>Mimus polyglottos</i>
Brown Thrasher	<i>Toxostoma rufum</i>
American Pipit	<i>Anthus spinoletta</i>
Sprague's Pipit	<i>Anthus spragueii</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>

Table 3-2 continued

<u>Common Name</u>	<u>Species</u>
European Starling	<i>Sturnus vulgaris</i>
White-eyed Vireo	<i>Vireo griseus</i>
Solitary Vireo	<i>Vireo solitarius</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>
Orange-crowned Warbler	<i>Vermivora celata</i>
Northern Parula	<i>Parula americana</i>
Yellow Warbler	<i>Dendroica petechia</i>
Magnolia Warbler	<i>Dendroica magnolia</i>
Yellow-rumped Warbler	<i>Dendroica coronata</i>
Black-throated Green Warbler	<i>Dendroica virens</i>
Yellow-throated Warbler	<i>Dendroica dominica</i>
Palm Warbler	<i>Dendroica palmarum</i>
American Redstart	<i>Setophaga ruticilla</i>
Prothonotary Warbler	<i>Protonotaria citrea</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Hooded Warbler	<i>Wilsonia citrina</i>
Summer Tanager	<i>Piranga rubra</i>
Northern Cardinal	<i>Cardinalis cardinalis</i>
Indigo Bunting	<i>Passerina cyanea</i>
Painted Bunting	<i>Passerina ciris</i>
Rufous-sided Towhee	<i>Pipilo erythrophthalmus</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>
LeConte's Sparrow	<i>Ammospiza leconteii</i>
Song Sparrow	<i>Melospiza melodia</i>
Swamp Sparrow	<i>Melospiza georgiana</i>
White-throated Sparrow	<i>Zonotrichia albicollis</i>
Dark-eyed Junco	<i>Junco hyemalis</i>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Eastern Meadowlark	<i>Sturnella magna</i>
Boat-tailed Grackle	<i>Quiscalus major</i>
Common Grackle	<i>Quiscalus quiscula</i>
Brown-headed Cowbird	<i>Molothrus ater</i>
Orchard Oriole	<i>Icterus spurius</i>
Northern Oriole	<i>Icterus galbula</i>
American Goldfinch	<i>Carduelis tristis</i>
House Sparrow	<i>Passer domesticus</i>

Table 3-3 Reptiles and Amphibians recorded from the Bonnet Carré Spillway and Vicinity (Dundee and Rossman 1991, Brantley 1994, pers. obs.).

<u>Common Name</u>	<u>Species</u>
Common Snapping Turtle	<i>Chelydra serpentina</i>
Cooter	<i>Pseudemys floridana</i>
Red-eared Slider	<i>Trachemys scripta</i>
Eastern Mud Turtle	<i>Kinosternon subrubrum</i>
Stinkpot	<i>Sternotherus odoratus</i>
Spiny Softshell	<i>Apalone spinifera</i>
Green Anole	<i>Anolis carolinensis</i>
Five-lined Skink	<i>Eumeces fasciatus</i>
Broad-headed Skink	<i>Eumeces laticeps</i>
Ground Skink	<i>Scincella lateralis</i>
Racer	<i>Coluber constrictor</i>
Rat Snake	<i>Elaphe obsoleta</i>
Mud Snake	<i>Farancia abacura</i>
Eastern Hog-nosed Snake	<i>Heterodon platyrhinos</i>
Speckled Kingsnake	<i>Lampropeltis getulus</i>
Milk Snake	<i>Lampropeltis triangulum</i>
Green Water Snake	<i>Nerodia cyclopion</i>
Yellow-bellied Water Snake	<i>Nerodia erythrogaster</i>
Banded Water Snake	<i>Nerodia fasciata</i>
Diamond-backed Water Snake	<i>Nerodia rhombifera</i>
Rough Green Snake	<i>Opheodrys aestivus</i>
Graham's Crayfish Snake	<i>Regina grahamii</i>
Glossy Crayfish Snake	<i>Regina rigida</i>
Brown Snake	<i>Storeria dekayi</i>
Western Ribbon Snake	<i>Thamnophis proximus</i>
Eastern Ribbon Snake	<i>Thamnophis sauritus</i>
Common Garter Snake	<i>Thamnophis sirtalis</i>
Cottonmouth	<i>Agkistrodon piscivorus</i>
Timber Rattlesnake	<i>Crotalus horridus</i>
American alligator	<i>Alligator mississippiensis</i>
Three-toed Amphiuma	<i>Amphiuma tridactylum</i>
Southern Dusky Salamander	<i>Desmognathus fuscus</i>
Dwarf Salamander	<i>Eurycea quadridigitata</i>
Eastern Newt	<i>Notophthalmus viridescens</i>
Gulf Coast Toad	<i>Bufo valliceps</i>
Woodhouse's Toad	<i>Bufo woodhousei</i>
Northern Cricket Frog	<i>Acris crepitans</i>
Bird-voiced Treefrog	<i>Hyla avivoca</i>
Gray Treefrog	<i>Hyla chrysoscelis/versicolor</i>
Green Treefrog	<i>Hyla cinerea</i>
Spring Peeper	<i>Hyla crucifer</i>
Squirrel Treefrog	<i>Hyla squirella</i>
Striped Chorus Frog	<i>Pseudacris triseriata</i>
Eastern Narrow-mouthed Toad	<i>Gastrophryne carolinensis</i>
Bullfrog	<i>Rana catesbeiana</i>
Bronze Frog	<i>Rana clamitans</i>
Pig Frog	<i>Rana grylio</i>
Southern Leopard Frog	<i>Rana sphenoccephala</i>

eared slider, stinkpot, green anole, ground skink, banded water snake, and Western cottonmouth are representative reptiles. Amphibians in the area include the bullfrog, pig frog, bronze frog, leopard frog, Gulf Coast toad, green and squirrel treefrogs, and several species of salamanders. A list of reptiles and amphibians can be found in Table 3-3.

A wide variety of terrestrial and aquatic invertebrates can be found in the area including arthropods, snails, annelids, nematodes, and protozoans. Insects are the most important invertebrates in the area and sometimes function as vectors, transmitting disease organisms to other animals and humans.

(c) Endangered and Threatened Species. Two Federally listed endangered/threatened wildlife species occur in the Bonnet Carré Spillway. Brief descriptions of these species follow.

(1) Bald Eagle. The bald eagle was listed as an endangered species in March 1967 (U.S. Fish and Wildlife Service 1991a); since that time, these birds have increased in number in Louisiana (U.S. Fish and Wildlife Service 1991b). A steady increase in the number of active nests has occurred over the past 20 years. Due to this increase, the Bald Eagle was reclassified by the U.S. Fish and Wildlife Service in 1994 as a threatened species.

Two nest sites are located in the vicinity of the Bonnet Carré Spillway. During the 1993-1994 Louisiana Department of Wildlife and Fisheries survey, both of these nest locations were active. Bald eagle nest sites are considered environmentally sensitive areas and are further discussed below.

(2) American Alligator. Currently, American alligators are listed as threatened under the Similarity of Appearance clause to the Endangered Species Act of 1973 (as amended). Population levels in Louisiana are sufficient to legally allow a state regulated trapping season. Tags are issued by the Louisiana Department of Wildlife and Fisheries to regulate harvest and harvest is dependent upon the potential carrying capacity of the harvest area. In general, the spillway is relatively poor alligator habitat when compared to nearby coastal marshes and other baldcypress-tupelogum swamps in the region. Currently, no system exists to allow a sustained yield harvesting program of alligators in the spillway.

3.1.7. Fisheries. Various water bodies interspersed throughout the area include ponds, lakes, borrow pits, bayous, canals, tidal passes, rivers, and navigation channels. This diversity of aquatic habitat types supports a wide range of finfish, shellfish, and other aquatic

invertebrate resources important from a commercial, recreational, and ecological standpoint.

(a) Recreational Species. Sport fishing is popular in the freshwater and brackish water habitats in the immediate area. Primary freshwater species sought by anglers include largemouth bass, black crappie, white crappie, bluegill, redear sunfish, warmouth, channel catfish, blue catfish, and freshwater drum. Recreational fisheries for red swamp crayfish, white river crayfish, and blue crabs occurs throughout the open and wooded areas of the spillway, but primarily in the many borrow pits and sandhauling pits. Saltwater sportfishing includes not only finfish, but also recreational shrimp trawling and crabbing. Shrimping involves brown and white penaeid shrimp; sport crabbers catch the blue crab exclusively. Some recreational pursuit of bait shrimp (primarily grass and river shrimp) occurs near the Bonnet Carré Spillway structure and guide levee borrow pits. Popular saltwater finfishes sought by sport fishermen in Lake Pontchartrain include spotted seatrout, Atlantic croaker, red drum, black drum, sheepshead, and southern flounder.

(b) Commercial Species. Commercially important freshwater fish include the channel catfish, blue catfish, flathead catfish, yellow bullhead, carp, largemouth buffalo, smallmouth buffalo, alligator gar, spotted gar, bowfin, and freshwater drum. Red swamp crayfish also are harvested commercially from the Bonnet Carré Spillway although it is somewhat limited due to water levels, temperature, and competition from recreational fisheries. Shad and river shrimp fishing occurs near the spillway structure during high Mississippi River stages when flows are entering the floodway. Most of the commercial fisheries in the area are dependent on estuarine finfish and shellfish in Lake Pontchartrain. The species of commercial importance include brown and white penaeid shrimp, blue crab, Atlantic croaker, spotted seatrout, spot, and black drum.

(c) Endangered and Threatened Species. The pallid sturgeon, a Federally listed endangered species, possibly occurs in the Mississippi River. The Gulf sturgeon, a Federally listed threatened species, occurs in Lake Pontchartrain. A brief description of these fish species follows.

(1) Pallid Sturgeon. The pallid sturgeon was listed as an endangered species in September, 1990 (U.S. Fish and Wildlife Service 1992). The range of the pallid sturgeon includes the middle and lower Mississippi, the Atchafalaya, the Missouri, the Platte, and Yellowstone Rivers. Pallid sturgeon require large, turbid, free-flowing riverine habitat with a rocky or sandy substrate (Gilbraith et al. 1988). They prefer main channel pools below sandbars (Kallemeyn and

Novotny 1977). Although expected to be present near the Bonnet Carré Spillway, there have been no records of pallid sturgeon from this part of the Mississippi River.

(2) Gulf Sturgeon. The Gulf sturgeon was listed as a threatened species in October 1991 (U.S. Fish and Wildlife Service 1991). A subspecies of the Atlantic sturgeon, the Gulf sturgeon once ranged from Tampa Bay, Florida to the Mississippi River. Although they may still be found in reduced numbers throughout this range, Gulf sturgeon are now largely confined to the eastern Gulf of Mexico (Barkuloo 1988).

Within Louisiana, Gulf sturgeon can be found in coastal lakes, streams and rivers east of the Mississippi River including Lakes Maurepas and Pontchartrain, and the Bogue Chitto, Amite, Tangipahoa, Tchefuncte, Pearl, and Tickfaw Rivers (Davis et al. 1970; Barkuloo 1988; Miranda and Jackson 1987). Douglas (1974) reported Gulf sturgeon only from the Lake Pontchartrain Basin and Pearl River. Fremling et al. (1989) reported the occurrence of Gulf sturgeon in the lower Mississippi River as rare.

3.1.8. Water Quality. Several standards applicable to all waters in the state and numerical standards applicable to specific major water bodies, their tributaries, and distributaries are examined by Louisiana Department of Environmental Quality. The numerical standards are intended to protect and enhance the inorganic and sanitary quality of state waters for currently designated and potential future uses. Standards apply to pH range, temperature, bacterial density, dissolved oxygen, chloride concentration, sulfate concentration, and total dissolved solids. The Mississippi River at the Bonnet Carré Spillway is considered suitable for any use or activity where human ingestion of untreated water is not probable. Such uses or activities include secondary contact recreation, propagation of fish and wildlife, and domestic raw water supply. Water quality within the Bonnet Carré Spillway when operation of the control structure or leakage through the structure is occurring is comparable to Mississippi River water quality. At other times, water quality improves, and designated uses include primary contact recreation, secondary contact recreation, and propagation of fish and wildlife. Coliform bacteria levels, an important water quality criterion for water contact activities, are within state standards for water contact recreation.

3.1.9. Prehistoric and Historic Sites. Numerous prehistoric and historic resources are recorded in the general project vicinity. Historic sites, including plantation houses and related features, are concentrated along the natural levee of the Mississippi River. Prehistoric sites tend to be

found in the swamps and marshes closer to Lake Pontchartrain. These resources are generally shell middens and, because they are often deeply buried, are sometimes only discovered during dredging operations.

The cultural resource inventory of project lands at Bonnet Carré was completed in several phases between 1986 and 1991. The result of these efforts was the listing of two properties on the National Register of Historic Places. One of these is the Kenner and Kugler Cemeteries Archeological District. This district consists of two African-American cemetery plots which date to the early nineteenth century and continued to receive interments until federal purchase of the property in 1928. The cemeteries are located between the spillway structure and the Illinois Central - Baton Rouge District Railroad. Project personnel are aware of these locations and buffer zones have been established to provide protection from project operations.

The other National Register property in the project area is the spillway structure itself. The structure, built between 1929 and 1931, is significant as an engineering landmark and is also significant for its important historical association with flood control efforts on the Lower Mississippi River. Because the Bonnet Carré Freshwater Diversion project will require the demolition of approximately 10% of the structure, a Memorandum of Agreement (MOA) was developed in 1992 to provide for appropriate mitigation measures. Included in the agreement were the preparation of a popular history and the development of a public interpretive display at the project site.

3.1.10. Aesthetics. The Bonnet Carré Spillway offers a wide variety of aesthetic environments. This is largely the result of its areal extent, as well as its unique geographical situation stretching from the Mississippi River to Lake Pontchartrain. Significant viewpoints exist at numerous locations along the lower and upper guide levees, along the three vehicular crossings of the spillway, and at many ground-level locales within the floodway itself.

One of the significant aesthetic resources of the project is the outstanding visual access provided for the Mississippi River. The guide levees provide elevated view stations and unobstructed views of a large expanse of the river. The surrounding land uses are largely industrial, including chemical plants and a nuclear power station, but this does not diminish the powerful image of the river. Rather, it allows for the proper interpretation of the Mississippi as a working river, an avenue of commerce and industry. In addition to the levee viewpoints, the project also provides more immediate access to the river. Visitors descend into the forebay where they fish and picnic, giving them a close-up experience of the river's aesthetics. They can see,

touch, smell, and hear the river in a personal way without fear of trespassing or danger.

Excellent views of the spillway structure, a powerful aesthetic resource in its own right, and the wide pastoral expanse of the forebay and floodway are also available from the elevated perspective offered by the levees. Ground-level views of the spillway structure and cleared landscape from within the floodway are also powerful and are experienced daily by scores of project visitors and travelers along St. Charles Parish Road 12.

Close to the spillway structure, the guide levees offer an entirely different viewing experience when the Mississippi River is high enough to flood the forebay and lay against the structure. These conditions occur for several weeks in the spring of most years. During these periods, the power of the river is imprinted upon project visitors. The project purpose is also clearly illustrated as some of the river's flow leaks through the structure, flooding the road and immediate floodway area. On the rare occasions when the structure is opened to release floodwaters to Lake Pontchartrain, the levees offer an unparalleled view of the river's power rushing through the structure's opened bays. Spillway openings are big events in the region and are attended by the news media and thousands of citizens.

The project also provides one of the few physical and visual access points to the western shore of Lake Pontchartrain. This access is provided where the lower guide levee intersects the lakeshore. At this locale, a cleared area of several acres is available to project visitors. Panoramic views of the lake and adjoining shoreline are utilized by the visiting public who fish, crab and picnic in this area.

Another significant aesthetic resource of the project is the outstanding viewing experiences provided by Interstate 10 which crosses the project near its lake edge. This stretch of I-10 provides unobstructed, elevated views of Lake Pontchartrain to thousands of travelers on a daily basis. Also provided is the diverse visual environment of the project's lake edge. Visual elements include cypress tree stands, tree stumps and mudflats; a railroad crossing on trestles with rock erosion protection; and miscellaneous project features including the guide levees and remnant wooden guide walls.

Aesthetic environments within the floodway are extremely varied due to the broad range of habitat types and project activities. Habitat types include disturbed areas almost denuded of vegetation, wide expanses of revegetated grasslands, numerous water bodies of various sizes, bottomland hardwood forests, and cypress swamp environments. Project visitors experience these areas from vehicles, on

foot, and from boats launched in the two large borrow pits. Many of these areas, especially between U.S. Hwy 61 and the lake, offer a high quality natural environment.

The spillway, of course, also has negative aesthetic attributes. Chief among these are the numerous locales of unauthorized trash dumping. Several remote areas of the project are plagued by the dumping of abandoned vehicles, household garbage, and construction debris. In addition, the project has many areas that are severely degraded from an aesthetic standpoint by operational and maintenance activities as well as visitor activities. Where sand hauling activities are underway, highly disturbed landscapes are in evidence. Areas frequented by large numbers of off-road vehicles are scarred by vehicle ruts, vegetation damage, trash, and noise pollution. Other public use areas suffer from a lack of attention to aesthetic concerns, including poor maintenance and lack of planned or managed landscaping.

3.2 Social Resources in the Project Vicinity

3.2.1. General. The primary function of the spillway is to reduce the potential flood hazards to the large population center downstream, including the New Orleans metropolitan area. The project was authorized by the Flood Control Act of 1928, following the Flood of 1927. During this flood, the Mississippi River levee below the City of New Orleans was intentionally breached to avoid heavy damage and potential loss of life. Since then, economic expansion, urbanization, and natural increases have led to significant population growth, notwithstanding the unusual fluctuation which occurred during the 1980's generally associated with changes in petro-chemical and port activities along the Gulf Coast. For purposes of this report, the socio-economic study area includes the five parishes (Primary Parishes) which are essentially within a radius of 25 miles of the project guide levees, and the population of an additional ten parishes (Secondary Parishes) largely within 25 to 50 miles of the project site (see Plate 6). Small portions of Ascension, Lafourche, Livingston, St. Tammany, and Tangipahoa Parishes are also within 25 miles of the project site and are included as Secondary Parishes. Small portions of East Baton Rouge, St. Helena, St. Martin, and Washington Parishes are also within 50 miles of the project guide levees but are beyond the scope of the study.

3.2.2. Demographics. There are no permanent residents currently living within the project rights-of-way. For a brief period of time, prior to the opening of the structure gates in 1973, the boat-launch operator and his family lived in a mobile home along U.S. Hwy 61 inside the floodway. Since that time, no one has lived on the project lands.

Residential developments in closest proximity to the spillway include the small communities of Norco and Montz, both located in St. Charles Parish. Norco is located adjacent to the lower guide levee, between the East Bank of the river and Louisiana Highway 45. In 1990, Norco had a population of 3,385 persons. Montz is located along the East Bank of the river and Louisiana Highway 628, immediately adjacent to the upper guide levee. The 1990 Census of Population and Housing did not identify Montz as a community separate from the overall population of Voting District 6. By deducting the population of Norco and the part of New Sarpy which is also in Voting District 6, however, we estimate that the 1990 population of Montz was about 1,000 people [Voting District (4,931) - Norco (3,385) - New Sarpy (458) = Montz (1,088, rounded to 1,000)]. In estimating the population of Montz we rounded downward, from 1,088 to 1,000, to consider the small number of rural residents living near the St. Charles/St. John the Baptist Parish line, who are also part of Voting District 6 but may not consider themselves part of the community of Montz.

Only a few miles upriver from Montz is LaPlace, in St. John the Baptist Parish. In 1990, LaPlace had a total population of 24,194. The total population of New Sarpy (below the lower guide levee and Norco) in 1990 was 2,940. Below Norco and New Sarpy, population densities tend to increase, generally in the direction of the Urbanized Area of New Orleans and the City of New Orleans.

Table 3-4 compares the population trends of individual parishes in the study area with the population of the entire State from 1960 to 1993. Since the Flood of 1927, the population of the entire study area has increased by more than a million people. Census data and preliminary estimates of Louisiana Tech University indicate that the population of the 15-parish study area has grown from approximately 763,000 in 1930 to an estimated 1,773,000 in 1993. The population of the Primary Parishes has almost doubled, from 540,300 to 1,056,500. The population of the Secondary Parishes has more than tripled, from 222,800 in 1930 to 716,800 in 1993. In 1993 the population of parishes within the study area and essentially below the spillway (including Terrebonne, Lafourche, St. Charles, Jefferson, Orleans, Plaquemines, and St. Bernard Parishes) totaled more than 1,275,000, and represents more than 70 percent of the total population of the study area. Economic development and increased flood protection helped to sustain population growth rates beyond national trends in the study area until the early 1980's.

Table 3-4 Historical Population Trends of the Study Area

PRIMARY PARISHES	1960	1970	1980	1990	1992	1993
Jefferson	208,769	337,568	454,593	448,306	456,389	457,069
Orleans	627,525	593,471	557,515	496,938	495,116	493,021
St. Charles	21,219	29,550	37,259	42,437	43,599	44,052
St. James	18,369	19,733	21,495	20,879	21,866	21,409
St. John	18,439	23,813	31,924	39,996	40,806	40,992
Sub-Total	894,321	1,004,135	1,102,785	1,048,556	1,057,776	1,056,543
SECONDARY PARISHES						
Ascension	27,927	37,086	50,068	58,214	61,828	62,109
Assumption	17,991	19,654	22,084	22,753	22,647	23,048
Iberia	29,939	30,746	32,159	31,049	31,731	31,467
Lafourche	55,381	68,941	82,483	85,860	87,016	87,316
Livingston	26,974	36,511	58,806	70,526	73,121	74,349
Plaquemines	22,545	25,225	26,049	25,575	25,869	26,075
St. Bernard	32,186	51,185	64,097	66,631	67,302	67,938
St. Tammany	38,643	63,585	110,869	144,508	153,351	155,990
Tangipahoa	59,434	65,875	80,698	85,709	88,111	88,631
Terrebonne	60,771	76,049	94,393	96,982	99,581	99,833
Sub-Total	371,791	474,857	621,706	687,807	710,557	716,756
STUDY AREA TOTAL	1,266,112	1,478,992	1,724,491	1,736,363	1,768,333	1,773,299
State Total	3,237,022	3,644,637	4,206,312	4,220,187	4,287,195	4,295,477

SOURCES: U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, "Number of Inhabitants, Louisiana".

U.S. Department of Commerce, Bureau of the Census, 1990 Census of Population and Housing, "Population and Housing Unit Counts, Louisiana".

Louisiana Tech University, unpublished population data for 1993.

From 1960 to 1970, for example, the population of the study area increased at a compound annual rate of 1.6 percent, while the population of the United States increased at a rate of about 1.3 percent. From 1970 to 1980 the population of the study area increased at an annual rate of about 1.5 percent, while the population of the U.S. increased at a rate of about 1.1 percent. From 1980 to 1990, however, the population of the study area increased at an annual rate of less than 0.1 percent. During the same time frame, the population of the U.S. grew at a rate of about 0.9 percent. Estimates by Louisiana Tech University indicate that an economic recovery in the study area has led to population growth of about 0.7 percent annually from July of 1990 to 1993, much more closely resembling the national trend of 1.1 percent annually during the same general period.

The area identified by the Bureau of the Census as the New Orleans Metropolitan Statistical Area (MSA) has increased from three parishes in 1960 to eight parishes as of 1993. In 1960 the MSA included Jefferson, Orleans, and St. Bernard Parishes. Since then Plaquemines, St. Charles, St. James, St. John the Baptist, and St. Tammany Parishes have been added. Lafourche and Terrebonne Parishes now make up the Houma MSA. The Secondary Parishes of Ascension and Livingston parishes are part of the Baton Rouge MSA. The Baton Rouge MSA also includes East Baton Rouge Parish, where the City of Baton Rouge and most of the urbanized area is located, and West Baton Rouge Parish.

Table 3-5 shows the most recent population projections currently available from the U. S. Department of Commerce. They reflect unpublished preliminary estimates prepared by the Bureau of Economic Analysis (BEA) adjusted to reflect the unusually low 1990 population report by the Bureau of the Census. Note that the historical estimate of total population in the Primary parishes in 1993 as reported by Louisiana Tech already exceeds the total population projections for 2000 and 2010 as indicated by BEA. The much slower growth rates projected by BEA are partially based on the anticipated national trend toward lower fertility rates, smaller families, and the aging of the so-called "baby-boom" generation, as well as shifts in the regional economy.

3.2.3. Economic Development. Several important manufacturing plants are located in the vicinity of the project (see Plate 7). Those above the floodway system

Table 3-5 Population Projections of the Study Area

PRIMARY PARISHES	2000	2010	2020	2040
Jefferson	454,700	460,000	469,500	467,000
Orleans	486,100	478,400	481,100	473,200
St. Charles	43,200	43,700	44,700	44,300
St. James	20,500	20,400	20,600	20,200
St. John	41,100	42,000	43,100	43,000
Sub-Total	1,045,600	1,044,500	1,059,000	1,047,700
SECONDARY PARISHES				
Ascension	57,700	57,500	58,100	57,100
Assumption	22,200	22,000	22,200	21,800
Iberia	68,200	68,100	68,900	67,700
Lafourche	87,400	88,600	90,600	90,000
Livingston	70,700	70,800	71,900	71,100
Plaquemines	24,600	24,300	24,500	24,100
St. Bernard	67,800	68,800	70,300	70,000
St. Tammany	150,400	156,300	161,800	162,400
Tangipahoa	86,600	87,800	89,700	89,000
Terrebonne	98,900	100,500	102,800	102,200
Sub-Total	734,500	744,700	760,800	755,400
STUDY AREA TOTAL	1,780,100	1,789,200	1,819,800	1,803,100
State Total	4,224,300	4,241,400	4,313,000	4,270,000

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, unpublished data based on the "BEA Regional Projections to 2040, Volume 2: Metropolitan Statistical Areas" published in 1990, adjusted to 1990 Census estimates.

include a metal processing plant (Bayou Steel) and an electrical generating plant (Louisiana Power and Light) located along the river and La. Highway 628, and the St. Pierre Fabrication and Welding company, located immediately across from the upper guide levee and the Illinois Central railroad (see Plate 7). Several petro-chemical processing plants are also located along the river, below the spillway and lower guide levee, at Norco and New Sarpy. These include a Shell Chemical Plant, Big Three Gas Industries, a Shell Oil Refinery, the Trans American Refinery, and Calciner Industries, Tetra Technologies, and GATX, all essentially in support of oil and gas production. In addition to the industrial facilities, several small miscellaneous retail and service activities are located along the river to meet the immediate needs of the communities.

Located directly across the river from the spillway (e.g. on the West Bank of the Mississippi River) are several industrial facilities of note. These include a nuclear powered electrical generating plant (Louisiana Power and Light), Agrico Chemical, Occidental Chemical, Union Carbide, and another Shell Chemical facility.

Historically, economic development trends within the study area have included the commercial harvest of fish and wildlife in the coastal region, agricultural and timber production along alluvial ridges and upland areas, and waterborne commerce and marine construction centered around the Port of New Orleans. As the port expanded, associated marketing and financial activities increased, along with the sales and services required to support a large metropolitan area. In 1928, when the spillway was authorized, economic developments below the project site centered largely around the Port of New Orleans. The 1930 population of the five Primary Parishes of the study area was about 540,000, with almost 459,000 or 85 percent living in Orleans Parish.

With increases in technology, a more industrialized economy has emerged, including deep-draft navigation on the Mississippi River and the exploration and production of oil and gas, both on and offshore. Other important mineral resources have been produced and processed in the area as well, including sulfur, salt, sand, and shell (used largely as an aggregate). The availability of large volumes of fresh water have contributed to the development of numerous petro-chemical plants along Mississippi River and connecting waterways, including those in the vicinity of the spillway. Large volumes of agricultural products shipped down from the Mid-West and South-Central States have also contributed to the development of the ports located along the river. In 1992, the combined traffic at the Port of New Orleans, and the Port of South Louisiana immediately upriver, totaled more than 266 million tons. Total tonnage reported for the

Port of New York in 1992 was 115 million tons. The National Aeronautics and Space Administration (NASA) at the Michoud assembly facility is still an important economic force influencing the regional economy, although less significant than in the past. Primary economic forces influencing growth during the 1980's and 1990's have been the construction of convention facilities, hotels, and restaurants, to accommodate a growing tourist trade. These conditions, the national trend toward a more market-oriented economy, and construction of rapid transit systems, have led to a large suburban population in New Orleans, like most major metropolitan areas. The 1990 Census estimates that only 47 percent of the population within the Primary Parishes live within the City of New Orleans (coextensive with Orleans Parish).

Table 3-6 compares the civilian labor force, employment, unemployment rate, and per capita personal income (PPI) of persons living in the Primary and Secondary Parishes with the Study Area in 1970, 1980, 1990, and 1993. The table also compares employment trends in the Primary and Secondary Parishes with that of the study area. It compares per capita personal income (PPI) expressed as a percentage of PPI for the State. The percentages indicate the higher level of economic activity in the Primary Parishes than in the Secondary Parishes. Note that the income figures are unadjusted for the effects of changing price levels.

Table 3-7 summarizes recent estimates of employment in the study area by industrial classification. Data are for those jobs covered under the Louisiana employment security law as of the second quarter of 1993. The percentages shown in the "% of Area" columns indicate the level of employment in each industrial group within the five Primary Parishes and in the total study area. The figures in the "% of La." columns indicate how much of the State's total employment in each industrial category was located within the study area. Note that these estimates are employment-based rather than

Table 3-6 Employment, Unemployment and Per Capita Income

	1970	1980	1990**	1993**
PRIMARY PARISHES				
Civilian Labor Force	369,888	488,284	485,025	461,075
Employment	351,339	460,194	457,125	432,500
% Unemployed	5.0%	5.8%	5.9%	6.2%
Income (PPI)*	\$3,720	\$9,760	\$16,440	\$17,080
% of State PPI*	121%	112%	108%	107%
SECONDARY PARISHES				
Civilian Labor Force	160,646	260,112	308,675	308,525
Employment	152,396	249,732	288,700	285,875
% Unemployed	5.1%	4.0%	6.6%	7.3%
Income (PPI)*	\$2,700	\$8,730	\$13,460	\$14,260
% of State PPI*	88%	101%	94%	95%
TOTAL STUDY AREA				
Civilian Labor Force	530,534	748,396	793,700	769,600
Employment	503,735	709,926	745,825	718,375
% Unemployed	5.1%	5.1%	6.0%	6.7%
Income (PPI)*	\$3,380	\$9,390	\$15,260	\$15,960
% of State PPI*	110%	108%	107%	106%
% of State Total Labor Force	43.3%	42.9%	42.3%	40.9%

* PPI- Per capita Personal Income. Income data in the last column are for 1991, latest available to date.

SOURCES: U.S. Dept. of Commerce, Bureau of the Census, "County and City Data Book", 1977 and 1983.

* U.S. Dept. of Commerce, Bureau of Economic Analysis, "Survey of Current Business"; and unpublished data.

** Louisiana Dept. of Labor, unpublished data 1990, 1993.

Table 3-7 Employment by Industry Category

INDUSTRY	PRIMARY PARISHES	% of Area	% of La. Total	TOTAL STUDY AREA	% of Area	% of La. Total
Agriculture	1,941	0.4	14.4	4,279	0.6	31.7
Mining	11,329	2.3	24.6	19,884	2.9	43.1
Construction	21,917	4.5	20.0	38,381	5.6	35.1
Manufacturing	41,517	8.6	22.4	68,820	10.0	37.2
Transportation	43,052	8.9	35.8	59,281	8.6	49.3
Wholesale Trade	30,564	6.3	35.7	39,395	5.7	46.0
Retail Trade	92,013	19.0	30.7	135,741	19.6	45.4
Finance	27,102	5.6	35.0	34,169	4.9	44.1
Services	190,694	39.4	32.3	258,646	37.4	43.8
Public Admin.	23,627	4.9	27.1	32,715	4.7	37.5
TOTAL	483,756	99.9	30.0	691,311	100	42.8

SOURCE: Louisiana Department of Labor, "Employment and Total Wages Paid by Employers Subject to the Louisiana Employment Second Quarter 1993".

resident-based, indicating where people work rather than their place of residence.

3.2.4. Adjacent Land Uses. Three primary roads cross the floodway. One is St. Charles Parish Highway 12, a two-lane road immediately paralleling the structure, which is flooded when the spillway is open. It connects the two highways which parallel the guide levees, Louisiana Highway 628 (above the spillway) and Louisiana Highway 48 (below the spillway). An elevated section of U.S. Highway 61 crosses the floodway about 1.5 miles above the spillway, and an elevated section of Interstate Highway 10 (I-10) crosses the floodway about 2.1 miles above U.S. 61, following the southern boundary of Lake Pontchartrain. Three railroads also cross the project lands, paralleling the highways. The tracks merge between St. Charles and Orleans Parishes to form an important transportation link supporting the Port of New Orleans.

Plate 7 illustrates land use and local (St. Charles Parish) zoning of the project lands and immediately adjoining areas. This map amply demonstrates the diverse land uses which are contiguous to the project boundaries. On the upriver side of the spillway, the small community of Montz lies adjacent to the Upper Guide Levee near the river. Louisiana Hwy 628 parallels the levee toe from the river to U.S. Hwy 61. With the exception of the small manufacturing area occupied by St. Pierre Fabrication and Welding Company, the adjoining areas are wooded and undeveloped.

Adjoining land use on the downriver (Norco) side of the spillway is more intensive and diverse. Beginning at the Mississippi River Levee and extending to the Illinois Central - Baton Rouge District Railroad is an extensive Shell Chemical facility. This heavy manufacturing facility is located in immediate proximity to the project office building. The character of property adjoining the Lower Guide Levee abruptly changes, however, between this railroad crossing and the next railroad crossing (Kansas City Southern Railroad). This area is residential in nature, including an elementary school, a recreation area, and a row of single family homes immediately along the levee toe.

Above U.S. Hwy 61 and stretching to the St. Charles Parish Levee, the nature of the adjoining properties changes once again. Located in this reach are two industrial facilities, Big Three Industries and Shell Chemical, and the Norco community sewerage treatment facility. From the St. Charles Parish Levee to the lake, the adjoining property is forested wetlands.

Table 3-8 summarizes a 1980 estimate of land uses and types within the Primary and Secondary Parishes of the study area. Note that these estimates were preliminary and were made by

the State of Louisiana prior to the current federal definition of "wetlands". Since 1980 the loss of wetlands has continued; and related research has led to additional knowledge of the significance of wetlands and broader definitions of the term. Table 3-8 is presented here to give the reader a general idea of the land use categories which are within each parish of the study area, including wetlands.

(a) Urban/Residential. As indicated in the tables showing population trends and land use, most of the urban and residential land in the study area is downriver from the project. The demand for additional residential and other urban land has stemmed in part from economic development and continued population growth. The 1930 census reported the total population of St. Charles Parish at about 12,000 people, with about 5,000 living on the West Bank of the river. In 1930 the total population of Orleans Parish (the City of New Orleans) was about 459,000 people. Since that time, pressures have increased for more residential developments in both St. Charles Parish and other areas of the New Orleans MSA, leading to an increasing demand for residential land.

The total number of housing units in St. Charles Parish increased from 5,746 in 1960 to 12,409 in 1980, and 16,016 in 1990. The total number of housing units in the Primary Parishes increased from 277,624 in 1960 to 422,187 in 1980, and 447,850 in 1990. The number of housing units in the ten Secondary Parishes totaled 113,451 in 1960, 226,226 in 1980, and 275,110 in 1990.

As shown in Table 3-8, the Louisiana Office of State Planning estimated that about 140,000 acres in St. Charles Parish (including lands on both sides of the river) were wetlands and represented about 70 percent of the total land area of the Parish. Residential land in St. Charles Parish accounted for about 6.6 percent of all Residential land in the five Primary Parishes. The density of residential developments in St. Charles Parish is significantly lower than that of the more urbanized areas of the study area. Census estimates for 1990 indicate that the density of residential property in St. Charles Parish was about 149.6 persons per square mile, while the density in Jefferson Parish was about 1,465.5 persons per square mile. The density in Orleans Parish in 1990 was about 2,751.6 persons per square mile.

(b) Industrial. The industrial activity taking place within the project rights-of-way has included primarily the maintenance of oil and gas pipelines and the dredging of sand and other sediments which have collected in the floodway during periods of high water when the spillway has

Table 3-8 1980 Estimates of Land Use in the Bonnet Carré Spillway Area

PRIMARY PARISHES	TOTAL LAND AREA	RESID. LAND	COML. & SERVICE LAND	INDUST. LAND	TRANS., COML. & REL SRVS.	MIXED URBAN & BLT-UP	AGRIC. LAND	FOREST LAND	STRIP MINES & QUARRIES	TRANSIT- IONAL AREA	WETLANDS & BEACHES
Jefferson	204,522	30,579	7,475	6,116	4,355	4,602	2,456	124	154**	1,220	147,441
Orleans	115,719	26,702	8,942	2,517	4,602	4,386	664	7,722	108	1,405	58,671
St. Charles	176,444	4,849	1,127	4,386	1,405	865	20,865	571	77	1,869	140,430
St. James	151,472	5,035	402	3,382	1,189	61	52,601	1,560	77	541	86,624
St. John	141,031	5,220	571	2,363	2,224	278	23,505	726	46	664	105,434
Sub-Total	789,188	72,385	18,517	18,764	13,775	10,192	100,091	10,703	462	5,699	538,600
SECONDARY PARISHES											
Ascension	187,089	13,204	1,359	3,413	2,149	62	73,961	40,586	232	772	51,351
Assumption	218,745	5,143	463	649	587	155	74,299	2,069	-	124	135,256
Iberia	375,238	11,367	2,363	1,498	865	463	121,110	15,691	201	93	221,587
Lafourche	705,417	12,787	2,054	571	834	1,004	121,573	1,622	15	488	564,469
Livingston	417,151	27,042	1,328	185	2,054	77	43,474	269,818	1,019	2,116	70,038
Plaquemines	502,788	7,768	2,008	4,510	3,691	1,313	19,012	13,853	1,745**	5,591	443,297
St. Bernard	282,096	6,502	1,127	1,637	31	46	1,915	7,923	170	5,622	257,123
St. Tammany	557,009	38,162	3,892	463	6,347	1,498	81,435	274,744*	3,413	7,120	139,935
Tangipahoa	508,732	25,729	3,351	942	5,791	479	158,778	231,425*	4,695	2,486	75,056
Terrebonne	799,352	11,243	3,073	1,791	1,035	2,394	54,331	108	-	865	724,512
Sub-Total	4,553,617	158,947	21,018	15,659	23,384	7,491	749,888	857,839	11,490	25,277	2,682,624
STUDY AREA	5,342,805	231,332	39,535	34,423	37,159	17,683	849,979	868,542	11,952	30,976	3,221,224

* Includes Shrub and Brush Rangeland: St. Tammany, 2,826 acres; and Tangipahoa, 170 acres.

** Includes Sandy Areas other than Beaches: Jefferson, 154 acres; and Plaquemines, 618 acres.

SOURCE: State of Louisiana, Department of Transportation and Development; and Louisiana Office of State Planning.

been open. Table 3-9 summarizes estimates of the amount of sand taken from the floodway in recent years. The commercial value of the sand as of August 1994 was approximately \$1.50 per cubic yard, including the operating and maintenance costs and the return on investment made by contractors. Based on this estimate, the total value of the sand harvested from the floodway in 1992 was approximately \$279,136 (186,091 x \$1.50 = \$279,136). The material dredged from the floodway is shipped by truck for use in maintaining and developing the many low-lying areas nearby which are subject to flooding from storms, high river stages, and periodic hurricanes.

While the Residential Land in St. Charles Parish represented only about 6.6 percent of all of the Residential Land in the Primary Parishes, Industrial Land accounted for about 23 percent, including Industrial Land on both sides of the river. As discussed in the section on economic development, several petro-chemical plants are located at Norco and New Sarpy, immediately downstream from the spillway. An electric generating plant is operated a short distance above the spillway at Montz.

(c) Agricultural. Although most of the land in St. Charles Parish is largely rural, less than 12 percent was classified as agricultural in the 1980 preliminary estimate developed by the State. The 20,865 acres of St. Charles Parish classified as Agricultural land nevertheless represented more than 20 percent of all Agricultural land in the five Primary Parishes. An estimated 849,979 acres in the 15-parish Study Area were identified as Agricultural land, representing about 16 percent of all land in the Study Area.

(d) Undeveloped. Based on the 1980 preliminary land use estimates prepared by the Office of State Planning, most of the undeveloped lands in the Primary Parishes are wetlands, totaling some 538,600 acres or 68 percent of all of the lands.

An estimated 10,703 acres of forest land and a portion of the 5,699 acres of transitional land may also be considered undeveloped, or less developed than the urban lands. About 60 percent of the entire Study Area was identified at Wetland and Beaches. Areas north of Lake Pontchartrain, including Livingston, St. Tammany, and Tangipahoa Parishes, still generate significant amounts of forest products, and might be considered undeveloped, in comparison with urban/residential areas. If historical trends continue, population growth and urban development will create increasing pressures to convert both forested and agricultural land to urban and sub-urban purposes in the vicinity of the project.

* Average shown is a cumulative average for the period beginning in 1984 and extending to the reporting year.
 SOURCE: Reports from Sand Hauling Permittees, on file at U.S. Army Corps of Engineers, New Orleans District

FISCAL YEAR (FY)	CUBIC YARDS	AVERAGE CU. YDS. *
1984	231,664	231,664
1985	512,388	372,026
1986	482,675	408,909
1987	205,640	358,092
1988	143,010	315,076
1989	144,040	286,570
1990	318,855	291,182
1991	335,439	296,714
1992	186,091	284,423
1993	300,109	285,991

Table 3-9 Cubic Yards of Sand Removed from the Bonnet Carré Spillway

Section 4 - Recreation Analysis

4.1. Existing Recreation on Project Lands

4.1.1. Estimate of User Days. The entire spillway, both guide levees, and borrow canals outside the spillway are extensively used by recreationists predominately from St. Charles, St. John the Baptist, Jefferson, and Orleans Parishes. Recreation survey data collected between the years of 1959 and 1970 and listed in the unapproved 1971 draft Bonnet Carré Master Plan indicate 315,000 average annual visits occurred for the 12-year reporting period. Similar reported figures obtained from Mr. C. A. Redmon of MVD indicate a 148,000 average annual visitation occurred for the 18-year period between 1965 and 1982. Use figures contained in the 1964 MR&T Design Memorandum (DM) Number 1A indicate recreational use of the spillway exceed 400,000 annually.

Since these surveys are dated and more detailed information is required, a new recreation use survey was performed. Surveys were conducted in 1994 by members of the master plan study team to more accurately determine the current level of usage. The survey teams collected data through observation of recreational activities on weekdays and weekends. One survey team concentrated on the upper guide levee side of the spillway, a second team on the lower guide levee, and a third team was stationed at the existing 26-acre recreation area north of U.S. Hwy 61 near the lower guide levee. The survey period included several weeks when high water conditions in the Mississippi River caused the temporary closure of the boat ramp located near Airline Highway. Boats were not allowed to launch at the ramp because of swift water conditions. Interior land based activities were marginally reduced for that period of time. However, crawfishing use flourished during its six weeks harvesting season. These flooding conditions caused by seepage occur on the average of once every other year.

The survey also indicated some hunting use within the spillway between the levee and borrow canal, and into the more heavily forested interior of the spillway. These areas provide moderate habitat and hunting opportunities for gray squirrel, fox squirrel, and swamp rabbit. Man day per acre values provided by the U.S. Fish and Wildlife Service multiplied by appropriate land/water acreage yield 850 hunting days annually in the spillway. Small game hunting is allowed October through February. Rabbit hunting has a 150 day season and squirrel hunting is allowed for 115 days. Waterfowl hunting occurs for 39 days, nine days in September and 30 days during November through January. By St. Charles Parish ordinance, only shot type discharge is allowed for

hunting. No large game hunting except for feral hogs occurs.

Based on data from the 1994 recreation survey and analysis of hunting and fishing potential, recreation user days in the spillway are estimated at 184,800 annual general recreation days and 61,450 general fishing and hunting days. Using the national economic development benefit evaluation procedure for calculating unit day value, an economic base condition is established documenting an annual dollar benefit attributable to the resource. For the purpose of this economic valuation, a general recreation day has a value of \$5.25 and a general hunting or fishing day is worth \$5.75. Total use estimates indicate approximately 246,250 annual recreationalists take part in some type of leisure time activity ranging from consumptive to non-consumptive. An associated annual economic value of \$1,323,538 is attributed to this use.

4.1.2. User population. Since its completion as a flood control project in the 1930's, the Bonnet Carré Spillway has gained recognition as a large Federal outdoor recreation area. Visitors engage in a variety of diverse outdoor recreation activities, including boating, skiing, fishing, swimming, hunting, shooting, camping, picnicking, and operating off-road dirt bikes and four-wheel vehicles.

Visitors are drawn to the Bonnet Carré Spillway because it is a large free public use area, it offers a variety of recreational opportunities, and because it is easily accessible within a short travel time to a large portion of the surrounding population, including the New Orleans metropolitan area. Within the primary market area (a 25-mile radius from the center of the spillway) 1,056,543 people reside. This large population base resides within a 30 minute to 1 hour travel time from a unique recreation site that can satisfy a broad base of experiences. Recreationists within this primary market area can enjoy a variety of outdoor experiences before work, during a lunch break, or after work especially during daylight savings time when daylight hours are extended. Maximum flexibility is afforded those within this primary market area.

Population dynamics indicate a shift in population from the city to the suburbs. Urbanization is occurring in the outlying areas of the east and west banks of Sts. Charles and John the Baptist Parishes, specifically Hahnville, Luling and Boutte due to the construction of I-310. Since the development of Interstate 10, the building of the Hale Boggs bridge, and I-310, the Bonnet Carré Spillway has become easily accessible to residents of the study area. The west bank is now easily accessible to the spillway because travel time and distance have been greatly reduced.

Within the secondary market area (50-mile radius), an additional population of 716,756 reside. A total of 1,773,299 people live within 50 miles of the spillway. This market area satisfies needs similar to the primary market area, however, the difference is travel time and less flexibility. People living 25 to 50 miles away must make more of an effort to travel to the site and may not stay as long as those living close due to time and daylight hour constraints. Lunch time visits are not an option to this group.

4.1.3. Types of Activities. The spillway has a variety of ecological zones including open grass lands, sand hauling areas, wetlands, forested areas, and ponded water. These public lands and waters provide resources for traditional recreation use such as picnicking, camping, crawfishing, crabbing, fishing, boating, water skiing, and hunting. They also provide ample areas for more specialized activities that are precluded elsewhere in the region such as dirt bikes and ATV's, retriever dog field trials, model airplane flying competitions, survival exercises, and outdoor music festivals.

The spillway has two boat launching sites which provide access into the interior borrow canals and into western Lake Pontchartrain where boating access is somewhat limited. One of these boat launches is located within the St. Charles Parish 26 acre leased recreation site. Boats launching from this site primarily use the upper and lower borrow canals, and the cross-cut canal. Also existing at this site are fishing docks, a picnic pavillion, scattered picnic tables, primitive camping, and two portable toilets.

The other boat launch in the spillway is located under the I-10 along the lower guide levee. Boats launching from this site use the I-10 construction access channel and a poorly marked channel to gain access into Lake Pontchartrain. Located at the lake end of the lower guide levee is a fishing jetty under construction which will eventually extend 300 feet into Lake Pontchartrain. This facility is being developed by St. Charles Parish. The completion of this facility is incorporated within the initial development phase of the master plan.

A model airplane field operated by a private club under a Corps permit exists in the vicinity of the structure and the St. Charles Parish Road 12. This development is located in an area of the spillway void of obstacles such as trees and wires. etc. The area is ideal for this activity to flourish, no similar sites exist anywhere in the region.

In the vicinity, but out of the spillway, is the Montz Park. This 1.86 acre neighborhood park is located next to the upper guide levee near the Mississippi River. The park is

mostly on land owned by the parish, it includes basketball courts and playground equipment.

During the survey, 24 popular recreational activities were identified. The most popular traditional activities identified in the survey were: sightseeing, meeting friends, motorcycle, boating and water skiing, and bank and boat fishing. Other less popular activities having significant use include: hiking/walking, picnicking, camping, bird watching, swimming, photography, bicycle riding, and sun bathing. Specialized recreational activities or those needing vast acreage, isolation or special water conditions include: crawfishing, motorcycle, ATV, and four-wheel drive vehicle riding, dog training, remote control boating and plane flying, and gun shooting.

4.1.4. Conflicting or Problematic Uses. Within the boundaries of the spillway, various forms of recreation use occur without active management oversight. Conflicts generally occur where competition for space on the same land or water take place. For example, conflicts occur with motorcycle and four-wheel drive vehicles, boating, and target shooting/hunting use. Motorcycles and four-wheel drive vehicles disrupt other recreationists who camp, walk for pleasure, bird-watch in solitude. These vehicles inflict damage to the grass levee slopes, interior grass lands, and wooded areas. Conflicts also occur in the area of commercial sand hauling where recreationists or these vehicles often compete for road space. These vehicles often use the temporary sand piles for hill climbing. Injury and deaths have occurred where these off-road vehicles have collide into each other.

Conflicts also occur in the water bodies or borrow canals, which parallel the east and west guide levees. Incompatible uses include bank fishing, swimming, skiing, speed boating, etc. These different forms of water recreation are not compatible. Fishing in solitude and water skiing and speed boating do not mix well. The other obvious conflict occurs with regard to shooting and hunting. Major conflicts occur when hunters and shooters discharge their firearms in the vicinity of others while they are pursuing their interest, such as crawfishing, bird-watching, or nature walking. No designated areas exist exclusively for hunters and target shooters.

4.2. Regional Recreation Analysis

4.2.1. Delineation of Market Area. The recreational habits of people living in this region are traditionally centered around hunting, fishing, boating, and other water-related activities. Bonnet Carré plays an integral role in the total recreation experience of residents living within the

25-mile radius primary market area consisting of St. James, St. John the Baptist, St. Charles, Orleans, and Jefferson Parishes. People living within this relatively short travel distance can access the spillway quickly and frequently. Impromptu visits during lunch time, before and after work are available to this primary market area group.

The secondary market area, consisting of a 50-mile radius, covers Tangipahoa, St. Tammany, St. Bernard, Plaquemine, Lafourche, Terrebonne, Assumption, Ascension, Iberville, and Livingston Parishes. Recreationists residing in this more distant market area must set aside more time for a visit. Travel time becomes a factor and less time can be spent on site. People travel from this distant market area to the spillway because it offers areas for the public to participate in a multitude of outdoor opportunities free of charge with few limitations. Major urban areas located within this region include New Orleans and Baton Rouge.

4.2.2. Demand. Demand is commonly viewed as an expression of desire to engage in an activity by an individual in a given area. To determine demand, two essential components must be defined: the market area and its population composition, and the desire by the public to engage in specific recreational activity.

The Louisiana State Comprehensive Outdoor Recreation Plan (SCORP) has identified an unfulfilled need for essentially every activity measured by the survey. Based upon the regional demand and limited supply of space and facilities in the spillway and vicinity, a significant need exists for additional facility development.

4.2.3. Supply. Market area supply data used in the demand need analysis were obtained from two basic sources: the Louisiana SCORP Recreation Inventory provided both public and commercial non-hunting recreation supply data and the U.S. Fish and Wildlife Service provided hunting man-day per acre figures. Market area supply data, in the form of recreational resources by facility type (i.e., picnic site, campsite, boat launch lane) were available for 11 recreation activities. Supply data, including standard SCORP typical use designation for eight recreational activities (bird watching, bicycling, crawfishing, crabbing, driving for pleasure, off-road ATV's, sight-seeing and swimming), are not available from the SCORP. However, expressed demands for these activities are reflected within the high quarter Sunday participation use figures shown in the needs calculation table.

4.2.4. Unmet Demand. The standard methodology used to calculate needs is contained in the SCORP. This calculation procedure involves given published participation rates multiplied by the regional population, the result is the

high quarter (summer season for most) user-day participation. This figure is then divided by 2.88 percent in order to transform these high quarter user days into high quarter Sunday participation. A summer Sunday is traditionally the highest use day of the week. Once this Sunday potential use figure is calculated, it is then multiplied by a SCORP use standard. The result is projected participation based upon the population base within the two market areas. Existing supply is then subtracted from the projected participation resulting in facility needs or demand. Based upon the 1993 study area population of 1,773,299, the demand-need calculations for the Bonnet Carré Spillway has established an unmet facility need or unsatisfied demand (see Table 4-1).

The greatest demand is shown for nature walks followed by horseback riding, boat fishing, motor boating, bank fishing, picnicking, tent camping, hiking, water skiing, trailer camping, and canoeing. Eight other activities: bird watching, bicycling, crawfishing, crabbing, driving for pleasure, off-road ATV's, sight-seeing, and swimming have expressed large high quarter use figures associated with their activity. These participation use figures identify popularity, and use is documented by these high quarter use figures; however, the Louisiana SCORP has not identified a standard for their use. Without a standard in the demand-need equation, a final facility need cannot be empirically calculated.

Hunting use in the spillway consists of all three types of hunting: small game, large game, and waterfowl. Small game hunting is the most frequent form of hunting and includes gray squirrel, fox squirrel, and swamp rabbit; large game hunting is limited to feral hogs; and waterfowl hunting is for wood ducks. Hunting in the spillway is accessible to all, unlike the abundance of private land in the vicinity that is restricted for the general public's use and available only to members of hunting clubs.

Based upon Louisiana Department of Wildlife and Fisheries 1992-93 data, 64,762 small game, 37,273 large game, and 18,635 waterfowl licenses were issued for a total of 120,670 hunting licenses covering the 15-parish primary and secondary market area. Hunting licenses demonstrate a desire or demand by approximately seven percent of the population to participate in hunting activity.

Fishing demand is higher in the market area due to the wide popularity of the sport, the availability to a large segment of the population (adults and children), and less specialized equipment needed to participate in the sport. Within the market study area in the 1992-93 reporting year, 206,426 resident freshwater licenses and 171,353 resident saltwater licenses were issued for a total of 377,779

Table 4-1. Demand Needs for the Primary and Secondary Market Area
1993 Population 1,773,299

Activity	High Qtr. Partic. Rate	High Qtr. User Day Partic.	High Qtr. Sunday Partic. at 2.88%	Standard	Projected Partic.	Existing Supply	Facility Needs (Demand)
Bird watching	0.66	1,170,377	37,706	-			
Bicycling	13.26	25,513,944	677,201	-			
Camping-tent	0.57	1,010,780	29,110	0.36 A	10480 A	233 A	10247 A
" -trailer	0.47	833,450	24,003	0.025 A	600 A	533 A	67 A
Canoeing	0.16	106,398	3,064	0.16 M	490 M	469 M	21 M
Crawfishing	2.48	4,397,782	126,656	-			
Crabbing	2.06	3,652,996	105,206	-			
Driving for Pleasure	6.13	10,870,322	313,065	-			
Fishing-boat	3.24	5,745,489	165,470	0.012 A	1986 A	90 A	1896 A
" -bank	1.98	3,511,132	101,121	0.012 A	1213 A	90 A	1123 A
Hiking	0.42	744,786	21,450	0.03 M	643 M	8 M	635 M
Horseback Riding	1.09	1,932,896	55,667	0.05 M	2783 M	14 M	2769 M
Motor boating	3.55	6,295,211	181,302	0.008 A	1450 A	98 A	1352 A
Nature walk	2.24	3,972,190	114,399	0.025 M	2860 M	14 M	2846 M
Off-road ATV	2.54	4,504,179	129,720	-			
Picnicking	1.77	3,138,739	90,395	0.02 A	1808 A	830 A	978 A
Sightseeing	7.23	12,820,951	369,243	-			
Swimming	2.06	3,652,996	105,206	-			
Water-skiing	1.19	2,110,226	60,774	0.008 A	487 A	98 A	389 A
Hunting-small game							
" -big game							
" -waterfowl							

Note: All of the high quarter activity participation rates are for the popular summer season, with the exception of small game and waterfowl hunting in the fall and big game hunting in the winter.

A=acres, M=miles

resident sport fishing licenses. Approximately 21 percent of the study area residents have resident fishing licenses. This demonstrates a significant demand for fishing in the area. Boat fishing, unlike hunting, occurs almost exclusively on water bodies classified as state water bottoms and are generally open to the public. Access is by boat ramp to these areas. Commercial areas charge a nominal fee, however, several public launch areas currently exist within and in the vicinity of the Bonnet Carré Spillway.

4.2.5. Future Trends. Since the Bonnet Carré Spillway is one of the largest areas of public land in the region, use will continue to increase as generations of families seek "free" recreational opportunities. According to the SCORP, the top six recreational activities in Louisiana are: 1) walking for pleasure, 2) bicycle riding, 3) running, 4) driving for pleasure, 5) fishing, and 6) driving off-road vehicles. All these activities are popular to those who use the spillway for their recreational leisure time. Fitness, referenced in the SCORP, is one of the prime reasons for recreation in Louisiana. Walking, bicycle riding, and running account for more than 500 million activity days statewide or approximately 48 percent of all recreation occurrences.

In the future, the trend of people moving away from the city and into outlying areas is likely to continue. The completion of I-310 has contributed to increased mobility and flexibility within the market areas, especially for people residing on the west bank of the Mississippi River. The Bonnet Carré Spillway offers a variety of unique outdoor experiences from active to passive. With implementation of this master plan and proper management techniques, the spillway will be more widely recognized as a prime recreation site. Participation will increase as the quality of the resource improves. Both the MR&T DM 1A and the 1971 draft Bonnet Carré master plan state that with adequate facility development, the visitation within the spillway could exceed 1,000,000 annually (approximately four times the current usage).

The SCORP further identifies recreation such as hunting, fishing, camping, and hiking to be popular, but the state's natural resources which support these activities are diminishing. Within the spillway these natural resources will be protected and managed and not be allowed to diminish, making their presence more significant and valuable to hunters and fishermen. The spillway satisfies a significant portion of current recreation in the primary and secondary market areas for traditional and natural resource-based recreation (hunting, fishing, bird watching) with minimal development. Also, the trend towards off-road motorcycle and horseback riding have shown a decline due to the closure of many private lands to public access. The

spillway provides large public areas for these specialized recreation opportunities to flourish, especially off-road vehicles. The spillway also provides boating and vehicular access to the Lake Pontchartrain shoreline which is not readily available to the public in this portion of the basin.

The spillway will continue to be a meeting spot for assemblies such as family reunions, club parties, picnics and other events requiring large spaces. For the past seven years, the New Orleans track club has sponsored the Great Spillway Classic which has become the state's largest cross-country race attracting 600 to 700 runners.

In the future, the freshwater diversion feature may be constructed within the spillway along the upper guide levee from the river to the lake. Increased public use opportunities will be provided including tailwater fishing areas and enhanced fish and wildlife productivity throughout the floodway and adjacent Lake Pontchartrain waters.

Section 5 - Factors Influencing and Constraining Resource Use, Development and Management

5.1. Project Operations

5.1.1. Spillway Openings. The authorized purpose of the project is the diversion of floodwaters during a major flood on the Mississippi River. Although the projected frequency of spillway openings is once every ten years, the actual occurrence of project operation is erratic and unpredictable. The interval between spillway openings has ranged from two years, between 1973 and 1975, to the 23 year hiatus between 1950 and 1973. In the 11 years between 1973 and 1983, the structure was opened four times. The irregular nature of project operation is a factor which must be considered in the planning and implementation of project features.

The short-term effect of spillway openings is the temporary discontinuance of virtually all other land use activities within the floodway. Land-based activities such as sand hauling and off-road vehicle use are interrupted by the flooding of project lands. In addition, safety and environmental protection measures are implemented during project operations which limit other users. These measures include the closure of both spillway guide levees to the public prior to and during spillway use to prevent disturbance of wildlife moving to and over the levees. Recreational boating within the spillway is also prohibited to insure human safety. In sum, virtually all recreation activities within the floodway are suspended when the spillway is passing floodwaters.

Spillway openings also have a short-term impact on recreational activities in the adjacent waters of Lake Pontchartrain. The primary impacts are related to the temporary displacement of certain aquatic species due to reduced salinities and temperatures and increased turbidity. These changes cause species such as spotted sea trout, red drum, and brown shrimp to move seaward, making them less accessible to local fishermen. These impacts affect recreational and commercial fisherman using the St. Charles Parish boat launch located at the I-10 bridge crossing and the Lower Guide Levee.

After closure of the spillway structure at the conclusion of a flood event, the long-term effects of project operation are the result of scour and significant deposition of river-borne sediments. This process of scour and deposition is especially heavy in the lower portion of the floodway between the river and U.S. Highway 61. The amount of sediment deposited in the spillway varies with each opening

and is estimated by using cross-sectional surveys. The 1973 flood deposited an estimated total of 12 million cubic yards. These effects argue against significant investment in the development of recreation facilities in the lower portion of the floodway. Investments in structures or landscaping in this area of high flood impacts would not be prudent.

5.1.2. Leakage Through Spillway Structure During High Water. During the high water season on the Mississippi River (e.g. late winter through spring), the river often rises above the concrete weir heights of the structure. When this occurs, floodwaters leak between the timber needles and enter the floodway. The volume of this leakage can range from a few hundred cubic feet per second (c.f.s.) to as much as 9,000 c.f.s., and the flow can last for several weeks to several months. Some years there is very little or no leakage through the structure and the effects are negligible in the floodway.

In other years such as 1994, the leakage is significant and can cause major changes within the floodway. These events have a similar, and somewhat reduced, effect as a spillway opening. Flooding of project lands essentially halts most land-based activities. Parish Road 12 is closed to traffic and most of the haul roads are impassable. The leased recreation areas, however, remain open and water-based recreation is unhindered.

While leakage events cause temporary impacts to various public uses in the spillway (dog training, ATV use, etc.), it also serves to introduce recreational diversity for visitors to the project. The recreation use survey performed in 1994 during and after an extended leakage event in the spillway documented the heavy public use of the spillway related to leakage events. The activity that most directly benefits is recreational crawfishing which increases significantly due to the optimal conditions produced by these events. It is estimated that the annual increase in this activity alone due to these high water events is 24,000 user days with an annual National Economic Development (NED) value of \$150,000.

This introduction of fresh water simulates the natural cycle of overbank flooding and provides numerous benefits to the aquatic and terrestrial resources in the spillway. These benefits include improved water circulation in the spillway's water bodies, nutrient introduction which provides short- and long-term benefits to the ecosystem, and restocking of fishery resources. In addition, the spillway acreage has significant value as a nursery area for aquatic estuarine species. Field sampling in early 1995 recovered menhaden, bay anchovy, blue crabs, and other estuarine species near the U.S. Hwy 61 crossing. Leakage events

probably serve to scour entry channels from the lake enabling estuarine species to enter and complete life cycles in this vital nursery area. The public acreage in the spillway remains one of the few areas available as nursery habitat on the south shore of Lake Pontchartrain.

The flooding which results from these leakage events, although not as significant as spillway openings, occur approximately every other year. This frequency of low-level flooding provides additional constraints on development of project lands throughout the floodway.

5.1.3. Sand Hauling. Directly related to the sedimentation which occurs with each spillway opening is the sand hauling permit program administered by the Operations Division. This program provides for the removal of the deposited sediments at no monetary cost to the Government. The removal of these sediments takes several years and is essential for preparing the floodway for the next spillway opening. Each year, permits are issued to interested commercial haulers for discrete parcels in the floodway. The sand hauling program is limited by current National Environmental Policy (NEPA) documentation to the cleared areas of the spillway.

The constraints imposed by the sand hauling activity in the floodway are its incompatibility with most other land uses and the safety risk related to the movement of bulldozers, end loaders, large tractor trailer rigs and dump trucks through the spillway. The immediate area of material extraction is highly disturbed and unsafe for recreational users. Such areas should be off-limits to recreational users of the floodway. At any given time, the extraction areas experiencing active disturbance from sand hauling operators is fairly limited.

On the other hand, truck traffic on sand hauling roads is quite extensive. These roads, built and maintained by commercial interests to provide truck access to their permit areas, are spread throughout the floodway. They provide the primary circulation routes within the floodway for project personnel and the visiting public. These roads are heavily utilized by recreationists both for access to points within the spillway and as off-road vehicle trails. Accidents involving trucks hauling sand and recreationists have occurred along these haul roads. Speed limitations and warnings need to be posted and use of the haul roads for off-road vehicle trails needs to be controlled.

5.1.4. Borrow Activities for Lake Pontchartrain Project. The use of project lands as a source of clay material for various levee projects presents constraints similar to those of the sand hauling program. The constraints imposed by the clay borrow activity in the floodway are its incompatibility

with other land uses and the safety risk related to the movement of large trucks through the spillway. Active clay borrow sites should be off-limits to recreational users of the floodway. In addition, speed limitations and warnings need to be posted and use of the access roads for off-road vehicle trails needs to be controlled.

The clay borrowing activity occurs in designated parcels located in the lower portion of the floodway between the spillway structure and the Kansas City Southern Railroad crossing. As with the sand hauling program, the area experiencing active disturbance from clay borrow activities is fairly limited at any given time.

5.1.5. Bonnet Carré Freshwater Diversion Project. The possible construction of the freshwater diversion structure and channel would occupy a narrow corridor of project lands located along the Upper Guide Levee. The short-term construction impacts would limit recreational activity in proximity to the work. Work areas and access roads would be off-limits to the visiting public to ensure safety. The long-term impacts, however, are significant and positive. Increased public use opportunities would be provided including tailwater fishing areas and enhanced fish and wildlife productivity throughout the floodway and adjacent lake waters.

5.2. Physical and Environmental Resources

5.2.1. Environmentally Sensitive Areas. Environmentally sensitive areas are defined as areas where scientific, ecological, or esthetic features have been identified. Because of the sensitive nature of these areas, limited or non-development for public use should be considered. The U.S. Fish and Wildlife Service has recommended that ecologically sensitive areas include those areas which are critical habitat for the continued existence of Federally listed threatened or endangered species. No such critical habitat areas currently exist on project lands.

(a) Forest/Vegetative Cover. Interrelationships among frequency and duration of flooding, topography, and soil type are the primary factors regulating the dynamics of vegetative development over time. Federally listed threatened or endangered plant species do not currently exist within the Bonnet Carré Spillway, but designation of particular species may potentially result in future designation of environmentally sensitive areas. Currently, forested tracts within the spillway are considered environmentally sensitive areas due to the aesthetic relief, vegetative stratification, diversity, and habitat for wildlife dependent upon forested cover. Project operation and maintenance activities, placement of recreation sites,

and the public use and accessibility (both authorized and unauthorized) in forested areas can potentially impact these sensitive areas. Clearing of forested vegetation should be kept to the minimum necessary to accomplish activities compatible with this master plan. In most instances, replanting and management of natural vegetation will become necessary requirements of site design.

(b) Wetlands/Water. Nearly the entire spillway inside the guide levees is subject to frequent and sometimes severe headwater flooding by project operation or leakage from the structure. Although such flooding represents a severe limitation for most types of development and is a key factor in assessing soil conditions and wetland management, it is compatible with some types of recreation use. The Bonnet Carré Spillway has water quality conditions that are good for all parameters except clarity during project operation. Turbidity limits visibility and is aesthetically displeasing for recreational uses, and creates the perception among many users of poor water quality. Coliform bacteria levels, an important water quality criterion for water contact activities, are within state standards for water contact recreation.

(c) Fish and Wildlife. Federally listed threatened or endangered animal species do not currently exist within the Bonnet Carré Spillway, but designation or regional expansion of particular species may potentially result in future designation of environmentally sensitive areas. U.S. Army Corps of Engineers regulations place some limits on the extent of resource management activities that the Corps may undertake on its own projects. Without participation of a local sponsor, fish and wildlife management in the Bonnet Carré Spillway is restricted to maintaining existing populations and resources. Enhancement of fish and wildlife resources, involving construction, operation, and maintenance of facilities or other improvements, requires the sponsorship of a non-federal fish and wildlife management entity.

(d) Archeological Resources. The only significant archeological resources in the spillway are the Kenner and Kugler cemeteries. Both of these sites are, to varying degrees, buried by recent sediments. Both sites were previously impacted in 1975 by project-related dredging operations. Since their discovery and boundary delineation, buffer zones around the two cemeteries were established to remove them from sand hauling leases and borrow activity associated with the Lake Pontchartrain Hurricane Protection project.

At present, the primary management objective for these cemeteries is site preservation. The precise locations of these two historic sites are kept confidential in order to

discourage vandalism. On-site project personnel are aware of the cemetery locations and monitor their condition. Recently, direct and cultural descendants of people buried in these cemeteries have requested installation of fences and historical markers to indicate their historical significance. Implementation of this request is somewhat problematic in the current situation of inadequate on-site management.

Some activities currently occurring in the spillway are not compatible with the protection of these important cultural resources. While no specific incidents of site damage have been documented, surface disturbing activities such as the use of motorcycles, ATV's, or 4WD trucks could adversely impact these sites. Other less intensive activities are not expected to cause any damage to these resources.

5.2.2. Unrestricted Public Access. At present, numerous uncontrolled entry points are available to the visiting public. Parish Road 12, which crosses the floodway near the spillway structure, provides access to several haul roads entering the floodway. Another major entry point for project visitors is the intersection of U.S. Highway 61 with the Lower Guide Levee. To the north of U.S. Highway 61, the levee crown provides access to the two St. Charles Parish recreation areas located within the floodway. South of U.S. 61, several access roads lead into the floodway from the levee crown. The Upper Guide Levee also provides access via several roads which enter the floodway between the spillway structure and U.S. 61. North of U.S. 61, the road atop the levee provides access to undeveloped recreation areas.

None of these entry points are controlled. This is a serious constraint on management of public activities on project lands. Implementation of public use control and natural resource management will require closure of some of the existing access routes and control of the remaining entry points.

5.3. Administrative and Policy Factors

5.3.1. Federal Cost-Sharing Requirements.

(a) Recreation Facilities. National policy regarding the development of recreation features at Federal water resources projects is articulated in three Federal statutes. The basic authority for recreational features on Corps projects is provided by the Flood Control Act of 1944, as amended. This act authorized the Chief of Engineers to construct, maintain and operate public park and recreational facilities at water resource development projects under his control, and to permit the construction, maintenance and operation of such facilities by others. The Federal Water

Project Recreation Act of 1965, as amended (Public Law 89-72) required that non-Federal agencies bear part of the cost of installing and all of the cost of maintaining recreation developments at Federal water resources projects.

Finally, the Water Resources Development Act of 1986 (Public Law 99-662) specifically defines the basis for sharing the financial responsibilities in the development and maintenance of recreational facilities. Where these facilities represent a combination of Federal and local interests, the costs of development are shared on a 50 percent basis between Federal and non-Federal agencies. Operation and maintenance of such facilities is entirely the responsibility of the non-Federal sponsor. A checklist of facilities which may be cost-shared in recreation developments at Corps projects is provided in Engineer Regulation 1165-2-400.

The 1964 Preliminary Master Plan for Public Access and Recreation for the MR&T Project (see Appendix 4) included facility development at the Bonnet Carré Spillway. Facilities recommended in the plan consisted of roads, boat ramps, parking areas, trails, comfort stations, landscaping, information signs, and picnicking and camping areas. The report was approved for planning purposes by the Chief of Engineers on 19 January 1966. This approval, however, required that implementation be deferred until adequate assurance is obtained from local sponsor(s) to participate on a 50 percent basis in the costs of development proposed in the plan.

In the absence of a non-Federal public sponsor, no Federal investment in recreation development is authorized. Because the Bonnet Carré Spillway is a "non-reservoir" project, not even minimal facilities for public health and safety can be provided in the absence of local participation. Only safety features integral to the project design can be provided at total Federal expense.

(b) Fish and Wildlife Enhancement. The Federal/local cost sharing policy for fish and wildlife enhancement features follows subsection 906(e) of the Water Resources Development Act of 1986. All first costs associated with fish and wildlife enhancement in the Bonnet Carré Spillway are a federal cost if such enhancement provides benefits that are determined to be national, is designed to benefit species that have been listed as threatened or endangered, or located on lands managed as a national wildlife refuge. When benefits of the enhancement do not qualify as above, 25 percent of the first cost shall be provided by non-Federal interests. The non-Federal share of operation, maintenance, and rehabilitation of enhancement activities is 25 percent.

Responsibilities of the U.S. Army Corps of Engineers under the North American Waterfowl Management Program are contained in a Cooperative Agreement dated January 1989. The recognized mission of the North American Waterfowl Management Plan is to emphasize protection and restoration of waterfowl habitat and focus on a goal of 62 million breeding ducks and a fall flight in excess of 100 million birds by the year 2000. The plan provides a framework for a Federal, state, and private partnership to implement a combination of wetland habitat protection, restoration, and development actions designed and managed to benefit breeding, migrating, and wintering waterfowl. U.S. Army Corps of Engineers responsibilities to this cooperative agreement are to identify the extent civil works projects address the plan goals, identify other opportunities at operating projects to plan goals, and identify and evaluate opportunities for restoring and developing waterfowl habitats during planning, design, and construction of new Corps projects. Minor modifications to operational features of existing projects can be accomplished with available funding if there are no adverse impacts on authorized project purposes. Funding through North American Waterfowl Management Plan can provide more costly modifications to projects, again provided they would have little or no significant adverse impacts to authorized project purposes. Cost-sharing assistance for projects is provided as directed by the Water Resources Development Act of 1986.

5.3.2. Manpower Restraints for Project Management. Under the Workforce Restructuring Act of 1994 (Public Law 103-226), the Federal workforce will be reduced by 272,900 over the five-year period including Fiscal Years 1995 to 1999. This mandate is implemented by Office of Management and Budget (OMB) budget planning guidance for Fiscal Year 1996. Under these guidelines, the Corps of Engineers is scheduled to lose 3,401 positions nationwide through Fiscal Year 1999. This loss represents an 11.6% reduction in the Corps workforce on staff at the end of Fiscal Year 1993.

The downsizing of the Corps of Engineers workforce over the next five years is a significant constraint in the attempt to more actively manage public use and wildlife and fisheries resources. Additional staff required to implement this master plan will have to come from a shrinking pool of Corps manpower.

5.4. Social and Cultural Factors

5.4.1. Existing Use Patterns. Another constraint to be considered in the development and implementation of this master plan is the long established pattern of existing public uses on the project lands. For six decades, the New Orleans District has allowed public uses of project lands to

occur with very little control. Some uses have been sanctioned through leases or permits, while others have been tolerated with little interference. Proposed changes to existing public uses, either through limitations on when and where certain activities can be undertaken or the prohibition of other uses, are likely to result in some level of public opposition.

This constraint is considered in the planning process by ensuring that existing public uses are accommodated to the maximum extent possible, consistent with established guidance. The recommendations of the Bonnet Carré Citizens Advisory Committee, adopted by the St. Charles Parish Council on 24 January 1994, are fully considered in the master plan process. Their recommendations represent the combined experience and desires of the current users of project lands.

5.4.2. Adjoining Land Uses. In the lower portion of the floodway between the Mississippi River and U.S. Highway 61, most of the adjoining lands are either industrial in use or are undeveloped woodlands. The exception to this description is the residential area adjacent to the Lower Guide Levee between the Illinois Central Gulf Railroad - Baton Rouge crossing and the Kansas City Southern Railroad crossing. Part of the town of Norco, this area contains numerous single-family houses (some of these with backyards abutting the project lands), a public elementary school, a recreational ballpark, a community swimming pool and a tennis court complex.

North of U.S. Highway 61, most of the adjoining land is undeveloped wetlands. The exception here is the industrial complex along the Lower Guide Levee which terminates at the location of the new St. Charles Parish hurricane protection levee.

The adjacent industrial uses constrain project resource development to a limited extent. Some potential project uses, such as wildlife enhancement or bird rookeries, are not entirely compatible with these adjoining manufacturing facilities. In addition to the external influence of adjacent land uses on project lands, the Corps also needs to be a "good neighbor." The residential area of Norco along the Lower Guide Levee presently suffers from noise and dust pollution generated by uncontrolled use of the levee by off-road vehicles. A buffer zone needs to be established in this area to protect the adjoining residents. Likewise, public use on project lands adjacent to wetlands needs to be controlled to ensure minimal impacts to the natural environment.

Section 6 - Resource Use Objectives

6.1. Corps-wide Objectives

The objectives of the Corps of Engineers' Natural Resources Stewardship and Recreation Management Programs (ER's 1130-2-540 and 1130-2-550 dated 15 November 1996) are listed below:

- (1) to manage natural resources on Corps of Engineers administered land and water in accordance with ecosystem management principles, to insure their continued availability;
- (2) to provide a quality outdoor recreation experience which includes an accessible, safe and healthful environment for a diverse population;
- (3) to increase the level of self-sufficiency for the Corps recreation program;
- (4) to provide outdoor recreation opportunities on Corps of Engineers administered land and water on a sustained basis; and
- (5) to optimize the use of leveraged resources to maintain and provide quality public experiences at Corps water resources projects.

6.2. Project Specific Objectives

The primary objective for this planning effort is to maintain the flood control function of the Bonnet Carré Spillway. Flood control is the project's authorized purpose; its importance in protecting the City of New Orleans and other downstream communities from high waters on the Mississippi River is undiminished from the time of its authorization and construction. For this reason, the requirement to maintain the spillway's flood control capacity and function overrides any conflicting purpose.

Additional objectives were developed specific to public use of the Bonnet Carré Spillway. These include:

- (1) resolve conflicts between existing public uses and user groups in the spillway;
- (2) to the extent practical, maintain and enhance existing recreational uses in the spillway;
- (3) provide new recreational opportunities such as environmental education programs;

- (4) maintain and improve spillway habitats for fish and wildlife resources;
- (5) encourage and accommodate sustained public utilization of project fish and wildlife resources; and
- (6) manage all project resources, including forest, fish, and wildlife as an integrated whole.

Section 7 - Land Classification Plan for Development and Resource Management

7.1. Land Allocation In Accordance With Authorized Purpose

All project lands are allocated to operation of the project for flood control purposes. No other project purposes are authorized.

7.2. Land Classification for Development and Resource Management

The land classification scheme presented below is intended to fully utilize project lands relative to legislative authority and policy directives. The resource use objectives listed in Section 6 of this plan reflect these authorities and policy directives and, therefore, they provide the goals for the classification process.

The suitability of the project's resources (Section 3) for the various management options were analyzed along with the project-specific and regional recreation analysis (Section 4). The planning constraints listed in Section 5 of this plan helped to refine the zoning of project lands. Also of importance in the derivation of this classification scheme were public desires for management and development of the project's resources, specifically those expressed in the January 1994 report of the Bonnet Carré Citizens Advisory Committee, and during the public and agency comment period between September and December 1996.

Resource objectives and management principles for each classification category are provided. These guidelines provide a framework for management and development of project lands and resources.

7.2.1. Project Operations. Project lands classified for project operations are limited to the spillway structure, the project office building located on the Lower Guide Levee, and the maintenance and storage compound adjacent to the office. These areas are used solely for project purposes.

(a) Resource Objectives. The primary objective for these areas is the maintenance of flood control functions. These areas are essential for project readiness.

(b) Management Principles. These areas of the project are off limits to the visiting public except when accompanied by project personnel. The spillway structure, office, and storage/warehouse areas are secured by high

fences and locks. Security measures should be maintained and enhanced where necessary.

7.2.2. Recreation. Included in this classification are the four developed recreation areas outgranted to the St. Charles Parish government, and the remote controlled airplane permit area.

(a) Resource Objectives. The primary objective for these recreation areas is to provide outdoor recreation opportunities on a sustained basis in a safe and healthful environment. These four areas should be managed to maintain and enhance existing recreational uses, and provide new recreational opportunities as appropriate. While wildlife and vegetative management are not the primary objectives in these areas, these values should be improved and enhanced where possible.

(b) Management Principles. The four existing outgrants for recreation use on the project lands should be inspected monthly by project operations personnel and annually by real estate personnel to ensure compliance with the stipulations in the outgrants. Non-compliance should be promptly reported to the lessee with a request to correct any deficiencies. Maintenance of the existing recreation areas appears adequate at present with the exception of the I-10/Lower Guide Levee boat launch facility. The courtesy piers are in poor condition, the site lights are damaged, trash collection is inadequate, and the general site conditions are less than satisfactory.

Aesthetic conditions at all five recreation areas are low to moderate in quality. Landscape management and upkeep of physical elements of each site should be improved. Signage is generally inadequate and should also be improved.

7.2.3. Mitigation. At present, no project lands have been designated specifically for mitigation, although several areas along the Upper Guide Levee north of U.S. Highway 61 are under consideration. In the future, mitigation credits could be generated for both civil works projects and those under the jurisdiction of Section 404 of the Clean Water Act, via implementation of features to create or restore wetland habitat values on wooded acreage in the Bonnet Carré Spillway.

(a) Resource Objectives. The primary objective for these areas, if approved, will be to provide functions or values depleted or lost as a result of other Federal actions in the vicinity of the Bonnet Carré Spillway. Any proposal to use the spillway for mitigation purposes will be evaluated in the context of the extent and duration of flooding expected during a worst-case event. Such an event

could destroy or severely damage any structural mitigation features within the spillway. Justifiable mitigation proposals must provide fish and wildlife benefits beyond those that can reasonably be expected to occur under current and future management schemes.

(b) Management Principles. Development and user activities will be limited to those which do not cause significant damage to functions or values being replaced in designated areas.

7.2.4. Environmentally Sensitive Areas.

(a) Ecological Resources. The bald eagle is a Federally listed threatened species, and it is protected under the Endangered Species Act of 1973, as amended. Consequently, bald eagle nesting sites are considered environmentally sensitive areas. Although bald eagle sightings have become common, no bald eagle nests are known to exist in the Bonnet Carré Spillway at the present time. Expansion of the bald eagle population in the vicinity is possible. Therefore, bald eagle nest site guidelines will be implemented if a nest is constructed on Corps land in the future. No critical habitat for other threatened or endangered species currently exists on project lands.

(a) Resource Objectives. The goal of this designation is to preserve or retain the values associated with these resources.

(b) Management Principles. Development in these areas will be prohibited. User activities will be limited to those which do not disturb or cause significant impacts to ecological resources.

(b) Cultural Resources. The locations of the historic Kenner and Kugler Cemeteries, including the buffer zones, are classified as sensitive areas. These properties are recognized as significant historic properties worthy of preservation and public interpretation through their listing on the National Register of Historic Places.

(1) Resource Objectives. The goals of this designation are to preserve the historic and scientific values of these cultural resources and to provide an appropriate interpretive program for public benefit.

(2) Management Principles. Development is prohibited in these two areas. User activities are limited to those which do not cause significant damage to ground surfaces. The two archeological resources, and their buffer zones, are excluded from the sand hauling permit program and the clay borrow activities for the Lake Pontchartrain

Hurricane Protection project. No motorcycle or off-road vehicle use is allowed in the vicinity of these two properties. A public interpretive program, possibly including fence enclosures and historical markers, should be implemented once adequate site supervision is assured.

(c) Aesthetic Resources. An area of high aesthetic value on the project lands is the baldcypress-tupelogum swamp located along the Upper Borrow Canal near Lake Pontchartrain. Although baldcypress trees occur throughout the forested areas of the spillway, they are found in mixed and disturbed contexts. The sensitive area designated here retains a natural condition which is high in aesthetic value.

(1) Resource Objectives. This resource should be preserved and maintained in as near a natural state as possible.

(2) Management Principles. Development should be kept to a minimum. Access should be provided to allow the public to view the beauty and uniqueness of this natural swamp ecosystem, which is its greatest attraction. Baldcypress-tupelogum swamps have the potential to support recreational activities such as crawfishing, wildlife observation, nature study, and canoeing. Hunting also would be allowed, although its potential is greater in the hardwood forest areas.

7.2.5. Multiple Resource Management. The vast majority of project lands are classified in the multiple resource management category. This classification recognizes that although the primary allocation of project lands is operations, a wide range of management activities compatible with this purpose are appropriate. Various management measures can be implemented to continue and enhance public recreation opportunities and realize the potentials of the project's natural resources without hindering the flood control function of the project.

This classification is subdivided into two major units; first, those lands most suitable for low density recreation and, secondly, those project lands better suited to wildlife and vegetative management. These are not mutually exclusive subdivisions. For example, some wildlife and vegetative measures are recommended for the low density recreation subareas. Likewise, some forms of recreational activity are compatible with the subareas classified for wildlife and vegetative management. These subdivisions, then, are useful for identifying those portions of the project lands where either low density recreation or wildlife and vegetative management activities take precedence over the other.

After partition of the multiple resource management category into low density recreation and wildlife/vegetative management subareas, future recreation areas are identified. These potential recreation developments are located in both subareas. Finally, an existing outgrant is described under the "other" category since it does not fall under the standard classification scheme.

(a) Recreation-Low Density. These lands consist, for the most part, of the cleared (e.g. non-forested) portions of the multiple resources management classification. Included is the vast majority of the floodway between the Mississippi River and U.S. Highway 61, as well as the cleared area down the middle of the floodway north of U.S. Highway 61. Also included are corridors along the Upper and Lower Guide Levees. These corridors extend from the floodside toe of the levees to the outer property boundary.

The boundaries of this subarea correspond to the areas subject to various project-related maintenance activities. The area within the floodway corresponds to the boundaries of the sand hauling permit program as well as the clay borrow areas for the Lake Pontchartrain Hurricane Protection project. In addition to these activities, project maintenance procedures require the clearing of woody vegetation in this portion of the floodway. The levee corridors included in this subarea are maintained through mowing operations.

(1) Resource Objectives. Maintenance activities related to project operations are of primary significance in this subarea. Other management activities are, therefore, subordinate to these programs. Of secondary importance is the provision of outdoor recreation opportunities on a sustained basis and in a safe and healthful environment. This will include the continued availability of existing recreational activity to the maximum extent practical. Another recreation objective is to address the problems of conflicting recreational use. Finally, measures to maintain and enhance habitats for fish and wildlife resources are included in management of this classification.

(2) Management Principles. Project maintenance activities take precedence in this sub-classification area. Permitted sand hauling activities, clay borrow excavation, mowing of levees, and clearing of vegetation by project personnel will be performed as necessary. The immediate work area of these activities will be off-limits to the visiting public due to safety concerns.

Most low density recreational activities will be permitted except in the immediate area of project-related maintenance activities. Activities which are compatible with this

classification include hiking, wildlife observation, fishing, crawfishing, dog training, picnicking and similar non-disruptive pursuits. Hunting and discharge of shotguns is also allowed in strict conformance with Federal laws and regulations, state law and local ordinances. However, hunting and discharge of shotguns is prohibited in the Norco Buffer Zone and in any area where firearms would endanger any other user in the spillway. Specifically prohibited in this subarea is all off-road vehicle activity. In accordance with Executive Order 11644 and Corps regulations, all Federal lands and waters are closed to off-road vehicle use except in designated areas and trails. No such area or trail presently exist on project lands; however, off-road vehicle areas are proposed below in the discussion of future recreation areas.

Wildlife and vegetative management measures for the low density recreation subcategory are described below.

(b) **Fish and Wildlife Management**. Included in this classification are the forested portions of the multiple resource management areas as well as the non-forested wetlands in the central "French cut" area near the lake. Located primarily between U.S. Highway 61 and Lake Pontchartrain, these forested and wet areas are valuable habitat for fish and wildlife resources. A discontinuous strip of woodlands along the Upper Guide Levee south of U.S. Highway 61 is also included in this category. Project maintenance activities required in this subarea are minimal.

(1) **Resource Objectives**. Of primary importance in this subarea is the maintenance and enhancement of fish and wildlife resources. Other management activities are subordinate to this objective. Fish and wildlife have ecological, economic, educational, aesthetic, historical, recreational, and scientific value to the region and nation. The management of any population of threatened or endangered species that may be discovered on project lands (or that colonize project lands and waters) shall receive the highest priority from a management perspective. The objective of a nonconsumptive fish and wildlife management program shall be to retain natural resources for the average visitor to observe and enjoy. This implies that the widest variety of species endemic to each community be maintained on project lands.

The provision of outdoor recreation opportunities which are compatible with or dependent upon fish and wildlife management is a secondary objective in this subarea. This will include the continued availability of existing recreational activity to the extent practical. New recreational opportunities should also be provided. Maintenance activities related to project operations are of

minor significance in this subarea. When required, project maintenance activities should be designed and implemented to minimize adverse effects on the natural resources of this area.

(2) Management Principles. Primary use of project lands as a floodway precludes intensive management for fish and wildlife management. U.S. Army Corps of Engineers regulations place limits on the extent of resource management activities that the Corps may undertake on its own projects. At a minimum, Corps fish and wildlife management in the Bonnet Carré Spillway is restricted to maintaining existing populations and resources under federal stewardship. Enhancement of fish and wildlife resources, involving construction, operation, and maintenance of facilities or other improvements, requires the financial participation of a local sponsor, usually 25% contribution for construction and 25% of the operation, maintenance, and rehabilitation.

Aquatic resource measures for the project lands are threefold. First, water areas outside of the active sand hauling areas, and beyond the immediate vicinity of the structure, will be passively managed for freshwater and estuarine finfish and shellfish. Secondly, areas within the sand hauling area will be restored to a condition suitable for aquatic organisms upon completion of sand hauling operations in the area. Third, enhancement projects for fisheries resources will be pursued in cooperation with a local sponsor, especially in concert with the proposed Bonnet Carré Freshwater Diversion project.

Wildlife resource objectives include management for wildlife observation, non-game, small game, waterfowl, furbearers, and commercial herpetofauna. This involves passive management and participation in various enhancement projects for wildlife resources in the spillway. Wildlife is a part of the outdoor experience of nature observers, hikers, campers, picnickers, and pleasure drivers. Wildlife observation and photography can be incidental to other project activities, or they can be a primary reason for visiting a particular site. Management activities will be undertaken to provide for both of these types of wildlife utilization.

Important existing or potential den or cavity nesting trees should be preserved and managed, and attempts should be made to make ample den or nest trees continuously available as a natural and vital component of the forest, as passive management for cavity-nesting species. The artificial nest structure for cavity nesters is a secondary technique to be used only when insufficient numbers of suitable cavities do not exist in the natural environment. Other active management procedures include intermediate timber harvests,

promotion of an edge ecotone along forest and water margins, subimpoundments, beaver pond management, water level manipulations and maintenance of vegetative openings. Nesting boxes can also be used to draw wildlife close to public use areas, trails, visitor centers, and other places for observation by the public.

Public hunting and trapping of a harvestable surplus of game will be the end result of passive and active management activities that will be undertaken for consumptive recreation of this type of wildlife utilization, particularly for squirrels, rabbits, waterfowl, furbearers, frogs and alligators. If feasible, suitable land will be licensed to the Louisiana Department of Wildlife and Fisheries in order to assure public hunting in accordance with state regulations. A hunting and/or trapping permit system may have to be utilized to control commercial take and control overuse within the Bonnet Carré Spillway, especially if an agreement with Louisiana Department of Wildlife and Fisheries to take an active role does not materialize. Although the Louisiana Department of Wildlife and Fisheries licenses commercial takers of reptile and amphibian wildlife for use in the pet and biological supply trade, herpetofaunal species other than alligators and frogs will be protected in the Bonnet Carré Spillway as part of the non-game program.

(c) Vegetative Management. The subarea for vegetative management efforts is the same as the area delineated for fish and wildlife management. Few project lands are suitable for commercial or intensive management of forest resources because of the primary role of the spillway as a floodway to divert river floodwaters. Additionally, the objectives of recreation and wildlife management often impact or necessitate manipulation of vegetative resources.

Besides natural resource values, vegetation is also a significant component of aesthetic resource management. Aesthetically sensitive areas include lands along the major highways traversing the floodway, primarily near Interstate Highway 10 and U.S. Highway 61. Retaining mature vegetation along these corridors and along water bodies or water courses near disturbed areas creates visual contrast, as well as habitat diversity.

(1) Resource Objectives. The objectives for this category of resource management are essentially the same as for fish and wildlife management. Maintenance and improvement of aesthetic resource quality, especially along transportation corridors is an objective. Therefore, vegetative manipulation in these areas will be an integral part of wildlife and fisheries management, and also integral to the provision of compatible recreational activities.

Another major consideration when managing natural and created resources associated with Corps' projects is the preservation and enhancement of the aesthetic integrity of streambanks and shorelines.

(2) Management Principles. For the most part, natural processes will be permitted to proceed in an uncontrolled fashion in existing wooded areas. Preservation may require management efforts to perpetuate ecologically balanced forest lands, including control of insects and disease both within and possibly outside the spillway. Technical assistance and coordination will be sought from the U.S. Forest Service, the Louisiana Department of Agriculture and Forestry, the Louisiana Department of Wildlife and Fisheries, Louisiana State University, and the U.S. Fish and Wildlife Service. The New Orleans District will continue to maintain levees, especially mowing of grasses, and the maintenance of all open areas of the floodway to permit unrestricted flow of floodwaters through the spillway. Areas that are not mowed will be cleared of willows, but revegetation through natural colonization of volunteers will be allowed unless otherwise managed for recreation or wildlife. In low-intensity recreation use areas, management of forest resources will be consistent with the maintenance of natural characteristics. Plantings as well as necessary clearings or selective removal of trees will seek to promote the creation or preservation of natural landscapes and seek to enhance wildlife habitats.

Any management plan to benefit wildlife should provide diversity of vegetation types and age classes. Nature provides this diversity through windstorms, catastrophic fires, disease epidemics, and insect infestations. With management, decisions can be made concerning the interspersion of vegetation types. Diversity is enhanced through creation and maintenance of openings in and near forested areas. Openings provide food, breeding habitat, nesting cover, brooding habitat, or escape cover. Wildlife openings can also be used to concentrate species populations in a given area in order to promote a more complete utilization of the resource or to increase the amount of edge effect.

Several management techniques, such as the planting of powerline and pipeline rights-of-way and range line corridors, have good value to most forest dependent wildlife species. A program for managing these areas customarily involves fertilizing, seeding, and mowing or bushhogging. The particular mix of seed and cultural treatment is determined by the featured wildlife species or group. Portions of large pipeline and power line rights-of-way can be planted, mowed, bushhogged, and the remainder allowed to revert to brush and sapling stages. The margins of adjacent forested land should form a scalloped pattern to maximize

edge effect. Large rights-of-way can be managed to provide patches of vegetation in various stages of succession. The utilization of these types of areas as permanent openings results in less hard mast and fiber production loss because less land is taken out of production. The carrying capacity can be raised by using these lands that are often neglected or left idle. Maintenance and management of pipeline, powerline and range line openings in the floodway will benefit populations of swamp rabbits and various songbird species.

(d) Future Recreation Areas. Within the category of multiple resource management, several future recreation areas are identified. All proposed recreation developments are contingent upon sponsorship by a responsible non-Federal agency. These areas include, as a first priority, several developments and/or activities to address safety and user conflict aspects of existing recreational uses in the floodway. These first priority items include the proposed motorcycle/ATV area(s), a proposed 4WD use area, clearing and snagging of the Lower Borrow Canal, clearing and marking of an entrance channel into Lake Pontchartrain from the I-10 access channel, and the completion of a fishing jetty and picnic area on the Lower Guide Levee at Lake Pontchartrain.

Other recreation developments proposed for the project lands are secondary in priority. These recommended areas consist of developments for enhancement of recreational opportunities on the project lands. They are supported by the delineation of unmet demand items in the regional recreational analysis (Section 4 of this plan) and/or are included in the list of recommendations submitted by the January 1994 Bonnet Carré Citizens Advisory Committee. In addition, they are compatible with the land classification in which they are located.

Recreation features recommended for future development include expansion of the existing recreation area along the Lower Guide Levee at U.S. Highway 61 to include a camping area and other facilities, a boat launch on the Lower Guide Levee drainage canal near the Illinois Central Gulf - McComb District Railroad crossing, nature trails in the wooded corridor between the Lower Guide Levee and the Lower Borrow Canal, a bicycle path crossing the spillway along one of the highway or railroad crossings and then atop the Lower Guide Levee to the Mississippi River at Norco, and a boat launch and picnic area on the Upper Borrow Canal just north of the U.S. Highway 61 bridge crossing.

(1) Resource Objectives. The primary objective for the proposed recreation areas is to provide outdoor recreation opportunities on a sustained basis in a safe and healthful environment. The proposed areas should be

developed and managed to enhance existing recreational uses and provide new recreational opportunities. The resource objectives of the particular multiple resource management subcategory (e.g. low density recreation or wildlife/vegetative management) in which the proposed developments are located take precedence in the case of conflicts with project operations or wildlife and vegetation management.

(2) Management Principles. Due to statutory and policy constraints, none of the proposed recreation areas will be developed in the absence of local, non-Federal sponsorship. Development of each proposed recreation feature will proceed only after careful analysis determines its compatibility with the resource objectives of the appropriate subcategory of the Multiple Resource Management classification. Detailed plans of development will be prepared jointly by the sponsor and the Corps.

As with the four existing outgrants for recreation use, future recreational areas on the project lands should be inspected monthly by project operations personnel and annually by real estate personnel to ensure compliance with the stipulations in the contracts/outgrants. Non-compliance should be promptly reported to the lessee with a demand to correct any deficiencies.

(e) Other Area. One existing outgrant is located in the multiple resources management category which does not fall under one of the above described classifications. This outgrant is for a combat engineer training area. The combat engineering outgrant makes a large portion of the multiple resource management category available to the 429th Engineer Brigade to conduct training within the spillway. The permit allows the operation of heavy equipment, dozers, graders, dump trucks, bucket loaders and the establishment of tactical bivouac sites. These activities are permitted without restriction in the northernmost portion of the floodway. Clearing of vegetation only is allowed in the corridor adjacent to the Upper Guide Levee which is the site of the proposed freshwater diversion outflow channel. This outgrant allows only temporary usage of project lands.

(1) Resource Objectives. The outgrant for combat training is not compatible with the objectives for the affected project lands. Especially of concern is the use of heavy equipment to clear vegetation in forested areas.

(2) Management Principles. Unless the combat training permit is essential for the 429th Engineer Brigade, it should be terminated immediately due to its complete incompatibility with wildlife and vegetative management objectives for these forested areas. In lieu of

termination, the permit should be modified to place all combat training with heavy equipment in the presently cleared areas in the low density recreation subdivision of the multiple resource management category.

(f) Outgrants and Use Permits. Under various outgrants and permits, a wide range of non-Corps activities and developments exist on project lands. These include highway and railroad crossings; pipeline, powerline and other utility rights-of-way; and miscellaneous features such as foot bridges over the outside drainage canals, radio tower locations, etc.

(1) Resource Objectives. The primary objective in the issuance and management of outgrants and permits is to ensure that the proposed or existing activity/facility is compatible with the land classification established for the affected project lands. The resource objectives of the particular land classification take precedence over the objectives of the proposed or existing non-Corps activity or facility.

(2) Management Principles. All proposed outgrants and use permits will be reviewed to determine their consistency with the resource objectives and management principles established in this master plan. Existing outgrants and permits will be similarly reviewed when they are being considered for renewal. If the proposed activity or development is not consistent with this master plan, the request should be denied or appropriately modified or conditioned to address the inconsistency. In all cases, the objectives and guidelines established for the project take precedence over the goals of private or non-Corps public activity or development.

Section 8 - Natural Resources Management Guidelines

8.1. Species Selected for Management

Every land management decision that affects habitat configuration (including no action), favors a species or group of species (species guild) at the expense of others. A featured species guild approach seeks to consciously establish a long-term direction for fish and wildlife management by utilizing the general habitat requirements of preferred guild species. These requirements provide guidance for coordination with other resource management practices and uses, for the application of direct improvements to overcome habitat limiting factors, for managing habitat of endangered and threatened species wherever they occur, and for being responsive to public interests and preferences for fish and wildlife.

This management concept designates specific tracts of land or water areas where management practices are implemented to favor a particular species guild. Guidelines based on the habitat requirements and mobility of the preferred species guild are developed and then used to direct the coordination of vegetation, fish, and wildlife management. Management practices such as intermediate forest cuttings and creation of subimpoundments then become the means of accomplishing management objectives. Featured guilds will be selected for all lands and waters except the structure, offices, maintenance compounds, and developed public use areas. Special practices can be implemented for developed public use areas which maximize species diversity for public observation. In all cases, if Federally listed threatened or endangered species are present, management for their protection is given priority.

The decision to select featured guild species in the Bonnet Carré Spillway would be made after consideration of the following factors:

- (1) Inherent capacity of the land to produce and sustain the food and cover within the species range under managed or natural conditions.
- (2) Compatibility with other resources and public uses considering conflicts and the uniqueness of the management opportunity.
- (3) Public interest and needs to include local fish and wildlife preferences, socioeconomic values, public use opportunities, aesthetics, and resource needs from a local, regional, and national perspective.

- (4) Cooperation and public involvement to include the U.S. Fish and Wildlife Service and Louisiana Department of Wildlife and Fisheries for joint annual work planning and inventorying, and the additional resource management expertise.
- (5) Selection of a variety of indigenous target species suitable for evaluation.

The following species guilds were preliminarily selected as fish and wildlife management guilds in the Bonnet Carré Spillway: freshwater crustaceans, freshwater game fish, small game mammals, furbearers, waterfowl, wading and shore birds.

8.1.1. Freshwater Crustaceans. Several species of freshwater crustaceans can be found in the Bonnet Carré Spillway, and two are taken by commercial and recreational pursuits. The red swamp crayfish (*Procambarus clarkii*) and the white river crayfish (*Procambarus zonangulus*) can be found in aquatic habitats throughout the spillway. Optimum habitat is permanent, static water bodies less than 15' inches in depth, with a mud bottom, abundant aquatic vegetation, and exposure to full sunlight. Crayfish activity is reduced at water temperatures below 45°F, but activity increases as temperatures rise and is optimal between 70°F and 85°F. Detritus and aquatic vegetation are the major food items.

8.1.2. Freshwater Game Fish. Primary species within this species guild include largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), white crappie (*Pomoxis annulatus*), and bluegill (*Lepomis macrochirus*). The optimal habitat for largemouth bass are lakes with extensive shallow areas to support submergent vegetation and deep enough to successfully overwinter this species. Good riverine habitat for largemouth bass is characterized by large, slow moving rivers or streams with soft bottoms, some aquatic vegetation, and relatively clear water. Fry feed mainly on microcrustaceans and small insects, juveniles consume mostly insects and small fish, and adults feed primarily on fish and crayfish. Adults often feed near vegetation within shallow areas, with a bimodal intensity, peaks in the early morning and late evening. Largemouth bass will nest on a wide variety of substrates including gravel, vegetation, roots, sand, mud, and cobble.

Habitat for black crappie include bodies of clear water in areas of low turbidity. Black crappie are less tolerant of high turbidities than are white crappie and, as a result, tend to dominate the latter species in clear water areas. Abundant cover, particularly in the form of aquatic vegetation, is necessary for growth and reproduction.

Common daytime habitat is shallow water in dense vegetation and around submerged trees, brush, or other objects. Fry feed mainly on microcrustaceans and planktonic insects, juveniles consume mostly planktonic insects and small fish, and adults feed primarily on fish and insects. Black crappie will nest on substrates of gravel, vegetation, sand, and mud.

Habitat for white crappie include bodies of relatively clear water in areas of moderate to low turbidity. White crappie are more tolerant of high turbidities than are black crappie and, as a result, tend to dominate the latter species in turbid water areas. Abundant cover, particularly in the form of aquatic vegetation, is necessary for growth and reproduction. Common daytime habitat is shallow water in dense vegetation and around submerged trees, brush, or other objects. Fry feed mainly on microcrustaceans and planktonic insects, juveniles consume mostly planktonic insects and small fish, and adults feed primarily on fish and insects. White crappie will nest on substrates of gravel, vegetation, sand, and mud.

Bluegills are most abundant along shoreline areas in lentic and lentic-type environments such as ponds, lakes, reservoirs, and large low velocity streams; deeper areas are required for overwintering and summer heat. Cover in the form of submerged vegetation or logs and brush is especially utilized juveniles and small adults. Bluegills are opportunistic feeders that can alter their diet according to food availability. Fry feed on zooplankton and small insects. Juveniles and adults feed on zooplankton, aquatic, and terrestrial insects, and some plant materials.

8.1.3. Small Game Mammals. This species guild includes the gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), and the swamp rabbit (*Sylvilagus aquaticus*). These are herbivorous mammals with an affinity for edge type habitats, particularly forested ecotones. Although the two squirrel species may inhabit the same general area, they tend to concentrate in slightly different habitats. Gray squirrels prefer dense stands of mature hardwoods with a dense understory, whereas fox squirrels generally prefer open forested habitats with little understory vegetation. Gray and fox squirrels need some tree cover and areas that support both hard and soft mast bearing vegetation. Den trees are preferred nesting sites, but both species will utilize leaf nests.

Swamp rabbits inhabit stream bottoms, swamps, and marshes. They have a high reproductive potential producing up to four litters of 3-4 young/litter annually. Bottomland hardwood forest areas are essential habitat for swamp rabbits. Brier and honeysuckle thickets provide high quality cover and swamp rabbits will readily take to the water when pursued.

8.1.4. Furbearers. Common furbearers in the Bonnet Carré Spillway include Virginia opossum (*Didelphis virginiana*), American beaver (*Castor canadensis*), nutria (*Myocastor coypus*), northern raccoon (*Procyon lotor*), and mink (*Mustela vison*). Habitat needs for these species are a diversity of forested and non-forested wetland areas, and management of these habitats to provide the necessary food resources. Food resources for the American beaver and nutria are woody and herbaceous wetland plant material. Mink almost exclusively utilize small vertebrate prey. The opossum and raccoon feed upon large macroinvertebrates, small vertebrates and supplementary plant material.

8.1.5. Waterfowl. Primary species within this guild include Wood Duck (*Aix sponsa*), Mottled Duck (*Anas fulvigula*), Blue-winged Teal (*Anas discors*), Green-winged Teal (*Anas crecca*), Mallard (*Anas platyrhynchos*), Northern Shoveler (*Anas clypeata*), Gadwall (*Anas strepera*), and Ring-necked Duck (*Aythya collaris*). Wood Ducks and Mottled Ducks are resident species in the Bonnet Carré Spillway, utilizing forested wetlands and marshes, respectively. Other duck species are primarily fall and spring migrants and winter visitors.

Habitat for waterfowl revolves around providing high-quality feeding and loafing habitat for waterfowl on a year-round basis, and brood-rearing and nesting habitat for resident species. Usually a good land/water interface in marsh environments provide the necessary habitat requirements.

8.1.6. Wading and Shore Birds. A wide variety of wading and shore birds utilize the Bonnet Carré Spillway. Common species include Great Blue Heron (*Ardea herodias*), Great Egret (*Casmerodius albus*), Snowy Egret (*Egretta thula*), Little Blue Heron (*Egretta caerulea*), Tricolored Heron (*Egretta tricolor*), Cattle Egret (*Bubulcus ibis*), Green Heron (*Butoroides striatus*), Yellow-crowned Night-Heron (*Nycticorax violaceus*), White Ibis (*Eudocimus albus*), Glossy Ibis (*Plegadis falcinellus*), White-faced Ibis (*Plegadis chihi*), Killdeer (*Charadrius vociferus*), Black-necked Stilt (*Himantopus mexicanus*), Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*Tringa flavipes*), Spotted Sandpiper (*Actitis macularia*), Western Sandpiper (*Calidris mauri*), Least Sandpiper (*Calidris minutilla*), and Common Snipe (*Gallinago gallinago*). These species utilize a variety of wetland habitats in the spillway including swamp, marsh, shallow flooded fields, and borders of open water bodies. A few wading and shore bird species, such as the White Ibis, can utilize different habitats within the area, but the majority of species in this guild are restricted to microhabitats based upon their specific foraging mode and prey selection.

8.2. Fish and Wildlife Management Guidelines

A number of techniques or tools are available which enable resource managers to manipulate habitat to meet the needs of fish and wildlife species. With the use of these tools the needs of a certain population of fish and wildlife at a given location for a specific period of time can be met. Techniques available are discussed in this section as are guidelines for their utilization. The theory behind the various management techniques, as well as guidelines for their use, also are included in this section.

Management techniques that emphasize the habitat requirements of featured guild species are stressed. Nonstructural management techniques generally are initially less expensive, and require no outlay of continuing maintenance funds. In contrast, structural management techniques, such as subimpoundments, may be expensive to build and maintain, particularly if pumps are installed.

8.2.1. Freshwater Crustacean Management. The primary objectives for crayfish management in the Bonnet Carré Spillway will be to enhance areas where water levels can be appropriate and to utilize extensive vegetative management in open and wooded areas of the spillway for crayfish food resources. Subimpoundments and manipulations of existing sand hauling pits and beaver ponds can be used to improve existing crayfish areas or create new areas. Many of the permanent and constructed ponds can be inter-connected and revegetated along their borders naturally with preferred species such as duckweed, duck potato, cattail, smartweed, and submerged aquatics. Dense stands of native wetland plant species can be produced with water depth and drawdown techniques. Where water control can be emphasized, such as beaver pond dams, small roads and dikes, culverts or other structures, water levels can be manipulated to provide supplemental foods such as Japanese millet. Japanese millet can be hand sown on exposed mud bottoms immediately after drawdown in the spring and early summer. A slow, natural drawdown would promote a diversity of native wetland plant species which would be preferred over a quick water level drop and the resulting monotypic vegetative stands. It may become necessary to control undesirable native and non-native vegetation through the use of mechanical, chemical, or prescribed burning methods in the spillway. Burning in the forested areas of the spillway is not a management option.

8.2.2. Freshwater Game Fish Management. Planning for game fish management in the Bonnet Carré Spillway will need to be an evolving effort with the development and construction of the Bonnet Carré Freshwater Diversion Project. The primary area designated for fishing is the Upper Borrow Canal. It is unclear at this time what effect the freshwater diversion

project will ultimately have on fish species and populations in this waterway. Irregular banklines and structure, such as fallen trees and brush piles along the bank can be included in management plans for this area under almost any construction scenario. Continued planning and more detailed management plans for fishing in the Upper Borrow Canal need to continue simultaneously with the refinement of the freshwater diversion project.

Other water bodies in the spillway; including the Lower Borrow Canal, large ponds, Barbar's Canal, and the Lake Pontchartrain shore waters; can also be suitable sites for enhancement measures for game fish. Planning and implementation of such activities in these water bodies, however, will require careful consideration of other management actions (such as those for freshwater crustaceans and waterfowl, and recreation) to avoid possible conflicts.

8.2.3. Small Game Mammal Management. Squirrel management in the Bonnet Carré Spillway relies on several forest management procedures. Timber management should be on a rotation of 80 to 120 years. If species are selected for management, oaks would be a preferred tree species in the forested areas of the spillway. Diversity of both white and red oak groups in the area would serve to enhance the available acorn crop on a year-to-year basis. During thinning or harvesting operations, an attempt should be made to protect den trees (2-4/acre preferred), and to maintain aerial pathways in the forest stand. If clearcuts are utilized as a regeneration method, the area should not exceed 10-30 acres and not be adjacent to forest stands less than 30 years of age. Procedures to increase the forest midstory, especially soft mast species, should be encouraged. Any fires, prescribed or otherwise, should be eliminated from the forested areas in the Bonnet Carré Spillway. Burning serves no management purpose in these sites and would be detrimental to squirrel management.

Gray squirrels and fox squirrels use both leaf nests and tree cavities for bedding, nesting, and escape cover. Species recruitment is higher when cavities are utilized. Where the supply of suitable tree cavities is the limiting factor in an area, the installation of nesting structures can increase the carrying capacity of an area. Structures can also be utilized to attract squirrels to specific areas for public observation.

Squirrel nest boxes can be effective within a number of settings. The carrying capacity of even-aged hardwood forests between 30 and 60 years of age can be significantly enhanced for squirrel by using nest structures. One nest box per 2 to 4 acres is the minimum to provide long-term benefits for squirrel populations. A maximum of 3 to 6 nest boxes per acre can be used where squirrel management

receives high priority. In most cases, one box per acre is reasonable where the squirrel is the featured species. Nest boxes should be placed as high as possible in trees without existing cavities. Maintenance checks should be made at least once every two to three years.

To be cost effective, pre-constructed boxes would be purchased. Installation time averages about 1 man-hour for each nest box. One cleaning and maintenance visit per year/average requires 0.3 to 0.5 man-hours per box. A record-keeping system, including cost, man-hours, location, and utilization, should be developed and maintained along with a field monitoring program.

Rabbits are not a forest game species, but rely on edge habitats. The population density is directly related to soil fertility and good maintenance of edge type habitats. The Bonnet Carré Spillway provides an excellent opportunity to manage for these edge type species with the extensive open areas adjacent to mature forest stands. Vegetative management in the open areas will serve to increase rabbit populations.

8.2.4. Furbearer Management. The furbearer species in the Bonnet Carré Spillway are primarily forest dependent and management procedures would be to enhance their available habitat. Den sites will probably be the most limiting factor. Burning is not recommended in the forested areas of the spillway and to improve the furbearer populations, den trees should remain on the order of 2-4/acre. Downed trees, brush piles, and logs should be maintained in forest stands.

The American beaver is generally considered a keystone species and its presence in an area will enhance the populations of fish, river otter, wood duck, raccoon, muskrat and nutria. Removal of beaver and their dams because of perceived nuisance problems (flooding and timber damage) should only be considered after evaluating the benefits and costs associated with their activities.

8.2.5. Waterfowl Management. Resident, migratory, and wintering waterfowl areas need abundant and readily available food in order to be attracted. The presence of preferred foods in adequate quantities can attract and retain species in a particular geographic location. Some species show a wide preference in feeding conditions, whereas others are more restricted in their food uptake, and therefore feeding locations. Subimpoundments and manipulations of existing sand hauling pits and beaver ponds can be used to improve existing areas or create new ones. The primary objective is to manipulate water levels to manage for food and cover. Such techniques can be used to attract and hold ducks within the project area, especially in the non-forested area of the spillway between the

structure and Airline Highway. Some of these improved areas will be located in non-hunting zones to provide resident and wintering birds safe rest areas relatively free from disturbance.

Many of the permanent and constructed ponds can be revegetated naturally with preferred species such as duckweed, duck potato, cattail, smartweed, and submerged aquatics. Where water control can be emphasized, such as beaver pond dams, small roads and dikes, culverts or other structures, water levels can be manipulated to provide supplemental foods such as Japanese millet. Japanese millet can be hand sown on exposed mud bottoms immediately after drawdown in the spring and early summer. Flooding of these areas in the fall and winter, can create excellent feeding.

If natural cavities are a limiting factor, wood ducks will readily nest in boxes provided as substitutes for natural cavities. If nesting boxes are properly placed, maintained, and predator proofed, increases in local populations can be expected. Wood duck boxes should be erected in baldcypress-tupelogum habitat or in bottomland hardwood forest stands if they flood when hens are searching for nest cavities. Upland forest areas are also acceptable if they are located on waterways leading to larger bodies of water and/or if they are less than one-half mile from permanent water.

Nest boxes should be initially installed in clusters of 2-3 boxes, with 50 to 100 feet between each box within a cluster. Each area of good brood habitat should have at least one cluster of boxes. When 30-50 percent of the boxes are utilized, the number of boxes can be increased with the upper limit being 4 boxes per acre. The boxes can be mounted on trees, poles, posts, or pipes. The type of each support and the height of the box above the ground or water depends on seasonal water fluctuations. Posts, poles, or pipes are usually used to support boxes over open water. Open water sites are preferred because boxes can be placed where desired, they are easily guarded against climbing predators, and are not subject to fire ant predation.

In forest stands or along waterways, boxes may be placed in trees. Boxes should be placed at least 10 feet above the ground and a predator guard installed. Nest boxes should be placed in areas with relatively open understories where they can be easily seen by wood duck hens. Any overhanging limbs should be removed from the front of the box. When boxes are placed along waterways, entrances should face toward the water.

The cleaning of boxes and the placement of nesting materials is very important because wood ducks will not carry nest materials to the nest site. Four to six inches of nesting material, such as shavings, soft hay, Spanish moss and

ground corn cobs, or saw dust used in combination with these items, should be placed in each box in January of each year. When the boxes are cleaned, they should be sprayed with a disinfectant and repaired, as required. A good public relations program may be necessary to explain the objectives of the program in order to discourage vandalism and disturbance of nests by the curious.

To be cost effective, pre-constructed boxes should be purchased. Installation time is extremely variable, depending upon the accessibility and location of brood habitat, but averages about 1.25 man-hours for each nest box. One cleaning and maintenance visit per year requires 0.3 to 0.5 man-hours per box.

8.2.6. Wading and Shore Bird Management. Use of wetlands among different wading and shore birds overlaps both temporally and spatially. The distribution and structure of major vegetational zones are critical to the availability of habitats for waterbird guilds. Maintaining a diversity of habitats throughout the year helps to provide food resources for many organisms. Managing a wetland complex to create varying habitats by drawdowns, flooding, and vegetative manipulation increases the diversity of foods available to resident and migratory waterbirds. When this food diversity occurs in the complex, several waterbird guilds will begin utilizing the wetland concurrently.

Effective management strategies for wading and shore birds must consider potential species utilization and water availability. The area of greatest potential for wading and shore bird management is the non-forested wetland complex between the structure and Airline Highway. This complex consists of many water bodies constructed by sand and clay hauling operations. Each area has specific limitations and a unique potential for management. Recommendations must be considered on a case by case basis. Increasing the availability of invertebrates in these areas is essential. Moving water between water bodies during flooding and after drawdowns ensures conditions that increases the rate of invertebrate colonization. Configuration and alteration of the sand and clay hauling pits both during and after construction can enhance desirable vegetation and the effect of land-water interface on invertebrate populations.

8.2.7. Big Game Management. Local ordinances restricting firearm use in the spillway, the recreational analysis provided in Section 4 of this plan, and resource availability does not support a big game management program. Populations of white-tailed deer and feral hogs should be monitored; increases may justify a permit hunting program or trapping system in the future.

8.3. Vegetative Management Guidelines

Vegetation resource objectives include passive and active management for various resource needs. This involves management and participation in various enhancement projects for resources in the spillway. Management activities will be undertaken to provide for this type of resource.

8.3.1. Management Principles. A number of techniques are available that enable resource managers to manipulate vegetation to meet the resource needs. The use of these techniques can fulfill the needs of a certain situation in a given location for a specific period of time.

Important existing or potential den or cavity nesting trees should be preserved and managed. Attempts should be made to make ample den or nest trees continuously available as a natural and vital component of the forest.

Vegetative management strategies should be realized primarily by providing and maintaining a diversity of age-classes and species compositions, and by identifying potential old-growth emphasis areas, environmentally sensitive areas, and habitat restoration sites. Old-growth forest is essential for preserving biological diversity, given that these areas are those in shortest supply and greatest endangerment from development. Old-growth ecosystems with stable species composition and large dominant trees are characterized by particular structural and functional attributes. Habitat elements that contribute most to the value of old-growth forest are large, standing dead trees and fallen decaying logs with tip-up mounds. Large snags provide dens and cavity-nest sites; fallen logs provide resting sites for reptiles and amphibians, and substrates for insects and larvae. Other old-growth attributes include overstory and understory plant species diversity, vertical foliage-height stratification (associated with bird species diversity), a complex soil/litter continuum (providing substrates for ground-dwelling and burrowing animals, soil microorganisms, and mycorrhizae), hard and soft mast production (wildlife food sources), ground vegetation (herbs, shrubs, and vines for cover and browse), and canopy gaps of various sizes and ages.

8.3.2. Old-growth Restoration Areas. Forest management based on a natural disturbance model must be supplemented by artificial means if a diversity of shade-intolerant, hard-mast producing forest species is desired to enhance wildlife habitat values. Forested lands in the spillway will be managed to favor age classes underrepresented in the area, usually mature and overmature (late successional) age classes, in contiguous tracts where possible. The conversion of some younger stands to mature ones will be

accelerated by appropriate silvicultural practices, such as thinning to encourage canopy diversification, enrichment planting of mast-producing species, and partial cutting to create scattered canopy gaps. Natural gap-phase regeneration supplemented by planned cutting cycles would ensure replacement of hard mast producers in late successional bottomland hardwood stands as they approach overmaturity (higher proportion of dying and damaged trees).

8.3.3. Intermediate Cuttings. Intermediate cuttings consist of selective thinning of forest stands during that portion of the stand existence not included in the regeneration period. These are the various timber cuttings made during development from the reproduction stage to maturity. Cuttings aimed primarily at controlling stand growth by adjusting stand density are called thinnings. Those conducted to regulate composition by species and improve the quality of very young stands are release cuttings. Cuttings made in older stands for the same purpose are called improvement cuttings.

Silvicultural theory, and specifically intermediate cutting, proceeds on the basic principle that vegetation on any site tends to extend itself aggressively to occupy the available growing space. Growing space is limited by factors such as available sunlight, water, and inorganic nutrients from the soil. Available land can produce a specific quantity of biomass. By the application of intermediate thinning treatments and silviculture, biomass production is concentrated in specifically selected trees. When managing for wildlife production, forest growth is concentrated in these specifically selected species and individual trees that provide both food and shelter for featured wildlife species. The redistribution of growth potential in forest stands by regulating the distribution of growing space for the advantage of the existing stand is perhaps the most commonly used tool in forest management next to the planting of seedlings.

The history of high grading and agricultural practices has, in many locations, created forest stands of less valuable species of an inferior quality. Trees are often poorly positioned within stands and optimum use is not made of existing growing space. Forest management practices will largely consist of improvement cuts. With 120-200 year rotation for most of the bottomland hardwoods, approximately 8-15 thinnings/improvement cuts would be made in each stand before areas are possibly regenerated. Long rotations are utilized because many forest dwelling wildlife species utilize tree cavities for nesting and shelter and mast is consumed for food. Natural cavities do not customarily begin forming in hardwoods until they reach an advanced age. Long rotations are used for management of wood ducks,

songbirds, raccoons, and squirrels in the assorted bottomland hardwood types.

8.3.4. Mast Management. Mast, particularly acorns and nuts, is a rich source of high energy food. It is by far the most important source of winter food for squirrels, raccoon, and wood ducks. Population levels, reproductive success, body weight of individuals, and the overall condition of these species are directly related to the annual acorn crop. Mast supplies are variable, but they seldom completely fail.

The primary objective of mast management is to produce enough mast to sustain the desired population of a featured species in a particular area. A combination of hard and soft mast producers should be established and maintained which will produce an even, yearly production to the extent possible. Reserve food producers are established and maintained to provide emergency food supplies when hard mast failures do occur.

Different species of trees and shrubs produce considerably different amounts of mast. Oaks of the red oak group are the heaviest producers of acorns. Oaks of the white oak group are quite variable in production with many nonbearing trees often intermingled with seemingly suitable trees. Weather and soil factors have an impact upon mast production. Extremes in temperature and rainfall effect yearly production within a particular stand, whereas, aspect, elevation, and soil productivity can cause production to vary from stand to stand. For example, one tree within a stand may be a heavy producer while an adjacent tree has no mast and one stand may have a good crop, whereas an adjacent stand produces little or no crop. Normally, trees on moist, fertile sites and trees with vigorous expanding crowns produce large crops. Stand densities which allow full crown development favor mast crop production. The initial age for mast production of most tree species is 25 years. Total stand mast production is increased by favoring oaks and hickories in the overstory. Stability of yield results from maintaining a variety of hard mast producing species.

8.3.5. Management of Openings. Any management plan to benefit wildlife should provide diversity of vegetation types and age classes. Nature provides this diversity through windstorms, catastrophic fires, disease epidemics, and insect infestations. With management, decisions can be made concerning the interspersions of vegetation types. Diversity is enhanced through creation and maintenance of openings in and near forested areas. Openings may be simply an earlier seral stage of surrounding vegetation or they may consist of special vegetation such as agricultural crops. Openings may provide food, breeding habitat, nesting cover, brooding habitat, or escape cover. Wildlife openings can

also be used to concentrate populations in a given area in order to promote a more complete utilization of the resource or to increase the amount of edge effect.

The creation and maintenance of openings is a very versatile and frequently used tool in wildlife management. The many techniques available require that a manager have a particular species or species group in mind when the creation of an opening is planned. Several management techniques, such as the planting of power line and pipeline rights-of-way, have good value to most forest dependent wildlife species. A program for managing these areas customarily involves fertilizing, seeding, and mowing or bushhogging. The particular mix of seed and cultural treatment is determined by the featured wildlife species or group. Portions of large pipeline and power line rights-of-way can be planted, mowed, bushhogged, and the remainder allowed to revert to brush and sapling stages. The margins of adjacent forested land should form a scalloped pattern to maximize edge effect. Large rights-of-way can be managed to provide patches of vegetation in various stages of succession. The utilization of these types of areas as permanent openings results in less hard mast and fiber production loss because less land is taken out of production. The carrying capacity can be raised by using these lands that are often neglected or left idle. Maintenance and management of pipeline and power line openings in the Bonnet Carré Spillway will benefit populations of swamp rabbits and various songbird species.

8.4. Wildlife Observation/Photography

Wildlife observation and photography are primarily recreational activities of birders, hikers, photographers, and of some campers, boaters, and other day users. A number of management activities and programs could be implemented at the project to provide for this type of wildlife use. Incidental wildlife use occurs primarily when visitors observe wildlife while viewing project features at scenic overlooks, picnic and camp at public use areas, participate in water-oriented activities such as swimming, fishing, and water-skiing; and visit resource management offices and visitor contact stations. A major effort should be made to provide campers with the opportunity to have a quality wildlife recreation experience. Most campers stay at a project for a minimum of two days which allows time for visitors to experience wildlife at the time of their choice and in an unhurried manner.

The primary method of attracting wildlife to offices, campgrounds, and overlook areas is through the installation of nesting boxes and the supplemental planting of shrubs and trees that provide cover and preferred foods. Many of these

planted species are very attractive and fit well into a landscape planting plan. Native species will be preferred over non-native species. Pipeline and project road rights-of-way can also be planted to support this type of wildlife use.

Modern forest practices and the harvesting of trees prior to advanced senescence have led to a decrease in the number of natural cavities. Scarcity of nest and roosting cavities is often a major factor limiting population levels of wood ducks, secondary cavity nesting birds, and woodpeckers. A lack of cavities can also limit the population of mammals, such as the gray squirrel and raccoon. In addition, suitable cavities are often not located near public use areas or campgrounds where visitors experience the natural environment. Squirrel, bat, and nongame bird nesting boxes can be installed and maintained in suitable locations along forest margins to provide nesting and cover sites. In suitable wood duck habitats, wood duck nesting boxes can also be installed and maintained. The decision to erect and maintain nest boxes in a proper manner requires a long-term commitment in time and money. The transportation of bulky boxes to remote locations, erection at the site, periodic cleaning and repair, monitoring of use, and record keeping take considerable expenditures of time and money. Thus, the decision to initiate a nest box program should be made after a definite biological need exists, and that the benefits to be gained justify the expenditure.

Where possible, self-interpretive walking or nature trails with trail markers should be constructed to describe some of the natural features in the spillway. Project trail pamphlets, birding species lists, tree and wildflower lists, and other printed material should be developed to interpret project resources. These type of items allow visitors to enjoy outdoor activities without being a part of a formal program.

8.5. Public Hunting and Fishing

Authority to permit hunting and fishing on water resource development projects and all lands owned in fee by the Federal government is found in 33 CFR Section 327.8. This section states "hunting, fishing, and trapping are permitted in accordance with applicable Federal, state, and local laws except in areas designated by the District Engineer." Special regulations promulgated by the District Engineer for Bonnet Carré Spillway can be enforced by U.S. Army Corps of Engineers employees under authority given by Title 36 of the U.S. Code of Federal Regulations. All regulations pertaining to seasons, bag and creel limits, licenses, etc., are enforced by the Louisiana Department of Wildlife and Fisheries. Corps park rangers only cite the public for

Title 36 violations and report other game and fish law violations to appropriate state officials. Louisiana game and fish regulations will be utilized and administered where lands are licensed to Louisiana Department of Wildlife and Fisheries for fish and wildlife management purposes.

Permits can be utilized in cooperation with the Louisiana Department of Wildlife and Fisheries to convey information on special regulations to members of the public, and for management purposes. The use of management guides and permits, which include maps and special regulations, aid in the implementation of a fish and wildlife program. Hunting permits can be utilized for biological, safety, and administrative considerations. A decision on limiting the number of permits to be issued for hunting has a major impact upon the method of permittee selection and the amount of staff effort involved in administering the program. If the number of permits is not limited, permits can be distributed by field personnel and by mail from district and field offices. There would be no need for a lottery or a drawing which requires considerable staff effort and mailing costs. Enforcement efforts by district staff are also minimized.

Permits with or without time limitations could be utilized whether or not the number of permits is limited. If the demand for hunting exceeds the supply of hunting opportunities, limiting individual hunters to a particular portion of the season increases the number of hunters who can utilize the resource. Adoption of this option requires the development of a recordkeeping system and an equitable procedure of distributing hunters over the time frame of the season.

Permits which assign hunters to specific areas could be used to distribute hunters to achieve management objectives in the areas of safety, control of harvest, or control of the quality of the hunting experience. If large numbers of hunters happen to select a particular tract of land simultaneously, the quality of the hunting experience not only can diminish but safety problems could develop. Over-harvest of wildlife can also occur under these conditions. The implementation of this type of permit system requires the development of a record system and an equitable method of distributing hunters to specific areas.

If biological, safety, or administrative considerations require that the number of hunters be limited, some sort of drawing or lottery may be necessary. Where the number of permits must be limited, a drawing is the best method for insuring fairness to all applicants. Mail and telephone requests, as well as permits for limited periods or for specific locations, can all be incorporated into the drawing or lottery. A drawing requires a large administrative

effort, widespread news releases, and significant mailing costs. Approximately 30-60 days are required for applicants to forward their applications after news releases appear in the media. The drawing should be held approximately one month before the beginning of the season so that permits can be mailed and prospective hunters can make prehunt scouting trips.

The administration of a drawing becomes more complex if permits are written for specific periods of time, if hunters are required to hunt specific tracts of land opened to hunting, or if permits are required for different wildlife species. The likelihood of misunderstanding and mistakes by the public increases with the complexity of the system. The layout, design, and printing of permits and management guides requires the input of graphic arts and reproduction personnel or contracts.

A public hunting policy for the Bonnet Carré Spillway will be successful if it is equitable, timely in nature, and well coordinated in its development and implementation. A copy of the draft hunting policy for the spillway will be circulated to Louisiana Department of Wildlife and Fisheries prior to the opening of each hunting season. A meeting with the biologists and enforcement personnel should be held to work out program implementation prior to each hunting season. Prior to the opening of every hunting season, a news release will be prepared in conjunction with the district Public Affairs Office. The releases will outline the details of the policy for the upcoming hunting season. Copies of the yearly hunting policy statement will be posted at the field office and additional copies will be distributed to local sporting goods stores.

Section 9 - Plan of Development and Design Criteria

9.1. Conceptual Plan

This master plan proposes a three-phased implementation of recreation and natural resource management activities on project lands. This approach recognizes that full realization of the resource objectives and management principles presented in Sections 7 and 8 of this plan will require the commitment of several non-Federal sponsors to cost-share various aspects of the plan. The process of obtaining commitments and funding from local sponsors could take several years to accomplish. Significant safety hazards to the visiting public and the potential for degradation of natural resource values, however, demand an immediate response to existing problems.

The first phase of this plan does not require local sponsorship for implementation. This initial phase consists of zoning of public uses and improved on-site management to enforce the controls and prohibitions required to minimally address safety problems and resource use conflicts that currently exist on the project lands. The Federal objectives of managing natural resources to insure their continued availability, and providing outdoor recreation opportunities on project lands in a safe and healthful environment are not being met by the status quo in the Bonnet Carré Spillway.

The current situation of uncontrolled public use and unplanned project operations is resulting in degradation of the project's recreational and natural resource values. Equally significant, the "hands-off" management approach fails to realize the great potential of these public lands. The implementation of improved on-site management and minimal public use controls will serve to stabilize and modestly increase the current recreational and natural resource values of the project lands. It will also provide the necessary foundation for improvements and enhancements implemented in phases 2 and 3 in cooperation with local sponsors. These cost-shared activities and developments will more fully actualize the project's potential use values to the public.

The second phase consists of several priority developments, or actions, necessary to restore existing recreational opportunities which will be restricted or prohibited with implementation of phase 1. These phase 2 items will require local sponsor(s) to cost-share 50 percent of the implementation costs and assume all maintenance costs. If possible, phases 1 and 2 should be effectuated simultaneously. In that way, there will be minimal

disruption of recreational activity. Included also in phase 2 are various fish and wildlife enhancements.

Phase 3 consists of additional recreational developments requiring non-Federal sponsorship. These developments are enhancements to the current mix of recreation opportunities.

9.2. Phase 1: Improved On-Site Management of Existing Uses

9.2.1. Personnel Requirements for Project Management. The rules and regulations governing public use of water resource development projects administered by the Corps of Engineers are found in Title 36, Chapter III, of the U.S. Code of Federal Regulations, Part 327. These regulations provide specific guidance regarding public use activity on Corps lands and waters, and the enforcement of those user controls. The regulations are enforced by Corps of Engineers employees designated by the District Engineer to have citation authority. Citations issued under these regulations may require a forfeiture of collateral (e.g. a fine) and/or an appearance before a U.S. Magistrate. Corps personnel are assisted by local law enforcement agencies who are responsible for the enforcement of local and state laws. Non-Federal law enforcement agents can not be given Federal citation authority under Title 36 CFR Part 327.

Several Engineer Regulations (ER's) and Pamphlets (EP's) provide additional guidance for the management of Corps lands and waters. Most important of these are ER and EP 1130-2-540 entitled "Environmental Stewardship Operations and Maintenance Policies," and ER and EP 1130-2-550 entitled "Recreation Operations and Maintenance Policies." These regulations provide guidance for the implementation of user controls prescribed by 36 CFR Part 327 and the accomplishment of the Corps natural resource management program. The regulations state that the objectives are accomplished by maintaining qualified professionals at all levels and implementing operational management plans. Personnel categories required for project management include a resource manager, park ranger(s), operation and maintenance personnel, and administrative personnel. The guidance clearly states that the ultimate responsibility for the project's natural resources and management of outdoor recreation activities rests with the Corps.

Minimum personnel requirements for controlling public use per 36 CFR Part 327 and initiating natural resource management activities at the Bonnet Carré Spillway is two full-time park rangers. These individuals should have a background in park management and/or natural sciences and should be required to complete a park ranger training program. The park rangers would have citation authority and should work overlapping schedules which provide maximum

coverage during the peak visitation days (Thursday through Monday). The project foreman, or another member of the project maintenance staff, should also be appropriately trained and designated with citation authority. This would provide support to the park rangers during the Monday through Friday work week. Additional support to the implementation of visitor controls should be provided through cooperative agreements with local law enforcement agencies to provide increased patrols (ER 1130-2-550, Chapter 7).

The second element missing from the current program is the development of natural resource components of operational management plans. This master plan provides the conceptual framework, as well as specific proposals, for these plans. Corps policy encourages the outgranting of suitable lands and waters for fish and wildlife management to states and the U.S. Fish and Wildlife Service under annual licenses. However, Corps personnel are responsible for oversight of these outgrants as well as conservation and resource management plans on project lands which are not outgranted. The Corps park rangers would also be responsible for the management of fish and wildlife activities, both those undertaken by outgrantees and those implemented by the Corps. Technical support will be provided by resource specialists in the New Orleans District office.

Another activity of the park ranger staff will be the careful monitoring of sensitive resources on project lands. These resources include the Kenner and Kugler cemeteries, as well as other sensitive ecological and aesthetic resources identified in this plan. The park ranger staff will also be responsible for administration of a Type C visitor center located in the existing project office building and at the existing interpretive sign near the Mississippi River. The center will include appropriate exhibits on topics such as project purpose and history, natural resources, and visitor safety. The visitor center will also dispense information, publications and maps to assist visitors in understanding, locating and safely using project facilities and natural resources.

9.2.2. Prohibition of Certain Current Uses. Enforcement of 36 CFR Part 327 will require the prohibition of certain user activities in the spillway. Current activities which will be permanently prohibited include the dumping of household or commercial trash and debris [part 327.9(b)], the cutting and removal of trees [part 327.14(b)], and any conduct which disrupts the use by others or impairs the safety of others [part 327.11(c)]. Prohibition will be enforced through active patrolling by the project park ranger and other project personnel, posting of rules and regulations on signs, and increased patrols by local law enforcement under cooperative agreement.

Control of vehicular access into project lands is also a key element of public use control. The multiple avenues of project access currently existing will make control and surveillance very difficult. In order to address this concern, some roads entering the floodway should be permanently closed. Preferably, these roads should be excavated and allowed to revegetate into a natural condition. In other instances, barricades, gates and fences will be necessary to control access. Control of entry during night time hours should be implemented, as necessary, to address public safety concerns.

In addition to the permanent prohibition of some activities, several existing public uses may need to be temporarily curtailed to comply with Corps guidance and promote public safety. These include a complete prohibition on the operation of off-road vehicles on project lands and a severe restriction of boating activity in the project waters. In accordance with Executive Order 11644 and ER 1130-2-550, Chapter 10, all project lands and waters are closed to off-road vehicle use except in areas and trails designated by the District Engineer. No such area has yet been designated. Thus, the current off-road vehicle use occurring on the project lands is not in compliance with Federal requirements and must be prohibited until such areas are formally designated. Off-road vehicle use areas are identified for development in Phase 2 (section 9.3.1.). Designation of these areas, and thus resumption of off-road vehicle use in the spillway, will only occur after they have been developed in cooperation with a local sponsor.

Boating activity may also need to be restricted with the implementation of Phase 1. This is due to the safety hazards existing in the project's waterways. The project waterways have never been cleared and snagged of obstructions. As a result, several underwater hazards exist and accidents with serious injury and loss of life have occurred. In recognition of these hazards, boating activities will be restricted to low speeds (10 miles per hour maximum) in all project waters. This includes both borrow canals, the cross-cut canal, the I-10 construction canal and the entrance channel into Lake Pontchartrain. No waterskiing, jetskiing, or other high speed boating will be allowed under the present conditions. Included in proposed Phase 2 (section 9.3.2. and 9.3.3.) activities are clearing, snagging and proper posting of the Lower Borrow Canal and the entrance channel into the lake.

As stated earlier in this section, these temporary prohibitions can be minimized if non-Federal sponsors sign on as cost-share partners to develop Phase 2 activities (section 9.3.) simultaneously with the implementation of Phase 1.

9.2.3. Delineation of Use Areas. Most existing recreational uses in the spillway will be permitted to continue after the implementation of Phase 1. However, these uses will be controlled through zoning of project lands and waters. These controls on public recreational activities are discussed in the land classification portion of this master plan (section 7) and are summarized here.

In those limited areas designated as project operations, no public use is allowed. These restricted areas include the spillway structure, the project office building, and the storage compound. Visitors who wish to visit these areas should contact the maintenance foreman or park ranger prior to entering these areas. The four existing recreation areas remain open to public use as allowed by the permit or lease with the New Orleans District. Visitors to these areas, however, will be subject to increased supervision with the implementation of Phase 1.

The multiple resource management classification which comprises the great majority of project lands and waters is subdivided into two categories; low density recreation areas, and fish and wildlife/vegetative management areas. In the low density recreation areas, most current public use activities are allowed to continue without disruption. For public safety reasons, hunting and the discharge of shotguns in these cleared areas of the floodway are prohibited in the Norco Buffer Zone and any area where firearms would endanger any other user in the spillway. Off-road vehicle usage is prohibited as discussed in section 9.2.2. above.

In the wooded portions of the floodway classified as fish and wildlife/vegetative management areas, existing recreational activity which is compatible with these natural resources will be allowed to continue. Such activities include hunting, fishing, crawfishing, birding, etc. As with all other areas of the project, off-road vehicle use will be prohibited in this area. In addition, boating on project waterways in this area will be restricted to low-speed activity as discussed in section 9.2.2. above. The Upper Borrow Canal will be permanently restricted to boat fishing activity. Waterskiing and other high speed boating will be limited to the Lower Borrow Canal after it is cleared and snagged to remove underwater obstructions.

9.2.4. Public Notification. Effective implementation of improved on-site management in the floodway will require extensive public notification. These notices will be issued by several media releases to ensure public awareness of new restrictions and procedures. Notices providing details and a point of contact should be published in the local news journals and broadcast on local radio stations. Informational handouts with maps should also be readily

available to the visiting public. Distribution locales could include the project office, the interpretive exhibit near the Mississippi River, and the existing recreation area adjacent to the Lower Guide Levee and U.S. Highway 61.

Initial implementation of user controls is likely to be difficult and generate considerable negative public response, especially from off-road vehicle users and boating enthusiasts. Some users will strongly object to a "taking away of their rights" and may vent their frustrations against Corps personnel and property. For this reason, a cooperative agreement with local law enforcement agencies, in particular the St. Charles Parish Sheriff's Office, to provide additional patrols and security will be necessary during this initial period. Additional Corps park rangers (more than the 2 positions proposed for long-term management) may be needed on a short-term basis. To provide this supplemental manpower, experienced natural resource management personnel could be obtained on a temporary duty basis from other Corps districts. In order to lessen public resistance, the controls should be initiated incrementally and, preferably, during the winter when recreational activities are at a minimum.

9.2.5. Modifications to Existing Project Activities. In addition to improved control of public recreational uses, Phase 1 implementation includes several changes to existing project activities to address the conservation and moderate enhancement to the project's natural resources. These modest changes can be implemented without local sponsorship and can be managed by the Corps park rangers with support from biologists in the district office.

(a) Sand Hauling Permit Program. This annual permitting program should be modified in two significant ways. First, the permitted sand hauling areas should be limited to the low density recreation classification presented in section 7 of this master plan. This classification corresponds to the limits of previously cleared areas and also matches the areas where environmental clearances have been obtained. Several permit areas in Fiscal Years 1993 through 1998 were located in areas beyond the limits of this classification. The clearing of woodlands in the fish and wildlife/vegetative management classification to remove silt deposits is not consistent with the resource objectives and management principles for that category and should be terminated.

The other suggested change to this program is the revision of an existing permit condition regarding site conditions left at the conclusion of excavation activities in a permit area. This revised permit stipulation would instruct the sand haulers to modify the regular and discontinuous nature of the borrow pits created by their operations. The water-

filled borrow pits left by sand hauling operations have value to fish and wildlife. These values can and should be increased through conscious efforts to provide variety along the edges of these water bodies and to connect smaller pits to ensure hydrological flow. Larger pits can remain separate from adjacent waters. This new requirement can be managed by the Corps park rangers on-site with occasional assistance by district biologists.

Ideally, any unused or unsuitable material left after pit excavation should be placed back into the pit and shaped so that a 1:5 or 1:10 slope can be achieved at least on one side of the pit. Trees and vegetative debris (brush piles) should also be placed back into pits to provide structure or cover for aquatic organisms. Vegetative plantings can be undertaken along the shorelines of pits to enhance both aesthetic, and fish and wildlife values.

(b) Other Project Maintenance Activities. The clearing of range lines through wooded areas of the spillway are necessary for the proper monitoring of floodwaters during spillway openings. These range lines stretch perpendicularly from the Upper to Lower Guide Levees. As presently maintained, these lines provide some value to wildlife by providing diversity of plant species and openings in the forest canopy. These values, however, can be enhanced by increasing scalloping of the edge between forest and clearing. Selective clearing of vegetation can also enhance the natural resource values of these openings.

Natural resource benefits can also be derived from similar efforts along pipeline and powerline corridors. These changes in maintenance can be implemented through changes in the outgrant agreements with little or no cost to the outgrantees.

(c) Clay Borrow Program. As with the sand hauling program, the fisheries value of borrow pits created by this activity should be enhanced by increasing the diversity of the land/water interface as well as providing structure for aquatic organisms. These borrow pits should also be designed to ensure hydrological connection to adjoining water bodies (especially smaller pits) to avoid the creation of stagnant, lifeless pits. The changes can be effectuated through new borrow area standards in New Orleans District construction contracts which identify Bonnet Carré as the source of clay material.

(d) Bonnet Carré Freshwater Diversion Project. The construction of this project would directly affect a narrow corridor of project lands and waters adjacent to the Upper Guide Levee. Most of the project is situated within the fish and wildlife/vegetative management classification. The purpose of this project is environmental enhancement in the

adjoining Lake Pontchartrain and Mississippi Sound ecosystems. The project has been designed to reduce adverse environmental effects in the spillway. However, more can be done to minimize impacts to the spillway's natural resources and, in fact, actually enhance those values. Additionally, several actions should be implemented to replace impacted recreation access and/or provide safe access to improved recreation opportunities. Six modifications to this project are suggested here.

First, the project design should be altered to significantly reduce the clearing of woodlands between the diversion structure and U.S. Highway 61. Although some loss of forested land is required for the channel right-of-way, the planned disposal areas should be relocated to the adjoining cleared areas within the floodway. This change would save approximately 230 acres of wooded project lands. A similar project design modification for the wooded areas between U.S. Highway 61 and the lake has already preserved 319 acres of forested project lands.

A second project modification which would also have significant natural resource value would be to route a portion of the diverted freshwater into wooded wetlands north of U.S. Highway 61. The immediately adjoining wooded areas on either side of the diversion channel would be the best candidates for this action. The effects, however, would be amplified if the freshwater could be diverted also to the wooded areas adjacent to the Lower Borrow Canal. This change would benefit water quality goals by providing additional filtration of the diverted river waters before they enter Lake Pontchartrain. The wooded areas receiving the waters would also benefit due to improved circulation and deposition of nutrients.

Temporary ponding of diverted river waters to increase retention time within the spillway's wetlands can also be compatible with the natural resource objectives of this master plan. Impoundments should be concentrated in the already wet forests and marshes near Lake Pontchartrain and could have significant benefits for migratory waterfowl. This ponding, however, should be planned and implemented carefully to ensure minimal damage to the existing vegetation and fish and wildlife populations of the project area. Excessive depths or durations of ponding could drown existing bottomland forests. The overall planning objective for flow distribution and impoundments should be to maximize benefits to the publicly owned natural resources in the floodway and divert any excess waters to adjoining wetlands.

Another modification with fish and wildlife benefits would be to provide edge diversity along the diversion channel. Currently, the Upper Borrow Canal has irregular banklines which provide a diversity of habitat settings. As presently

designed, the project will remove these irregular banklines and replace them with a straight and regular land/water interface. This impact can be avoided by purposely making the banklines irregular to provide a diversity of water depths and bankline configurations.

A fourth modification or refinement to the project design should be to design the disposal haul roads north of U.S. Highway 61 to minimize impacts to wooded areas and maximize recreational access after completion of the project. In order to minimize damage to wooded areas, the haul roads should be carefully located and designed. Haul roads which could be later utilized for recreational access to the interior diversion canal bankline (especially in the area closer to U.S. Highway 61), should be left in place after construction is complete. Other haul roads corridors should be returned to their pre-construction condition and allowed to naturally re-vegetate.

The last two suggested modifications or additions to the project design should be undertaken to maintain and enhance recreational opportunities in the spillway. In terms of maintaining existing recreational activities, a boat launching ramp should be provided on the Upper Borrow Canal/diversion canal near the U.S. Highway 61 bridge crossing. This ramp would provide access for project maintenance activity and would also replace the boating access lost as the result of project construction closing off the connection to the cross-cut canal.

A final suggested modification is to provide safe fishing access to the tailwater area of the proposed diversion structure. As experience with the Caernarvon Freshwater Diversion Structure demonstrates, the public will be drawn to this area to fish regardless of attempts (fencing and signs, etc.) to keep them away. The best approach is to recognize this situation not as a problem but rather as an opportunity. Minimal facilities for public health and safety should be integrated into the project design. These features may include, but are not limited to, such items as guardrails, stair steps, handrails, life rings, life lines, and hard-surfaced walkways. Sustained public use may later require provisions for a public restroom and potable water supply. The provision of safe access for fishing in the tailwater area of the structure is consistent with the low density recreation classification of this portion of the project lands.

9.3. Phase 2: Facilities / Actions Proposed for Immediate Development

Phase 2 consists of several priority developments, or actions, necessary to restore existing recreational

opportunities which will be restricted or prohibited with implementation of phase 1. These phase 2 items will require local sponsor(s) to cost-share 50 percent of the implementation costs and assume all maintenance costs.

9.3.1. Establishment of Off-Road Vehicle Areas. The two designated locations for an ATV, motorcycle and go-kart use area and an adjoining 4WD use area were selected to provide sufficient areas for these activities without impinging on other user activities. Specific designation of project lands for the operation of off-road vehicles is required by Executive Order and Corps regulations; all other project lands will be closed to the use of off-road vehicles.

ER 1130-2-550, Chapter 10, provides specific guidance for the designation and management of such areas. This guidance was followed in the selection of the two designated off-road vehicle areas. They have been located to minimize harm to the project's natural resources and to minimize conflicts with other recreational users and neighboring land uses. The designated areas are located within the low density recreation category of the multiple resource management classification. These previously cleared areas are deemed more suitable for the use of off-road vehicles than the wooded area adjoining the Lower Borrow Canal which was recommended by the Bonnet Carré Citizens Advisory Committee.

However, as the result of comments received during the public and agency review period, a potential expansion area for ATV and motorcycle use has been identified in the final plan (see plate 9). The potential expansion area consists of the large expanse of woods located adjacent to the Lower Borrow Canal (the same area recommended by the Bonnet Carré Citizens Advisory Committee).

The final decision on the potential expansion of ATV and motorcycle use areas rests upon the results of an environmental assessment(EA) to be completed in fiscal year 1998. This assessment will examine all potential impacts of ATV and motorcycle use in the potential expansion area to the project's natural resources as well as conflicts with other visitor use activities. The EA will determine how much, if any, of the potential expansion area will be designated as an additional off-road use area. Only those areas which meet stringent Corps guidance and environmental requirements will be considered for designation.

The two currently designated off-road vehicle areas are subject to sand hauling activities. As stated in section 7.2.5.(a)(2), the areas of active sand hauling operations take precedence within these designated off-road vehicle areas. Therefore, the immediate work areas as well as haul roads in active use will be identified as off-limits to these recreational users. The off-limit areas will be

clearly marked by signs and also shown in map handouts to project visitors.

Minimal implementation requirements for these 4WD vehicle areas will include the marking of area boundaries with paint and signs, minor grading and bushhogging, and installation of entrance signs and bulletin boards, and parking areas. No trail construction is anticipated. Separate areas for go-karts will be provided within the ATV and motorcycle area. These track areas will be graded and bushhogged 50 feet wide. Both tracks will be filled with semi-compacted fill material. In the go-kart area, berms will be created on the outside of curves. Berms will also be provided at jumps in the motorcycle areas.

(a) Location Plans. See plate 11.

(b) Cost Estimate. \$108,000.

(c) Potential Local Sponsor(s). St. Charles Parish Council, Pontchartrain Levee District, Louisiana Office of State Parks

9.3.2. Clearing and Snagging of Lower Borrow Canal. At present this waterway is heavily utilized by the visiting public for a variety of boating activities. Boat fishing, pleasure boating, waterskiing and jet skiing are common activities. Use of this waterway is heavily encouraged by the provision of a boat launch facility at the St. Charles Parish recreation area operated under an outgrant from the New Orleans District.

A significant safety problem exists because the waterway has never been cleared of underwater obstructions. Fallen trees and other debris exist on the canal's bottom creating potential collision objects for the boating public. Especially of concern are high speed activities such as waterskiing and jet skiing. The clearing and snagging of this waterway would remove this safety hazard and allow the resumption of high speed boating activity.

(a) Location Plans. See plate 11.

(b) Cost Estimate. \$103,000.

(c) Potential Local Sponsor(s). St. Charles Parish Council, Louisiana Department of Transportation and Development

9.3.3. Provide a Safe Channel into Lake Pontchartrain. The boat launch located at the intersection of I-10 and the Lower Guide Levee is utilized primarily by boaters wanting access to Lake Pontchartrain. These boaters utilize the I-10 access channel located between the east- and west-bound

spans of the Interstate and then follow a poorly marked and unmaintained channel into the lake. This channel contains numerous underwater obstructions as evidenced by the occurrence of several boating accidents in the area. The clearing, snagging, and proper marking of this channel would remove the safety hazards and, thereby provide a safe channel into Lake Pontchartrain. This action was requested in the report of the Bonnet Carré Citizens Advisory Committee.

(a) Location Plans. See plate 11.

(b) Cost Estimate. \$40,000.

(c) Potential Local Sponsor(s). St. Charles Parish Council, Louisiana Department of Transportation and Development

9.3.4. Fish and Wildlife Enhancements. Two enhancements are included in this phase. One of these is the installation and maintenance of 200 wood duck boxes in the wooded areas of the spillway near the upper and lower borrow canals. The other enhancement included here is 12,000 linear feet of Christmas tree fencing along the lakefront of the spillway.

(a) Location Plans. See plate 11.

(b) Cost Estimate. \$34,000.

(c) Potential Local Sponsor(s). Louisiana Department of Wildlife and Fisheries, Lake Pontchartrain Basin Foundation, volunteer efforts by the Boy Scouts of America

9.3.5. Fishing Jetty and Picnic Area at Lower Guide Levee and Lake Pontchartrain. The proposed development includes the recently completed fishing jetty extending several hundred feet from the terminus of the Lower Guide Levee into Lake Pontchartrain, an adjacent picnic area, and provision of adequate parking and restroom facilities. The St. Charles Parish Council has recently constructed the fishing jetty from concrete construction rubble. The fishing jetty and picnic area were requested in the report of the Bonnet Carré Citizens Advisory Committee.

(a) Location Diagrams. See plate 11.

(b) Cost Estimates. \$27,500.

(c) Potential Local Sponsor(s). St. Charles Parish Council, Lake Pontchartrain Basin Foundation

9.4. Phase 3: Future Recreation Development

9.4.1. Expansion of Existing Recreation Area at Lower Guide Levee and U.S. Highway 61. Expanded recreational features could be provided adjacent to the existing recreation area. The St. Charles Parish Council initially proposed an extensive recreational facility at this location including primitive and developed camping areas and miscellaneous ballfields. The plans were eventually scaled back to the present array of facilities. The provision of camping facilities at this locale was specifically requested in the report of the Bonnet Carré Citizens Advisory Committee.

(a) Location Diagrams. See plate 12.

(b) Potential Local Sponsor(s). St. Charles Parish Council, Louisiana Department of Transportation and Development

9.4.2. Boat Launch at Lower Guide Levee Drainage Canal. An improved boat launch is recommended at this locale to provide access into the Lower Guide Levee drainage canal (also called Engineers Canal) and hence into a canal providing access into the Bayou La Branche wetlands. This boat launch would replace the informal launching area currently in use in this location.

(a) Location Diagrams. See plate 12.

(b) Potential Local Sponsor(s). St. Charles Parish Council, Louisiana Department of Transportation and Development

9.4.3. Nature Trails along Lower Guide Levee. This proposal consists of various nature trails in the wooded corridor between the Lower Guide Levee and the Lower Borrow Canal. These trails could utilize the existing range line cuttings for initial entry into the woods. Interpretive signs could be posted to identify plant species and different environments.

(a) Location Diagrams. See plate 12.

(b) Potential Local Sponsor(s). St. Charles Parish Council, Louisiana Department of Wildlife and Fisheries, Lake Ponchartrain Basin Foundation

9.4.4. Bicycle Path Across the Spillway and Along the Lower Guide Levee. The ICG Railroad has informally notified the New Orleans District that they may be abandoning their railroad crossing closest to Lake Pontchartrain. The proposed bike path would be built atop an existing railroad trestle or highway crossing and would be part of the bicycle path system around the lake. Connecting to this crossing

would be a path along the top of the Lower Guide Levee to its junction with the Mississippi River Levee at Norco. A rest stop along the bicycle path circling Lake Pontchartrain was requested in the report of the Bonnet Carré Citizens Advisory Committee.

(a) Location Diagrams. See plate 12.

(b) Potential Local Sponsor(s). St. Charles Parish Council, Pontchartrain Levee District, Louisiana Department of Transportation and Development (utilizing ISTEA funding)

9.4.5. Boat Launch and Picnic Area at Upper Guide Levee and U.S. Highway 61. An improved boat launch at this locale would provide access into the Upper Borrow Canal. Included in this proposal are picnic and parking areas. This boat launch would replace the primitive launching area currently in use in this location and also would supplement the boat launch provided as part of the Bonnet Carré Freshwater Diversion project [see section 9.2.5.(d)].

(a) Location Diagrams. See plate 12.

(b) Potential Local Sponsor(s). St. Charles Parish Council, St. John Parish Council, Louisiana Department of Transportation and Development

9.4.6. Fish and Wildlife Enhancements. These enhancements include the installation of additional wood duck boxes and maintenance of Christmas tree fences along the Lake Pontchartrain shoreline.

(a) Location Diagrams. See plate 12.

(b) Potential Local Sponsor(s). Louisiana Department of Wildlife and Fisheries, Lake Pontchartrain Basin Foundation

Section 10 - Special Problems and Constraints

10.1. Public Health and Safety Concerns

In addition to the safety issues discussed earlier in this master plan, several public health and safety concerns deserve attention during implementation of Phase 1 development.

10.1.1. Water Quality Concerns. At present, testing of the project's waters is only conducted in conjunction with openings of the spillway. During spillway operations, water quality samples are collected in the Mississippi River, in the floodway and in Lake Pontchartrain. The focus of these investigations is the impact of spillway openings on the salinity and water quality of Lake Pontchartrain and the other affected receiving bodies.

During preparation of an earlier draft master plan for the Bonnet Carré Spillway, coliform bacteria analyses were performed on water quality samples taken from the Upper and Lower Borrow Canals between 15 June and 16 August 1971. Total coliform counts were obtained as well as fecal coliform counts. Fecal coliform tests are excellent indicators of recent sewage pollution. Table 10-1 presents the results of these tests as well as coliform level standards for primary and secondary contact recreation.

As review of this table shows, water in the Lower Borrow Canal near the "Lions Club Park" had a high coliform count which greatly exceeded the standards for primary contact recreation. The park was located in the same locale as the present St. Charles Parish recreation area near U.S. Highway 61 and the Lower Guide Levee, and provided similar facilities. More recent data is not available to determine if there is currently a problem with fecal coliform counts in the Lower Borrow Canal.

The other project waterbody of concern from a water quality standpoint is the Lower Guide Levee drainage canal situated outside the floodway (also known as Engineers Canal). This drainage canal receives effluent from the Norco Sewerage Treatment Plant, discharge of an undetermined nature from the Big Three Industries facility adjacent to the sewerage plant, urban runoff from the Norco

Table 10-1. Summary of Coliform Data and Recommended Levels

	Log Mean, Coliform per 100 ml	
	Total	Fecal
Sample Locations:		
Lower Borrow Canal	3,964	216
A. Lions Club Park	13,950	409
B. Other Areas	438	32
Upper Borrow Canal	489	33
All Samples in Spillway	1,894	129
Recommended Levels:		
Primary Contact Recreation (includes swimming, skiing)	1,000 ^{1,2}	200 ³
Secondary Contact Recreation (includes fishing, boating)	-	2000 ³

References:

- ¹ Environmental Health Practice in Recreational Areas.
U.S. Dept. of Health, Education and Welfare. Public Health Service Publication No. 1195, page 90.
- ² R.C. Jung, F. Incaprera and C.J. Powell. 1969. Symposium on water pollution. Journal of the La. State Medical Society 121:69-71.
- ³ Water Quality Criteria. National Technical Advisory Committee. Federal Water Quality Administration, Washington, D.C. (April 1968) pages 10-12.

area, and is hydrologically connected to heavily polluted Bayou Trepagnier. The recreation use survey performed during the preparation of this master plan documented bank fishing in this canal as well as boat launching activity.

A comprehensive program of water quality testing of project waterways should be implemented during Phase 1 development. The program should focus on public health parameters but also provide information of value in managing the project's natural resources. Corrective actions and/or use restrictions should be employed to address any identified problems.

10.1.2. Potential HTRW Concerns. No hazardous, toxic or radioactive wastes (HTRW) problems are presently known to exist on project lands or waters. Several potential concerns, however, have been identified during preparation of this master plan and should be investigated during Phase 1 implementation. These concerns center on previous oil and gas exploration activity on the project lands, and the heavy concentration of petrochemical plants surrounding the project.

A total of 21 oil and gas exploration wells have been drilled on project lands over the last 40 years. A few of these were producing wells resulting in the naming of the "Norco Oil and Gas Field" within the spillway. No active wells or exploration leases currently exist on the project lands.

The Office of Conservation within the Louisiana Department of Natural Resources has identified one unclosed well site disposal pit within the project area. This former well site is located close to the Upper Guide Levee between the spillway structure and the Illinois Central Gulf Railroad - Baton Rouge District crossing. In the vicinity of this well site, abandoned pipelines and former tank batteries related to producing oil and gas wells are known to exist. Both of these situations could present safety hazards to the visiting public as well as Corps personnel and contractors. Excavation work for the Bonnet Carré Freshwater Diversion project may encounter remnants of these oil and gas activities.

Of more general concern is the potential for HTRW problems related to the intensive concentration of petrochemical manufacturing complexes in the surrounding region. Obviously, there is the possibility of accidental spills along highway, railroad, or pipeline crossings of the floodway. Additionally, the possibility of intentional dumping of hazardous or toxic materials on the project lands can not be totally discounted. The fact that dumping of household and commercial garbage is a major management problem in the spillway indicates that illegal dumping of

more dangerous wastes could also be a problem. It's important to note that no evidence of such spills or dumping were uncovered during preparation of this master plan.

An initial HTRW assessment consistent with ER 1165-2-132, the Corps ERGO program, and ASTM standards should be conducted during Phase 1 implementation of project management and prior to excavation work related to the Bonnet Carré Freshwater Diversion project. This program would include an exhaustive records search and extensive field investigations to identify any HTRW hazards on the project lands or waters. If necessary, remedial actions and/or precautions for project visitors and project personnel will be implemented.

10.2. Natural Resource Hazards

Numerous natural resource hazards exist on the project lands. Although none of these are unusual to the region or peculiar to the Bonnet Carré Spillway, the visitor assistance program to be implemented during Phase 1 development should provide appropriate management measures to minimize the risks to the visiting public. Appropriate warnings and advisories should be an integral part of the project's public information program.

10.2.1. Alligators. The American alligator presently occurs in and adjacent to the Bonnet Carré Spillway. Alligators are a Federally listed threatened by similarity of appearance species to the Endangered Species Act. Feeding and harassment are prohibited. To provide a measure of public safety to recreationists and access to a renewable, harvestable resource, it is recommended that the New Orleans District outgrant alligator management, harvesting, and administration of the statewide program on Bonnet Carré Spillway project lands to the Louisiana Department of Wildlife and Fisheries.

10.2.2. Poisonous Snakes. Several species of poisonous snakes including the western cottonmouth and timber rattlesnake can be expected to occur on project lands. These animals are recognized as integral components of the natural ecosystems of the region and are beneficial in several respects. Visitors should be discouraged from handling any snakes.

10.2.3. Fire Ants. Fire ants occur throughout the region and may cause two types of problems. First, these insects are a health and safety hazard to visitors and employees. Secondly, the mounds can cause problems for mowing equipment. Fire ants have painful bites resulting in sores that last several days. Multiple bites can be very dangerous to small children and allergic adults.

Information on control should be obtained from the Louisiana Department of Agriculture and Forestry and incorporated into the maintenance program at the project.

10.2.4. Mosquitoes. Mosquitoes can be disease vectors as well as pests. Mechanical or biological controls should be emphasized if needed.

10.2.5. Poison Ivy. This plant is well known for its irritating oils. The species occurs in the study area and if located near areas of intense human activity should be eliminated by chemical or mechanical means.

10.2.6. Honeylocust. The honeylocust tree is common in the project area. The long, stout thorns on the trunks of these trees are very serious safety hazards, especially for small children. In high use recreation areas, these trees should be removed.

Section 11 - Conclusions and Recommendations

11.1. Summary of Use, Development and Management Concerns

Although the Bonnet Carré Spillway has never been operated as a Federal recreation area, it has developed into an extensively used, albeit unofficial, outdoor recreation area. The unregulated nature of recreation activity occurring in the spillway has led to numerous conflicts between users, and problems between users and neighboring residential areas. Beyond the concern over these conflicts, uncontrolled usage of the spillway has resulted in public health and safety problems.

The Federal objectives of managing natural resources to insure their continued availability, and providing outdoor recreation opportunities on project lands in a safe and healthful environment are not being met by the status quo in the Bonnet Carré Spillway. The current situation of uncontrolled public use and unplanned project operations is resulting in degradation of the project's recreational and natural resource values. Equally significant, the "hands-off" management approach fails to realize the great potential of these public lands.

This master plan proposes a three-phased implementation of recreation and natural resource management activities on project lands and waters. The first phase of this plan does not require local sponsorship for implementation. This initial phase consists of zoning of public uses and improved on-site management to enforce the controls and prohibitions required to minimally address safety problems and resource use conflicts that currently exist on the project lands. These actions will serve to stabilize, and modestly increase, the current recreational and natural resource values of the project lands and waters.

Implementation of phase 1 provides the necessary foundation for improvements and enhancements proposed in phases 2 and 3 in cooperation with local sponsors. Increased on-site management provided under phase 1 development will demonstrate the New Orleans District's commitment to proper stewardship of project lands and waters. With the Corps providing overall project supervision, several non-Federal sponsors can be expected to participate in various phase 2 and 3 developments.

The second phase consists of several priority developments, or actions, necessary to restore existing recreational opportunities which will be restricted or prohibited with implementation of phase 1. These phase 2 items will require local sponsor(s) to cost-share 50 percent of the

construction costs and assume all operation and maintenance costs. If possible, phases 1 and 2 should be effectuated simultaneously. In that way, there will be minimal disruption of recreational activity.

Phase 3 consists of additional recreational developments and fish and wildlife enhancements requiring non-Federal sponsorship. These cost-shared activities and developments will more fully actualize the project's potential values to the public.

11.2. Implementation Requirements

The successful implementation of natural resource and outdoor recreation management at the Bonnet Carré Spillway, consistent with guidance in ERs and EPs 1130-2-540 and 1130-2-550, requires a natural resource management staff presence to provide on-site management. This staff is additional to the current maintenance crew stationed at the project. Absent this commitment, public use controls will not be successful and public health and safety concerns will remain unaddressed.

The first year costs of phase 1 implementation are estimated to be \$207,000. This estimate includes one FTE (full-time equivalent position) for a GS-11 Park Ranger, the purchase of a four-wheel drive vehicle, a patrol boat and miscellaneous supplies and equipment, and contract expenses. After the initial year, annual costs of improved on-site management increase to approximately \$500,000 due to the addition of a GS-9 Park Ranger and a GS-5 Office Clerk. These costs are more than balanced by the estimated public benefits of existing recreational activity (annual benefit of \$1,324,000). Using these figures, a benefit/cost ratio of 6.4 to 1 for the initial year and 2.6 to 1 for additional years can be derived.

Facility development costs in phases 2 and 3 are expected to be minimal, as described in section 9 of this plan, and will be spread out over several years. Capital intensive development is not compatible with the project's setting or flood control purpose. No such facilities are proposed.

11.3. Validation and Recommendation

The major effort for completion of this master plan was undertaken by Planning Division; however, continuous coordination through an interdisciplinary study team representing Operations, Real Estate, Programs and Project Management, and Engineering Divisions was necessary. The U.S. Fish and Wildlife Service also participated in this study group. This coordinated team effort has established

the principal guidelines and objectives for resource use of Federal lands and waters in the Bonnet Carré Spillway.

It is recommended that this master plan be approved as a comprehensive guide to the use, development, and management of the project's natural and manmade resources.



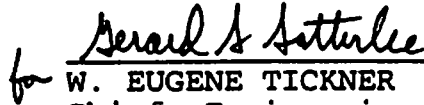
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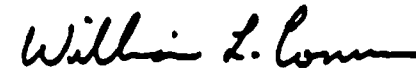
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11.4. Approval

1 July 1998
Date


WILLIAM L. CONNER
Colonel, Corps of Engineers
District Engineer

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