Sediment Supply from Bank Caving on the Lower Mississippi River, 1765 to Present

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Abstract

Bank caving rates and associated total sediment supply were calculated along the Lower Mississippi River from Cairo, IL, to Baton Rouge, LA, using historical maps between 1765 and 1992. Comparison of these maps reveals that the added sediment loads from bank erosion have greatly declined through time. During the Pre-cutoff period (1765–1931), the cumulative sediment supply from bank caving between Cairo, IL, and Baton Rouge, LA, ranged from about 395 million cubic yards/year (MCY/yr) to 535 MCY/yr with a median value of approximately 470 MCY/yr. The 1880-1931 period had the highest rate of sediment supply from bank caving with a median value of approximately 610 MCY/yr. By the 1990s, the sediment supply from bank erosion was essentially eliminated as a result of the revetment program, with significant erosion being observed at only a few locations, totaling approximately 17 MCY/yr. This equates to approximately a 96% reduction in the amount of total sediment being supplied to the channel system from bank erosion.

Introduction

Background

The Mississippi River has been heavily altered to maintain navigation and control flooding to river and coastal communities. The Mississippi River and Tributaries (MR&T) Project is one of the most complex and comprehensive water resources projects in the world. The primary elements of the MR&T Project include levees; channel improvement features such as cutoffs, bank stabilization, dikes, and dredging; floodways; and tributary basin improvements. The morphological response of the Lower Mississippi River (LMR) reflects the integration of these features with various natural events. To understand the controlling factors of river morphology and land loss in coastal regions, multiple researchers have attempted to quantify sediment loads entering and exiting the system (Keown et al. 1986; Kesel 1988; Kesel et al. 1992; Horowitz et al. 2001; Meade and Moody 2009; Allison et al. 2012; Allison et al. 2017). The key to understanding the morphological processes in the system is the establishment of the spatial and temporal aspects of sediment movement through the system from the sediment sources through the pathways to the ultimate sinks. Often, these budgets lack this source-pathways-sink (SPS) concept. This study represents a component of the initial efforts of a comprehensive sediment budget for the LMR. This first effort focuses on the sediment sources component of the SPS, with the focus being on the sediment supply from bank caving.

Multiple sediment budgets have been created for the LMR to investigate the state of the river before and after large-scale human modifications. Each budget contains either a piece of the SPS concept or only focuses on a specific study reach. One of the first attempts to quantify the amount of sediment derived from bank caving along the LMR was conducted by Ockerson (1892). In this study, he compared banklines between the late 1870s and early 1890s and determined that bank caving supplied almost 900 MCY/yr between Cairo, IL, and Donaldsonville, LA. Robbins (1977) and Winkley (1977) showed the calculated sediment supply from bank caving for this same time period for the reach between the Arkansas River and Old River, LA, to be approximately 600 MCY/yr.

Total suspended sediment (SS) loads calculated by Keown et al. (1986) estimated the pre-1960s total SS loads for the LMR from Cairo, IL, to Tarbert Landing, LA, to be approximately 299 million tons/yr (MT/yr) (or 134 MCY/yr assuming the density of quartz is equal to 165.4 lb/cu ft). Suspended sediment loads calculated by Kesel et al. (1988) reported the annual loads between 1930 and 1952 to be approximately 463 MT/yr (228 MCY/Yr) at Tarbert Landing. While all these studies used different data sets and approaches, it is apparent that the annual sediment loads in the late 1800s to mid 1900s between Cairo, IL, and Tarbert Landing, LA, were likely in excess of approximately 300 to 400 MT/yr (134 to 179 MCY/Yr).

In perhaps the most comprehensive sediment budget to date, Kesel et al. (1992) estimated that the total sediment load at Cairo, IL, between 1880 and 1911 was approximately 526 MCY/yr, which includes estimates of sediment loads stored within the channel and floodplains. Kesel et al. (1992) also concluded that only approximately 353 MCY/yr passed Tarbert Landing, LA, for the same time period, indicating that there is considerable sediment storage in the system. In the post-1950s studies, numerous researchers have analyzed suspended sediment data and reported dramatic reductions of between 50% and 90% in sediment loads compared to the pre-1950s data (Robbins 1997; Keown et al. 1986; Kesel 1988; Kesel 1992; Horowitz et al. 2001; Meade and Moody 2009; Allison et al. 2012; Allison et al. 2017). These studies suggest that the post-1950s total annual suspended sediment loads at Tarbert Landing, LA, are in the range of approximately 115 MT/yr to 250 MT/yr (51 to 112 MCY/yr). These reductions have been attributed to various factors, the most common of which include dam construction in the upper basin, soil conservation efforts throughout the basin, and extensive use of revetments.

Objectives

This study represents the first step in the development of a comprehensive sediment budget for the LMR based on the SPS concept with the first step being to quantify sediment supply from bank caving. The primary objectives of this effort were to develop estimates of sediment supply from bank caving for the following six time periods: (1) 1765 to 1820–30; (2) 1820–30 to 1881–93; (3) 1881–93 to 1930–32; (4) 1930–32 to 1947; (5) 1947 to 1967; and (6) 1967 to 1992.

Approach

To execute project deliverables, the objectives were completed by:

1. Georeferencing historical maps in a Geographic Information Systems.
2. Digitizing bank lines of the LMR for the time periods mentioned in the Objectives section.

3. Drawing polygons between corresponding bank lines to calculate the area eroded from bank caving.
4. Multiplying the area eroded by the bank height, then dividing it by the time between surveys (using the midpoint) to calculate an average bank erosion (or bank caving supply) rate for the LMR through time.

Methods

The methods used to develop the erosion rates and sediment supply from the caving banks along the LMR are described in this section. The approach is divided into the following two sections: Geo-referencing maps and bankline digitization and Calculation of erosion rates.

Geo-referencing maps and bankline digitization

Early stream channel maps are a compilation of early Holocene LMR courses produced by the Mississippi River Commission (MRC) in 1938 (Figure 1). These maps were produced from the following surveys: (1) Lieut. Ross Survey of 1765; (2) the 1820–30 US Land Office Surveys; (3) MRC surveys from 1881–93 and 1930–32; and (4) Navigation maps (also produced by the MRC) for 1947, 1967, and 1992.

These maps were geo-referenced in ESRI ArcGIS by selecting at least three known points of longitude and latitude to calculate a first- degree polynomial transformation to accurately geo-reference and overlay the maps (Figure 1). The geographic coordinate system for the maps is North American Datum 1983, UTM Zone 15N. After the maps were georeferenced, banklines for all surveys were digitized from Cairo, IL, to Baton Rouge, LA. A total of 130 meander bends were digitized for the LMR

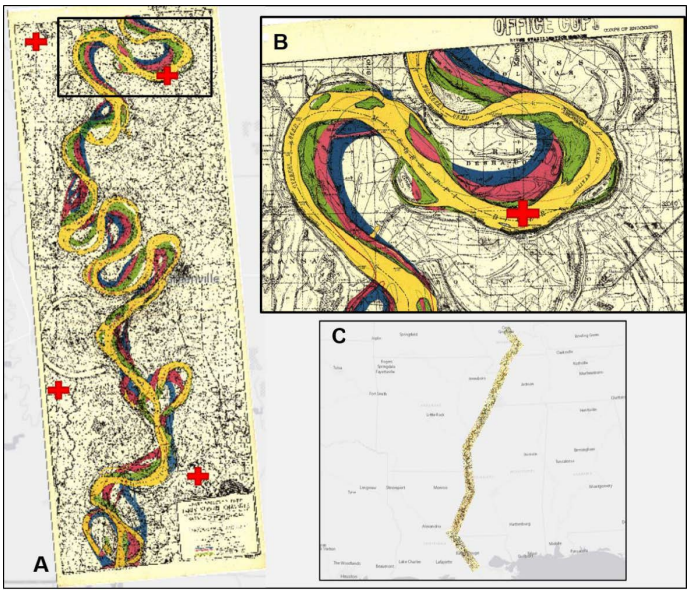

Figure 1. Geo-referencing of early stream channel maps. The red crosshairs correspond to points chosen to geo-reference an early stream channel map (inserts A, B). The early stream channel maps geo-referenced for the entire alluvial valley are shown in insert C.

Calculation of Erosion Rates

The first step in calculating the bank caving erosion rates is to measure the area eroded between bank lines for two consecutive time periods (Figure 2). To get volumetric erosion rates (in cubic feet/year), bank heights (in feet) were calculated from Fisk (1947) cross sections (Figures 3 and 4) and multiplied by the area eroded (square feet) and divided by the time between surveys. Considering older surveys took multiple years to complete (e.g., the 1820–1830 survey), the mid-point of multi-year surveys is used (1825). Thus, to calculate the next survey in time (1881–1893), midpoints for both surveys are used in the calculation (1887–1825 is 62 yr between surveys).

Bank heights were calculated using cross- sections taken across the channel that denote the top of bank and thalweg elevations. For example, Figure 3 shows the location of a typical cross section (271) at Jackson Point Bend south of Natchez, MS. The actual cross section for the Jackson Point bend is shown in Figure 4. For river bends without any cross sections that extended through the channel, the nearest cross section was used.

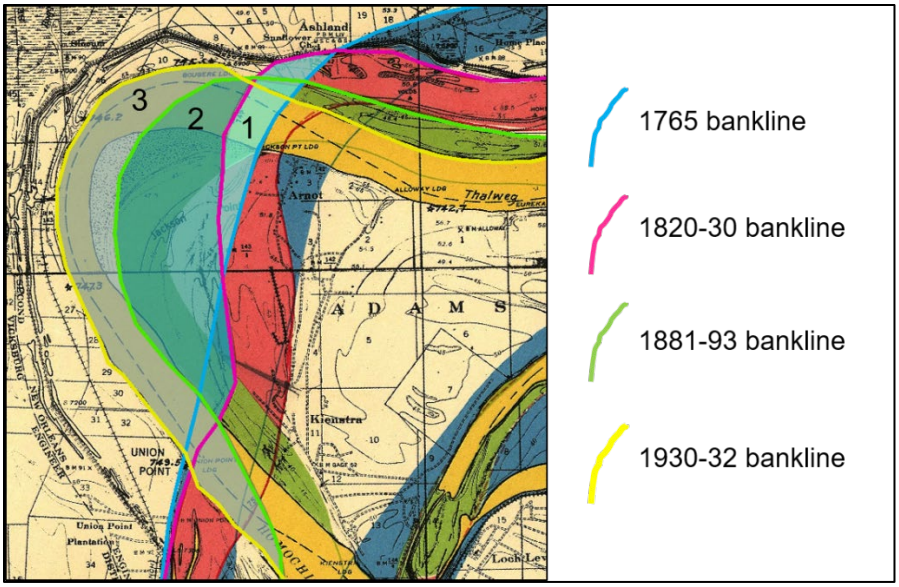

Figure 2. Bank line digitization process for each river bend through time (shown in colors) presented here for Jackson Point Bend in Mississippi. Polygons are drawn between corresponding banklines to calculate the area eroded through time (in square feet per year). Polygon 1 is for the 1765 to 1820–30 bankline comparison while polygons 2 and 3 are for banklines 1820–30 to 1881–93 and 1881–93 to 1930–32, respectively.

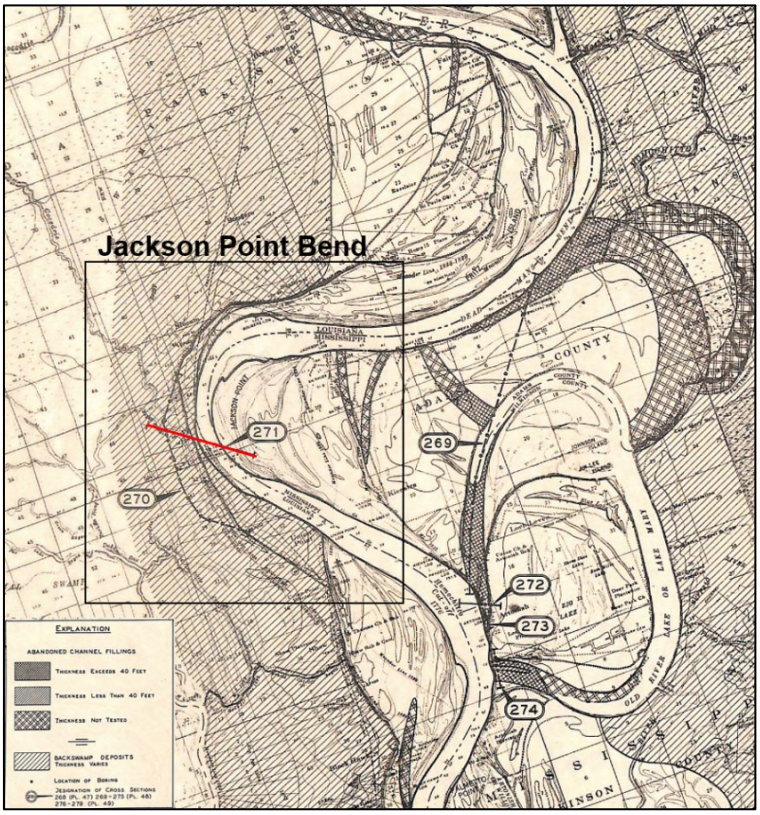

Figure 3. Fisk (1947) map at a reach below Natchez, MS, and above the Old River Control Complex (ORCC), LA. Jackson Point Bend is shown in the black square. Cross section 271 is drawn in red and is used to calculate a bank height for this bend.

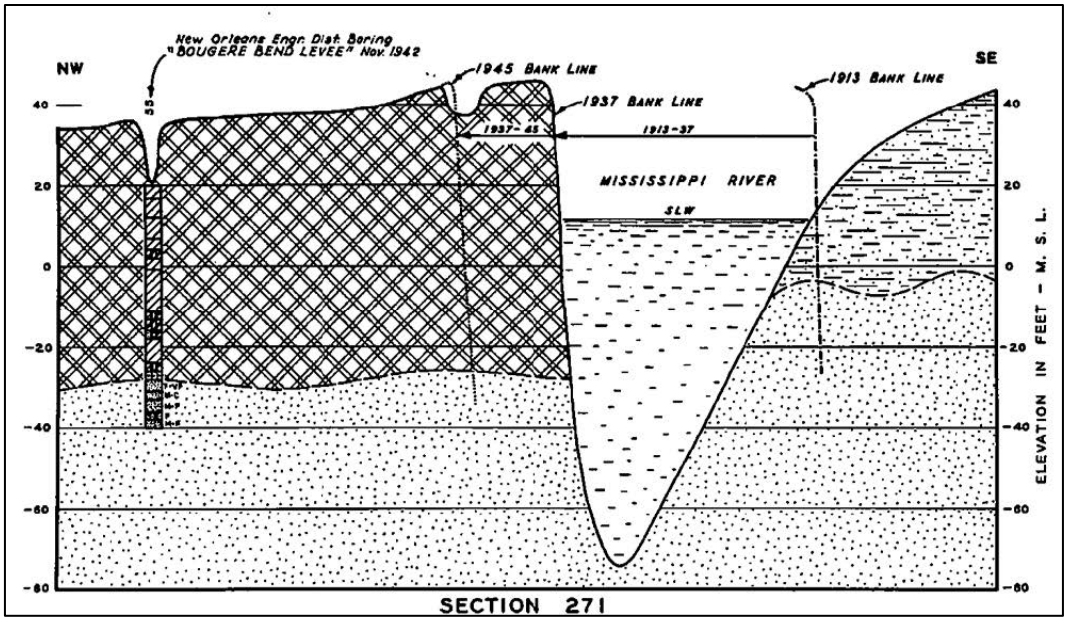

Figure 4. Cross section 271 through the channel at Jackson Point Bend (Mississippi). Cross- section from Fisk (1947). See Figure 3 for location.

Results

The total volume of sediment derived from bank erosion for all 130 bends for the six time periods between 1765 and 1992 is shown in Appendices A–F. For bends where there was essentially no observed erosion for a certain time interval, a zero value is entered. Bends that contain no erosion due to either artificial or natural cutoffs are entered as ND (No Data).

The study area was divided into the following five sub-reaches shown in Table 1: (1) Reach 1 – Cairo to Memphis (~215 mi); (2) Reach 2 – Memphis to Arkansas River (~156 mi); (3) Reach 3 – Arkansas River to Vicksburg (~147 mi); (4) Reach 4 – Vicksburg to Old River Control Complex (ORCC) (~126 mi); and (5) Reach 5 – ORCC to Baton Rouge (~80 mi). Reaches 1 – 4 all have approximately the same number of bends (28–29) and are located upstream and downstream of the Arkansas River. Reach 5 is a somewhat anomalous reach with only 15 bends but is examined separately due to its proximity to the flow diversion at ORCC.

As mentioned, the bank heights for each bend were taken from the Fisk 1947 cross-section data. However, it must be recognized that bank heights could vary significantly at other locations along the bend, and at different time periods. For this reason, the bank height data were grouped into the five study reaches in an attempt to capture this variability. The bank height data for each of the five study reaches is shown in Figure 5. For this study, the 25th, 50th, and 75th percentiles of the bank heights were used to calculate a range of sediment supply rates in each of the study reaches.

Figure 6 shows a cumulative plot of sediment supply from bank caving based on the median value of bank height between Cairo, IL, and Baton Rouge, LA. Note that because of the significant changes in river length throughout the time periods, plotting the data versus a

specific river mile was problematic. For this reason, the x-axis reflects the bend numbers with bend 1 located near Cairo, IL, and bend 130 at Baton Rouge LA. The location of each bend with respect to the 1962 River Miles is also shown in Appendices A–F. Landmark locations (cities, rivers, and structures) are plotted on the graph as a spatial aid.

Temporally, the largest erosion rates occurred in the 1880s–1930s period, with an annual sediment supply from bank erosion of approximately 610 MCY/yr (Figure 6). Figure 7 compares the sediment supply from bank caving for three time periods: Period 1 (pre-cutoffs - 1765–1931); Period 2 (post-cutoffs - 1931–1967); and Period 3 (recent period - 1967–1992). The results based on the median value of bank heights along with the 25th and 75th percentiles are shown for each time period. In Period 1, supply rates range from 395 MCY/yr to 535 MCY/yr, with a median of approximately 470 MCY/yr. Sediment supply decreases in Period 2, ranging from 315 MCY/yr to 425 MCY/yr, with a median supply rate of 380 MCY/yr. This is an annual reduction in the sediment supply from bank caving of approximately 20%. For Period 3, the median value of sediment supply from bank caving had been reduced dramatically by the revetment program to approximately 17 MCY/yr, with a range between approximately 15 MCY/yr and 19 MCY/yr. This equates to a reduction in sediment supply between Period 1 and Period 3 of approximately 96%.

To assist in visualizing the spatial trends of the data, the sediment supply for all five reaches and six time periods is shown in Table 1. Figure 8 also shows the sediment supply rates averaged by 50 mi reaches for each time period. Although there is considerable variability in the data, it does appear that supply rates are generally greatest downstream of the confluence of the Arkansas River. Rates are generally lower farther upstream and also downstream of the ORCC.

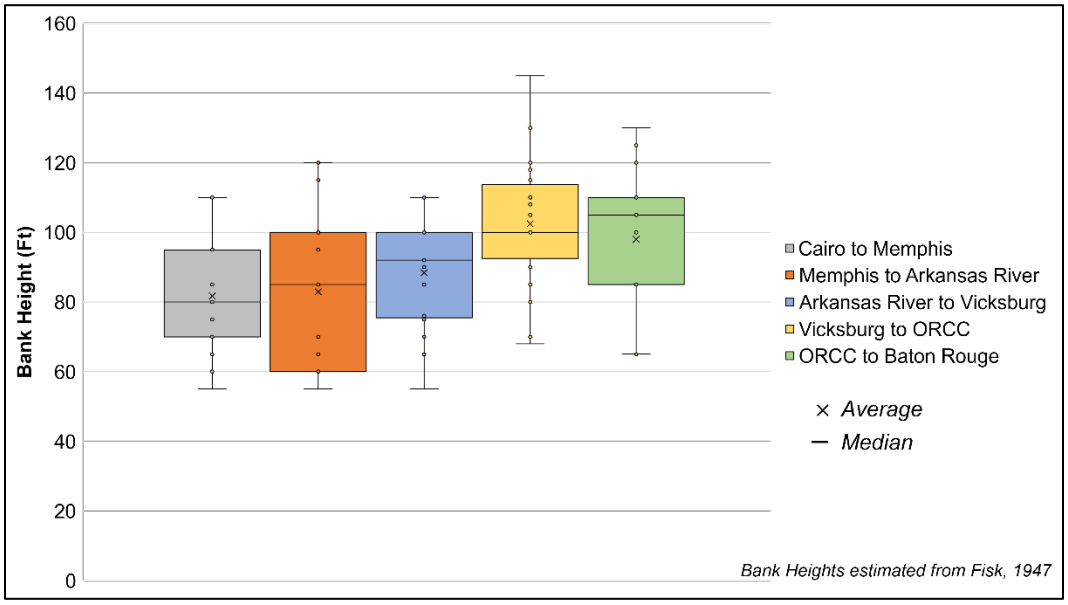

Figure 5. Bank heights for each of the five reaches.

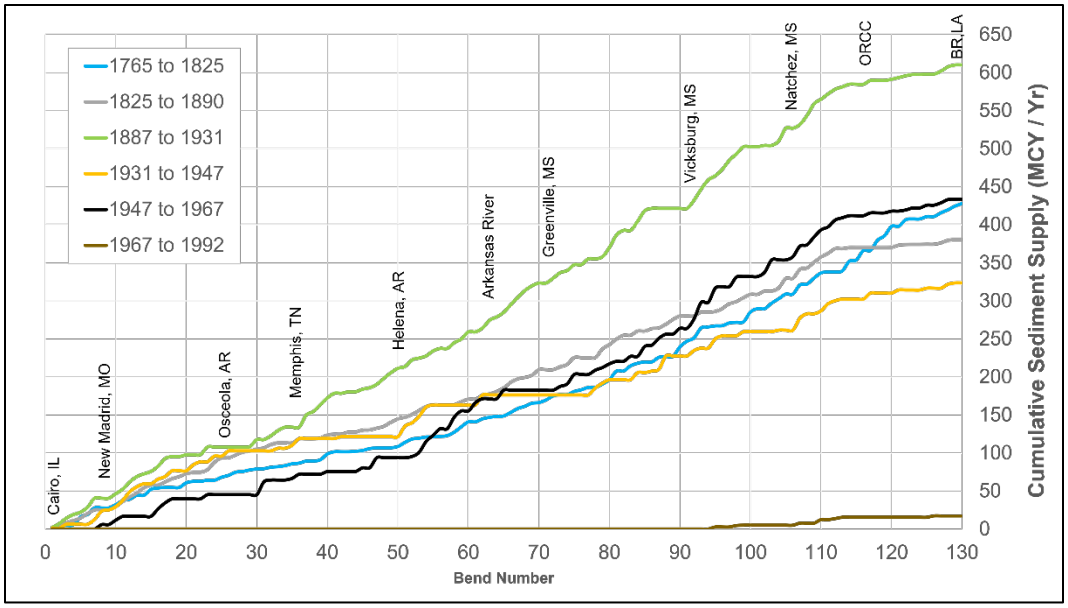

Figure 6. Plot of cumulative sediment supply using the median bank height by reach for the six time periods.

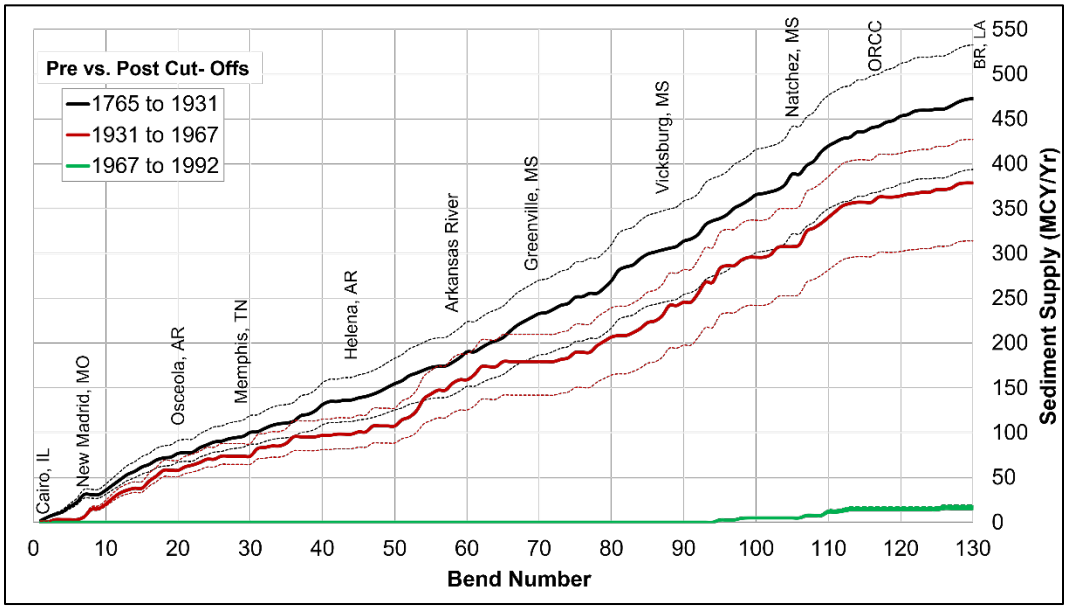

Figure 7. Cumulative sediment supply for three time periods. Dashed lines denote the sediment supply based on 25th and 75th percentiles. The statistical bounds for the 1967 to 1992 curve are too small to be seen.

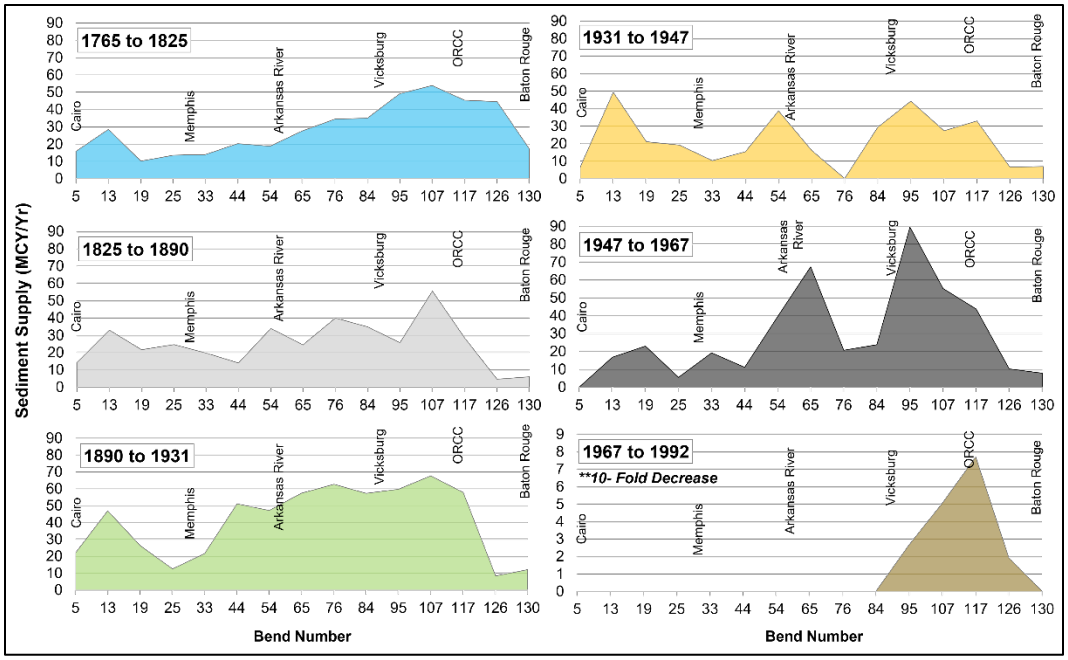

Figure 8. Spatial trends of sediment supply through time. The y-axis of the 1967 to 1992 graph has been exaggerated to highlight areas of erosion.

Table 1. Annual sediment supply from bank caving (MCY/yr) for five reaches (numbers in parentheses are the number of bends in each reach). The table has been color coded to assist in the visual interpretation of spatial and temporal trends.

Time Period	Reach 1 (29)*	Reach 2 (29)*	Reach 3 (29)*	Reach 4 (28)*	Reach 5 (15)*	Totals**
1765 to 1825	78	50	98	128	74	428
1825 to 1887	102	61	101	105	10	380
1887 to 1931	108	137	176	163	25	610
1931 to 1947	103	60	47	92	21	323
1947 to 1967	45	102	104	161	22	434
1967 to 1992	0	0	0	15	2	17

*Reach Values Over 100 MCY/yr = Red; 50 to 100 MCY/yr = Green; less than 50 MCY/yr = Blue
**Total Values Over 350 MCY/yr = Red; 150 to 350 MCY/yr = Green; less than 150 MCY/yr = Blue

Discussion

Sediment supply rates from bank caving between Cairo, IL, and Baton Rouge, LA, were calculated for six time periods from 1765 to 1992. Considering the entire pre-cutoff period from 1765 to 1931, the sediment supply from bank caving ranged from 395 MCY/yr to 535 MCY/yr with a median value of approximately 470 MCY/yr. In the post-cutoff period from 1931 to 1967,

the sediment supply was still large, but had been reduced by about 20%, ranging from 315 MCY/yr to 425 MCY/yr with a median value of approximately 380 MCY/yr. However, with the revetment program nearing completion by the 1970s, the sediment supply from bank caving between 1967 and 1992 was dramatically reduced, ranging from approximately 15 MCY/yr to 19 MCY/yr with a median value of approximately 17 MCY/yr. Thus, when comparing present-day (1967–1992) and pre-cutoff time periods (1765–1931), there has been approximately a 96% reduction in sediment supply from bank caving.

These dramatic reductions in sediment supply from bank caving to the system may have both morphologic and environmental impacts that, to date, have not been fully investigated. To fully understand the implications of these sediment reductions requires examination of both the quantity and caliber of the material being supplied from the bank caving sites. In this study, the total sediment supply from the streambanks was calculated, but the proportion of coarse and fine sediments was not quantified. Additional studies are needed to estimate the grain size gradations entering the system from bank caving. This will require a more exhaustive review of the geologic literature as well as more detailed inspections of historical borings and corresponding grain size analyses.

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Appendix A: Sediment Volume Supplied from Bank Caving from 1765 to 1825

Table A-1. Total sediment volumne supplied from bank caving for all 130 bends from 1765 to 1825. A value of zero is assigned to bends with no erosion. Bends that were artifically or naturally cutoff or avulsed are denoted as ND (No Data).

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
1	955	1.68	1.92	2.29
2	941	2.44	2.79	3.31
3	926	0.00	0.00	0.00
4	920	0.69	0.79	0.93
5	913	8.98	10.26	12.19
6	900	2.85	3.26	3.87
7	889	7.48	8.55	10.15
8	880	0.00	0.00	0.00
9	878	0.00	0.00	0.00
10	870	3.72	4.25	5.04
11	865	4.66	5.32	6.32
12	858	1.66	1.90	2.26
13	850	4.54	5.19	6.16
14	841	0.00	0.00	0.00
15	825	6.75	7.72	9.16
16	821	1.60	1.82	2.17
17	809	0.56	0.64	0.76
18	805	0.00	0.00	0.00
19	803	0.00	0.00	0.00
20	787	5.39	6.16	7.32
21	765	1.59	1.82	2.16
22	759	0.00	0.00	0.00
23	754	1.37	1.57	1.86
24	753	0.00	0.00	0.00

Table A-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
25	750	3.43	3.92	4.65
26	746	2.21	2.52	2.99
27	744	3.60	4.11	4.88
28	743	0.80	0.91	1.08
29	740	1.77	2.02	2.40
30	729	0.88	1.24	1.46
31	721	0.31	0.45	0.52
32	716	1.36	1.92	2.26
33	708	0.52	0.74	0.87
34	697	0.94	1.33	1.56
35	694	1.68	2.38	2.80
36	687	0.65	0.92	1.08
37	682	1.89	2.68	3.15
38	679	0.00	0.00	0.00
39	673	1.25	1.77	2.08
40	672	5.38	7.62	8.97
41	667	2.04	2.89	3.40
42	660	0.00	0.00	0.00
43	656	0.00	0.00	0.00
44	650	0.45	0.64	0.75
45	645	0.74	1.05	1.24
46	639	1.73	2.45	2.89
47	634	0.57	0.80	0.94
48	629	0.00	0.00	0.00
49	626	0.16	0.23	0.27
50	625	1.25	1.78	2.09
51	624	3.80	5.38	6.33
52	621	3.07	4.35	5.12
53	606	0.78	1.11	1.30

Table A-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
54	600	1.16	1.64	1.94
55	595	0.00	0.00	0.00
56	589	0.46	0.66	0.77
57	588	0.81	1.15	1.36
58	584	3.25	4.61	5.42
59	578	5.78	7.05	7.66
60	575	5.26	6.40	6.96
61	572	0.00	0.00	0.00
62	570	3.28	4.00	4.35
63	560	1.61	1.96	2.13
64	553	1.14	1.39	1.51
65	550	0.35	0.43	0.47
66	547	3.80	4.63	5.03
67	545	4.22	5.14	5.59
68	541	2.43	2.96	3.22
69	539	3.26	3.97	4.31
70	533	0.74	0.91	0.99
71	529	2.78	3.39	3.69
72	527	4.30	5.24	5.69
73	517	1.42	1.73	1.88
74	514	0.00	0.00	0.00
75	503	3.45	4.20	4.57
76	502	1.81	2.21	2.40
77	498	2.61	3.18	3.46
78	497	0.00	0.00	0.00
79	484	3.64	4.43	4.82
80	477	4.78	5.83	6.33
81	469	9.20	11.21	12.19
82	463	0.00	0.00	0.00

Table A-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
83	461	5.70	6.95	7.55
84	459	2.72	3.32	3.61
85	449	1.47	1.80	1.95
86	443	0.00	0.00	0.00
87	437	5.55	5.99	6.82
88	430	1.05	1.14	1.29
89	429	0.00	0.00	0.00
90	426	11.84	12.80	14.56
91	424	6.78	7.33	8.34
92	420	4.11	4.44	5.05
93	413	12.01	12.98	14.76
94	406	1.18	1.28	1.45
95	403	1.28	1.39	1.58
96	398	0.25	0.28	0.31
97	392	3.31	3.57	4.07
98	388	0.75	0.81	0.92
99	384	0.64	0.69	0.78
100	380	12.04	13.02	14.81
101	378	3.90	4.22	4.80
102	373	0.00	0.00	0.00
103	370	6.92	7.48	8.51
104	368	5.17	5.58	6.35
105	366	5.74	6.21	7.06
106	358	0.00	0.00	0.00
107	353	11.07	11.97	13.61
108	346	1.03	1.12	1.27
109	343	7.31	7.90	8.99
110	339	6.25	6.76	7.69
111	330	1.15	1.24	1.42

Table A-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
112	323	0.00	0.00	0.00
113	318	1.30	1.41	1.60
114	314	10.24	12.66	13.26
115	311	1.44	1.78	1.86
116	307	10.12	12.51	13.10
117	301	0.00	0.00	0.00
118	297	10.80	13.35	13.98
119	296	4.93	6.10	6.39
120	290	10.00	12.35	12.94
121	281	0.00	0.00	0.00
122	276	6.92	8.55	8.95
123	270	0.84	1.03	1.08
124	265	0.00	0.00	0.00
125	256	2.59	3.20	3.35
126	252	0.00	0.00	0.00
127	248	4.01	4.95	5.19
128	243	3.21	3.96	4.15
129	239	3.94	4.87	5.10
130	231	2.71	3.34	3.50
Total		361	428	480

Appendix B: Sediment Volume Supplied from Bank Caving from 1825 to 1887

Table B-1. Total sediment volumne supplied from bank caving for all 130 bends from 1825 to 1887. A value of zero is assigned to bends with no erosion. Bends that were artifically or naturally cutoff or avulsed are denoted as ND (No Data).

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
1	955	1.95	2.22	2.64
2	941	3.31	3.78	4.49
3	926	1.60	1.83	2.18
4	920	2.73	3.12	3.70
5	913	2.89	3.30	3.92
6	900	5.02	5.74	6.82
7	889	4.26	4.87	5.78
8	880	0.00	0.00	0.00
9	878	0.00	0.00	0.00
10	870	4.08	4.66	5.54
11	865	5.53	6.32	7.51
12	858	5.40	6.17	7.32
13	850	4.52	5.17	6.14
14	841	6.00	6.86	8.14
15	825	3.16	3.61	4.29
16	821	ND	ND	ND
17	809	3.49	3.99	4.74
18	805	3.82	4.37	5.19
19	803	2.46	2.81	3.33
20	787	3.20	3.66	4.34
21	765	1.35	1.55	1.84
22	759	0.29	0.34	0.40
23	754	3.08	3.52	4.18
24	753	8.45	9.66	11.47

Table B-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
25	750	5.16	5.90	7.00
26	746	ND	ND	ND
27	744	3.25	3.71	4.41
28	743	3.02	3.46	4.10
29	740	1.35	1.54	1.83
30	729	2.08	2.94	3.46
31	721	0.96	1.36	1.60
32	716	3.02	4.27	5.03
33	708	1.71	2.42	2.85
34	697	0.00	0.00	0.00
35	694	ND	ND	ND
36	687	3.54	5.02	5.90
37	682	ND	ND	ND
38	679	0.00	0.00	0.00
39	673	0.83	1.17	1.38
40	672	2.83	4.00	4.71
41	667	0.90	1.28	1.50
42	660	ND	ND	ND
43	656	1.77	2.51	2.95
44	650	ND	ND	ND
45	645	1.83	2.60	3.06
46	639	0.23	0.32	0.38
47	634	1.71	2.42	2.85
48	629	1.59	2.26	2.66
49	626	3.84	5.44	6.40
50	625	3.06	4.34	5.11
51	624	1.54	2.18	2.57
52	621	2.71	3.83	4.51
53	606	3.54	5.01	5.89

Table B-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
54	600	3.84	5.44	6.40
55	595	1.55	2.20	2.59
56	589	ND	ND	ND
57	588	ND	ND	ND
58	584	ND	ND	ND
59	578	3.30	4.02	4.37
60	575	2.89	3.52	3.83
61	572	0.00	0.00	0.00
62	570	4.06	4.94	5.37
63	560	1.60	1.95	2.12
64	553	2.47	3.01	3.27
65	550	3.89	4.74	5.15
66	547	5.93	7.23	7.86
67	545	3.92	4.78	5.20
68	541	1.41	1.72	1.87
69	539	2.21	2.70	2.93
70	533	6.13	7.47	8.12
71	529	ND	ND	ND
72	527	ND	ND	ND
73	517	3.08	3.75	4.08
74	514	2.73	3.33	3.62
75	503	7.34	8.94	9.72
76	502	ND	ND	ND
77	498	0.00	0.00	0.00
78	497	0.00	0.00	0.00
79	484	9.19	11.19	12.17
80	477	4.79	5.84	6.35
81	469	5.91	7.20	7.83
82	463	4.15	5.06	5.50

Table B-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
83	461	ND	ND	ND
84	459	4.48	5.46	5.93
85	449	0.00	0.00	0.00
86	443	2.70	3.29	3.57
87	437	0.76	0.84	0.93
88	430	4.45	4.94	5.44
89	429	5.47	6.08	6.69
90	426	4.43	4.92	5.42
91	424	ND	ND	ND
92	420	ND	ND	ND
93	413	4.19	4.66	5.12
94	406	ND	ND	ND
95	403	0.85	0.94	1.04
96	398	3.70	4.11	4.53
97	392	5.56	6.18	6.80
98	388	2.75	3.06	3.36
99	384	4.26	4.74	5.21
100	380	4.17	4.63	5.09
101	378	ND	ND	ND
102	373	3.58	3.98	4.38
103	370	0.00	0.00	0.00
104	368	4.00	4.45	4.89
105	366	11.28	12.53	13.78
106	358	0.00	0.00	0.00
107	353	10.56	11.73	12.90
108	346	1.79	1.99	2.19
109	343	6.59	7.33	8.06
110	339	6.33	7.03	7.73
111	330	4.48	4.97	5.47

Table B-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
112	323	5.23	5.82	6.40
113	318	ND	ND	ND
114	314	1.07	1.32	1.48
115	311	ND	ND	ND
116	307	ND	ND	ND
117	301	ND	ND	ND
118	297	ND	ND	ND
119	296	ND	ND	ND
120	290	0.38	0.48	0.53
121	281	2.49	3.08	3.45
122	276	0.62	0.76	0.85
123	270	0.11	0.13	0.15
124	265	0.00	0.00	0.00
125	256	0.15	0.18	0.21
126	252	0.00	0.00	0.00
127	248	1.37	1.69	1.90
128	243	2.76	3.41	3.82
129	239	0.69	0.85	0.95
130	231	0.00	0.00	0.00
Total		319	380	431

Appendix C: Sediment Volume Supplied from Bank Caving from 1887 to 1931

Table C-1. Total sediment volumne supplied from bank caving for all 130 bends from 1887 to 1931. A value of zero is assigned to bends with no erosion. Bends that were artifically or naturally cutoff or avulsed are denoted as ND (No Data).

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
1	955	1.70	1.95	2.31
2	941	4.54	5.19	6.16
3	926	6.16	7.04	8.36
4	920	4.07	4.66	5.53
5	913	2.77	3.17	3.77
6	900	5.72	6.54	7.76
7	889	10.33	11.81	14.02
8	880	0.00	0.00	0.00
9	878	0.00	0.00	0.00
10	870	5.15	5.89	6.99
11	865	5.41	6.19	7.35
12	858	8.29	9.47	11.25
13	850	6.07	6.93	8.24
14	841	3.05	3.49	4.14
15	825	2.87	3.28	3.90
16	821	6.01	6.86	8.15
17	809	8.73	9.98	11.85
18	805	2.33	2.66	3.16
19	803	0.00	0.00	0.00
20	787	2.01	2.29	2.72
21	765	ND	ND	ND
22	759	0.15	0.17	0.20
23	754	8.80	10.06	11.95
24	753	ND	ND	ND

Table C-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
25	750	ND	ND	ND
26	746	ND	ND	ND
27	744	ND	ND	ND
28	743	ND	ND	ND
29	740	0.48	0.55	0.66
30	729	6.49	9.19	10.81
31	721	0.00	0.00	0.00
32	716	3.65	5.17	6.08
33	708	4.74	6.72	7.90
34	697	3.17	4.50	5.29
35	694	ND	ND	ND
36	687	ND	ND	ND
37	682	11.19	15.86	18.65
38	679	3.33	4.72	5.55
39	673	6.26	8.87	10.44
40	672	6.38	9.03	10.63
41	667	4.28	6.07	7.14
42	660	0.00	0.00	0.00
43	656	1.43	2.02	2.38
44	650	ND	ND	ND
45	645	2.38	3.37	3.96
46	639	1.40	1.98	2.33
47	634	3.10	4.39	5.17
48	629	5.55	7.86	9.25
49	626	5.23	7.41	8.72
50	625	4.12	5.84	6.87
51	624	1.66	2.36	2.77
52	621	6.06	8.59	10.10
53	606	1.78	2.53	2.97

Table C-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
54	600	1.97	2.79	3.28
55	595	4.68	6.63	7.80
56	589	2.29	3.24	3.81
57	588	ND	ND	ND
58	584	5.37	7.60	8.95
59	578	4.01	4.88	5.31
60	575	7.66	9.33	10.14
61	572	0.00	0.00	0.00
62	570	4.19	5.10	5.54
63	560	8.33	10.16	11.04
64	553	3.56	4.34	4.71
65	550	4.97	6.06	6.59
66	547	8.34	10.16	11.05
67	545	7.80	9.51	10.34
68	541	7.35	8.96	9.74
69	539	5.08	6.18	6.72
70	533	3.06	3.73	4.05
71	529	0.00	0.00	0.00
72	527	5.13	6.25	6.79
73	517	6.00	7.31	7.95
74	514	2.36	2.87	3.12
75	503	6.27	7.64	8.31
76	502	0.00	0.00	0.00
77	498	6.31	7.69	8.36
78	497	0.00	0.00	0.00
79	484	2.35	2.86	3.11
80	477	10.06	12.26	13.32
81	469	13.42	16.35	17.77
82	463	4.97	6.05	6.58

Table C-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
83	461	0.00	0.00	0.00
84	459	9.92	12.08	13.14
85	449	11.13	13.57	14.75
86	443	2.64	3.22	3.50
87	437	0.00	0.00	0.00
88	430	ND	ND	ND
89	429	ND	ND	ND
90	426	ND	ND	ND
91	424	0.00	0.00	0.00
92	420	9.67	10.90	11.99
93	413	12.86	14.49	15.94
94	406	10.66	12.01	13.21
95	403	4.89	5.51	6.07
96	398	7.56	8.52	9.37
97	392	10.63	11.98	13.18
98	388	7.37	8.31	9.14
99	384	8.23	9.28	10.21
100	380	ND	ND	ND
101	378	ND	ND	ND
102	373	1.62	1.82	2.01
103	370	0.00	0.00	0.00
104	368	5.25	5.92	6.51
105	366	14.83	16.71	18.38
106	358	0.00	0.00	0.00
107	353	4.45	5.01	5.52
108	346	10.39	11.71	12.88
109	343	13.57	15.29	16.82
110	339	5.48	6.17	6.79
111	330	6.18	6.96	7.66

Table C-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
112	323	5.43	6.12	6.74
113	318	2.69	3.03	3.33
114	314	2.82	3.49	3.66
115	311	ND	ND	ND
116	307	ND	ND	ND
117	301	4.05	5.00	5.24
118	297	ND	ND	ND
119	296	ND	ND	ND
120	290	1.25	1.54	1.62
121	281	1.84	2.27	2.38
122	276	1.94	2.39	2.51
123	270	1.35	1.67	1.75
124	265	0.00	0.00	0.00
125	256	0.39	0.48	0.50
126	252	0.00	0.00	0.00
127	248	3.18	3.93	4.12
128	243	4.62	5.71	5.98
129	239	1.94	2.40	2.52
130	231	0.00	0.00	0.00
Total		501	610	687

Appendix D: Sediment Volume Supplied from Bank Caving from 1931 to 1947

Table D-1. Total sediment volumne supplied from bank caving for all 130 bends from 1931 to 1947. A value of zero is assigned to bends with no erosion. Bends that were artifically or naturally cutoff or avulsed are denoted as ND (No Data).

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
1	955	1.26	1.44	1.71
2	941	0.00	0.00	0.00
3	926	4.29	4.90	5.82
4	920	0.00	0.00	0.00
5	913	0.00	0.00	0.00
6	900	0.00	0.00	0.00
7	889	5.52	6.31	7.49
8	880	9.48	10.83	12.86
9	878	1.43	1.63	1.93
10	870	3.71	4.24	5.04
11	865	7.60	8.68	10.31
12	858	9.70	11.08	13.16
13	850	5.63	6.44	7.64
14	841	3.54	4.04	4.80
15	825	0.00	0.00	0.00
16	821	5.22	5.96	7.08
17	809	3.06	3.50	4.16
18	805	6.63	7.57	8.99
19	803	0.00	0.00	0.00
20	787	ND	ND	ND
21	765	6.88	7.86	9.33
22	759	3.43	3.92	4.65
23	754	ND	ND	ND
24	753	6.50	7.42	8.82

Table D-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
25	750	ND	ND	ND
26	746	6.02	6.88	8.17
27	744	ND	ND	ND
28	743	ND	ND	ND
29	740	ND	ND	ND
30	729	0.00	0.00	0.00
31	721	0.00	0.00	0.00
32	716	0.00	0.00	0.00
33	708	2.40	3.40	4.00
34	697	0.00	0.00	0.00
35	694	2.78	3.94	4.64
36	687	6.26	8.87	10.44
37	682	ND	ND	ND
38	679	ND	ND	ND
39	673	ND	ND	ND
40	672	0.00	0.00	0.00
41	667	0.00	0.00	0.00
42	660	1.76	2.49	2.93
43	656	0.00	0.00	0.00
44	650	0.00	0.00	0.00
45	645	0.00	0.00	0.00
46	639	0.00	0.00	0.00
47	634	0.00	0.00	0.00
48	629	ND	ND	ND
49	626	ND	ND	ND
50	625	ND	ND	ND
51	624	9.66	13.68	16.10
52	621	3.16	4.47	5.26
53	606	5.97	8.45	9.95

Table D-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
54	600	8.50	12.05	14.17
55	595	2.06	2.92	3.44
56	589	0.00	0.00	0.00
57	588	0.00	0.00	0.00
58	584	0.00	0.00	0.00
59	578	ND	ND	ND
60	575	ND	ND	ND
61	572	ND	ND	ND
62	570	10.84	13.21	14.36
63	560	0.00	0.00	0.00
64	553	0.00	0.00	0.00
65	550	ND	ND	ND
66	547	ND	ND	ND
67	545	ND	ND	ND
68	541	ND	ND	ND
69	539	ND	ND	ND
70	533	0.00	0.00	0.00
71	529	0.00	0.00	0.00
72	527	0.00	0.00	0.00
73	517	0.00	0.00	0.00
74	514	0.00	0.00	0.00
75	503	ND	ND	ND
76	502	ND	ND	ND
77	498	ND	ND	ND
78	497	7.53	9.18	9.97
79	484	5.22	6.36	6.91
80	477	3.72	4.54	4.93
81	469	ND	ND	ND
82	463	ND	ND	ND

Table D-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
83	461	0.00	0.00	0.00
84	459	7.61	9.27	10.08
85	449	ND	ND	ND
86	443	1.64	2.00	2.17
87	437	2.04	2.30	2.53
88	430	15.56	17.53	19.28
89	429	0.00	0.00	0.00
90	426	ND	ND	ND
91	424	ND	ND	ND
92	420	6.43	7.25	7.97
93	413	2.77	3.12	3.43
94	406	ND	ND	ND
95	403	10.64	11.99	13.19
96	398	3.68	4.15	4.57
97	392	0.00	0.00	0.00
98	388	ND	ND	ND
99	384	4.81	5.41	5.96
100	380	ND	ND	ND
101	378	ND	ND	ND
102	373	ND	ND	ND
103	370	ND	ND	ND
104	368	1.74	1.96	2.16
105	366	ND	ND	ND
106	358	ND	ND	ND
107	353	14.05	15.83	17.41
108	346	5.07	5.71	6.28
109	343	ND	ND	ND
110	339	3.45	3.88	4.27
111	330	8.33	9.39	10.33

Table D-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
112	323	3.42	3.86	4.24
113	318	1.94	2.19	2.41
114	314	ND	ND	ND
115	311	ND	ND	ND
116	307	ND	ND	ND
117	301	6.34	7.84	8.21
118	297	ND	ND	ND
119	296	ND	ND	ND
120	290	0.00	0.00	0.00
121	281	3.32	4.10	4.29
122	276	0.00	0.00	0.00
123	270	0.00	0.00	0.00
124	265	0.00	0.00	0.00
125	256	1.97	2.43	2.54
126	252	0.00	0.00	0.00
127	248	0.00	0.00	0.00
128	243	4.13	5.10	5.34
129	239	1.44	1.78	1.87
130	231	0.00	0.00	0.00
Total		270	323	368

Appendix E: Sediment Volume Supplied from Bank Caving from 1947 to 1967

Table E-1. Total sediment volumne supplied from bank caving for all 130 bends from 1947 to 1967. A value of zero is assigned to bends with no erosion. Bends that were artifically or naturally cutoff or avulsed are denoted as ND (No Data).

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
1	955	0.00	0.00	0.00
2	941	0.00	0.00	0.00
3	926	0.00	0.00	0.00
4	920	0.00	0.00	0.00
5	913	0.00	0.00	0.00
6	900	0.00	0.00	0.00
7	889	0.00	0.00	0.00
8	880	5.14	5.87	6.97
9	878	0.00	0.00	0.00
10	870	5.14	5.87	6.98
11	865	4.39	5.02	5.96
12	858	0.00	0.00	0.00
13	850	0.00	0.00	0.00
14	841	0.00	0.00	0.00
15	825	0.00	0.00	0.00
16	821	8.60	9.83	11.67
17	809	6.84	7.82	9.29
18	805	4.64	5.30	6.30
19	803	0.00	0.00	0.00
20	787	0.00	0.00	0.00
21	765	0.00	0.00	0.00
22	759	0.00	0.00	0.00
23	754	4.83	5.52	6.55
24	753	ND	ND	ND

Table E-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
25	750	ND	ND	ND
26	746	ND	ND	ND
27	744	ND	ND	ND
28	743	0.00	0.00	0.00
29	740	0.00	0.00	0.00
30	729	0.00	0.00	0.00
31	721	11.84	16.77	19.73
32	716	1.74	2.47	2.91
33	708	0.00	0.00	0.00
34	697	0.00	0.00	0.00
35	694	1.53	2.17	2.56
36	687	3.86	5.47	6.44
37	682	ND	ND	ND
38	679	ND	ND	ND
39	673	ND	ND	ND
40	672	2.49	3.53	4.15
41	667	0.00	0.00	0.00
42	660	0.00	0.00	0.00
43	656	0.00	0.00	0.00
44	650	ND	ND	ND
45	645	3.47	4.91	5.78
46	639	0.00	0.00	0.00
47	634	9.33	13.22	15.56
48	629	ND	ND	ND
49	626	ND	ND	ND
50	625	ND	ND	ND
51	624	ND	ND	ND
52	621	1.13	1.59	1.88
53	606	3.83	5.43	6.39

Table E-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
54	600	10.12	14.34	16.87
55	595	5.76	8.16	9.60
56	589	6.10	8.64	10.17
57	588	0.00	0.00	0.00
58	584	10.82	15.33	18.03
59	578	6.60	8.04	8.74
60	575	ND	ND	ND
61	572	9.06	11.03	11.99
62	570	4.04	4.93	5.36
63	560	0.00	0.00	0.00
64	553	0.00	0.00	0.00
65	550	9.26	11.28	12.26
66	547	ND	ND	ND
67	545	0.00	0.00	0.00
68	541	ND	ND	ND
69	539	ND	ND	ND
70	533	0.00	0.00	0.00
71	529	0.00	0.00	0.00
72	527	0.00	0.00	0.00
73	517	4.02	4.90	5.33
74	514	2.77	3.38	3.67
75	503	10.21	12.44	13.52
76	502	ND	ND	ND
77	498	0.00	0.00	0.00
78	497	4.64	5.65	6.14
79	484	2.79	3.39	3.69
80	477	4.07	4.95	5.39
81	469	2.67	3.26	3.54
82	463	0.00	0.00	0.00

Table E-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
83	461	5.39	6.57	7.14
84	459	0.00	0.00	0.00
85	449	10.65	12.98	14.10
86	443	1.36	1.66	1.80
87	437	8.03	9.04	9.95
88	430	4.88	5.50	6.05
89	429	0.00	0.00	0.00
90	426	6.83	7.69	8.46
91	424	ND	ND	ND
92	420	11.18	12.60	13.86
93	413	19.05	21.46	23.61
94	406	ND	ND	ND
95	403	16.54	18.63	20.50
96	398	1.85	2.09	2.29
97	392	0.00	0.00	0.00
98	388	11.12	12.52	13.78
99	384	0.64	0.73	0.80
100	380	0.00	0.00	0.00
101	378	ND	ND	ND
102	373	5.12	5.77	6.35
103	370	14.26	16.06	17.67
104	368	0.00	0.00	0.00
105	366	ND	ND	ND
106	358	3.78	4.26	4.68
107	353	12.27	13.83	15.21
108	346	1.59	1.79	1.97
109	343	9.14	10.30	11.33
110	339	8.26	9.31	10.24
111	330	3.63	4.09	4.50

Table E-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
112	323	7.84	8.83	9.71
113	318	2.64	2.97	3.27
114	314	2.20	2.72	2.85
115	311	ND	ND	ND
116	307	ND	ND	ND
117	301	3.01	3.72	3.90
118	297	ND	ND	ND
119	296	ND	ND	ND
120	290	1.88	2.32	2.43
121	281	0.00	0.00	0.00
122	276	1.23	1.53	1.60
123	270	2.17	2.68	2.81
124	265	0.00	0.00	0.00
125	256	2.95	3.64	3.81
126	252	0.00	0.00	0.00
127	248	2.51	3.10	3.25
128	243	3.47	4.28	4.49
129	239	0.42	0.52	0.54
130	231	0.00	0.00	0.00
Total		358	434	486

Appendix F: Sediment Volume Supplied from Bank Caving from 1967 to 1992

Table F-1. Total sediment volumne supplied from bank caving for all 130 bends from 1967 to 1992. A value of zero is assigned to bends with no erosion. Bends that were artifically or naturally cutoff or avulsed are denoted as ND (No Data).

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
1	955	0.00	0.00	0.00
2	941	0.00	0.00	0.00
3	926	0.00	0.00	0.00
4	920	0.00	0.00	0.00
5	913	0.00	0.00	0.00
6	900	0.00	0.00	0.00
7	889	0.00	0.00	0.00
8	880	0.00	0.00	0.00
9	878	0.00	0.00	0.00
10	870	0.00	0.00	0.00
11	865	0.00	0.00	0.00
12	858	0.00	0.00	0.00
13	850	0.00	0.00	0.00
14	841	0.00	0.00	0.00
15	825	0.00	0.00	0.00
16	821	0.00	0.00	0.00
17	809	0.00	0.00	0.00
18	805	0.00	0.00	0.00
19	803	0.00	0.00	0.00
20	787	0.00	0.00	0.00
21	765	0.00	0.00	0.00
22	759	0.00	0.00	0.00
23	754	0.00	0.00	0.00
24	753	0.00	0.00	0.00

Table F-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
25	750	0.00	0.00	0.00
26	746	0.00	0.00	0.00
27	744	0.00	0.00	0.00
28	743	0.00	0.00	0.00
29	740	0.00	0.00	0.00
30	729	0.00	0.00	0.00
31	721	0.00	0.00	0.00
32	716	0.00	0.00	0.00
33	708	0.00	0.00	0.00
34	697	0.00	0.00	0.00
35	694	0.00	0.00	0.00
36	687	0.00	0.00	0.00
37	682	0.00	0.00	0.00
38	679	0.00	0.00	0.00
39	673	0.00	0.00	0.00
40	672	0.00	0.00	0.00
41	667	0.00	0.00	0.00
42	660	0.00	0.00	0.00
43	656	0.00	0.00	0.00
44	650	0.00	0.00	0.00
45	645	0.00	0.00	0.00
46	639	0.00	0.00	0.00
47	634	0.00	0.00	0.00
48	629	0.00	0.00	0.00
49	626	0.00	0.00	0.00
50	625	0.00	0.00	0.00
51	624	0.00	0.00	0.00
52	621	0.00	0.00	0.00
53	606	0.00	0.00	0.00

Table F-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
54	600	0.00	0.00	0.00
55	595	0.00	0.00	0.00
56	589	0.00	0.00	0.00
57	588	0.00	0.00	0.00
58	584	0.00	0.00	0.00
59	578	0.00	0.00	0.00
60	575	0.00	0.00	0.00
61	572	0.00	0.00	0.00
62	570	0.00	0.00	0.00
63	560	0.00	0.00	0.00
64	553	0.00	0.00	0.00
65	550	0.00	0.00	0.00
66	547	0.00	0.00	0.00
67	545	0.00	0.00	0.00
68	541	0.00	0.00	0.00
69	539	0.00	0.00	0.00
70	533	0.00	0.00	0.00
71	529	0.00	0.00	0.00
72	527	0.00	0.00	0.00
73	517	0.00	0.00	0.00
74	514	0.00	0.00	0.00
75	503	0.00	0.00	0.00
76	502	0.00	0.00	0.00
77	498	0.00	0.00	0.00
78	497	0.00	0.00	0.00
79	484	0.00	0.00	0.00
80	477	0.00	0.00	0.00
81	469	0.00	0.00	0.00
82	463	0.00	0.00	0.00

Table F-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
83	461	0.00	0.00	0.00
84	459	0.00	0.00	0.00
85	449	0.00	0.00	0.00
86	443	0.00	0.00	0.00
87	437	0.00	0.00	0.00
88	430	0.00	0.00	0.00
89	429	0.00	0.00	0.00
90	426	0.00	0.00	0.00
91	424	0.00	0.00	0.00
92	420	0.00	0.00	0.00
93	413	0.00	0.00	0.00
94	406	0.00	0.00	0.00
95	403	2.28	2.68	2.94
96	398	0.00	0.00	0.00
97	392	0.00	0.00	0.00
98	388	1.61	1.89	2.08
99	384	0.32	0.38	0.41
100	380	0.00	0.00	0.00
101	378	0.00	0.00	0.00
102	373	0.00	0.00	0.00
103	370	0.00	0.00	0.00
104	368	0.00	0.00	0.00
105	366	0.00	0.00	0.00
106	358	0.00	0.00	0.00
107	353	2.37	2.78	3.06
108	346	0.00	0.00	0.00
109	343	0.00	0.00	0.00
110	339	3.94	4.64	5.10
111	330	0.00	0.00	0.00

Table F-1. Continued.

Bend No.	Approximate 1962 River Mile Mid-Point	Volume of Sediment Supplied from Bank Caving (MCY/yr)		
		25th	50th	75th
112	323	1.18	1.39	1.53
113	318	1.43	1.68	1.85
114	314	0.00	0.00	0.00
115	311	0.00	0.00	0.00
116	307	0.00	0.00	0.00
117	301	0.00	0.00	0.00
118	297	0.00	0.00	0.00
119	296	0.00	0.00	0.00
120	290	0.00	0.00	0.00
121	281	0.00	0.00	0.00
122	276	0.00	0.00	0.00
123	270	0.00	0.00	0.00
124	265	0.00	0.00	0.00
125	256	0.00	0.00	0.00
126	252	1.55	1.92	2.19
127	248	0.00	0.00	0.00
128	243	0.00	0.00	0.00
129	239	0.00	0.00	0.00
130	231	0.00	0.00	0.00
Total		15	17	19