

NOTES

INTRODUCTION

¹ Harold N. Fisk, *Geological Investigation of the Alluvial Valley of the Lower Mississippi River* (Vicksburg: Mississippi River Commission, 1944), 67-69; Robert W. Harrison, *Alluvial Empire* (Little Rock: Pioneer Press, 1961), 12.

² A classic study of the meander phenomenon is J. F. Friedkin, *A Laboratory Study of the Meandering of Alluvial Rivers* (Vicksburg: Waterways Experiment Station, 1945). Friedkin found that meanders develop even in a perfectly straight channel with uniform banks and unvarying flow, the sole requirement being that the banks should be susceptible to erosion. Water can carry sand only a short distance downstream. For this reason erosion produces deposition in the channel; the bar deflects the current, producing increased erosion of the bank opposite, and this in turn produces more deposition. Meander begets meander, and is propagated downstream. Consequently, too, any factor which limits erosion will limit meander.

³ "Six...delta complexes have been studied in lower Louisiana. From oldest to youngest, they are Bayou La Rose, Maringouin, Cocodrie, Teche, Lafourche, and Plaquemine-St. Bernard." Harold N. Fisk, *Geological Investigation of the Atchafalaya Basin and the Problem of Mississippi River Diversion* (Vicksburg: Waterways Experiment Station, 1952), 34.

⁴ *Lafcadio Hearn, Chita* (New Young: Harper & Brothers, 1889), 15.

⁵ The drainage basin is approximately 32 percent arid, 15 percent semiarid, and 53 percent humid. *House of Representatives Document 798*, 71 Congress, 3 Session

(1931), 84. It ranges over 36 degrees of longitude and 21 degrees of latitude. *Ibid.*, 61. These great variations in climate and aridity not only make the flooding of the river extremely variable but, as a rule, prevent the synchronization of floods in the great tributaries. When even a partial exception to the rule occurs—as in 1927—the results are likely to be cataclysmic.

⁶ "Above the mouth of Red River on the right bank, and above Baton Rouge on the left bank, the drainage of the alluvial valley finds its way through small streams and bayous into tributaries of the Mississippi River. Below these points the drainage is through numerous bayous, lakes, and streams, into the Gulf of Mexico." *Ibid.*, 67. This is not perfectly accurate (small tributaries do enter even below Baton Rouge) but it is true as regards the overall drainage pattern.

⁷ Mark Twain, *Life on the Mississippi*, from *The Favorite Works of Mark Twain* (New York: Garden City, 1939), 127-128.

⁸ For the purposes of this study, the following terminology will be adopted:

"Valley" means the Alluvial Valley—the Mississippi flood plain south of Cape Girardeau.

"Delta" means the delta plain—the part of the flood plain south of the Red River.

"Engineer" when capitalized means an officer of the U. S. Army Corps of Engineers, or a civilian engineer employed by the Corps.

"District" when capitalized means the New Orleans District of the Corps of Engineers.

CHAPTER ONE

¹ Major D. O. Elliott, *The Improvement of the Mississippi River for Flood Control and Navigation*, 2 vols. (Vicksburg: Waterways Experiment Station, 1932), II, 275. Hereafter cited as *Improvement of the Mississippi*.

² "...it was a beautiful thing," wrote Garcilasco de la Vega, "to look upon the sea where there had been fields, for on each side of the river the water extended over twenty leagues of land, and all this area was navigated by canoes,

and nothing was seen but the top of the tallest trees." Quoted in Robert W. Harrison, *Alluvial Empire* (Little Rock: Pioneer Press, 1961), 52.

³ M. Penicaut, *Annals of Louisiana from 1698 to 1722*, 138-139. In B. F. French, *Historical Collections of Louisiana and Florida* (New York: J. Sabin and Sons, 1869).

⁴ De la Tour is supposed to have disputed Bienville's choice of a site on just these grounds.

⁵ Dumont de Montigny, *History of Louisiana*, 23-24. In B. F. French, *Historical Collections of Louisiana* (New York: Lamport, Blakeman & Law, 1853).

⁶ *Flood Control in the Lower Mississippi River Valley* (Vicksburg: Mississippi River Commission, 1969), 2.

⁷ To Wadsworth, 10 July 1803. Letters Sent, II, 26, Record Group 107, National Archives. The sender was almost certainly the Secretary of War. See also—to Wadsworth, 13 February 1804, Buell Collection, Item 51, Record Group 77, National Archives. References to this collection hereinafter cited in the form "Buell 51 NA."

⁸ Wilkinson indicated considerable intelligence and foresight in warning against the vulnerability of Louisiana to maritime attack. His curious "Memoir" of 27 March 1812 protested against the distrust enveloping his own reputation while putting forward a comprehensive plan for the defense of Louisiana. He recommended the seizure of Pensacola, an alliance with the Mexican revolutionists, calling out the "yeomanry" of Louisiana and the Mississippi Territory, the massing of materiel at Baton Rouge and—only 5 years after Fulton—the employment for warlike purposes of "6 Boats, to be propelled by steam." Wilkinson to Eustis, 27 March 1812, Buell 297 NA.

⁹ Despite certain indications of continuing activity, at least in the form of surveys and investigations, there does not appear to have been any positive action of consequence even in the military field until after the War of 1812. One such indication which also has a certain interest in itself is a report, Armistead to—, 25 December 1807, in which Engineer Captain W. K. Armistead reported from Fort St. Philip on, among other things, the existence of a ruinous "Ft. Bourbon" across the river—i. e., at or near the site of the future Fort Jackson. Armistead considered the site unsuitable for masonry fortification.

¹⁰ W. Stull Holt, *The Office of the Chief of Engineers of the Army: Its Non-Military History, Activities and Organization* (Baltimore: The Johns Hopkins Press, 1923), 1. Hereafter cited as Stull Holt, *Office of the Chief of Engineers*.

¹¹ *Ibid.*, 2.

¹² However, even Rensselaer did not give a civil engineering degree until 1835, and its course was limited to 1 year until 1860. See Forrest G. Hill, *Roads, Rails & Waterways: The Army Engineers in Early Transportation*

(Norman: University of Oklahoma Press, 1957), 208. Hereafter cited as Hill, *Roads, Rails and Waterways*. See also Raymond H. Merritt, *Engineering in American Society 1850-1875* (Lexington: University Press of Kentucky, 1969), 40-45. Hill emphasizes the school's limitations, Merritt its achievements.

¹³ Quoted in Hill, *Roads, Rails and Waterways*, 4.

¹⁴ Swift to Dallas, 21 March 1815, Buell 546 NA.

¹⁵ —To Dumas, 4 May 1815, Buell 555 NA orders Dumas to New Orleans. —to Gadsden, 13 January 1816, Buell 631 NA contains Gadsden's orders; Swift to—, 16 October 1815, Buell 685 makes it plain that Dumas has been arrested, though not why; Buell 808 NA is Gadsden's report to Jackson. The title is given Gadsden in the Monthly Returns of the Corps of Engineers, Record Group 77 NA, hereafter cited as Monthly Returns. The Returns are available in two record groups, the work copies retained by the Corps (RG77) and the fair copies submitted to the Adjutant General (RG94).

¹⁶ Hill, *Roads, Rails and Waterways*, 6-9.

¹⁷ Orders to General Bernard and—, 10 February 1817, Buell 710 NA.

¹⁸ Poussin was sent on a per diem arrangement; "whilst on Topographical Duty, you will be allowed one dollar and a half per day..." Swift to Poussin, 10 February 1817, Buell 712 NA. Strictly speaking, all ranks in the Topographical Engineers were brevet ranks until President Jackson organized the service as a separate bureau in 1831.

¹⁹ Swift to Gadsden, 9 April 1818, Buell 758 NA.

²⁰ Swift to Cox, 28 July 1818, Buell 806 NA. The agent handled the money under the "total" supervision of the local Engineer. Materials and workmanship were supplied by a Washington firm.

²¹ Emanuel Raymond Lewis, *Seacoast Fortifications of the United States: An Introductory History*. (Washington: Smithsonian Institution, 1970), 42; *Annual Report of the Chief of Engineers for 1898*, 745.

²² *Laws of the United States Relating to the Improvement of Rivers and Harbors*, 3 vols. (Washington: Government Printing Office, 1940), I, 21. Hereinafter cited as *Laws Relating to Rivers and Harbors*.

²³ *Ibid.*, 22.

²⁴ *House of Representatives Document 35*, 17 Congress, 2 Session (1823); Andrew A. Humphreys and Henry L. Abbot, *Report upon the Physics and Hydraulics of the Mississippi River...* (Washington: Government Printing Office, 1876), 121.

²⁵ *Laws Relating to Rivers and Harbors*, I, 27; on Gibbons v. Ogden, see Felix Frankfurter, *The Commerce Clause*

Under Marshall, Taney & Waite (Chicago, 1964) and citations therein.

²⁶ *Proceedings of Congress*, 18 Congress, 1 Session (1824), 3217.

²⁷ *House of Representatives Document 2*, 20 Congress 1, Session (1827), 51-52. This report of Secretary of War James Barbour gives an excellent summary of the work undertaken in the years of Adams-Clay nationalism.

²⁸ *House of Representatives Document 125*, 20 Congress, 1 Session (1828), is the Bernard-Poussin report. The quoted phrase used in the preceding citation will be found in this report, 41.

²⁹ However, officers from other branches were regularly detailed to the Engineers and the Topographical Engineers. Andrew A. Humphreys, for example, was detailed from the artillery.

³⁰ *House of Representatives Document 2*, 21 Congress, 2 Session (1830), 12.

³¹ *House of Representatives Document 1*, No. 17, 22 Congress, 2 Session (1832).

³² Hill, *Roads, Rails and Waterways*, 214.

³³ *Ibid.*, 128.

³⁴ Shreve to Gratiot, *House of Representatives Document 1*, 23 Congress, 1 Session (1834), 126-130; Louis C. Hunter, *Steamboats on the Western Rivers: An Economic and Technological History* (New York: Octagon Press, 1969), 13-17, 75-76, 89-90, 193-203.

³⁵ Elliott, *Improvement of the Mississippi*, I, 69.

³⁶ Humphreys and Abbot, *Physics and Hydraulics*, 396-403. The authors take these cutoffs for study and reach general conclusions about all cutoffs. Modern views do not hold that all cutoffs are feasible, but that each one proposed must be studied independently. "The extent and character of the channel changes which follow a cutoff depend entirely upon local conditions. No general rule covering them can be deduced." Elliott, *Improvement of the Mississippi*, I, 61. See also Harley B. Ferguson, *History of the Improvement of the Lower Mississippi River for Flood Control and Navigation, 1932-1939* (Vicksburg: Mississippi River Commission, 1940).

³⁷ Harrison, *Alluvial Empire*, 61-65; Humphreys and Abbot, *Physics and Hydraulics*, 154 *et seq.* On flooding, see *House of Representatives Document 11*, 24 Congress, 1 Session (1835), 34.

³⁸ *Ibid.*, 67-87; Martha Virginia Shipman, "The Mississippi River Commission," unpublished M. A. Thesis (University of Arkansas, 1937), 10-11. The flood of 1849 inundated a large part of New Orleans as well as agricultural land. See Harry (Henry) Kmen, "New Orleans' Forty Days in '49," *The Louisiana Historical*

Quarterly, XL (January 1957), 24-25.

³⁹ *Laws Relating to Rivers and Harbors*, I, 116.

⁴⁰ *Returns of the Bureau of Topographical Engineers*, October 1850 and January 1852. In 1851 Humphreys was taken ill in the field. He traveled to Europe, partly for study and partly to regain his health and, following his return, was assigned to office work on the Pacific Railroad projects at Washington. Here he met Henry L. Abbot, who had done fieldwork on the railroad surveys. When the Delta Survey was resumed in 1857, Abbot took over the fieldwork, in which he received assistance from civil engineer Caleb G. Forshey. See the introduction to the *Physics and Hydraulics*.

⁴¹ Charles Ellet, *The Mississippi and Ohio Rivers: Containing Plans for the Protection of the Delta* (Philadelphia: Lippincott, Grambo & Co., 1853). Previously printed as *Senate Executive Document 20*, 32 Congress, 1 Session (1852). Hereinafter cited as *Ellet, Mississippi and Ohio*.

⁴² Elliott's volumes, an official publication of the Mississippi River Commission, praised Ellet's work: "In general, Ellet's studies are worthy of admiration. He not only prophesied the alarming increases in flood elevations which have since occurred, but his flood plan is in many respects remarkably similar to the present adopted project. . . . Ellet's greatest mistake was probably his advocacy of headwater reservoirs. His conclusions here were unsound." Elliott, *Improvement of Mississippi River*, II, 302.

⁴³ Ellet, *Mississippi and Ohio*, 63.

⁴⁴ These were essentially the criticisms of Humphreys and Abbot. See *Physics and Hydraulics*, 407-408.

⁴⁵ Elliott says, "(Ellet) apparently regarded levees as a dangerous expedient to be used only when no other method of flood control was practicable." *Improvement of Mississippi River*, II, 308.

⁴⁶ *Senate Executive Document 20*, 32 Congress, 1 Session (1852), 49-50.

⁴⁷ See for example Humphreys and Abbot, *Physics and Hydraulics*, 114-115.

⁴⁸ *Ibid.*, 350.

⁴⁹ The work was translated into the principal European languages, and was widely read, though not always praised, by Continental engineers. See Humphreys and Abbot, "Reply to Criticisms Made by Dr. Hagen," *Van Nostrand's Eclectic Engineering Magazine*, XVIII (January 1878), 1-8.

⁵⁰ On "levees-only" see Humphreys and Abbot, *Physics and Hydraulics*, 428-445. The other points will be discussed in the following chapters. A good biography of Humphreys is needed. See Henry H. Humphreys, *Andrew*

Atkinson Humphreys, A Biography (Philadelphia: John C. Winston Company, 1924).

⁵¹ *House of Representatives Document 185*, 22 Congress, 1 Session (1831-1832), 53-54.

⁵² Monthly Returns, March 1840; September 1840; March 1841; May 1841; September 1842. See also T. Harry Williams, *P. G. T. Beauregard, Napoleon in Gray* (Baton Rouge: LSU Press, 1954), 9-12.

⁵³ Monthly Returns, November 1845; November 1846; January 1847; December 1847; August 1848; September 1852; October 1852. The general distribution of rank in August 1848 also saw Robert E. Lee made a Brevet Colonel, Henry Halleck a Brevet Captain, and George B. McClellan a Brevet Captain.

⁵⁴ Hill, *Roads, Rails and Waterways*, 138; Monthly Returns, September, October, November 1852; May, September, October 1853. Smith was made captain in July 1853 and died on 13 September of the same year.

⁵⁵ *House of Representatives Report 88*, 34 Congress, 1 Session (1856), contains a critical report by the Commerce Committee on Davis' action, and the text of the proposed

contract with Eads & Nelson. Estill McHenry, ed., *Addresses and Papers of James B. Eads, Together with a Biographical Sketch* (St. Louis: Slawson & Co., Printers, 1884), vii, says that the proposal passed the House of Representatives "but failed for want of time in the Senate."

⁵⁶ *Annual Report of the Chief of Engineers for 1866*, in *House of Representatives Executive Document 59*, 39 Congress, 1 Session (1866), 9 *et seq.* References to these reports will henceforth be given in the form *Annual Report* (1866). Not all forms of civil works were abandoned; efforts to open the Passes of the Mississippi continued intermittently, and the Pacific Railroad surveys were carried out by the Topographical Bureau. These were works desired for various reasons by powerful elements of the Democratic Party, especially in the South, and were exceptions to the overall trend of events under the so-called "doughface Presidents," Pierce and Buchanan.

⁵⁷ Monthly Returns, February 1856; October 1856; April 1857; November 1860; January 1861; February 1861. Among others, the following former Engineer officers served with the contending armies: George B. McClellan, Robert E. Lee, Henry W. Halleck, William S. Rosecrans, P. G. T. Beauregard, Edmund Kirby Smith, George G. Meade, John Pope, and Godfrey Weitzel.

CHAPTER TWO

¹ In the 15 years between 1861 and 1876, the production of Delta staples dropped from 469,000 hogsheads of sugar and 2.3 million bales of cotton to 135,000 hogsheads and 1 million bales of cotton. The House committee which gave these figures blamed failure to recover from the war upon the fact that the "heart of the richest valley in the world...is annually inundated by the waters of the Mississippi." *House of Representatives Report 494*, 44 Congress, 1 Session (1876), 1.

² Between 1860 and 1870 the states drained by the Mississippi increased 64 percent in population. Manufactures in some cases increased five times over. During debate of the Eads bill, "Granges, boards of trade, chambers of commerce, political conventions...as well as...State legislatures" were cited in Congress as demanding the opening of the Passes. *Congressional Record*, 43 Congress, 2 Session (1875), 1442-1443. The boom in the regions that used the Mississippi as a road of commerce did not, of course, contradict the simultaneous picture of desolation in the inundated regions of the Delta. Boom and depression existed simultaneously and both contributed to the shaping of Federal policy for the river.

³ The accompanying chart is based on C. H. Chorpening, "Waterway Growth in the United States," *Centennial Transactions of the American Society of Civil Engineers* (1953), 1001. A good summary of the postwar change in attitude was expressed by James B. Eads, the future

builder of the jetties, to the Mississippi Improvement Convention, 12 February 1867: "Formerly constitutional objections were urged against the improvement of these rivers by those who had no scruples in voting for seaboard works. But such objectors are now rare, and their mischievous quibbles are generally rejected by a loyal people.... Does any statesman gainsay (Washington's) right to do it then? Does any patriot question its power to do it when the Union was in peril? When the necessity occurred there was a power in the government somewhere to provide for it." McHenry, *Addresses and Papers of James B. Eads*, 1.

⁴ Monthly Returns, March 1861.

⁵ Later under Major General Nathaniel P. Banks.

⁶ Monthly Returns, March 1862.

⁷ *Ibid.*, March 1864.

⁸ Captain George L. Gillespie. The Military Division was renamed the Department of the Gulf in August 1866 and later, under the Second Reconstruction Act, became part of the Fifth Military District (Texas and Louisiana). Gillespie stayed until 22 August 1867.

⁹ Monthly Returns, December 1865, March and August 1866; *Annual Report* (1866), 364.

¹⁰ The evolution of the responsibilities of the New Orleans District will be treated in the topical chapters that follow.

¹¹ *Annual Report* (1866), 9 *et seq.*

¹² *Annual Report* (1867), 376 *et seq.* Captain Charles Howell, later to be District Engineer at New Orleans, was chief assistant to Major John N. Macomb, who had charge of the Office of Western River Improvements at Cincinnati.

¹³ *Proceedings of the Convention for the Improvement of the Mississippi River* (Washington, D. C.: Mississippi River Improvement Convention, 1884), 31. The language of the speakers at the convention was only a colorful and unrestrained repetition of the viewpoint that Howell stated in his official report a decade earlier. See *Annual Report* (1874), Appendix R, 5-6. For that matter, McAlester had mentioned the same possibility in 1866: see *House of Representatives Document 56*, Part 2, 39 Congress, 2 Session (1866), 236-243.

¹⁴ 15 *Stat.* 25.

¹⁵ Elliott, *Improvement of the Mississippi River*, I, 6.

¹⁶ Summaries in *Annual Report* (1874), Appendix R, 19 *et seq.* See also *Annual Report* (1866), 240.

¹⁷ The Danube also discharges into a sheltered sea. The Sulina outlet of the Danube, where jetties had been successfully employed, was the subject of studies and polemics by American engineers trying to show that it was, or was not, similar to the Passes of the Mississippi and that the Black Sea was, or was not, a useful analogue to the Gulf of Mexico. See for example the discussion in Barnard's minority report of 29 January 1874, in *Annual Report* (1874), 73-76. On the four basic methods of improvement, see *House of Representatives Executive Document 16*, 33 Congress, 1 Session (1853), 8.

¹⁸ Of the many names used for this pass, the most sensible, Northeast Pass, is no longer used. Antoine-Simon Le Page du Pratz, *The History of Louisiana* (New York: Lamport, Blakeman & Law, 1853), 117 calls it East Pass but notes the existence of another small pass nearby called Otter Pass, which is "fit only for pettyaugres (pirogues)." Since *loutre* is French for otter, it seems probable that the name was transferred to the larger pass and then fractured by folk etymology into Pass a l'Outre ("Pass to the Outside"). The most common form in the 1870's was Pass a Loutre which, if it was neither French nor English, was at least simple, and is adopted here.

¹⁹ *Laws Relating to Rivers and Harbors*, I, 152.

²⁰ *Annual Report* (1866), Appendix XX, 236; *ibid.* (1867), Appendix F, 362.

²¹ *Ibid.*, 370-372; Monthly Returns, October 1867.

²² *Ibid.*, July 1868.

²³ *Annual Report* (1869), 260.

²⁴ From a memoir prepared by William M. Burwell and included in Howell's report for 1867. Burwell also estimated the ultimate cost of the *Essayons* at \$350,000. *Annual Report* (1874), Appendix R, 19 *et seq.*

²⁵ *Annual Report* (1874), 260.

²⁶ Chase's report was dated 9 February 1837. I have not been able to obtain a copy. His conclusions however may be deduced from his letter to General Charles Gratiot, Chief of Engineers, in 1836. At the request of the New Orleans Chamber of Commerce, Chase informs Gratiot he has dispatched a surveying party to the river mouth. He then proceeds to anticipate their conclusions. "...no improvement by art either by dredging or by permanent jetties or piers can be accomplished so as to secure permanent benefit.... I would also recommend that the proposition to cut the canal recommended by Major Buisson be at once adopted... and that the sum of \$500,000 be asked for the commencement of this work. The surveys, plans and details," he adds, "will not furnish data to alter materially this estimate." Letters of Captain W. H. Chase, No. 147, Record Group 77, National Archives. "M. Buisson" is spoken of by Ellet as "a distinguished engineer of New Orleans," in *Senate Executive Document 20*, 32 Congress, 1 Session (1852), 20.

²⁷ *Laws Relating to Rivers and Harbors*, 119.

²⁸ *House of Representatives Executive Document 16*, 33 Congress, 1 Session (1852).

²⁹ *Annual Report* (1875), Appendix R, 5-15 and 50-52.

³⁰ Monthly Returns, July 1866.

³¹ *Annual Reports* (1874), Appendix B, 79.

³² By this time the rise of the Granger movement was exerting pressure on Congress to find farm products an alternate route to market. See, for example, the statement of Congressman Charles G. Williams of Wisconsin speaking in favor of the first (House) version of the Eads bill: "However flippant the term may be on the tongue here (at Washington), whether you denominate it the 'grangers,' the 'hay-seed,' or the plain 'farmers movement,' or whatever glee all this cheap wit may create, still the sober question remains to the people of the West, 'How shall the cheap transportation of our surplus products from the interior to the seaboard be best secured?'" *Congressional Record*, 43 Congress, 2 Session (1875), 1442.

³³ He built the propeller-driven ironclads *Milwaukee* and *Winnebago* among others. *Congressional Record*, 43 Congress, 2 Session (1875), 1505. Eads' ironclads saw action more than a month before the fight of the *Monitor* and *Merrimac*. McHenry, *Addresses and Papers of James B. Eads*, vii-viii. Eads was a figure who naturally provoked partisanship, and his colorful biography by Florence Dorsey, *Road to the Sea* (New York and Toronto: Reinhart, 1947), is recommended with reservations. Eads

and Humphreys were great engineers, both egoists possessing adamantine certainties about their own abilities. But Eads was the maverick entrepreneur, Humphreys an organization man. Each considered himself the supreme authority on the Mississippi River. The clash between them was predestined, if anything ever was.

³⁴ Elmer Lawrence Corthell, *A History of the Jetties of the Mouth of the Mississippi River* (New York: John Wiley and Sons, 1881), 365. Hereafter cited as Corthell, *History of the Jetties*.

³⁵ *House of Representatives Executive Document 114* (Part 2), 43 Congress, 2 Session (1875).

³⁶ *Congressional Record*, 43 Congress, 2 Session (1875), 1441. This was by no means the first suggestion for involving private enterprise in the work on the river. Previous proposals had usually been for a "Mississippi Levee and Telegraph Company," or some variant thereof. The idea was to have levees constructed by a private company under specifications set by a mixed board of civil and military engineers. See *Senate Miscellaneous Document 3*, 42 Congress, Special Session (1871), 1-4; *House of Representatives Report 44*, 42 Congress, 2 Session (1872), 16; *House of Representatives Executive Document 187*, 42 Congress, 3 Session (1873), 1-7.

³⁷ In 1851 Ellet had reported that "at the head of South Pass... it is now scarcely possible for any useful craft to enter. A spit of sand has formed directly in the mouth of the pass, which has almost entirely closed up the entrance, and destroyed it for all commercial purposes." *Senate Executive Document 17*, 31 Congress, 2 Session (1851), 3-4. The Engineer Board of Chase, Latimer, Barnard, and Beauregard called the pass "now quite insignificant." *House of Representatives Executive Document 16*, 33 Congress, 1 Session (1854), 4-5.

³⁸ The chief provisions of the Act of 3 March 1875 were as follows:

Depth ft	Width ft	Payment
20	200	\$ 500,000
22	200	500,000
24	250	500,000
24*	250	250,000
26	300	500,000
26*	300	250,000
28	350	500,000
28*	350	250,000
30	350	500,000
30*	350	500,000
		<u>\$4,250,000</u>

* Indicates money payable when the channel had been maintained for 12 consecutive months. Five percent interest was added to date from the first attainment of the specified depth and width.

The remaining \$1 million was retained, 5 percent interest being paid to Eads and associates, with the principal becoming payable in two equal installments, at the end of 10 and 20 years, provided the 30- by 350-foot channel was maintained. In addition, \$100,000 per year for maintenance was to be paid from the first attainment of the 30- by 350-foot channel, which Eads was to maintain for 20 years. Thus, payment would total \$8 million.

From *Laws Relating to Rivers and Harbors*, I, 246-247.

³⁹ Monthly Returns, June 1875.

⁴⁰ *Ibid.*, February 1877. Captain M. R. Brown, "Annual Report upon the Improvement of South Pass of the Mississippi River Showing the Condition of the Works on June 30, 1878," 24. In *Annual Reports, New Orleans, La., Engineer District*, II.

⁴¹ Corthell, *History of the Jetties*, 344-345; *Annual Report* (1875), Appendix S; *House of Representatives Executive Document 12*, 44 Congress, 2 Session (1876); diagrams and charts accompanying *Annual Report* (1800), Appendix L.

⁴² Cf. discussion of the *Grand Republic* incident in Corthell, *History of the Jetties*, Appendix VIII, 278-295. Eads charged that a boatload of visiting capitalists was intercepted by one of Howell's assistants who gave them information purporting to show that the Gulf was shoaling beyond the jetties.

⁴³ By the terms of the final bill the 30-foot channel was still required, but no width was specified. If a continuous line of 30-foot depths wide enough to receive the sounding lead could be found, Congress would be satisfied. *Laws Relating to Rivers and Harbors*, I, 281-283; 301-302.

⁴⁴ Note especially the Boards of 1874 and 1878, which reported favorably on the jetty system both before and after Eads had done his work, and the reports of Micah Brown. See *Annual Report* (1875), Appendix S, 6 *et seq.*

⁴⁵ Corthell, *History of the Jetties*, 26-27; reports a critical speech by Carl Schurz, for example.

⁴⁶ "The conclusion is inevitable: the jetties must be extended annually at the same rate that the bar is advancing, if we intend to maintain permanently the same depth upon the bar. If the depth to be maintained is 27 feet at low water, or 28 feet at high water, it will be found... that the annual advance will not be less than 1,200 feet." Humphreys and Abbot, *Physics and Hydraulics*, 672. Italics in original. This analysis, published as an appendix to the *Physics and Hydraulics*, was originally prepared by Humphreys as part of his campaign against the jetties. It appears also in the *Annual Report* (1874), Part I, 854-867, and in *House of Representatives Executive Document 220*, 43 Congress, 1 Session, 1-15.

⁴⁷ Howell's results were probably attributable to negligence. The contours of the Gulf bottom beyond the jetties were continually changing during the course of the

work, and a few scattered soundings might give almost any results.

⁴⁸ See Eads' complaints in Corthell, *History of the Jetties*, 279-295.

⁴⁹ *Ibid.*, 305-308.

⁵⁰ *New Orleans Democrat*, 6 May 1876.

⁵¹ Corthell, *History of the Jetties*, 305; Williams, P. G. T. *Beauregard*, 288-290.

⁵² M. R. Brown, "Annual Report," 24-27, in *Annual Reports, New Orleans, La., Engineer District*, II. Also *Senate Executive Document 95*, 45 Congress, 2 Session (1878), 46-47.

⁵³ The first seagoing vessel to enter the river by the jettied pass was the *Hudson* on 12 May 1876. During 1877, 587 ocean vessels went through the pass, and by 1879 Southwest Pass was almost abandoned except by fishing boats and schooners. Dorsey, *Road to the Sea*, 206, 213. The same year a New York paper reported, "To realize how much the jetties have already done for New Orleans, one has only to sail along the riverfront of the city, where I counted last week no fewer than one hundred and twenty large square-rigged sailing vessels and eighteen ocean steamers. Fully four-fifth of these ships came from foreign ports." *New York Daily Tribune*, 29 March 1879.

⁵⁴ Corthell, *History of the Jetties*, 320-330.

⁵⁵ *Senate Executive Document 8*, 40 Congress, 1 Session (1866), 13.

⁵⁶ *Annual Report* (1869), 327 *et seq.* A bill was considered by the Senate Committee on Commerce to underwrite state bonds of Louisiana, Mississippi, and Arkansas for levee repairs but the scheme came to nothing. *Senate Miscellaneous Document 8*, 41 Congress, 1 Session (1869), Louisiana was reported to have issued \$8 million in bonds for levees by 1872 without any appreciable success in defending her best cotton land. *House of Representatives Report 44*, 42 Congress, 2 Session (1872), 6. See also Joe Gray Taylor, *Louisiana Reconstructed* (Baton Rouge: LSU Press, 1974), 195-196.

⁵⁷ Elliott, *Improvement of the Mississippi*, II, 162; *Annual Report* (1875), 539. The three-and-two makeup, with the president chosen from the Corps personnel, had the same form as the later House plan for the Mississippi River Commission.

⁵⁸ *Ibid.*, 552, 539; Elliott, *Improvement of the Mississippi*, II, 162.

⁵⁹ *Annual Report* (1875), 564-565.

⁶⁰ The flood of 1874 opened a period of transformation, and the flood of 1882 brought it to a climax. In 1874 Congress authorized the President to issue food and rations to the sufferers and followed up by creating the Levee Commission. There is some background on the state of Congressional feeling at this time in Martha Virginia Shipman, "The Mississippi River Commission," Unpublished Master's Thesis (University of Arkansas, 1937), 14-15.

⁶¹ Conventions were held throughout the period. See, e.g., *Give Us an Unobstructed Mississippi* (St. Louis: J. J. Daly and Co., printers, 1877); *Official Report of the Proceedings of the Mississippi River Improvement Convention* (St. Louis: Great Western Printing Co., 1881); and *Proceedings of the Mississippi River Improvement Convention* (St. Louis: Great Western Printing Co., 1881); and *Proceedings of the Mississippi River Improvement Convention* (Washington: n.p., 1884).

⁶² Tom Sawyer appeared in 1875, *Life on the Mississippi* in 1883, and *Huckleberry Finn* in 1884.

⁶³ *Congressional Record*, 46 Congress, 2 Session (1879), 1730. See also Arthur DeWitt Frank, *The Development of the Federal Program of Flood Control on the Mississippi River* (New York: Columbia University Press, 1930), 41-44.

⁶⁴ *Congressional Record*, 46 Congress, 2 Session (1879), 2101.

⁶⁵ See Senator Ferry's speech in favor of the defeated amendment. *Congressional Record*, 46 Congress, 1 Session (1879), 2102.

⁶⁶ *Laws Relating to Rivers and Harbors*, I, 304. The critical paragraph was Section 4: "It shall be the duty of the said commission to take into consideration and mature such plan or plans and estimates as will correct, permanently locate, and deepen the channel and protect the banks of the Mississippi River; improve and give safety and ease to the navigation thereof; prevent destructive floods; promote and facilitate commerce, trade, and the postal service . . . *Provided*, that the Commission shall report in full upon the practicability, feasibility, and probable cost of the various plans known as the jetty system, the levee system, and the outlet system, as well as upon such others as they deem necessary."

The effect of this Delphic utterance was to establish channel stabilization as the primary goal, but to open the way to the advocates of levee building, who began by urging levees as a means of channel improvement and ended by frankly building for flood control.

⁶⁷ Shipman, "Mississippi River Commission," 26-33; Robert Harrison, *Alluvial Empire*, 150-152.

CHAPTER THREE

¹ *House of Representatives Executive Document 58*, 46 Congress, 2 Session, 22-23.

² Special Order 83, Headquarters of the Chief of Engineers, 25 July 1879, in Monthly Returns, July 1879.

³ *Annual Report* (1881), 2732-2734.

⁴ See Shipman, "Mississippi River Commission," 35; Elliott, *Improvement of the Mississippi*, III, Plates LIX and LX; John R. Ferrell, *From Single- to Multi-Purpose Planning: the Role of the Army Engineers in River Development Policy, 1824-1930* (Baltimore: Historical Division, OCE, 1976), 73.

⁵ *Proceedings of the Mississippi River Commission*, I (1879-1884), 21 January 1880, 14; 7 May 1881, 2. Hereinafter cited as *Commission Proceedings*.

⁶ The Commission resolved in 1880 that a levee system "gives aid to navigation, promotes and facilitates commerce... trade and postal service," a repetition of the language of the organic law. *Commission Proceedings*, I, 22 January 1880, 20. However, it held also that levees were works subsidiary to the main purpose of channel stabilization. *Ibid.*, 25 March 1881, 7-9. The remark about experimental work is in *ibid.*, 24 March 1881, 6.

⁷ *Annual Report* (1883), Pt. 1, 2118; 22 *Stat.* 191.

⁸ *Laws Relating to Rivers and Harbors*, I, 382.

⁹ *Annual Report* (1882), Pt. 2, 1354.

¹⁰ On the extent of the flood, see illustration. "During this flood an area of 34,600 square miles in the lower valley was overflowed to an estimated average depth of six and one-half feet. The river was above bank-full stage for sixty days at Cairo and eighty days at Red River Landing, La." Elliott, *Improvement of the Mississippi*, I, 97. Plea of Greenville, *Commission Proceedings*, I, 16 August 1882, 6. Plea of 11 Louisiana Parishes, *ibid.*, 19 November 1882, 4. Statement of Senator Lamar, *ibid.*, 15 August 1882, 3.

¹¹ *Ibid.*, 16 August 1882, 6.

¹² *Ibid.*, 17 August 1882, 10. Brigadier General Quincy A. Gillmore, the president, did not vote. Eads and Judge R. S. Taylor were absent, Eads being in poor health at the time. In a letter to the Commission (*ibid.*, 15) he asked that his vote be recorded in the affirmative on any proposition to close the levee gaps.

¹³ On levee priorities, see *Commission Proceedings*, III, 4 August 1892, 38. On the standard gage, see e.g. *ibid.*, 11 November 1899, 614. An example of maintenance rulings (forbidding cuts, pipes, and flumes) is given in *ibid.*, 24 March 1891, 10. Commission standards were of course extended as its authority grew to cover virtually the whole

river above the Head of Passes, and the major tributaries as well. See summary in *Annual Report* (1928), 1876-1877.

¹⁴ *Commission Proceedings*, 27 November 1886, 13-15; 10 May 1884, 8; 12 November 1900, 686.

¹⁵ Above paragraphs based on material in George D. Waddill Papers, NOD Library; ledgers and account books, NOD Library; John Klorer "An Engineer Reminisces," Ms memoir, NOD Library.

¹⁶ Waddill papers.

¹⁷ *Commission Proceedings*, 9 July 1897, 455, 22 July 1897, 438-440.

¹⁸ "When the Mississippi River Commission was created, the report of Humphreys and Abbot became a virtual 'Bible,' and successive generations of engineers saw fit to repeat the conclusions of the report. The idea that levees afforded the only sensible means of control became fixed in the minds of official engineers." Harrison, *Alluvial Empire*, 122-123. This viewpoint seriously underestimates Eads' influence, exaggerates Humphreys', and underrates the physical difficulties and political pressures which the Commission faced in developing a workable policy.

¹⁹ "It would seem, therefore, that a closure of the crevasses might be expected to accelerate the removal of those shoals which have been produced by them..." reported the Commission on 17 February 1880. Compare Humphreys and Abbot, *Physics and Hydraulics*, 412: "Direct measurements do not show that deposits occur in the river channel below the crevasses."

²⁰ The theory that an almost impervious Tertiary "blue clay" formed the bed of the river was introduced in the *Physics and Hydraulics*, 91-95, and was repeated by Humphreys throughout his life. This represented a serious underestimate of the depth of Quaternary sediments in the Delta.

²¹ *Commission Proceedings*, II, 1 July 1887, 9; 30 June 1887, 2.

²² *Commission Proceedings*, 2 October 1890, 10. "The work to be done, which is necessary to protect the (Atchafalaya) district from another inundation, should the water of '91 reach the line of the last flood, will cost in money far more, than we have or can expect to raise this year.... In spite of popular clamor, we have levied the extreme limit of taxation... which is claimed to be so onerous that mass meetings of the people are being called to protest against collection. It is true that the power to issue bonds has also been conferred upon (us), but owing to stringency here and in New York of the money market, we have failed to negotiate them." See *ibid.*, 12-23 and *passim*. The plea of navigation was sometimes still made, but was more often omitted, as in the plea quoted.

²³ *Laws Relating to Rivers and Harbors*, I, 577-578. A resolution appropriating \$4 million to meet the spring flood of 1891 restored the clause forbidding levee construction for flood control, apparently in a purely formal and pietistic spirit, since the Commission had long grown adept in justifying any levee by the navigation criterion. Reasons for revival of the clause come down to this: levee opponents wanted the restriction, and proponents felt it did not matter.

²⁴ *Laws Relating to Rivers and Harbors*, I, 609; *Commission Proceedings*, 19 March 1891, 2-3. The revival brought forth some blunt talk from riparian politicians and local interests: the levee boards were burdened with debt; the restriction was not meant, and should not be taken, seriously. See *Commission Proceedings*, 15 July 1891, 11-19. The votes which followed indicated that the Commission agreed. *Ibid.*, 19-20. The proviso disappeared again in subsequent acts and was not revived.

²⁵ *Ibid.*, 1 October 1890, 1-9, 16.

²⁶ *Ibid.*, 29 November 1890, 19.

²⁷ *Ibid.*, 2 August 1892, 62-63.

²⁸ *Ibid.*, 11 January 1896, 296-297; *Laws Relating to Rivers and Harbors*, I, 785.

²⁹ *Index to Annual Reports (1866-1912)*, I, 1085.

³⁰ C. H. Chorpening, "Waterway Growth in the United States," *Centennial Transactions of the American Society of Civil Engineers* (1953), 1024.

³¹ Threat to sue, *Commission Proceedings*, 27 June 1894, 166; Weather Bureau bulletin quoted, Harrison, *Alluvial Empire*, 120.

³² *Ibid.*, 123.

³³ *Ibid.*, 124.

³⁴ *Ibid.*, 159.

³⁵ John C. H. Lee, "A Flood Year on the Mid-Mississippi," *The Military Engineer* (July-August 1928), 306. This and other gage readings, by the way, indicated height above a standard low point. The zero, though supposed to represent extreme low water, was, in fact, a standardized benchmark and minus readings were occasionally reported. See Elliott, *Improvement of the Mississippi*, I, 76.

³⁶ *Ibid.*, 307. See also *House of Representatives Document 798*, 71 Congress, 3 Session (1931), 99.

³⁷ *New York Times*, 17 April 1927, 9.

³⁸ See Elliott, *Improvement of the Mississippi*, III, Plate XXVII, for a vivid picture of the rainfall distribution. Many areas contiguous to the river received from one third to one half their normal annual precipitation during these 2 months alone. Compare *ibid.*, Plate II. The heavy rains of the preceding fall and winter saturated the terrain and filled the natural reservoirs. Rainfall was worst in Arkansas, Missouri, Tennessee, and Louisiana, and the rains of December, January, and March were responsible for the three great "waves" of the flood, each following a month after the precipitation. See *House of Representatives Document 798*, 71 Congress, 3 Session (1931), 96 *et seq.* for a comprehensive statistical and descriptive summary of the flood.

³⁹ This was the "Good Friday rain" which some residents of the city still remember.

⁴⁰ *New York Times*, 19 April 1927, 1.

⁴¹ *Ibid.*, 2.

⁴² *Ibid.*, 20 April 1927, 7.

⁴³ The crevasses of 1927 had a combined length of 5.2 miles, and water escaping through them overflowed about 23,000 square miles of land. Elliott, *Improvement of the Mississippi*, I, 114.

⁴⁴ *New York Times*, 24 April 1927, 1.

⁴⁵ Lee, "A Flood Year on the Mississippi," 309.

⁴⁶ *New York Times*, 22 April 1927, 1.

⁴⁷ *Ibid.*, 23 April 1927, 1.

⁴⁸ *Ibid.*, 24 April 1927, 1.

⁴⁹ *Ibid.*, 27 April 1927, 1.

⁵⁰ *Ibid.*, 30 April 1927, 1, 29.

⁵¹ Estimates by the Secretary of War. *House of Representatives Document 90*, 70 Congress, 1 Session (1927), 2. The Mississippi Flood Control Association estimate of direct damages was \$236,334,414.06. *Ibid.*, 10.

CHAPTER FOUR

¹ See for example Gifford Pinchot's testimony in *Hearings Before the Committee on Flood Control of the House of Representatives* (Washington: Government Printing Office, 1927), V, 3469-3472. These hearings were

marked by extreme hostility to the Corps on the part of the chairman, Frank R. Reid of Illinois. Reference cited hereafter as *House of Representatives Flood Control Hearings (1927-1928)*.

²The Jadwin Plan is given in *House Document 90*, 70 Congress, 1 Session (1927). The Commission plan was withheld from Congress by Jadwin, but was secured by the committee and printed as *House of Representatives Committee Document 1*, Committee on Flood Control, 70 Congress, 1 Session (1927). See also Elliott, *Improvement of the Mississippi*, II, 323. Jadwin's own version of the differences between the plans is given in *House of Representatives Flood Control Hearings* (1927-1928), V, 3581. The four Boards reporting to the Chief of Engineers were the Spillway, Diversion, Reservoir, and Navigation Boards. Jadwin considered the Mississippi River Commission a fifth "Board," on a level with the others.

³*Laws Relating to Rivers and Harbors*, III, 204 *et seq.* The act repeats the language of the Jadwin Plan to a remarkable extent. The definitive account of the Mississippi River and Tributaries Project is Norman P. Moore, *Improvement of the Lower Mississippi River and Tributaries, 1931-1972* (Vicksburg, Mississippi River Commission, 1972).

⁴*House of Representatives Document 90*, 70 Congress, 1 Session (1927), 4-5 and 24.

⁵*House of Representatives Document 798*, 71 Congress, 3 Session (1931), I, 5.

⁶*House of Representatives Document 90*, 70 Congress, 1 Session (1927), 6-7. Jadwin quoted in letter, Jadwin to Black, 23 December 1927, Box 892, NA, RG 77.

... The Jadwin Plan envisioned a total cost of \$296.4 million, later raised by Congress to \$325 million.

⁸Elliott, *Improvement of the Mississippi*, II, 291-292. Local interests were not always happy about the fuse-plug concept, or for that matter, about the Jadwin Plan. See *House of Representatives Flood Control Hearings* (1927-1928), V, 4768-4769, and *infra*.

⁹"The chief contentions against the Army Plan are that there is no necessity for floodways and backwater areas of such width and length as the Army Plan provides, and that it lacks provision for indemnification for property to be used, damaged, or destroyed in the areas to be taken over for floodways, backwater areas, and outlets." *Flood Control in the Lower Mississippi Valley, Report Submitted by the Board of State Engineers to his Excellency, Huey P. Long, Governor of the State of Louisiana, November 30, 1929* (n.p., n.d.), 5. The claim for indemnification was based on the fact that the people of the floodway had previously taken equal chances with the rest of the flood plain—i.e., the levees might crevasse anywhere. By raising the mainline levees and leaving the levees guarding the floodway entrances as they were (thereby converting them into "fuseplugs") the flood control plan insured that great floods would enter the floodway areas and no place else. See *ibid.*, 8-9 and *passim*. The Louisiana Board of State Engineers demanded indemnification for flowage rights, restriction of floodway use to only one of the proposed basins, continuous and adequate guide levees, and relocation of traffic arteries which traversed the floodway.

ibid., 22-23. These, plus the demand for control structures in place of the fuseplugs, and the "widening of Berwick Bay sufficiently to discharge the additional floodwaters," were all substantially met by the future evolution of the flood program.

¹⁰*House of Representatives Document 90*, 70 Congress, 1 Session (1927), 3. This was vigorously opposed by local interests which secured total assumption of the burden by the Federal Government. See *Laws Relating to Rivers and Harbors*, III, 2005. However, the same paragraph of the Flood Control Act that provided for total Federal assumption of cost also declared for the principle of local contribution.

¹¹Colonel Charles Potter, President of the Commission, was promoted and then ousted and replaced by Brigadier General T. H. Jackson, a move widely believed to have been engineered by Jadwin with the support of the White House to insure acceptance of the Jadwin Plan and to bring the Commission to heel. See *House of Representatives Document 90*, 70 Congress, 1 Session (1927), 33; references in note 2 of this chapter; biography of Potter in Scheufele, *North Pacific Division*, Appendix I.

¹²See Harrison, *Alluvial Empire*, 115-135, for a good brief account of floods from 1897 to 1927.

¹³*Ibid.*, 113 (chart).

¹⁴*Ibid.*, 122.

¹⁵See Elliott, *Improvement of the Mississippi*, II, 315 and 319 on extension of Commission authority.

¹⁶Shipman, "Mississippi River Commission," 90-101, gives a much less favorable view of the Commission's role comparing it only with what came after and not with what came before.

¹⁷Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920* (New York: Atheneum, 1969); *House Document 308*, 69 Congress, 1 Session (1925); Ferrell, *From Single- to Multi-Purpose Planning*, *passim*.

¹⁸*Laws Relating to Rivers and Harbors*, III, 1703.

¹⁹The establishment of the Federal Barge Line played a large part in this revival. See *Mississippi River Navigation* (Vicksburg: Mississippi River Commission, 1970), 5. For present traffic see chart, *ibid.*, Appendix I. Chorpening, "Waterway Growth in the United States," 1025-1026, rightly sees the underlying causes of the revival in the needs of industry and a growing population. The war speeded a redevelopment of water commerce that would have occurred anyway.

²⁰*Laws Relating to Rivers and Harbors*, III, 1903, Sec. 3.

²¹*Ibid.*, III, 2404, Sec. 1. This important act also redefined into its present form the responsibilities of local authority in works undertaken by the Federal

Government. See *ibid.*, 2405, Sec. 3.

²² For a discussion of these points see Chapter Six.

²³ War Department General Order 15, Office of the Chief of Engineers, 7 October 1929, paragraphs 2 and 3.

²⁴ On the cutoff program see Brigadier General Harley B. Ferguson, *History of the Improvement of the Lower Mississippi River for Flood Control and Navigation, 1932-1939*. Pages 4-5 give a concise account of the Boeuf and Eudora Floodways.

²⁵ Bonnet Carré is shown as a church on the west bank, within the convex curve of the river, on the Bernard and Poussin map. The area identified with the name in recent years is the east bank, i.e., the concave arc of the bend where bank caving normally takes place. Here the river approaches to within 8 miles of Lake Pontchartrain. Pontchartrain, in turn, connects with the Gulf through Lake Borgne and the Mississippi Sound.

²⁶ Other crevasses occurred in 1948 and 1959. Elliott, *Improvement of the Mississippi*, II, 198.

²⁷ Humphreys and Abbot, *Physics and Hydraulics*, 422 *et seq.*; Ellet, *Mississippi and Ohio Rivers*, 170-180.

²⁸ *Laws Relating to Rivers and Harbors*, III, 1932. On the Comstock and Taylor proposals, see J. A. Ockerson and R. S. Taylor, *Outlets for Reducing Flood Heights* (St. Louis: MRC, 1914), 7, 43-45.

²⁹ The report of the Spillway Board is printed as *House of Representatives Document 95*, 70 Congress, 1 Session (1927).

³⁰ *House of Representatives Document 798*, 71 Congress, 3 Session (1931), is the prime source for the first years of the flood control program.

³¹ *Ibid.*, 206.

³² *Ibid.*, 207. Many photographs and plans of the work will be found following *ibid.*, 238.

³³ *Ibid.*, 206.

³⁴ *Ibid.*, 214 *et seq.*

³⁵ *Ibid.*, 207-214; 235.

³⁶ *Ibid.*, Plate III; *Annual Report* (1937), I, 1675.

³⁷ *Annual Report* (1937), I, 1678.

³⁸ By comparison, the project flood was visualized as consisting of 2.2 million second-feet from the Ohio and 250,000 from the upper river; or by a different rainfall distribution, 1.45 million from the Ohio and 1 million from the upper river. The 1937 flood was, therefore, about 82 percent of the project flood at Cairo.

³⁹ *Annual Report* (1937), I, 1679; *Commission Proceedings* (1932-1939), II, 5228-5235.

⁴⁰ *Annual Report* (1937), I, 1743; 1679.

⁴¹ *Ibid.*, 1744.

⁴² *Ibid.*, 1678.

⁴³ Harold N. Fisk, *Geological Investigation of the Atchafalaya Basin and the Problem of Mississippi River Diversion*, I, 8-9.

⁴⁴ *Ibid.*, 17-18; 65-68.

⁴⁵ William Sommer, "Atchafalaya Basin Levee Construction," Unpublished Master's Thesis (Tulane University, 1966), 8-9.

⁴⁶ *Commission Report* (1881), 131.

⁴⁷ Quoted in *Commission Report* (1881), 130.

⁴⁸ See Chapter One.

⁴⁹ Fisk, *Geological Investigation of the Atchafalaya*, 122.

⁵⁰ *Annual Report* (1880), Pt. II, 1295; (1881), Part II, 1391-1392; *Annual Report* (1888), Pt. IV, 2294 *et seq.* On Eads' resignation, see Dorsey, *Road to the Sea*, 264.

⁵¹ The Atchafalaya is leveed for 52 miles south of Old River junction. Fisk, *Geological Investigation of the Atchafalaya*, 9. The western rim of the basin (the Teche ridge) and the eastern rim (the Lafourche-Mississippi ridge) were to be leveed and closed by fuseplugs at the northern ends. Thus, three channels were to be created: the Atchafalaya itself, and the West and East Atchafalaya Floodways, the last two to be used during great floods only. Despite the significant changes introduced by the building of the Morganza Floodway and Control Structure in place of the East Floodway, this pattern remains the basic form of the Atchafalaya diversion system.

The floodways converge below the leveed portion of the river, where the whole basin becomes a single flood channel.

⁵² Fisk, *Geological Investigation of the Atchafalaya*, 141.

⁵³ Rodney A. Latimer and Charles W. Schweizer, *The Atchafalaya River Study* (Vicksburg: Mississippi River Commission, 1951), 35. In 1970 some eastward flow was again observed, for the first time in 28 years. Interview with Jefferson L. Smith, Chief of Construction Division, New Orleans District.

⁵⁴ *Ibid.*, 43, 47. Ironically, the Chief of Engineers and the Mississippi River Commission reported favorably on a scheme to enlarge Old River for navigation the same year. See *Senate Document 53*, 82 Congress, 1 Session (1951).

⁵⁵ Fisk, *Geological Investigation of the Atchafalaya*, 141. A critical period occurs in the deterioration of a channel,

when the water velocity drops too low to carry sand. The rapid precipitation which follows blocks the channel with a "sand plug" after which filling is rapid and well-nigh irreversible.

⁵⁶ See the series of articles by B. L. Krebs in *New Orleans Times-Picayune*, 20-23 September 1953.

⁵⁷ Sommer, "Atchafalaya Basin Construction," *passim*. Sommer was Assistant Chief of the Design Branch in the New Orleans District.

⁵⁸ Interview with Herbert Juneau, Lafayette, La., 1971.

⁵⁹ Interview with Warren B. Dodd, New Orleans, La., 1971, and Herbert Juneau, Lafayette, La., 1971.

⁶⁰ Interview with George H. Hudson, New Orleans, La. 1971.

⁶¹ *Washington Post*, 4 April 1973.

⁶² *New York Times*, 5 April 1973.

⁶³ *Washington Post*, 6 April 1973.

⁶⁴ *Ibid.*, 9 April 1973.

⁶⁵ *AP Bulletin* PD 1045 AES 4/9; *New Orleans Times-Picayune*, 9 April 1973.

⁶⁶ *New Orleans States-Item*, 11 April 1973.

⁶⁷ *AP Bulletin* SR 1043 AES 4/17.

⁶⁸ Quoted in *Ibid.*

⁶⁹ *UPI Bulletin* 09: 32 AES 4/18.

⁷⁰ *UPI Bulletin* 08: 49 AES 4/20.

⁷¹ *UPI Bulletin* 09: 37 AES 4/23.

⁷² *Washington Post*, 28 April 1973.

⁷³ *UPI Bulletin* 09: 37 AED 5/7.

⁷⁴ See *Christian Science Monitor*, 22 May 1973.

⁷⁵ *U. S. News and World Report*, 23 April 1973.

⁷⁶ *Jacksonville (Ill.) Journal*, 24 May 1973.

⁷⁷ *Jackson Clarion-Ledger*, 6 May 1973.

⁷⁸ *Christian Science Monitor*, 31 May 1973.

CHAPTER FIVE

¹ The district apparently did not have firm boundaries, but was assigned projects in a region that generally included the Sabine basin but excluded the Mississippi and Red. See for example *Annual Report* (1902), 329 *et seq.* On coast defenses, citations in *Index to Annual Reports*, II, 1979-1982.

² Scheufele, *North Pacific Division*, 1.

³ Creation of Divisions, *Annual Report* (1889), 16; assignment of New Orleans to Southeast Division, *ibid.*, 194.

⁴ Creation of Gulf Division, *Annual Report* (1902), 62; assignment of Adams, above and *ibid.*, 310.

⁵ *Ibid.*, 315-316.

⁶ *Senate Document 1*, 19 Congress, 2 Session (1826), 217; *House of Representatives Document 185*, 22 Congress, 1 Session (1831-1832), 53-54. See also *Annual Report* (1876) 514. On the Florida Canal, see Henry E. Barber, "The History of the Florida Cross-State Canal," Ph. D. Dissertation, University of Georgia, 1969.

⁷ *Treasury Document 373* (1882) cited in *Index to the Annual Reports* (1866-1912), I, 623-624.

⁸ *Annual Report* (1876), 511-514, 523.

⁹ *Ibid.*, 508-511.

¹⁰ *Index to the Annual Reports* (1866-1912), 623-624.

¹¹ *Laws Relating to Rivers and Harbors*, I, 219.

¹² *Annual Report* (1873), 66.

¹³ This officer is an intriguing figure in many ways. His life was short (he died in 1882, when he was only 40) and his projects by and large were unsuccessful. Yet he planned the canal to the Gulf, directed the first surveys of the Gulf Intracoastal Waterway, and experimented with the mattress revetment for the harbor of New Orleans.

¹⁴ *Annual Report* (1875), 875.

¹⁵ *Ibid.*, 876.

¹⁶ *Ibid.*, 877-80. Pages 876-900 contain the first thorough study for the route of the western Intracoastal Waterway.

¹⁷ *Laws Relating to Rivers and Harbors*, II, 1127.

¹⁸ *House of Representatives Document 640*, 59 Congress, 2 Session (1902), 7. On the origins of the Louisiana oil and sulfur industries, see C. Vann Woodward, *Origins of the New South, 1877-1913* (Baton Rouge: Louisiana State University Press, 1951, 1971), 303-304.

¹⁹ *Ibid.*, 2, 9; "United States Inland Waterways: Existing and Proposed Routes. Compiled from maps accompanying report of Board of Eng'rs. dated Feb. 1, 1910 and other sources," New Orleans District Library. The Engineer Board which reported on the Florida-Rio Grande section of the national Intracoastal Waterway recommended following one of these canals on grounds of cost. *House of Representatives Document 610*, 63 Congress, 2 Session (1914), 40.

²⁰ George D. Waddill, then a junior engineer with the New Orleans District, left a description of his part in these surveys. "Memorandum from Mr. Chas. Senour. Subject: Survey of Gulf Intracoastal Waterway—1907," George D. Waddill Papers, New Orleans District Library.

²¹ *House of Representatives Document 610*, 63 Congress, 2 Session (1914), 32; *Laws Relating to Rivers and Harbors*, II, 1242.

²² *Annual Report* (1912), Pt. 1, 659; *ibid.* (1909), 1468.

²³ *Annual Report* (1917), Pt. II, 2551.

²⁴ *Laws Relating to Rivers and Harbors*, II, 1352 *et seq.*

²⁵ In 1907 Edgar Jadwin, future Chief of Engineers, wrote: "The Mississippi river seems to be started on its proper function, as far as transportation is concerned, of carrying heavy articles to relieve the railroads, and doing it more economically." He viewed the western Intracoastal Waterway as a logical way to develop this function, and he felt that the region west of the Mississippi, with its longer distances and higher freight rates, would especially benefit from the development of waterways for bulk transport. See *House of Representatives Document 640*, 59 Congress, 2 Session (1907), 26-27 and *passim*.

²⁶ *Laws Relating to Rivers and Harbors*, III, 1869.

²⁷ *Ibid.*, III, 1879.

²⁸ *House of Representatives Document 238*, 68 Congress, 1 Session (1924), 6-7. On the IWC, see Edwin A. Leland, Jr., "An Administrative History of the Inland Waterways Corporation," Ph. D. Dissertation, Tulane University, 1960.

²⁹ Article "Houston," *Encyclopedia Britannica* (Chicago: The Encyclopedia Britannica, Inc., 1939), XI, 844-845; *House of Representatives Document 582*, 87 Congress, 2 Session (1962), 3.

³⁰ *House of Representatives Document 238*, 68 Congress, 1 Session (1924), 7-8 and accompanying maps and charts.

³¹ *Ibid.*, 11.

³² *Mississippi River Navigation*, 19.

³³ *Laws Relating to Rivers and Harbors*, III, 1899.

³⁴ *Annual Report of the New Orleans District* (1926), 871.

³⁵ *Annual Report of the Chief of Engineers* (1930), 5.

³⁶ *Ibid.* (1931), 5.

³⁷ *Ibid.* (1968), 409-412.

³⁸ *Mississippi River Navigation*, Appendix A.

³⁹ See Chapter Two.

⁴⁰ Biographical information obtained for Historical Division, Office of the Chief of Engineers, P. O. Box 1715, Baltimore, Md. 21203.

⁴¹ *Annual Report* (1878), Pt. I, 614-617

⁴² *Laws Relating to Rivers and Harbors*, I, 271.

⁴³ *Annual Report* (1879), 875-878.

⁴⁴ *Commission Proceedings*, 18 September 1882, 19.

⁴⁵ *Commission Proceedings*, 8 November 1893, 150; 22 July 1897, 442. The Orleans Levee Board applied for Commission funds but was evidently refused.

⁴⁶ *Commission Proceedings*, 30 November 1897, 498; 11 December 1898, 515. See also *Maps of the Mississippi River* (Vicksburg: Mississippi River Commission, 1936), Map 46.

⁴⁷ Cf. *Commission Proceedings*, 2 September 1886, 18; 21 September 1888, 13; 24 September 1888, 24; December 1888, 13; 28 December 1888, 5; 1 July 1896, 360.

⁴⁸ See Chapter III, *Commission Proceedings*, 16 March 1897, 419-420.

⁴⁹ See *Senate Document 36*, 87 Congress, 1 Session (1961), *passim*.

⁵⁰ On early efforts by New Orleans to secure a river-lake connection see *Laws Relating to Rivers and Harbors*, I, 20; *Annual Report* (1868), 486-496. Such a connection, resembling the Industrial Canal, was seen as a part of an intracoastal waterway system by Brigadier General Simon Bernard in 1826. See Note 6, this chapter.

⁵¹ *Commission Proceedings*, 1 November 1908, 1449-1450; 25 November 1970; *Annual Report* (1925), 810-911.

⁵² *Laws Relating to Rivers and Harbors*, III, 1811.

⁵³ *House of Representatives Committee Document 46*, Committee on Rivers and Harbors, 71 Congress, 2 Session (1930), 1.

⁵⁴ *Ibid.*, 1-2.

⁵⁵ *Ibid.*, 3. But see *House of Representatives Committee Report 46*, Committee on Rivers and Harbors, 71 Congress, 2 Session (1930).

⁵⁶ *Annual Report (1948)*, 1040; *House of Representatives Document 96*, 79 Congress, 1 Session (1942).

⁵⁷ *House of Representatives Document 245*, 82 Congress, 1 Session (1951) 1, 6.

⁵⁸ The Bureau of the Budget represented local contributions as amounting to only about nine-tenths of one percent, which may have been accurate with regard to direct costs but did not reflect the whole burden of the locality. The Chief of Engineers required that local interests supply all rights-of-way, maintain a projected highway bridge over the Outlet (a bridge whose construction had already been authorized for the eastern Intracoastal Waterway), hold the United States free from all claims for damages, and "construct, maintain and operate terminal facilities commensurate with requirements for the expanded port." *Ibid.*, 5.

⁵⁹ *Ibid.*, 2-3.

⁶⁰ See speeches by Senators Russell Long and Allen

Ellender, *Congressional Record*, 84 Congress, 2 Session (1956), CII, Pt. 4, 5027.

⁶¹ Public Law 84-455; *New York Times*, 14 May, 20 January, 19 January 1954.

⁶² *House of Representatives Document 740*, 63 Congress, 2 Session (1914), I, 681-688.

⁶³ During 1898-1909 the Corps improved Bayou Plaquemine as a connection to the Mississippi, providing it with a lock at the town of Plaquemine a few miles south of Baton Rouge. See *Annual Report (1898)*, 1471; *Annual Report (1909)*, 1460. This link has now been discontinued.

⁶⁴ Article "Lake Charles," *Encyclopedia Britannica* (Chicago: The Encyclopedia Britannica, Inc., 1939). XIII, 601.

⁶⁵ *House of Representatives Document 46*, 46 Congress, 3 Session (1871); *Annual Report (1881)*, 1301.

⁶⁶ *House of Representatives Document 299*, 75 Congress, 1 Session (1937).

⁶⁷ *Annual Report (1941)*, 863.

⁶⁸ The lock was built to protect the basin of the Mermentau from saltwater intrusion.

CHAPTER SIX

¹ War Department, Office of the Chief of Engineers, General Order 15, 7 October 1929, Pars. 2 and 3. Mississippi River Commission Library, Vicksburg, Miss.

² *Annual Report (1941)*, 798. The change occurred on 1 November 1940, Lieutenant Colonel Clark Kittrell of the Second New Orleans District becoming Engineer of the combined District.

³ Interview with George H. Hudson, 1970.

⁴ Ms. District History, in "Historical Summaries of Public Works," Mississippi River Commission Library. See also *Annual Report (1941)*, 5; Blanche D. Coll *et al.*, *The Corps of Engineers: Troops and Equipment* (Washington: Government Printing Office, 1958), 9 *et seq.*

⁵ Interview with George H. Hudson, 1970.

⁶ See Public Law 71, 84 Congress, 1 Session, 15 June 1955.

⁷ *Hurricane Study: History of Hurricane Occurrence Along Coastal Louisiana* (New Orleans: U. S. Army Engineer District, 1961), 1-34. See also Dumont de Montigny, *History of Louisiana*, 24 *et seq.*; Issac Monroe

Cline, *Tropical Cyclones* (New York, 1955), 24-25; and Harrison, *Alluvial Empire*, 48.

⁸ The Federal Disaster Act of 1950 (64 *Stat.* 1109) authorized the President to proclaim disaster areas and made a variety of assistance available to the victims.

⁹ *House of Representatives Document 231*, 89 Congress, 1 Session (1965), 46-47.

¹⁰ *Ibid.*, 47.

¹¹ *Hurricane Betsy, September 8-11, 1965* (New Orleans: U. S. Army Engineer District, 1965), *passim*; Public Law 89-298, 27 October 1965 (79 *Stat.* 1073).

¹² See *Annual Report (1968)*, 427. Compare map of Hurricane Camille's flooding pattern, in *Report on Hurricane Camille* (New Orleans: U. S. Army Engineer District, 1970), Exhibit 49, with *Hurricane Betsy*, Plates 5-11. On south Louisiana, see *Hurricane Camille*, Exhibits 46-47.

¹³ Public Law 99-84 as amended by Section 206 of 33 U. S. Code 701n (the Flood Control Act of 1962) deals with Corps duties during emergencies. Public Law 875-81 deals

with disaster planning and relief before and after such emergencies.

¹⁴ See *Engineer Regulation 500-1-1*, 1 September 1967, as amended.

¹⁵ *Ibid.*, Pars. 22.10-22.13.

¹⁶ *Ibid.*, Par. 22.33.

¹⁷ *Ibid.*, Par. 22.412.

¹⁸ *Hurricane Betsy*, 8.

¹⁹ The brief sketch given here refers only to the immediate period of the disaster. The Coast Guard, the Department of Health, Education and Welfare, the General Services Administration, the Federal Housing Administration, the Small Business Administration, the Department of Labor, the Federal Bureau of Investigation, and a variety of other agencies may become involved in the complicated problems resulting from the destruction of property and the dangers of public health and safety that follow a storm. See e.g. *Hurricane Betsy*, 12-13.

²⁰ Interview with Milton Rider, 1971.

²¹ *Annual Report* (1909), 511.

²² See Chapter One.

²³ *Annual Report* (1909), 511. See also *Annual Report* (1893), 1908 and the remarkable map in *Annual Report* (1882), 1542.

²⁴ *Annual Report* (1882), 1540.

²⁵ *Annual Report* (1893), 1902-1904. References to specific acts of Congress will be found in *Annual Report* (1909), 511-512.

²⁶ *Ibid.*, 512; *Laws Relating to Rivers and Harbors*, I, 632. For the "plan of Captain Willard" mentioned in the law, see *Annual Report* (1892), 1905, which gives the general principles on which the Vicksburg Engineer Office proposed to treat the Red.

²⁷ *Ibid.*, 513.

²⁸ See the following citations in the *Annual Reports*: (1911), 624; (1913), 2314; (1914), 2361; (1915), 2692; (1916), 2539; (1917), 2626.

²⁹ *Annual Report* (1921), 888; (1924), 941.

³⁰ *Comprehensive Basin Study: Red River Below Denison Dam* (New Orleans: U. S. Army Engineer District, 1968), II, Appendix I, 4-5; I, 81.

³¹ Cited in Irving K. Fox and Isabel Picken, *The Upstream-Downstream Controversy in the Arkansas-White-Red Basins Survey*, Inter-University Case Program No. 55 (Indianapolis and New York: Bobbs-Merrill, 1960), 5. On reservoirs, see 49 *Stat.* 1570; 60 *Stat.* 647; *Annual Report* (1956), I, 627.

³² *Ibid.*, 5-6 and *passim*.

³³ The Federal agencies were the Corps, the Federal Power Commission, and the Departments of Agriculture, Commerce, Health, Education and Welfare, and Interior. The chairman was Colonel Thomas J. Bowen, New Orleans District Engineer. Much of the practical work must be credited to Frederic M. Chatry, currently Chief of Engineering Division of the New Orleans District. The interim plan owed much to the work of Jerome C. Baehr and John Gentilich.

³⁴ 82 *Stat.* 731; *H. Doc.* 304, 90th Congress.

³⁵ *Red River Study*, I, 90-91; 115.

³⁶ "In 1969 the Arkansas River Waterway carried two and a quarter million tons of commerce, even though it was in operation only about 8 months of the year. This past year of 1970, the tonnage was almost 3-1/2 million. During the year, the amount of new jobs created so far... is well over 13,000." Remarks by Lieutenant General F. J. Clarke, Chief of Engineers, at Water Resources Associated, Chicago, Illinois., 31 January 1971.

³⁷ Raymond F. Dasmann et al., *Environmental Impact of the Cross-Florida Barge Canal with Special Emphasis on the Oklawaha Regional Ecosystem* (Gainesville: Florida Defenders of the Environment, 1971), III.

³⁸ *House of Representatives Document 251*, 89 Congress, 1 Session (1965), 4.

³⁹ See *House of Representatives Document 582*, 87 Congress, 2 Session (1962), vii-viii. On cost-sharing, see *House of Representatives Document 169*, 88 Congress, 1 Session (1963), *passim*.

⁴⁰ Interviews with Herbert Juneau, Lafayette Area Engineer, 1971; A. H. Davis, Calcasieu Lockmaster, 1971; and Warren B. Dodd, 1971. See also *A Detailed Report on Hurricane Study Area No. 1: Lake Pontchartrain and Vicinity, Louisiana* (Atlanta, 1962).

⁴¹ *Laws Relating to Rivers and Harbors*, II, 888.

⁴² Fish and Wildlife Coordination Act, 72 *Stat.* 563; NEPA, 83 *Stat.* 852; WPCA Amendments, 86 *Stat.* 816.

⁴³ See Albert E. Cowdrey, "Pioneering Environmental Law: The U. S. Army Engineers and the Refuse Act," *Pacific Historical Review*, XLIV (1975), 331-349.

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APPENDIX I

DISTINGUISHED CIVILIAN EMPLOYEES OF NEW ORLEANS DISTRICT¹

Nicholas Balovich Construction Superintendent, Operations Division
Robert N. Bruce Chief, Construction Division
Anna R. Carey Administrative Assistant, Operations Division
Horace L. Dear Chief, Navigation Branch
Fernando Estopinal, Jr. Area Engineer, New Orleans Area Office
George H. Hudson Chief, Engineering Division
Herman Huesmann Chief, Foundations & Materials Branch, Engineering Division
Lizzamond A. Jeanfreau Navigation Specialist, Operations Division
John E. Kennedy Assistant Chief, Operations Division
Robert A. Schaneville Personnel Officer
W. B. Smith Chief, Operations Division
Horace A. Thompson Chief, Operations Division
Herbert L. Williams Supervisory Structural Engineer

¹ These are distinguished civilian employees who have been singled out by the New Orleans District for recognition. All are now retired, and were associated with the District's work during the past generation.

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