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Simulation Studies of Flow and Sediment Transport Using a Mathematical Model, Atchafalaya River Basin, Louisiana

Geological Survey, Bay Saint Louis, Miss Water Resources Div

May 77

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SIMULATION STUDIES OF FLOW AND SEDIMENT TRANSPORT USING A MATHEMATICAL MODEL, ATCHAFALAYA RIVER BASIN, LOUISIANA

U. S. GEOLOGICAL SURVEY

Water-Resources Investigation 77-14

Prepared in cooperation with the U. S. Fish and Wildlife Service

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V. E. McKelvey, Director

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CONVERSION FACTORS

The conversion factors for the terms used in this report are listed below. The metric equivalents are shown only to the number of significant figures consistent with the values for the English units within the text.

English	Multiply by	Metric
feet (ft)	0.3048	meters (m)
square foot (ft^2)	0.0929	square meter (m^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)

SIMULATION STUDIES OF FLOW AND SEDIMENT TRANSPORT USING A MATHEMATICAL MODEL, ATCHAFALAYA RIVER BASIN, LOUISIANA

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ABSTRACT

Simulation studies were made of flow and sediment transport for the Atchafalaya River basin, Louisiana using a mathematical model calibrated and supplied by the Hydrologic Engineering Center and the New Orleans District, U.S. Army Corps of Engineers. The study results are based on three, 50-year computer simulations for the following alternatives: (1) no-action alternative, (2) channelization with a center-channel flow area of 80,000 ft^2 (square feet), and (3) channelization with a center-channel flow area of 100,000 ft^2. Analyses of the simulated data base for depth-frequency, inundated-area, floodway cross-section and water-surface profile relationships were made for 10 flow rates. The analyses indicate a general trend of aggradation in the lower part of the floodway with a consequent trend toward increasing the inundated area, especially at higher flood flows.

INTRODUCTION

According to Gagliano and van Beek (1975), the Atchafalaya Basin is a large shallow depression lying within the deltaic plain of the Mississippi River in south Louisiana comprising an 1,800 mi^2 (square mile) lowland area confined between natural levee ridges that delineate former courses of the Mississippi River. Until about 90 years ago, the basin was occupied by a series of large freshwater lakes and swamps. At that time, construction of levees and floodways was commenced and progressive major upstream diversions of the Mississippi and Red Rivers were initiated. As a consequence, floodwaters and sediment entered the basin causing major changes in the configuration and natural environments of the basin. Today (1976) the Atchafalaya floodway (about 15 mi [miles] wide and 150 mi long) is a major component of the lower Mississippi River flood-control system. The floodway is designed to carry about 50 percent of the design project flood of 3 million ft^3/s (cubic feet per second). An excellent review of flood-control capabilities of the Atchafalaya Basin floodway is given by Hebert (1967). A map of the Atchafalaya floodway is shown in figure 1.

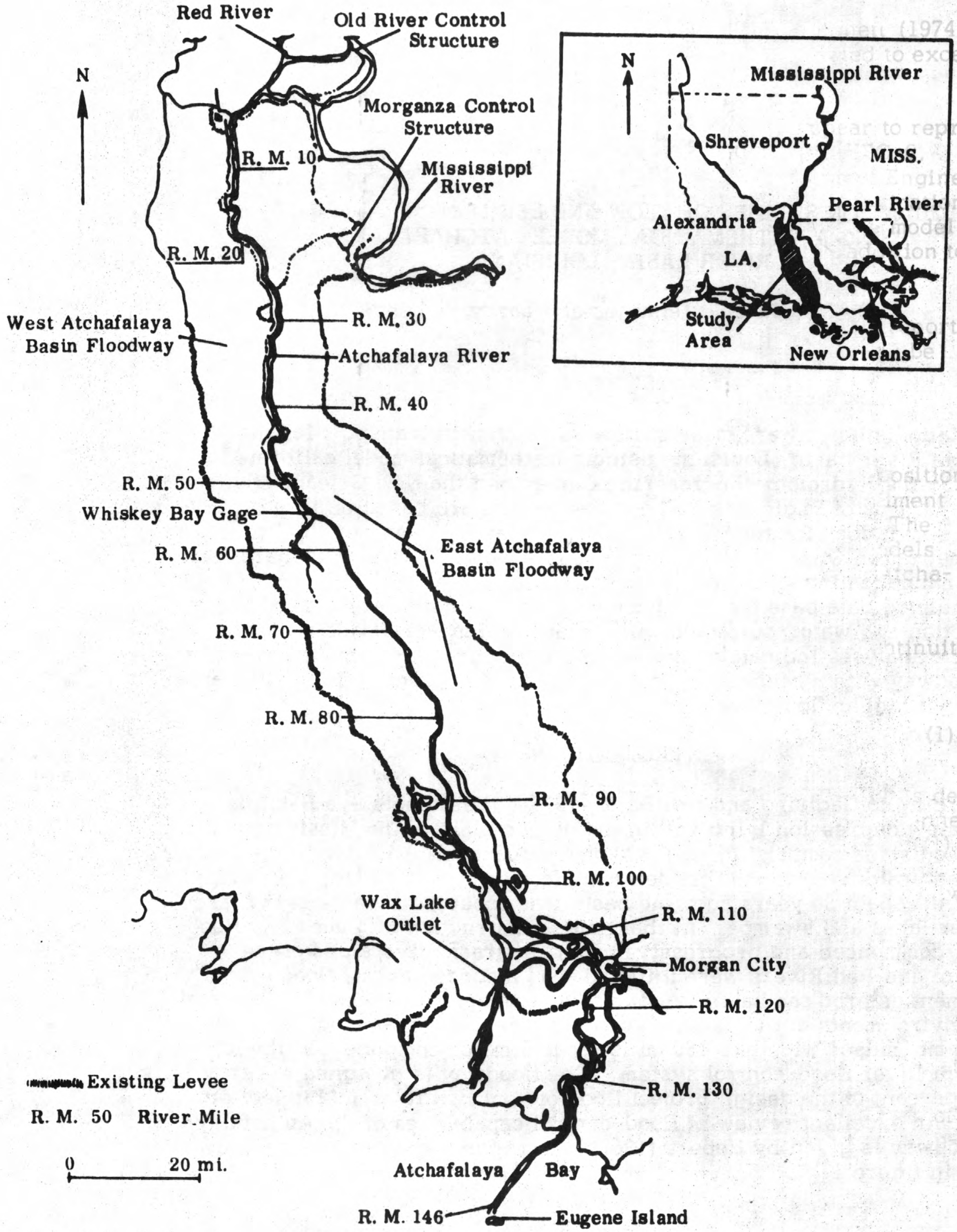


Figure 1. Location of Atchafalaya Basin study area (after Amar and Thomas)

In 1974, as a part of its studies of the environmental consequences of proposed new channelization work in the lower Atchafalaya floodway below Whiskey Bay Pilot Channel (about river mile 53), the U.S. Fish and Wildlife Service arranged for the U.S. Geological Survey to perform hydrologic studies using a mathematical model of the Atchafalaya Floodway. The model, calibrated by the U.S. Army Corps of Engineers, is a special version of computer program HEC-6 "Scour and Deposition in Rivers and Reservoirs", U.S. Army Corps of Engineers (1976). The model was made operational on the computer facilities at the Geological Survey's Gulf Coast Hydroscience Center in June 1976. Three 50-year flow-sediment simulations were made using channel geometry and input data supplied by the New Orleans District (NOD), U.S. Army Corps of Engineers and the calibrated and verified model, supplied by the Hydrologic Engineering Center (HEC) U.S. Army Corps of Engineers, Davis, California. Each simulation of flow and sediment transport was for a different channelization alternative as specified by U.S. Fish and Wildlife - U.S. Army Corps of Engineers work groups: (1) no-action alternatives, (2) channelization with a center-channel flow area of 80,000 ft^2, and (3) channelization with a center-channel flow area of 100,000 ft^2. Each alternative considered 1973 channel geometry at 143 cross sections as starting conditions.

Purpose and Objectives of Study

Special computer files were created to store the simulation results for each model run corresponding to each channelization alternative. From these files, additional analyses were made as requested by U.S. Fish and Wildlife Service. The purpose of this report is to present these analyses which include: (1) floodway depth-frequency relations for 52 basin cross sections below mile 53.19, (2) inundated-area relations for the entire basin, and (3) water-surface profiles at both the beginning and the end of the 50-year simulation, for 10 flow rates (including the 1.5 million ft^3/s NOD floodway design flow rate) for the entire basin for each alternative.

Acknowledgments

The authors wish to thank Mr. John T. Sellers, General Electric Corporation who performed the bulk of the computer programming related to this study. Also, they acknowledge the significant assistance of Mr. William A. Thomas, HEC, U.S. Army Corps of Engineers and the advice of Messrs. William G. Garrett and James W. Austin, Jr., NOD, U.S. Army Corps of Engineers and Mr. Dan K. Tabberer, U.S. Fish and Wildlife Service.

DESCRIPTION OF THE FLOW-SEDIMENT MODEL

The wildlife and environmental study requirements of U.S. Fish and Wildlife Service indicated the need for a detailed analysis of flow and sediment movement in the Atchafalaya Floodway. The non-channel areas of the floodway are of special interest because they are habitat areas for many important species of wildlife. To achieve the desired results the use of an unsteady, two-dimensional flow-sediment model was indicated. Unfortunately such a model does not presently exist, according to a review of available models by Bennett (1974). Even if such a model did exist, data requirements might be expected to exceed available data for the Atchafalaya Basin.

The model which was selected for use in the study, does appear to represent the state-of-the art in flow-sediment modeling. This model, HEC-6, Scour and Deposition in Rivers and Reservoirs, U.S. Army Corps of Engineers (1976) is a one-dimensional, steady-flow, movable-bed model. Modifications by HEC personnel, U.S. Army Corps of Engineers have extended the model to allow for deposition of silt and clay material in overbank areas in addition to scour and deposition in the main channel.

Because a complete description of the model is available in a report by U.S. Army Corps of Engineers (1976), only a brief description will be given in this report.

Theoretical Basis of the Model

HEC-6 is a simulation program designed to analyze scour and deposition by modeling the interaction between the water-sediment mixture, sediment material forming the stream's boundary, and the hydraulics of flow. The model is of the movable-bed type as opposed to fixed-bed physical models such as the model used to study ultimate channel development in the Atchafalaya Basin, U.S. Army Corps of Engineers (1973).

The basis for simulating the movable bed is the solution of the continuity equation for sediment material, also called the Exner Equation,

$$\frac{\partial G}{\partial x} + B_o \frac{\partial y_s}{\partial (DD)} = 0 \qquad (1)$$

where G is sediment load in cubic feet per day, DD is time in days, y_s is depth of sediment deposit above channel bottom in feet, x is distance along channel in feet, and B_o is width of deposit on the movable bed in feet. Equation (1) is solved in finite difference form by accepting an upstream sediment load (related to inflowing water discharge) for each grain size present, and moving the sediment load from section to section through the model. Transport capacity is calculated using the method devised by Toffaleti (1966). The rate and amount of scour is controlled in the model by tracking the amount of channel surface area that is armored and by keeping a running calculation of the thickness of the active bed.

The basin hydraulic parameters needed to "drive" the sediment calculations are velocity, depth, width, and slope. These parameters are supplied by repeated calculations of the floodway water-surface profile for sequences of steady flows. The steady-flow sequences are defined as a histogram representation of the upstream water-discharge hydrograph.

Model limitations.--The major limitation of HEC-6 is the fact that it is a one-dimensional steady-flow model with no provision for simulating the development of meanders, flow-sediment movement through minor channels, or specification of a lateral distribution of sediment load across a cross section. The program raises or lowers elevations for the entire cross section within the confines of the movable bed. The movable bed is that part of the floodway that has been observed to participate in scour and deposition. Definition of the movable bed for the purposes of modeling the Atchafalaya Floodway was made through a study of historical sedimentation observed over a period of years at sedimentation ranges established throughout the floodway. A special provision of the Atchafalaya model, not included in the HEC-6 model, is the separate specification of silt and clay deposition in left and right overbank areas. Both scour and deposition are allowed to occur in the main channel for all grain sizes.

Data Base and its Reliability

Basic hydrologic data required for the HEC-6 model includes three major categories: geometric data, sediment data and hydrologic data.

Geometric data.--This data describes the initial condition of the floodway in terms of cross-section information, reach lengths and Manning's *n*-values for water-surface profile calculations. Because the model performs water-surface profile computations using the step-backwater method (see Henderson, 1966), 143 cross sections spaced at 1 to 2 mi intervals were developed from field surveys by the NOD. Each cross section contained from 20 to 95 ground or channel bottom elevations in feet above mean sea level. The cross sections, obtained in 1973 and identified with river-mile designation, defined the floodway from the confluence of Red River and Old River down to Eugene Island, some 13 mi out into Atchafalaya Bay below Morgan City, Louisiana. Figure 1 shows significant channel and floodway features with occasional river miles noted. Manning's *n*-values were originally chosen by field observations and later refined in the calibration of the model as explained in later sections of this report.

Geometric data were supplied by NOD for each channelization alternative. The cross sections for each center-channel alternative were overlaid on the natural 1973 channel conditions. Thus, initial geometric data were available for each channelization alternative. Although problems were encountered with inappropriate cross sections or suspicious elevations, in general the geometric data is reliable.

Sediment data.--Sediment data supplied by NOD includes information on (1) the grain size of sediment material in the streambed, (2) the gradation and amount of total inflowing sediment load, and (3) fluid and sediment properties. Gradation of streambed material was supplied by NOD. Long-term sediment records were available at Simmesport, Louisiana for definition of inflowing sediment relations. The total inflowing sediment load was subdivided into clay, two sizes of silt, and four sizes of sand (very fine, fine, medium, and coarse). Fluid and sediment properties were assigned using typical values. The reliability of sediment data is believed to be adequate.

Hydrologic data.--Hydrologic data, as supplied by NOD, includes water-discharge hydrographs and daily water temperatures (used in sediment computations). Streamflow records at Simmesport, Louisiana were available for use. However, because long-term homogenous records are not available, a 10-year representative period from 1963 to 1972 water years was used repeatedly to make up a continuous hypothetical 50-year hydrologic data sequence or time series. In addition, historical records from selected high- and low-flow years were placed in the input record. For example, records for 1937, 1945, 1949, 1950, 1958, 1961, 1962, 1973, 1974, and 1975 water years were placed in the 50-year period. Table 1 shows the hypothetical, 50-year sequence of water years. Past years were placed at their approximate time location within the series. Within each year, the continuous flow hydrograph was represented by a flow histogram of steady flows varying in duration from 3 days to several months depending on flow variation. At least 3 days are required to establish a given steady flow throughout the reach. Although the 50-year sequence of hydrologic data is not an actually observed sequence, it is believed to be a representative estimate of future conditions for use in simulation modeling. Computations in the model were made only through the main channel outlet at Morgan City, La. although 30 percent of the flow passes through the Wax Lake Outlet. Therefore, the model uses only 70 percent of inflow below river mile 103.

Calibration and Verification

The Atchafalaya Model was calibrated and verified by HEC and NOD, Thomas (1975), Amar and Thomas (1976). Model calibration involved the intricate process of adjusting cross-section *n*-values, inflowing sediment loads and natural levee elevations along the river. The process is continued until the model demonstrates the ability to reproduce, with reasonable accuracy, the historical water-surface elevations, the changes in bed profile, and related sediment deposition characteristics.

The calibration and verification period for the model was the 11-year period, 1963-73, for which an adequate data set of geometric, sediment, and hydrologic data existed. The discharge hydrograph at Simmesport, for water years 1963 to 1973, was converted into a discharge histogram of steady flows. Initial geometry at all cross sections for 1963 was defined along with inflowing sediment relations and other initial conditions. Previously, *n*-values, which express representative roughness for all reaches, were calibrated at six gage locations in the floodway. Computed and observed water-surface elevations agreed within ± 0.5 ft at the six gages. The model was then run for the 11-year period and observed and computed values for 1973 were compared for various cross-section locations in the floodway.

Table 1.--Hypothetical 50-year sequence of water-year inflow records

No.	Water year	No.	Water year	No.	Water year	No.	Water year	No.	Water year
1	1974	11	1971	21	1971	31	1971	41	1971
2	1975	12	1972	22	1945	32	1972	42	1972
3	1963	13	1963	23	1963	33	1963	43	1963
4	1964	14	1937	24	1964	34	1964	44	1964
5	1965	15	1965	25	1965	35	1958	45	1965
6	1966	16	1966	26	1949	36	1966	46	1966
7	1967	17	1967	27	1950	37	1967	47	1967
8	1968	18	1968	28	1968	38	1961	48	1968
9	1969	19	1969	29	1969	39	1962	49	1969
10	1970	20	1970	30	1970	40	1970	50	1973

Adjustments were made to the inflowing sediment load relation at Simmesport to achieve good comparison in water-surface elevations at the end of the calibration period (1973). It was necessary to reduce inflowing sand loads to 30 percent of observed values, which represented a 10 percent reduction in total sediment inflow. Results at Simmesport, which show a trend of degradation for a 100,000 ft^3/s flow rate, are shown in figure 2. Figure 3 shows observed and computed trends for a flow of 400,000 ft^3/s at river miles 29 (Melville gage) and 41 (Krotz Springs gage) which were not used in the calibration. Based on these comparisons and other comparisons, the model was considered adequately verified by HEC and NOD.

Comparisons were also made by HEC and NOD using typical cross sections for 1963 initial conditions, and observed and calibrated conditions for 1973. Fairly close agreement in cross-section area was observed; however, because the model is constrained to retain the shape of initial conditions as a result of making a constant vertical change at points on the cross section, changes in cross-sectional shape between 1963 and 1973 were not simulated adequately.

The model, as calibrated and verified, exhibits some definite limitations for use in simulation studies. A major limitation is the lack of calibration and verification information for the floodway area below Whiskey Bay (mile 53.19). Because this is the area of proposed channelization, verification of model results in this area of the floodway are believed to be crucial to interpretation of simulation results. In the simulation studies described below, it was assumed that the model was adequate to at least estimate the relative effects of the three channelization alternatives.

Simulation

The calibrated and verified Atchafalaya model was made operational on the Gulf Coast Hydroscience Center computer facilities. Because of the change from one computer to another, some minor differences in round-off of significant figures were observed. However, these differences are not significant and did not affect simulation results.

The simulations for each channelization alternative were performed using input data supplied by NOD. In a normal run with HEC-6, only a limited amount of printout is generally specified, however, for the Atchafalaya model simulations, which were done in 10-year increments for each alternative, practically all meaningful results were written on magnetic disk storage devices. These files were then available for summarization, statistical analysis, plotting, and so forth. Table 2 shows an example retrieval from the files for the no-action alternative at the end of the 50-year simulation period for a flow of 450,000 ft^3/s. Similar results are given in tables 3 and 4 for the same discharge for other alternatives. Cumulative bed changes for each cross section from the beginning of the simulation are shown for left overbank, main channel, and right overbank. Note that only deposition occurs on overbanks. Mean sea-level elevations (for main channel, water surface, overbanks and the thalweg), and water-discharge and sediment-load rates are also shown.

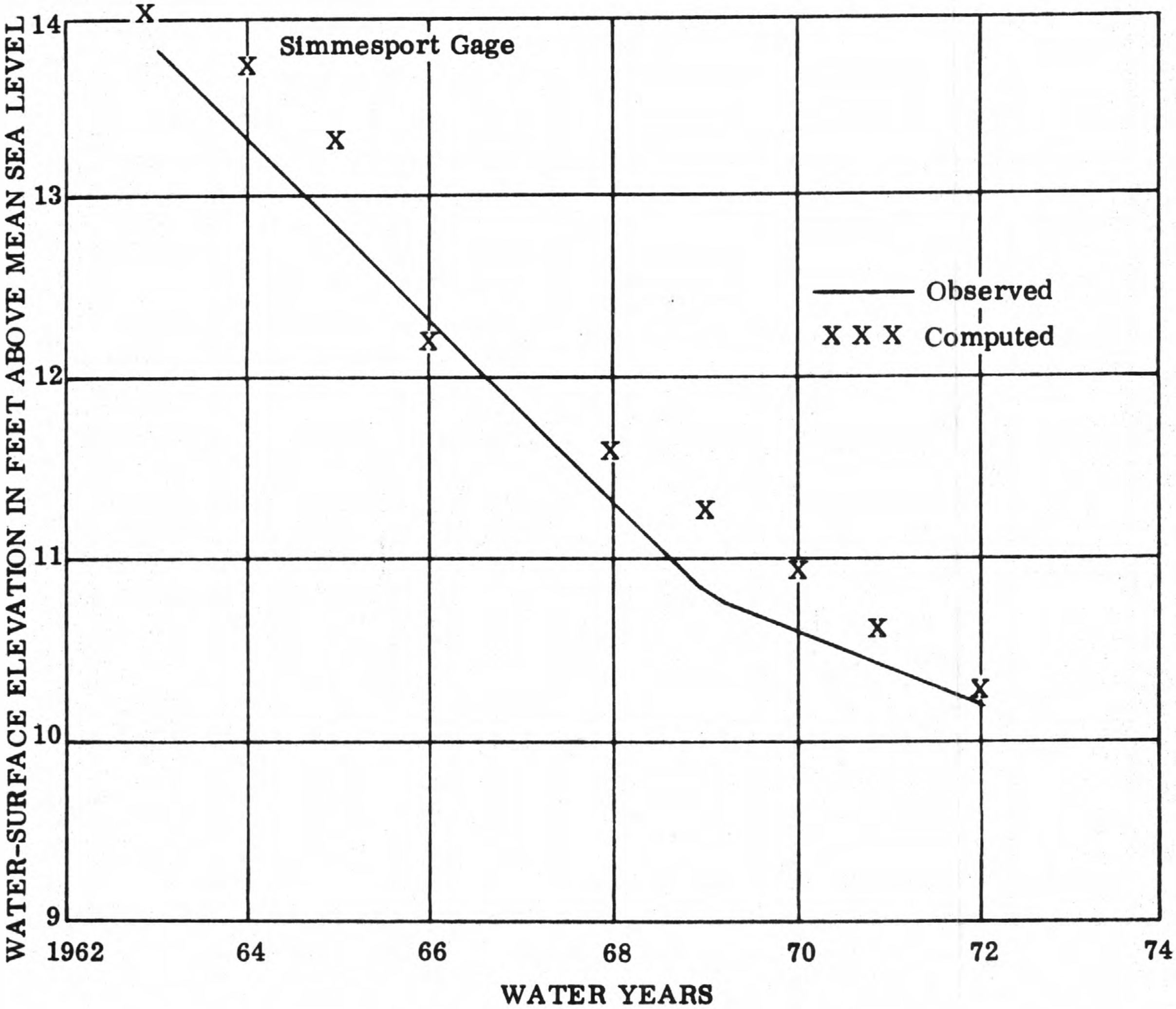


Figure 2. Calibrated water-surface elevation trends at Simmesport gage for a flow of 100,000 cubic feet per second (after Amar and Thomas [1976])

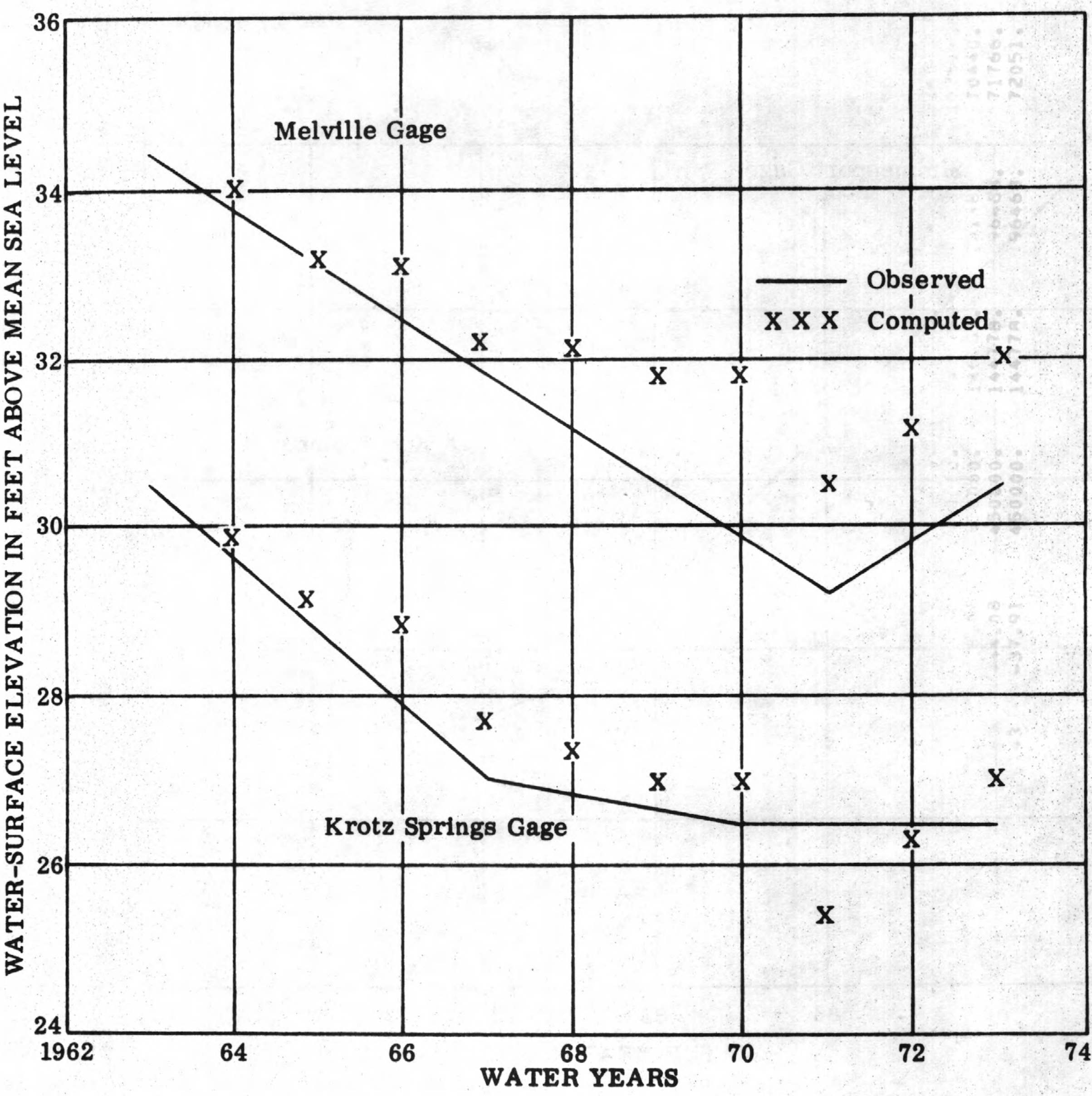


Figure 3. Verification of water-surface elevation trends at Melville and Krotz Springs gages for a flow of 400,000 cubic feet per second (after Amar and Thomas [1976])

Table 2.--File retrieval for the no-action alternative for a flow of 450,000 cubic feet per second at the end of the 50-year simulation

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
19.000	0.27	-0.84	0.0	43.75	-21.14	450000.	147011.	105185.	178904.	39.27	47.10
18.000	0.32	8.39	0.33	43.79	-43.71	450000.	147011.	105185.	209054.	36.32	35.93
16.000	0.73	13.21	0.09	43.43	-31.09	450000.	147011.	105185.	209264.	35.73	38.59
14.000	0.41	8.49	0.0	43.18	-34.01	450000.	147011.	105185.	211919.	35.81	17.00
13.000	0.22	4.22	0.0	43.03	-22.48	450000.	147011.	105185.	231627.	40.72	37.80
12.000	0.0	10.43	0.0	42.86	-35.57	450000.	147011.	105185.	268763.	44.30	33.20
11.000	0.02	4.92	0.78	42.76	-42.08	450000.	147011.	105185.	216456.	44.32	33.98
10.000	0.00	13.30	0.69	42.69	-46.20	450000.	147011.	105185.	148859.	45.00	34.29
8.000	0.08	2.27	0.09	42.55	-59.83	450000.	146983.	105097.	115269.	40.08	44.39
6.000	0.20	-2.10	0.02	42.48	-50.50	450000.	146907.	104790.	92990.	40.20	39.92
4.000	0.06	13.34	0.00	41.86	-33.36	450000.	146876.	104665.	1178404.	40.06	41.00
2.000	0.03	9.79	0.08	41.43	-31.61	450000.	146870.	104644.	2031778.	38.93	27.78
1.000	0.04	27.61	0.01	41.17	-35.59	450000.	146864.	104623.	2289254.	40.04	40.61
0.600	0.03	22.75	0.01	41.02	-78.25	450000.	146858.	104596.	1793764.	40.03	39.41
0.400	0.01	33.27	0.00	40.82	-29.03	450000.	146858.	104596.	2268134.	23.81	44.90
0.200	0.08	34.80	0.09	40.62	-37.00	450000.	146858.	104596.	2421012.	36.08	35.19
4.900	0.01	-5.87	0.02	40.90	-51.97	450000.	146857.	104595.	54470.	45.81	39.02
6.200	3.83	-0.45	0.0	40.45	-76.45	450000.	146857.	104595.	175383.	41.33	48.40
7.800	0.0	-0.22	0.0	39.89	-24.72	450000.	146857.	104595.	167562.	49.30	52.50
8.700	0.35	-0.62	0.90	39.52	-19.82	450000.	146857.	104595.	267911.	41.75	37.80
9.800	3.75	-0.93	0.69	39.12	-19.83	450000.	146857.	104595.	608118.	40.45	41.19
10.600	0.0	-0.50	4.76	38.75	-13.50	450000.	146857.	104595.	776629.	45.20	41.46
11.800	0.0	-0.45	3.74	38.24	-23.85	450000.	146857.	104595.	1054604.	46.80	41.04
12.800	0.0	-0.44	0.0	37.90	-27.74	450000.	146857.	104595.	393321.	47.40	43.10
13.900	0.0	2.35	1.49	37.66	-62.95	450000.	146857.	104595.	41602.	47.90	46.39
15.400	0.04	-0.85	0.0	37.13	-28.85	450000.	146857.	104595.	112604.	40.04	48.00
16.400	5.18	-1.13	0.0	36.67	-30.93	450000.	146857.	104595.	262378.	31.08	49.80
17.500	0.01	23.25	1.45	36.38	-40.05	450000.	146857.	104595.	68304.	42.81	41.95
18.700	0.16	0.90	1.13	35.92	-37.70	450000.	146857.	104595.	66701.	36.76	41.43
19.600	0.0	-0.01	3.12	35.76	-83.21	450000.	146857.	104595.	49754.	43.40	40.82
20.600	0.0	2.26	0.52	35.38	-30.44	450000.	146857.	104595.	211883.	40.90	43.52
21.700	0.0	-18.77	0.0	35.13	-65.37	450000.	146857.	104595.	93030.	44.70	48.40
23.400	0.0	-5.04	0.0	34.74	-52.94	450000.	146857.	104595.	80518.	46.10	45.60
24.700	0.0	0.38	0.16	34.45	-76.42	450000.	146857.	104595.	84303.	40.60	38.16
25.600	0.09	47.47	2.40	34.25	-61.53	450000.	146857.	104595.	69380.	37.89	35.20
26.500	0.08	-6.18	0.26	34.02	-70.88	450000.	146857.	104595.	81645.	35.78	40.06
27.600	0.18	-10.77	0.80	33.75	-81.87	450000.	146857.	104595.	97568.	36.48	38.40
28.300	0.22	-5.98	1.34	33.60	-73.88	450000.	146857.	104595.	96817.	39.02	38.64
29.400	0.77	-5.67	1.17	33.35	-57.77	450000.	146855.	104589.	95255.	34.37	30.37
30.500	0.34	-5.11	2.51	33.11	-104.31	450000.	146855.	104589.	102975.	38.54	36.91

Table 2.-- (Continued)

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
31.300	0.14	36.06	3.69	32.96	-73.34	450000.	146855.	104589.	94619.	40.24	39.19
32.600	0.39	-4.14	0.26	32.64	-51.34	450000.	146855.	104589.	105685.	32.09	36.26
33.500	0.15	-11.18	0.0	32.44	-67.58	450000.	146855.	104589.	113173.	37.15	39.90
34.600	0.68	-2.43	0.74	32.13	-99.23	450000.	146855.	104589.	105089.	33.08	35.34
35.600	0.0	2.90	0.25	31.85	-65.50	450000.	146855.	104589.	122972.	38.10	38.15
36.600	0.11	-0.79	0.0	31.57	-56.29	450000.	146855.	104589.	120816.	39.01	39.30
37.700	0.0	-7.44	0.07	31.31	-71.14	450000.	146855.	104589.	124005.	43.80	35.27
38.500	0.02	-3.08	1.31	31.16	-61.98	450000.	146855.	104589.	134116.	38.42	33.51
39.400	0.83	2.71	0.85	30.93	-64.49	450000.	146855.	104589.	131695.	31.03	31.25
40.700	1.02	-5.89	1.47	30.59	-59.29	450000.	146855.	104589.	136074.	31.82	32.97
41.500	0.0	-4.00	0.48	30.39	-58.90	450000.	146855.	104589.	127240.	32.90	36.68
42.500	0.0	16.80	0.0	30.19	-88.20	450000.	146855.	104589.	130168.	35.90	35.00
43.700	0.0	7.35	0.0	30.10	-82.65	450000.	146855.	104589.	134901.	35.50	33.90
44.800	0.0	16.20	0.0	29.69	-91.40	450000.	146855.	104589.	137130.	35.60	32.10
45.700	0.0	-2.71	0.0	29.43	-67.61	450000.	146855.	104589.	153068.	33.40	35.30
46.700	0.0	-6.83	2.06	29.10	-65.53	450000.	146854.	104587.	155417.	34.10	28.16
47.500	0.0	-2.64	0.0	28.84	-55.74	450000.	146854.	104587.	154988.	33.10	34.00
48.600	0.49	14.63	0.0	28.37	-71.67	450000.	146854.	104587.	149068.	31.69	31.50
49.800	0.0	5.51	1.38	27.92	-70.19	450000.	146854.	104587.	156844.	32.20	31.58
50.700	0.0	12.38	0.69	27.66	-78.02	450000.	146854.	104587.	184058.	31.30	31.69
51.600	0.0	-5.90	0.64	27.42	-89.80	450000.	146854.	104587.	126250.	32.20	30.84
52.700	0.06	-9.56	3.60	27.14	-90.56	450000.	146854.	104587.	91797.	30.66	32.80
53.190	0.02	-9.09	0.00	26.93	-85.09	450000.	146854.	104587.	70130.	29.02	29.00
55.200	0.06	-0.41	1.09	26.37	-70.41	450000.	146848.	104569.	103783.	20.06	21.09
56.310	0.0	0.52	0.0	25.72	-67.48	450000.	146848.	104569.	118288.	28.00	28.00
57.060	0.0	12.13	0.0	25.13	-53.87	450000.	146848.	104569.	149386.	27.00	27.00
57.680	0.0	2.36	0.0	24.58	-60.64	450000.	146848.	104569.	195717.	27.00	27.00
59.390	0.0	3.69	0.0	24.15	-71.31	450000.	146848.	104569.	253811.	25.00	25.00
60.150	0.0	18.82	0.0	23.41	-53.18	450000.	146848.	104569.	127967.	24.00	24.00
61.150	0.0	12.07	0.0	23.19	-58.93	450000.	146848.	104569.	229190.	24.00	24.00
62.030	0.0	4.14	0.0	23.16	-65.86	450000.	146848.	104569.	161435.	20.00	22.00
63.370	0.0	5.10	0.0	22.94	-45.90	450000.	146848.	104569.	99377.	20.00	22.00
65.200	0.0	-0.62	0.0	22.12	-87.62	450000.	146848.	104569.	323475.	21.00	23.00
67.000	0.0	8.34	0.36	21.83	-60.66	450000.	146848.	104569.	120413.	20.00	20.35
68.500	0.00	3.78	0.50	21.59	-56.22	450000.	146848.	104569.	72777.	20.00	20.50
69.330	0.0	15.19	0.0	21.46	-62.81	450000.	146848.	104569.	65023.	20.00	20.00
69.970	0.04	1.13	0.0	21.13	-51.87	450000.	146848.	104569.	314001.	20.04	22.00
71.000	0.0	6.31	0.0	21.02	-61.69	450000.	146848.	104569.	132611.	20.00	21.00
72.050	0.02	8.96	0.53	20.87	-36.04	450000.	146083.	101485.	70440.	20.02	20.53
73.310	0.04	11.92	0.51	20.69	-44.08	450000.	144778.	96468.	71766.	20.04	20.51
74.940	0.0	13.09	0.02	20.43	-37.91	450000.	144778.	96468.	72051.	18.00	20.02

Table 2.-- (Continued)

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation in ft, m.s.l.: Left over bank	Water-surface elevation in ft, m.s.l.: Right over bank
76.530	0.0	-1.91	0.00	20.19	-51.91	450000.	144778.	96468.	89727.	20.00	20.00
77.470	0.0	15.10	0.0	20.09	-42.90	450000.	144778.	96468.	63249.	20.00	17.00
79.350	0.00	12.42	0.0	19.66	-47.58	450000.	144778.	96468.	29986.	20.00	14.00
81.130	0.33	10.34	0.0	18.87	-31.66	450000.	144778.	96468.	237456.	13.83	20.00
82.430	2.46	11.38	0.59	18.60	-46.62	450000.	144778.	96468.	32440.	12.46	14.09
84.170	0.11	-14.73	0.0	18.08	-55.73	450000.	144778.	96468.	531566.	12.11	26.00
85.390	3.68	5.89	3.72	17.96	-38.11	450000.	144778.	96468.	33680.	15.18	15.22
87.000	0.07	10.16	5.13	17.75	-37.84	450000.	144778.	96468.	16138.	10.07	15.13
88.800	4.94	-8.34	5.88	17.48	-57.34	450000.	142149.	86601.	25207.	14.94	15.88
90.230	1.56	2.58	4.90	17.35	-53.42	450000.	138880.	75744.	17761.	11.58	14.90
91.740	4.47	-4.08	5.08	17.19	-47.08	450000.	136360.	68455.	15683.	14.47	15.08
92.660	2.93	-2.08	4.59	17.10	-54.08	450000.	134126.	62578.	12264.	12.93	14.59
93.780	0.32	10.63	2.79	16.95	-41.37	450000.	134126.	62578.	19632.	10.32	12.79
95.090	0.01	14.63	1.36	16.71	-47.37	450000.	134126.	62578.	13581.	10.01	11.36
97.190	0.0	15.83	1.62	16.29	-55.17	450000.	134126.	62578.	10838.	9.00	10.62
98.310	2.17	2.10	3.52	15.87	-57.90	450000.	134126.	62578.	231341.	0.0	0.0
99.990	1.70	6.51	3.66	15.62	-50.49	450000.	134126.	62578.	68599.	3.70	11.66
101.570	0.00	-14.93	1.05	15.33	-68.93	450000.	134126.	62578.	262268.	10.00	11.05
102.780	0.0	5.22	1.28	15.23	-32.78	315000.	93888.	43805.	9191.	12.60	10.28
104.700	0.00	1.38	4.71	14.72	-38.62	315000.	90019.	37175.	23506.	30.00	7.71
106.000	0.00	2.08	5.15	14.42	-24.92	315000.	88523.	34525.	28318.	30.00	8.15
106.200	0.00	1.46	5.50	14.35	-25.54	315000.	87906.	33394.	29977.	30.00	8.50
106.600	0.00	1.49	5.55	14.28	-30.51	315000.	87377.	32454.	32750.	30.00	8.55
106.800	0.00	1.18	5.35	14.22	-30.82	315000.	86941.	31693.	34535.	30.00	8.35
107.000	0.00	1.90	5.33	14.16	-30.10	315000.	86401.	30790.	32905.	30.00	8.33
107.400	4.66	-3.79	7.55	14.07	-42.49	315000.	84769.	28441.	36971.	7.16	8.45
108.900	4.69	2.63	6.39	13.74	-21.17	315000.	82945.	26083.	42230.	7.29	9.29
110.400	2.51	-8.87	1.96	13.23	-49.77	315000.	82945.	26083.	71622.	7.31	4.86
111.500	1.56	-4.04	4.64	13.09	-35.04	315000.	82944.	26083.	129162.	3.48	6.54
112.100	2.74	10.50	3.36	12.92	-54.50	315000.	82902.	26028.	37784.	4.54	5.26
114.680	10.03	11.73	2.38	12.62	-63.77	315000.	82896.	26020.	204661.	11.63	3.78
115.400	2.38	8.85	2.89	12.36	-73.65	315000.	82896.	26020.	207631.	4.38	3.29
115.900	3.69	15.61	11.70	12.37	-68.78	315000.	82889.	26011.	51813.	3.93	12.03
116.400	10.41	18.31	3.72	12.19	-67.49	315000.	82878.	25996.	40622.	12.41	4.82
117.160	6.06	15.95	1.03	12.09	-74.65	315000.	82870.	25986.	23880.	7.26	7.63
117.970	2.05	13.78	4.13	11.84	-38.22	315000.	82870.	25986.	23027.	5.05	5.13
118.000	2.03	13.04	4.08	11.65	-38.96	315000.	82870.	25986.	22256.	5.03	5.08
118.490	0.67	15.19	1.89	11.79	-68.31	315000.	82866.	25981.	26709.	4.77	7.39
119.280	0.22	21.43	2.01	11.54	-64.47	315000.	82863.	25977.	53743.	5.82	6.21
120.220	0.28	19.82	1.36	11.35	-61.88	315000.	82862.	25975.	35688.	6.18	6.46

Table 2.--(Continued)

River mile	Bed change, in ft Left over bank	Channel	Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day Clay	Silt	Sand	Water-surface elevation, in ft, m.s.l. Left over bank	Right over bank
120.770	0.40	18.44	3.13	11.26	-67.36	315000.	82859.	25972.	29853.	3.30	5.13
121.730	0.34	11.61	2.80	11.03	-64.09	315000.	82794.	25886.	22249.	2.84	7.60
122.200	0.42	12.95	11.06	10.94	-65.95	315000.	82794.	25886.	18914.	3.32	13.16
123.400	0.94	10.64	4.00	10.75	-52.16	315000.	82604.	25648.	22673.	2.04	6.00
124.350	2.54	10.15	2.59	10.55	-66.15	315000.	82336.	25320.	33320.	3.44	4.09
125.630	0.68	5.75	1.59	10.29	-44.55	315000.	81951.	24860.	39850.	1.68	4.19
126.500	0.84	4.57	5.60	10.12	-31.73	315000.	81951.	24860.	40317.	1.04	7.50
127.130	1.60	4.38	3.57	9.76	-30.32	315000.	80852.	23593.	42517.	2.60	7.57
129.000	3.56	8.94	4.41	9.38	-67.36	315000.	79941.	22581.	36751.	4.36	1.31
129.550	3.17	8.35	2.08	9.25	-70.55	315000.	79339.	21915.	33516.	0.07	0.0
130.500	2.56	7.36	2.42	9.03	-43.74	315000.	78180.	20781.	37208.	5.06	4.12
131.650	1.57	4.91	3.16	8.74	-65.99	315000.	77532.	20177.	36556.	0.47	5.26
133.120	3.43	6.31	1.95	8.36	-29.49	315000.	77205.	19881.	35229.	6.13	7.05
134.280	3.47	3.42	0.30	7.97	-50.28	315000.	77010.	19706.	37309.	5.97	2.20
135.100	2.80	4.62	0.45	7.77	-47.88	315000.	76816.	19526.	37951.	6.10	2.95
135.800	3.42	6.45	0.39	7.58	-33.25	315000.	76658.	19377.	36648.	6.02	3.49
136.000	2.19	8.93	0.0	7.59	-9.07	315000.	76658.	19377.	16439.	0.0	9.00
138.000	0.29	6.58	0.00	5.72	-11.42	315000.	76658.	19377.	9206.	0.0	9.00
140.000	1.05	4.95	0.00	4.54	-13.05	315000.	76658.	19377.	19600.	0.0	9.00
142.000	0.70	4.00	0.00	3.58	-14.00	315000.	76658.	19377.	2467.	0.0	9.00
144.000	0.38	3.35	0.0	2.30	-14.65	315000.	76658.	19377.	8649.	0.0	9.00
146.000	0.25	1.53	0.0	0.20	-16.47	315000.	76658.	19377.	11591.	0.0	9.00

Table 3.--File retrieval for the 80,000-square-feet channelization alternative for a flow of 450,000 cubic feet per second at the end of the 50-year simulation

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation in ft, m.s.l.: Left over bank	Water-surface elevation in ft, m.s.l.: Right over bank
19.000	0.15	-0.90	0.0	42.89	-21.20	450000.	147011.	105185.	143087.	39.15	47.10
18.000	0.25	6.18	0.23	42.96	-45.92	450000.	147011.	105185.	227125.	36.25	35.83
16.000	0.62	11.05	0.06	42.62	-33.25	450000.	147011.	105185.	191056.	35.62	38.56
14.000	0.35	5.44	0.0	42.40	-37.06	450000.	147011.	105185.	185860.	35.75	17.00
13.000	0.09	3.03	0.0	42.23	-23.67	450000.	147011.	105185.	268014.	40.59	37.80
12.000	0.0	7.46	0.0	42.10	-38.54	450000.	147011.	105185.	230169.	44.30	33.20
11.000	0.01	4.27	0.68	41.99	-42.73	450000.	147011.	105185.	200139.	44.31	33.88
10.000	0.0	12.73	0.57	41.92	-46.77	450000.	147011.	105185.	143970.	45.00	34.17
8.000	0.06	1.73	0.07	41.77	-60.37	450000.	146994.	105141.	114532.	40.06	44.37
6.000	0.09	-2.92	0.01	41.70	-51.32	450000.	146929.	104884.	91533.	40.09	39.91
4.000	0.03	12.41	0.00	41.08	-34.29	450000.	146905.	104793.	1170656.	40.03	41.00
2.000	0.02	8.87	0.06	40.66	-32.53	450000.	146904.	104789.	2062626.	38.92	27.76
1.000	0.02	26.91	0.01	40.39	-36.29	450000.	146903.	104787.	2294101.	40.02	40.61
0.600	0.02	22.09	0.00	40.24	-78.91	450000.	146900.	104774.	1810181.	40.02	39.40
0.400	0.00	32.53	0.0	40.05	-29.77	450000.	146900.	104774.	2220210.	23.80	44.90
0.200	0.04	34.10	0.05	39.85	-37.70	450000.	146895.	104754.	2350862.	36.04	35.15
4.900	0.01	-6.66	0.01	40.13	-52.76	450000.	146895.	104753.	54197.	45.81	39.01
6.200	2.86	-0.51	0.0	39.67	-76.51	450000.	146895.	104753.	101568.	40.36	48.40
7.800	0.0	-0.24	0.0	39.07	-24.74	450000.	146895.	104753.	94897.	49.30	52.50
8.700	0.19	-0.62	0.70	38.68	-19.82	450000.	146895.	104753.	111617.	41.59	37.60
9.800	2.97	-0.95	0.56	38.26	-19.85	450000.	146895.	104753.	109024.	39.67	41.06
10.600	0.0	-0.62	3.60	37.87	-13.62	450000.	146895.	104753.	103790.	45.20	40.30
11.800	0.0	-0.45	2.53	37.32	-23.85	450000.	146895.	104753.	1066220.	46.80	39.83
12.800	0.0	-0.54	0.0	36.97	-27.84	450000.	146895.	104753.	1405010.	47.40	43.10
13.900	0.0	0.53	1.84	36.74	-64.77	450000.	146895.	104753.	42601.	47.90	46.74
15.400	0.03	-0.85	0.0	36.19	-28.85	450000.	146895.	104753.	79503.	40.03	48.00
16.400	4.32	-1.13	0.0	35.69	-30.93	450000.	146895.	104753.	155087.	30.22	49.80
17.500	0.01	21.78	0.91	35.41	-41.52	450000.	146895.	104753.	69157.	42.81	41.41
18.700	0.12	0.75	0.84	34.94	-37.85	450000.	146895.	104753.	61987.	36.72	41.14
19.600	0.0	-1.81	2.14	34.78	-85.01	450000.	146895.	104753.	51891.	43.40	39.84
20.600	0.0	1.93	0.41	34.39	-30.77	450000.	146895.	104753.	211566.	40.90	43.41
21.700	0.0	-20.59	0.0	34.15	-67.19	450000.	146895.	104753.	92439.	44.70	48.40
23.400	0.0	-5.76	0.0	33.76	-53.66	450000.	146895.	104753.	83577.	46.10	45.60
24.700	0.0	-0.60	0.11	33.46	-77.40	450000.	146895.	104753.	81802.	40.60	38.11
25.600	0.06	46.54	1.57	33.26	-62.46	450000.	146895.	104753.	66362.	37.86	34.37
26.500	0.04	-7.15	0.14	33.03	-71.85	450000.	146895.	104753.	77002.	35.74	39.94
27.600	0.10	-11.50	0.22	32.76	-82.60	450000.	146895.	104753.	91005.	36.40	37.82
28.300	0.12	-6.82	1.14	32.61	-74.72	450000.	146895.	104753.	89720.	38.92	38.44
29.400	0.56	-6.54	0.55	32.36	-58.64	450000.	146893.	104750.	88659.	34.16	29.75
30.500	0.11	-6.07	1.83	32.12	-105.27	450000.	146893.	104750.	96432.	38.31	36.23
31.300	0.04	34.86	3.44	31.97	-74.54	450000.	146893.	104750.	88087.	40.14	38.94
32.600	0.29	-5.13	0.12	31.65	-52.33	450000.	146893.	104750.	101442.	31.99	36.12
33.500	0.0	-12.44	0.0	31.46	-68.84	450000.	146893.	104750.	105136.	37.00	39.90

Table 3.-- (Continued)

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
34.600	0.51	-3.73	0.47	31.15	-100.53	450000.	146893.	104750.	101958.	32.71	35.07
35.600	0.0	1.72	0.12	30.87	-66.68	450000.	146893.	104750.	115828.	38.10	38.02
36.600	0.05	-1.81	0.0	30.59	-57.31	450000.	146893.	104750.	114186.	38.95	39.30
37.700	0.0	-8.23	0.01	30.33	-71.93	450000.	146893.	104750.	117686.	43.80	35.21
38.500	0.01	-3.94	0.92	30.17	-62.84	450000.	146893.	104750.	126759.	38.41	33.12
39.400	0.44	1.67	0.52	29.95	-65.53	450000.	146893.	104750.	127979.	30.64	30.92
40.700	0.64	-6.82	1.01	29.61	-60.22	450000.	146893.	104750.	132439.	31.44	32.51
41.500	0.0	-5.17	0.22	29.41	-60.07	450000.	146893.	104750.	125558.	32.90	36.42
42.500	0.0	15.29	0.0	29.22	-89.71	450000.	146893.	104750.	128062.	35.90	35.00
43.700	0.0	5.72	0.0	29.13	-84.28	450000.	146893.	104750.	130575.	35.50	33.90
44.800	0.0	15.24	0.0	28.72	-92.36	450000.	146893.	104750.	129551.	35.60	32.10
45.700	0.0	-3.66	0.0	28.46	-68.56	450000.	146893.	104750.	146072.	33.40	35.30
46.700	0.0	-7.71	0.72	28.13	-66.41	450000.	146893.	104749.	150794.	34.10	26.82
47.500	0.0	-4.19	0.0	27.87	-57.29	450000.	146893.	104749.	155711.	33.10	34.00
48.600	0.41	13.74	0.0	27.40	-72.56	450000.	146893.	104749.	143345.	31.61	31.50
49.800	0.0	5.98	0.46	26.91	-69.72	450000.	146893.	104749.	155244.	32.20	30.66
50.700	0.0	13.26	0.43	26.64	-77.14	450000.	146893.	104749.	175128.	31.30	31.43
51.600	0.0	-5.01	0.41	26.37	-88.91	450000.	146893.	104749.	177667.	32.20	30.61
52.700	0.0	-8.69	0.95	26.07	-89.69	450000.	146893.	104749.	118852.	30.60	30.15
53.190	0.02	-9.42	0.0	25.86	-85.42	450000.	146893.	104749.	467378.	29.02	29.00
55.200	0.0	23.35	0.02	25.24	-46.65	450000.	146893.	104749.	68822.	20.00	21.02
56.310	0.0	10.78	0.0	24.24	-57.22	450000.	146893.	104749.	1564492.	28.00	28.00
57.060	0.0	16.89	0.0	23.87	-49.11	450000.	146893.	104749.	1123324.	27.00	25.00
57.680	0.0	11.71	0.0	23.47	-51.29	450000.	146893.	104749.	1003002.	27.00	27.00
59.390	0.09	11.60	0.0	23.14	-63.40	450000.	146893.	104749.	710214.	8.09	24.00
60.150	0.0	6.61	0.0	23.02	-65.39	450000.	146893.	104749.	400020.	24.00	24.00
61.150	0.0	18.15	0.0	22.53	-52.85	450000.	146893.	104749.	382253.	24.00	24.00
62.030	0.0	14.59	0.0	22.56	-55.41	450000.	146893.	104749.	173450.	20.00	21.00
63.370	0.22	7.67	0.0	22.37	-43.33	450000.	146893.	104749.	76235.	7.22	22.00
65.200	0.0	40.60	0.0	21.61	-54.40	450000.	146893.	104749.	386403.	20.00	22.00
67.000	0.13	3.78	0.09	21.35	-65.22	450000.	146893.	104749.	140916.	0.0	20.09
68.500	0.0	11.81	0.0	21.15	-48.19	450000.	146893.	104749.	66096.	20.00	20.00
69.330	0.0	17.12	0.16	21.01	-60.88	450000.	146892.	104749.	94799.	20.00	20.16
69.970	0.38	3.57	0.01	20.91	-49.43	450000.	146892.	104749.	91424.	0.38	20.01
71.000	0.0	14.23	0.0	20.56	-39.77	450000.	146892.	104749.	355139.	20.00	22.00
72.050	0.0	-6.26	0.0	20.45	-51.26	450000.	146892.	104749.	177985.	20.00	27.00
73.310	0.0	22.19	0.01	20.32	-32.81	450000.	146892.	104749.	83212.	20.00	-39.99
74.940	0.0	16.48	0.0	20.06	-33.52	450000.	146892.	104749.	86313.	18.00	20.00
76.530	0.0	4.86	0.0	18.92	-45.14	450000.	146892.	104749.	2096017.	20.00	20.00
77.470	0.0	5.57	0.0	18.60	-52.43	450000.	146892.	104749.	1527207.	20.00	20.00

Table 3.--(Continued)

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
79.350	0.01	21.78	0.08	18.45	-38.22	450000.	146892.	104749.	19486.	15.51	13.08
81.130	1.23	12.78	0.01	17.87	-27.22	450000.	146892.	104749.	512798.	14.73	20.01
82.430	3.61	15.23	1.26	17.65	-42.77	450000.	146892.	104749.	96690.	13.61	14.76
84.170	2.07	-0.43	0.0	17.24	-42.43	450000.	146892.	104749.	160742.	14.07	26.00
85.390	2.84	16.35	3.60	17.16	-25.65	450000.	146892.	104749.	20843.	12.84	15.10
87.000	1.57	10.37	5.43	16.95	-36.63	450000.	144366.	94537.	18163.	11.57	15.43
88.800	4.23	3.56	5.17	16.70	-45.44	450000.	141761.	85091.	21721.	14.23	15.17
90.230	2.41	12.53	4.25	16.58	-43.47	450000.	138666.	75125.	14964.	12.41	14.25
91.740	5.42	6.41	4.29	16.42	-35.59	450000.	136202.	68099.	17047.	5.42	14.29
92.660	2.73	10.46	4.14	16.33	-41.54	450000.	133944.	62255.	15920.	12.73	14.14
93.780	2.99	9.31	3.43	16.15	-42.69	450000.	131903.	57530.	20293.	9.99	13.43
95.090	1.93	14.17	2.69	15.95	-47.83	450000.	131903.	57530.	25565.	1.93	12.69
97.190	0.53	16.41	4.16	15.56	-53.59	450000.	131902.	57530.	30981.	0.0	0.0
98.310	4.22	7.51	4.75	15.35	-52.49	450000.	131902.	57530.	33180.	0.0	0.0
99.990	2.48	12.36	3.49	15.07	-44.64	450000.	130008.	53695.	35238.	0.0	0.0
101.570	3.92	8.61	3.31	14.83	-45.39	450000.	130008.	53695.	24029.	0.0	0.0
102.780	2.06	23.61	2.83	14.63	-18.39	315000.	91006.	37586.	20463.	0.0	0.0
104.700	0.00	1.12	4.10	14.05	-38.88	315000.	87230.	32066.	27815.	30.00	7.10
106.000	0.00	1.62	4.56	13.73	-25.38	315000.	85784.	29893.	30099.	30.00	7.56
106.200	0.00	0.97	4.87	13.66	-26.03	315000.	85185.	28965.	31090.	30.00	7.87
106.600	0.00	0.93	4.94	13.59	-31.07	315000.	84675.	28196.	33650.	30.00	7.94
106.800	0.00	0.58	4.77	13.53	-31.42	315000.	84257.	27577.	35379.	30.00	7.77
107.000	0.00	1.20	4.75	13.46	-30.80	315000.	83741.	26842.	34197.	30.00	7.75
107.400	4.10	-4.61	6.66	13.37	-43.31	315000.	82199.	24942.	39874.	6.60	7.56
108.900	4.09	0.20	5.54	13.05	-23.60	315000.	80568.	23132.	46814.	6.69	8.44
110.400	2.34	-9.05	1.78	12.51	-49.95	315000.	80568.	23132.	59162.	7.14	4.68
111.500	1.16	-6.81	4.14	12.39	-37.81	315000.	80568.	23132.	106247.	3.06	6.04
112.100	2.56	9.66	3.07	12.23	-55.34	315000.	80134.	22634.	36269.	4.36	4.97
114.680	9.47	6.14	2.11	11.98	-69.36	315000.	79899.	22366.	40740.	11.07	3.51
115.400	2.03	3.81	2.53	11.76	-78.69	315000.	79767.	22213.	42671.	4.03	2.93
115.900	2.85	18.32	11.16	11.73	-66.07	315000.	79761.	22207.	29809.	3.09	11.49
116.400	10.01	16.77	3.16	11.59	-69.03	315000.	79751.	22196.	28259.	12.01	4.26
117.160	5.12	14.80	0.76	11.49	-75.80	315000.	79744.	22188.	18518.	6.32	7.36
117.970	1.89	11.98	3.71	11.27	-40.02	315000.	79744.	22188.	18165.	4.89	4.71
118.000	1.88	11.39	3.69	11.27	-40.62	315000.	79744.	22188.	22019.	4.88	4.69
118.490	0.56	12.56	1.55	11.22	-70.94	315000.	79740.	22184.	17000.	4.66	7.05
119.280	0.20	17.50	1.63	11.01	-68.40	315000.	79738.	22181.	41619.	5.80	5.83
120.220	0.25	14.87	1.11	10.85	-66.83	315000.	79737.	22180.	23917.	6.15	6.21
120.770	0.34	13.75	2.67	10.78	-72.05	315000.	79734.	22177.	15070.	3.24	4.67
121.730	0.28	7.63	2.46	10.58	-68.07	315000.	79670.	22107.	12628.	2.78	7.26

Table 3.--(Continued)

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
122.200	0.36	8.84	9.45	10.49	-70.06	315000.	79670.	22107.	15006.	3.26	11.55
123.400	0.82	8.55	3.52	10.28	-54.25	315000.	79496.	21926.	25176.	1.92	5.52
124.350	2.28	8.66	2.29	10.09	-67.64	315000.	79245.	21668.	33592.	3.18	3.79
125.630	0.60	2.92	1.34	9.86	-47.38	315000.	78900.	21324.	40912.	1.60	3.94
126.500	0.72	3.77	5.16	9.69	-32.53	315000.	78265.	20685.	40773.	0.92	7.06
127.130	1.35	1.99	3.16	9.38	-32.71	315000.	77298.	19778.	42880.	2.35	7.16
129.000	3.15	8.11	3.89	9.02	-68.19	315000.	76446.	18997.	37669.	3.95	0.79
129.550	2.74	6.81	1.82	8.90	-72.09	315000.	75888.	18486.	34647.	0.0	0.0
130.500	2.29	6.44	2.15	8.70	-44.66	315000.	74815.	17610.	40093.	4.79	3.85
131.650	1.42	4.05	2.81	8.41	-66.85	315000.	74210.	17136.	39394.	0.32	4.91
133.120	3.07	4.19	1.76	8.08	-31.61	315000.	72946.	16158.	38239.	5.77	6.86
134.280	3.16	2.98	0.23	7.72	-50.72	315000.	72765.	16026.	40332.	5.66	2.13
135.100	2.59	2.89	0.37	7.54	-49.61	315000.	72590.	15895.	40618.	5.89	2.87
135.800	3.16	5.34	0.31	7.36	-34.36	315000.	72444.	15785.	39158.	5.76	3.41
136.000	1.84	8.41	0.0	7.38	-9.59	315000.	72444.	15785.	7966.	0.0	9.00
138.000	0.24	6.69	0.00	5.67	-11.31	315000.	72444.	15785.	11957.	0.0	9.00
140.000	0.94	4.76	0.00	4.46	-13.24	315000.	72444.	15785.	4141.	0.0	9.00
142.000	0.63	4.00	0.00	3.53	-14.00	315000.	72444.	15785.	2649.	0.0	9.00
144.000	0.35	3.25	0.0	2.21	-14.75	315000.	72444.	15785.	8567.	0.0	9.00
146.000	0.22	1.45	0.0	0.20	-16.55	315000.	72444.	15785.	9546.	0.0	9.00

Table 4.--File retrieval for the 100,000-square-feet channelization alternative for a flow of 450,000 cubic feet per second at the end of the 50-year simulation

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
19.000	0.11	-0.91	0.0	42.53	-21.21	450000.	147011.	105185.	138020.	39.11	47.10
18.000	0.23	5.13	0.19	42.61	-46.97	450000.	147011.	105185.	234491.	36.23	35.79
16.000	0.55	10.48	0.04	42.28	-33.82	450000.	147011.	105185.	182686.	35.55	38.54
14.000	0.32	4.29	0.0	42.07	-38.21	450000.	147011.	105185.	172550.	35.72	17.00
13.000	0.07	2.75	0.0	41.90	-23.95	450000.	146970.	105003.	280250.	40.57	37.80
12.000	0.0	4.80	0.0	41.81	-41.20	450000.	146970.	105003.	196598.	44.30	33.20
11.000	0.01	4.54	0.61	41.65	-42.46	450000.	146970.	105003.	215009.	44.31	33.81
10.000	0.0	12.83	0.52	41.58	-46.67	450000.	146970.	105003.	152239.	45.00	34.12
8.000	0.05	1.58	0.06	41.44	-60.52	450000.	146959.	104976.	116695.	40.05	44.36
6.000	0.08	-3.16	0.01	41.36	-51.56	450000.	146899.	104744.	94274.	40.08	39.91
4.000	0.02	12.21	0.00	40.74	-34.49	450000.	146878.	104666.	1234878.	40.02	41.00
2.000	0.01	8.72	0.06	40.31	-32.68	450000.	146878.	104665.	2088519.	38.91	27.76
1.000	0.02	26.64	0.01	40.04	-36.51	450000.	146878.	104665.	2305331.	40.02	40.61
0.600	0.01	21.87	0.00	39.89	-79.13	450000.	146878.	104665.	1821247.	40.01	39.40
0.400	0.00	32.36	0.0	39.69	-29.94	450000.	146878.	104665.	2228959.	23.80	44.90
0.200	0.03	33.91	0.03	39.49	-37.89	450000.	146874.	104648.	2310772.	36.03	35.13
4.900	0.01	-6.94	0.01	39.77	-53.04	450000.	146874.	104648.	54577.	45.81	39.01
6.200	2.42	-0.50	0.0	39.30	-76.50	450000.	146874.	104648.	98962.	39.92	48.40
7.800	0.0	-0.29	0.0	38.69	-24.79	450000.	146874.	104648.	98962.	49.30	52.50
8.700	0.20	-0.62	0.62	38.29	-19.82	450000.	146874.	104648.	137188.	41.60	37.52
9.800	2.36	-0.99	0.47	37.86	-19.89	450000.	146874.	104648.	282761.	39.06	40.97
10.600	0.0	-0.61	3.04	37.46	-13.61	450000.	146874.	104648.	337875.	45.20	39.74
11.800	0.0	-0.45	2.13	36.90	-23.85	450000.	146874.	104648.	376106.	46.80	39.43
12.800	0.0	-0.54	0.0	36.54	-27.84	450000.	146874.	104648.	741297.	47.40	43.10
13.900	0.0	-0.10	1.82	36.31	-65.40	450000.	146874.	104648.	42683.	47.90	46.72
15.400	0.03	-0.85	0.0	35.75	-28.85	450000.	146874.	104648.	79310.	40.03	48.00
16.400	3.95	-1.13	0.0	35.24	-30.93	450000.	146874.	104648.	126132.	29.85	49.80
17.500	0.01	21.05	0.71	34.96	-42.25	450000.	146874.	104648.	69740.	42.81	41.21
18.700	0.09	0.83	0.69	34.48	-37.77	450000.	146874.	104648.	67357.	36.69	40.99
19.600	0.0	-2.94	1.65	34.33	-86.14	450000.	146874.	104648.	53005.	43.40	39.35
20.600	0.0	2.15	0.39	33.91	-30.55	450000.	146874.	104648.	182066.	40.90	43.39
21.700	0.0	-21.87	0.0	33.69	-68.47	450000.	146874.	104648.	94757.	44.70	48.40
23.400	0.0	-6.26	0.0	33.30	-54.16	450000.	146874.	104648.	85915.	46.10	45.60
24.700	0.05	-1.18	0.09	33.00	-77.98	450000.	146874.	104648.	79447.	40.65	38.09
25.600	0.05	46.00	1.39	32.80	-63.00	450000.	146874.	104648.	64685.	37.85	34.19
26.500	0.05	-7.54	0.17	32.57	-72.24	450000.	146874.	104648.	77973.	35.75	39.97
27.600	0.08	-12.00	0.18	32.31	-83.10	450000.	146874.	104648.	86677.	36.38	37.78
28.300	0.09	-7.26	0.99	32.15	-75.18	450000.	146874.	104648.	87225.	38.89	38.29
29.400	0.48	-7.00	0.41	31.90	-59.10	450000.	146873.	104646.	88639.	34.08	29.61
30.500	0.09	-6.52	1.63	31.66	-105.72	450000.	146873.	104646.	95001.	38.29	36.03

Table 4.--(Continued)

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
31.300	0.03	34.52	3.12	31.51	-74.88	450000.	146873.	104646.	89020.	40.13	38.62
32.600	0.24	-5.74	0.09	31.19	-52.94	450000.	146873.	104646.	100619.	31.94	36.09
33.500	0.10	-12.96	0.0	31.00	-69.36	450000.	146873.	104646.	103488.	37.10	39.90
34.600	0.49	-4.39	0.45	30.70	-101.19	450000.	146873.	104646.	100824.	32.69	35.05
35.600	0.0	1.13	0.11	30.42	-67.27	450000.	146873.	104646.	114009.	38.10	38.01
36.600	0.05	-2.34	0.0	30.14	-57.84	450000.	146873.	104646.	113088.	38.95	39.30
37.700	0.0	-8.64	0.0	29.88	-72.34	450000.	146873.	104646.	116729.	43.80	35.20
38.500	0.02	-4.41	0.84	29.72	-63.31	450000.	146873.	104646.	122350.	38.42	33.04
39.400	0.32	1.23	0.40	29.50	-65.97	450000.	146873.	104646.	126012.	30.52	30.80
40.700	0.49	-7.25	0.69	29.16	-60.65	450000.	146873.	104646.	131793.	31.29	32.19
41.500	0.0	-5.74	0.18	28.96	-60.64	450000.	146873.	104646.	126464.	32.90	36.38
42.500	0.0	14.55	0.0	28.77	-90.45	450000.	146873.	104646.	127467.	35.90	35.00
43.700	0.0	5.02	0.0	28.69	-84.98	450000.	146873.	104646.	127784.	35.50	33.90
44.800	0.0	14.65	0.0	28.28	-92.95	450000.	146873.	104646.	126148.	35.60	32.10
45.700	0.0	-4.15	0.0	28.02	-69.05	450000.	146873.	104646.	138337.	33.40	35.30
46.700	0.0	-8.22	0.54	27.68	-66.92	450000.	146873.	104645.	143971.	34.10	26.64
47.500	0.0	-4.90	0.0	27.43	-58.00	450000.	146873.	104645.	151282.	33.10	34.00
48.600	0.21	12.99	0.0	26.97	-73.31	450000.	146873.	104645.	139960.	31.41	31.50
49.800	0.0	5.87	0.26	26.47	-69.83	450000.	146873.	104645.	150920.	32.20	30.46
50.700	0.0	13.41	0.35	26.19	-76.99	450000.	146873.	104645.	164171.	31.30	31.35
51.600	0.0	-4.87	0.37	25.92	-88.77	450000.	146873.	104645.	175543.	32.20	30.57
52.700	0.00	-8.31	0.87	25.61	-89.31	450000.	146873.	104645.	139177.	30.60	30.07
53.190	0.01	-9.00	0.0	25.39	-85.00	450000.	146873.	104645.	487391.	29.01	29.00
55.200	0.0	24.74	0.40	24.80	-45.26	450000.	146872.	104645.	56469.	20.00	20.40
56.310	0.0	16.75	0.0	24.01	-51.25	450000.	146872.	104645.	1167198.	28.00	28.00
57.060	0.0	19.26	0.0	23.68	-46.74	450000.	146872.	104645.	564167.	27.00	27.00
57.680	0.0	15.51	0.0	23.28	-47.49	450000.	146872.	104645.	748343.	27.00	27.00
59.390	0.0	13.83	0.0	22.96	-61.17	450000.	146872.	104645.	352810.	25.00	30.00
60.150	0.0	14.61	0.0	22.78	-57.39	450000.	146872.	104645.	304311.	24.00	24.00
61.150	0.0	19.19	0.0	22.53	-51.81	450000.	146872.	104645.	300134.	24.00	24.00
62.030	0.0	15.58	0.0	22.46	-54.42	450000.	146872.	104645.	114050.	24.00	22.00
63.370	0.0	13.46	0.0	21.95	-37.54	450000.	146872.	104645.	267880.	20.00	22.00
65.200	0.0	31.26	0.0	21.45	-63.74	450000.	146872.	104645.	251675.	23.00	23.00
67.000	0.0	12.58	0.08	21.27	-56.42	450000.	146872.	104645.	104158.	20.00	20.08
68.500	0.0	17.25	0.0	21.07	-42.75	450000.	146872.	104645.	64094.	20.00	20.00
69.330	0.0	19.67	0.0	20.94	-58.33	450000.	146872.	104645.	94672.	20.00	20.00
69.970	0.00	8.92	0.0	20.75	-44.08	450000.	146872.	104645.	166837.	20.00	22.00
71.000	0.0	20.05	0.0	20.48	-33.95	450000.	146872.	104645.	198121.	20.00	23.00
72.050	0.0	-3.93	0.0	20.41	-48.93	450000.	146872.	104645.	81273.	20.00	25.00
73.310	0.0	20.21	0.08	19.56	-34.79	450000.	146872.	104645.	81137.	20.00	20.08

Table 4.--(Continued)

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
74.940	0.0	18.40	0.0	19.19	-31.60	450000.	146872.	104645.	156244.	18.00	20.00
76.530	0.0	11.26	0.0	18.32	-38.74	450000.	146872.	104645.	884680.	20.00	20.00
77.470	0.0	19.13	0.0	18.24	-38.87	450000.	146872.	104645.	259724.	20.00	17.00
79.350	0.02	21.38	0.04	17.86	-38.62	450000.	146872.	104645.	108837.	20.02	14.04
81.130	1.39	5.72	0.03	17.29	-34.28	450000.	146872.	104645.	115831.	14.89	20.03
82.430	3.56	17.82	1.06	17.11	-40.18	450000.	146872.	104645.	68805.	13.56	14.56
84.170	1.57	3.98	0.0	16.73	-38.02	450000.	146871.	104645.	112101.	13.57	26.00
85.390	3.32	17.41	3.72	16.63	-24.59	450000.	146871.	104645.	20420.	14.32	15.22
87.000	1.35	16.60	5.00	16.43	-30.40	450000.	144171.	93897.	23528.	11.35	15.00
88.800	3.83	9.70	3.07	16.21	-39.30	450000.	141259.	83606.	25070.	13.83	15.07
90.230	2.06	16.33	3.94	16.08	-39.67	450000.	138095.	73732.	20725.	12.06	13.94
91.740	3.43	11.25	3.90	15.93	-30.75	450000.	135424.	66401.	18626.	13.43	13.90
92.660	2.69	13.51	3.75	15.84	-38.49	450000.	133136.	60695.	17877.	12.69	13.75
93.780	1.86	12.27	3.14	15.69	-39.73	450000.	131067.	56082.	19960.	11.86	13.14
95.090	0.96	16.71	2.68	15.50	-45.29	450000.	129024.	52094.	27131.	10.96	12.68
97.190	0.0	16.78	2.93	15.19	-53.22	450000.	129024.	52094.	26447.	9.00	11.93
98.310	4.89	12.28	4.91	14.95	-47.72	450000.	127496.	49281.	80599.	2.89	0.0
99.990	3.41	12.53	2.96	14.70	-44.47	450000.	125418.	45838.	36822.	5.41	10.96
101.570	0.78	5.94	1.54	14.52	-48.06	450000.	123705.	43126.	27084.	10.78	11.54
102.780	0.00	18.00	1.96	14.38	-24.00	315000.	86593.	30188.	16895.	12.60	10.96
104.700	0.00	0.23	4.15	13.87	-39.77	315000.	83155.	26204.	27367.	30.00	7.15
106.000	0.00	1.10	4.59	13.56	-25.90	315000.	81827.	24607.	30713.	30.00	7.59
106.200	0.00	0.44	4.92	13.49	-26.56	315000.	81279.	23925.	31879.	30.00	7.92
106.600	0.00	0.45	4.99	13.42	-31.55	315000.	80611.	23358.	34340.	30.00	7.99
106.800	0.00	0.10	4.85	13.36	-31.90	315000.	80428.	22899.	35801.	30.00	7.85
107.000	0.00	0.67	4.81	13.30	-31.33	315000.	79956.	22355.	34573.	30.00	7.81
107.400	4.19	-5.29	6.81	13.21	-43.99	315000.	78537.	20919.	38989.	6.69	7.71
108.900	4.17	-1.17	5.53	12.89	-24.97	315000.	76546.	19075.	45893.	6.77	8.43
110.400	2.60	-9.00	2.05	12.32	-49.90	315000.	76546.	19075.	45963.	7.40	4.95
111.500	1.11	-7.52	4.52	12.22	-38.52	315000.	76546.	19075.	96268.	3.01	6.42
112.100	2.74	9.07	3.41	12.06	-55.93	315000.	76157.	18715.	34848.	4.54	5.31
114.680	9.19	5.03	2.30	11.82	-70.47	315000.	75943.	18516.	33955.	10.79	3.70
115.400	2.13	-0.51	2.68	11.65	-83.01	315000.	75826.	18406.	69573.	4.13	3.08
115.900	2.60	19.11	10.97	11.59	-65.28	315000.	75820.	18401.	26245.	3.04	11.30
116.400	9.69	15.65	3.31	11.48	-69.95	315000.	75811.	18392.	23008.	11.69	4.41
117.160	5.22	13.49	0.67	11.39	-77.11	315000.	75804.	18386.	16474.	6.42	7.27
117.970	2.10	11.76	4.27	11.16	-40.24	315000.	75804.	18386.	16122.	5.10	5.27
118.000	2.09	12.11	4.25	11.15	-39.89	315000.	75804.	18386.	16690.	5.09	5.25
118.490	0.72	9.64	1.52	11.13	-73.86	315000.	75801.	18383.	16000.	4.82	7.02
119.280	0.26	16.04	1.62	10.91	-69.86	315000.	75799.	18381.	39603.	5.86	5.82

Table 4.-- (Continued)

River mile	Bed change, in ft: Left over bank	Bed change, in ft: Channel	Bed change, in ft: Right over bank	Water-surface elevation, in ft, m.s.l.	Thalweg ft, m.s.l.	Flow ft^3/s	Sediment load in tons/day: Clay	Sediment load in tons/day: Silt	Sediment load in tons/day: Sand	Water-surface elevation, in ft, m.s.l.: Left over bank	Water-surface elevation, in ft, m.s.l.: Right over bank
120.220	0.33	12.75	1.09	10.76	-68.95	315000.	75797.	18380.	18482.	6.23	6.19
120.770	0.42	11.90	2.78	10.69	-73.90	315000.	75795.	18378.	12254.	3.32	4.78
121.730	0.35	5.62	2.50	10.51	-70.08	315000.	75736.	18326.	12842.	2.85	7.30
122.200	0.44	6.93	8.37	10.46	-71.97	315000.	75625.	18225.	15382.	3.34	10.47
123.400	0.96	7.51	3.63	10.25	-55.29	315000.	75467.	18091.	25224.	2.06	5.63
124.350	2.61	7.99	2.40	10.07	-68.31	315000.	75236.	17896.	33134.	3.51	3.90
125.630	0.71	1.09	1.36	9.86	-49.21	315000.	74920.	17638.	41532.	1.71	3.96
126.500	0.86	3.92	5.29	9.70	-32.38	315000.	74318.	17140.	39529.	1.06	7.19
127.130	1.56	0.70	3.17	9.41	-34.00	315000.	73430.	16453.	40114.	2.56	7.17
129.000	3.33	7.97	4.11	9.07	-68.33	315000.	72631.	15844.	37710.	4.13	1.01
129.550	2.93	6.11	1.93	8.95	-72.79	315000.	72110.	15448.	34596.	0.0	0.0
130.500	2.36	6.35	2.22	8.75	-44.75	315000.	71099.	14755.	40099.	4.86	3.92
131.650	1.65	3.51	2.94	8.48	-67.39	315000.	70532.	14380.	40123.	0.55	5.04
133.120	3.21	4.21	1.73	8.15	-31.59	315000.	69322.	13588.	39058.	5.91	6.83
134.280	3.29	2.71	0.27	7.80	-50.99	315000.	69151.	13482.	40742.	5.79	2.17
135.100	2.70	2.49	0.46	7.63	-50.01	315000.	68986.	13378.	40670.	6.00	2.96
135.600	3.31	5.10	0.39	7.45	-34.60	315000.	68847.	13288.	40263.	5.91	3.49
136.000	2.05	8.77	0.0	7.47	-9.23	315000.	68847.	13288.	15448.	0.0	9.00
138.000	0.23	6.49	0.00	5.60	-11.51	315000.	68847.	13288.	9287.	0.0	9.00
140.000	0.98	4.78	0.00	4.46	-13.22	315000.	68847.	13288.	17213.	0.0	9.00
142.000	0.66	3.98	0.00	3.53	-14.02	315000.	68847.	13288.	2527.	0.0	9.00
144.000	0.37	3.26	0.0	2.23	-14.74	315000.	68847.	13288.	8401.	0.0	9.00
146.000	0.24	1.47	0.0	0.20	-16.53	315000.	68847.	13288.	10188.	0.0	9.00

In addition, cross-section geometry, total inundated-area and water-surface profiles for 10 flow rates were saved, as mentioned, on magnetic storage at the end of each 10-years of each simulation. The 10 flows in cubic feet per second were 50,000; 100,000; 150,000; 200,000; 250,000; 300,000; 350,000; 450,000; 630,000; and 1,500,000. The last two flow rates are the maximum observed flow (prior to 1973) and the design floodway flow rate respectively.

RESULTS OF SIMULATION STUDIES

This section presents and discusses some of the results of the model simulations. Specifically, the results pertain to: (1) floodway depth-frequency relations based on 52 cross sections for the basin below mile 53.19, (2) inundated-area relations for the entire basin, and (3) water-surface profiles at the beginning and end of the 50-year period for 10 flow rates (including the 1.5 million ft^3/s design flow) for the entire basin for each alternative. These results in no way exhaust the analyses that could be made--the Atchafalaya model results include a significant amount of sediment-transport information that remains to be analyzed. It should be pointed out that because of the complexity of the model, errors may exist in the simulation results that could only be discovered by extensive analysis beyond the scope of this study. In addition, the limitations of the model as previously discussed, the relative weakness of calibration and verification, and the vast nature and magnitude of the modeling problem must be taken into account in interpreting results.

Depth-Frequency Relations

Figures 4, 5, and 6 and tables 5, 6, and 7 show selected depth-frequency relations for the floodway below mile 53.19 at the end of the 50-year simulation. These relations are similar to the hypsometric curves in Gagliano and van Beek (1975) except that water depths instead of ground elevations are shown. The relations were constructed by reading the Atchafalaya model cross-section files of ground elevations, overlaying water-surface elevations for given flow rates, and computing water depths. The proportion of computed depths, weighted by distance, were counted within 1-ft class intervals and the cummulative frequency in percent was computed. All depths within the floodway area were lumped together for the analysis. The figures and tables, which show only representative results, indicate only minor differences amoung the alternatives. For example, table 5 indicate depths throughout the floodway in the interval of 9-10 ft, were less than this value 93.60, 93.59, and 92.56 percent of the time for no action, 80,000 ft^2 and 100,000 ft^2 channelization alternatives respectively. These are very small differences as can be seen in figure 4. Perhaps depth-frequency relations on selected cross sections in the floodway would show more variation.

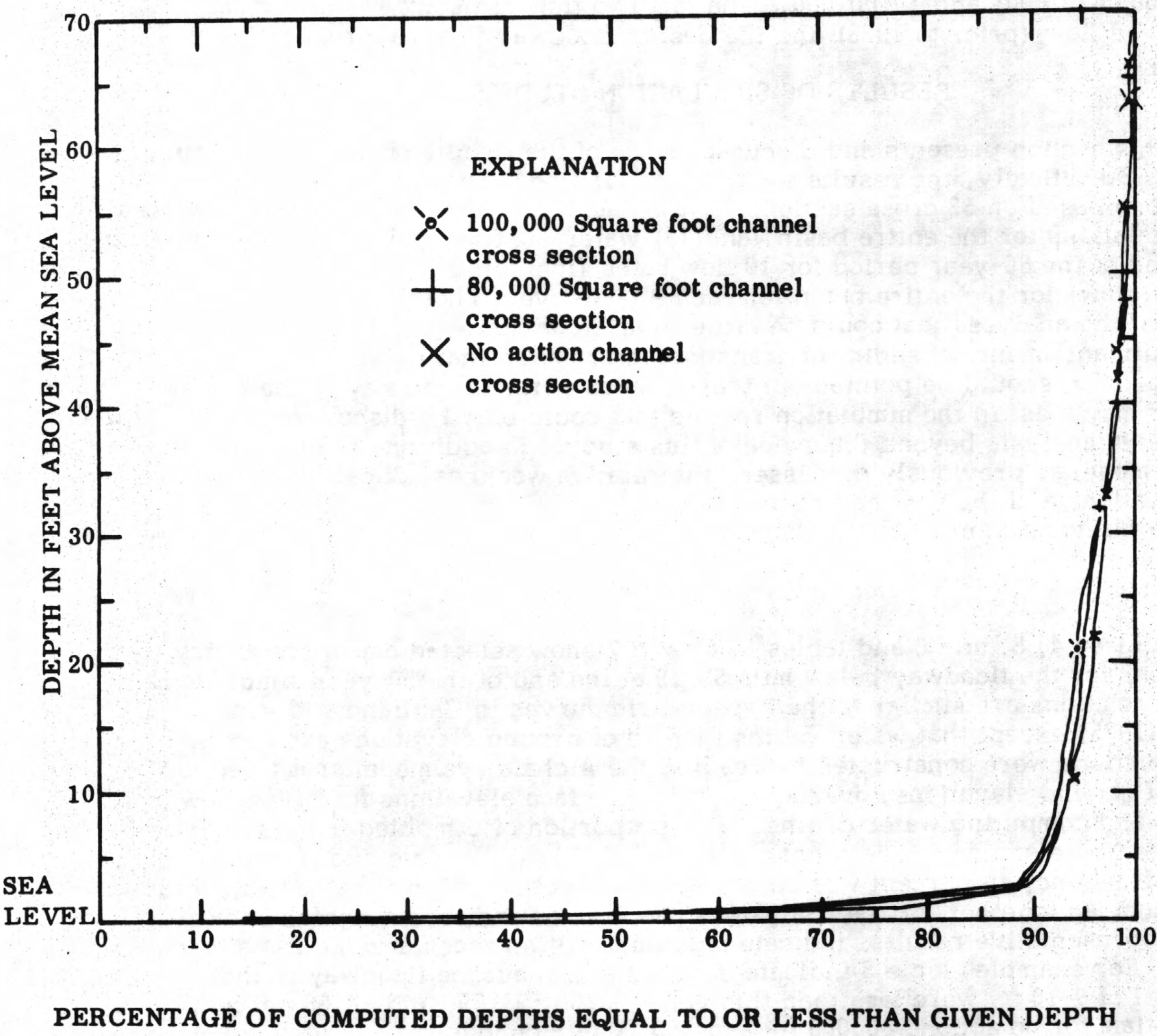


Figure 4. Depth-frequency plot for all cross sections below mile 53.19 for flow of 50,000 cubic feet per second at the end of a 50-year simulation for three channelization alternatives

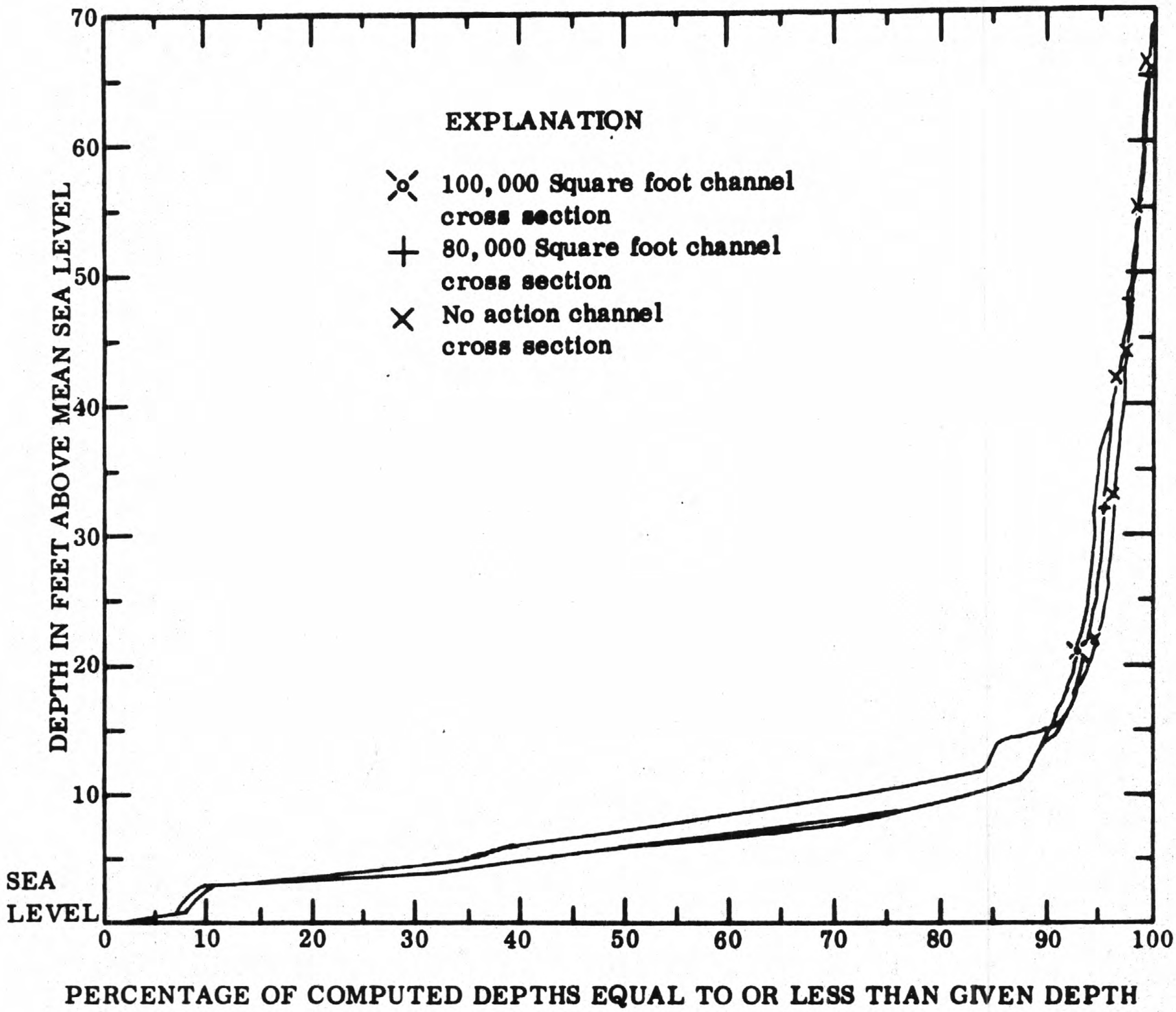


Figure 5. Depth-frequency plot for all cross sections below mile 53.19 for flow of 350,000 cubic feet per second at the end of a 50-year simulation for three channelization alternatives

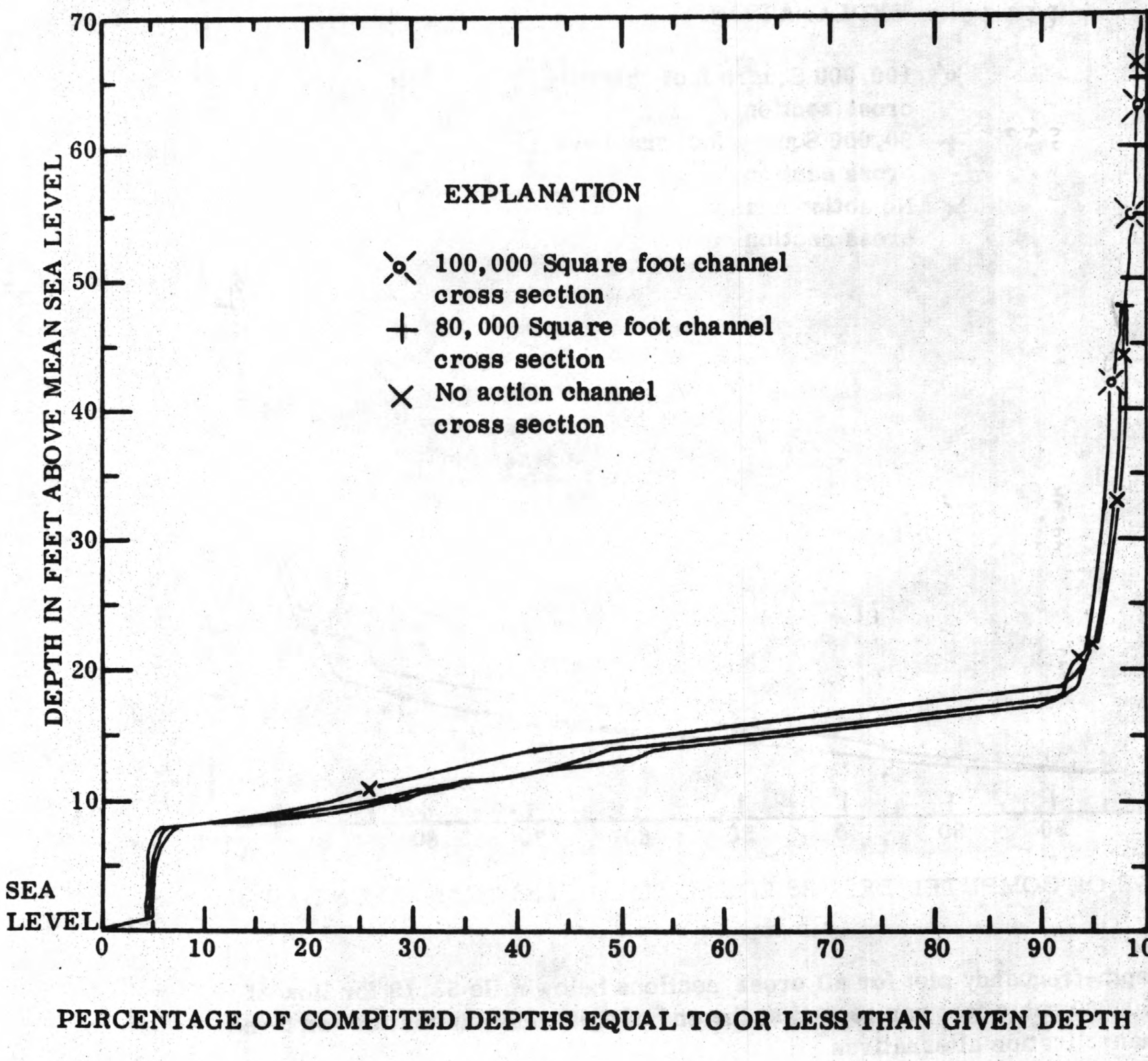


Figure 6. Depth-frequency plots for all cross sections below mile 53.19 for flow of 630,000 cubic feet per second at the end of a 50-year simulation for three channelization alternatives

Table 5.--Depth-frequency table for all cross sections below mile 53.19 for flow of 50,000 cubic feet per second at the end of a 50-year simulation for three alternatives

Channel alternative					
No action		80,000 ft^2		100,000 ft^2	
Depth interval, feet	Percent	Depth interval, feet	Percent	Depth interval, feet	Percent
0- 1	64.24	0- 1	77.01	0- 1	73.11
1- 2	78.27	1- 2	83.88	1- 2	81.27
2- 3	89.07	2- 3	89.84	2- 3	88.48
3- 4	90.32	3- 4	90.99	3- 4	89.63
4- 5	91.17	4- 5	91.75	4- 5	90.60
5- 6	91.81	5- 6	92.21	5- 6	91.09
6- 7	92.46	6- 7	92.69	6- 7	91.47
7- 8	92.70	7- 8	92.95	7- 8	92.00
8- 9	93.27	8- 9	93.35	8- 9	92.16
9- 10	93.60	9- 10	93.59	9- 10	92.56
10- 11	94.05	10- 11	93.69	10- 11	92.74
11- 12	94.27	11- 12	93.80	11- 12	92.97
12- 13	94.55	12- 13	93.95	12- 13	93.17
13- 14	94.75	13- 14	94.17	13- 14	93.24
14- 15	95.08	14- 15	94.32	14- 15	93.44
15- 16	95.30	15- 16	94.69	15- 16	93.72
16- 17	95.62	16- 17	94.85	16- 17	94.02
17- 18	95.78	17- 18	95.00	17- 18	94.15
18- 19	95.95	18- 19	95.11	18- 19	94.29
19- 20	96.03	19- 20	95.20	19- 20	94.41
20- 21	96.12	20- 21	95.29	20- 21	94.48
21- 22	96.21	21- 22	95.40	21- 22	94.63
22- 23	96.32	22- 23	95.48	22- 23	94.70
23- 24	96.45	23- 24	95.78	23- 24	94.82
24- 25	96.50	24- 25	95.86	24- 25	95.08
25- 26	96.64	25- 26	96.03	25- 26	95.43
26- 27	96.87	26- 27	96.12	26- 27	95.56
27- 28	96.97	27- 28	96.23	27- 28	95.81
28- 29	97.07	28- 29	96.31	28- 29	96.04
29- 30	97.21	29- 30	96.53	29- 30	96.29
30- 31	97.34	30- 31	96.75	30- 31	96.86
31- 32	97.44	31- 32	96.91	31- 32	97.04
32- 33	97.51	32- 33	97.18	32- 33	97.15
33- 34	97.60	33- 34	97.21	33- 34	97.31
34- 35	97.69	34- 35	97.35	34- 35	97.51
35- 36	97.84	35- 36	97.45	35- 36	97.77
36- 37	97.95	36- 37	97.71	36- 37	98.01
37- 38	98.10	37- 38	97.85	37- 38	98.22
38- 39	98.16	38- 39	97.96	38- 39	98.26
39- 40	98.24	39- 40	98.15	39- 40	99.42

Table 5.--(Continued)

Channel alternative

No action Depth interval, feet	No action Percent	80,000 ft^2 Depth interval, feet	80,000 ft^2 Percent	100,000 ft^2 Depth interval, feet	100,000 ft^2 Percent
40- 41	98.29	40- 41	98.40	40- 41	98.54
41- 42	98.38	41- 42	98.47	41- 42	98.70
42- 43	98.46	42- 43	98.52	42- 43	98.74
43- 44	98.51	43- 44	98.67	43- 44	98.94
44- 45	98.58	44- 45	98.73	44- 45	99.03
45- 46	98.62	45- 46	98.83	45- 46	99.09
46- 47	98.67	46- 47	98.94	46- 47	99.15
47- 48	98.77	47- 48	99.12	47- 48	99.21
48- 49	98.83	48- 49	99.19	48- 49	99.28
49- 50	98.90	49- 50	99.27	49- 50	99.40
50- 51	98.98	50- 51	99.30	50- 51	99.45
51- 52	99.05	51- 52	99.36	51- 52	99.50
52- 53	99.11	52- 53	99.42	52- 53	99.52
53- 54	99.16	53- 54	99.48	53- 54	99.52
54- 55	99.21	54- 55	99.51	54- 55	99.57
55- 56	99.26	55- 56	99.54	55- 56	99.59
56- 57	99.34	56- 57	99.57	56- 57	99.65
57- 58	99.41	57- 58	99.62	57- 58	99.67
58- 59	99.46	58- 59	99.68	58- 59	99.69
59- 60	99.51	59- 60	99.72	59- 60	99.72
60- 61	99.54	60- 61	99.74	60- 61	99.77
61- 62	99.60	61- 62	99.76	61- 62	99.77
62- 63	99.63	62- 63	99.79	62- 63	99.79
63- 64	99.64	63- 64	99.81	63- 64	99.80
64- 65	99.70	64- 65	99.81	64- 65	99.84
65- 66	99.71	65- 66	99.83	65- 66	99.86
66- 67	99.73	66- 67	99.86	66- 67	99.87
67- 68	99.76	67- 68	99.89	67- 68	99.90
68- 69	99.77	68- 69	99.91	68- 69	99.92
69- 70	99.80	69- 70	99.94	69- 70	99.94
70- 71	99.81	70- 71	99.94	70- 71	99.95
71- 72	99.82	71- 72	99.96	71- 72	99.95
72- 73	99.87	72- 73	99.96	72- 73	99.95
73- 74	99.88	73- 74	99.96	73- 74	99.95
74- 75	99.90	74- 75	99.96	74- 75	99.95
75- 76	99.91	75- 76	99.96	75- 76	99.95
76- 77	99.93	76- 77	99.96	76- 77	99.96
77- 78	99.96	77- 78	99.97	77- 78	99.96
78- 79	99.96	78- 79	99.97	78- 79	99.96
79- 80	99.96	79- 80	99.98	79- 80	99.97

Table 5.--(Continued)

Channel alternative

No action: Depth interval, feet	No action: Percent	80,000 ft^2: Depth interval, feet	80,000 ft^2: Percent	100,000 ft^2: Depth interval, feet	100,000 ft^2: Percent
80- 81	99.96	80- 81	99.98	80- 81	99.97
81- 82	99.96	81- 82	99.99	81- 82	99.97
82- 83	99.96	82- 83	99.99	82- 83	99.98
83- 84	99.96	83- 84	99.99	83- 84	99.98
84- 85	99.96	84- 85	99.99	84- 85	99.98
85- 86	99.96	85- 86	99.99	85- 86	99.98
86- 87	99.97	86- 87	99.99	86- 87	99.99
87- 88	99.97	87- 88	99.99	87- 88	99.99
88- 89	99.97	88- 89	99.99	88- 89	99.99
89- 90	99.97	89- 90	99.99	89- 90	99.99
90- 91	99.97	90- 91	99.99	90- 91	99.99
91- 92	99.98	91- 92	100.00	91- 92	100.00

Table 6.--Depth-frequency table for all cross sections below mile 53.19 for flow of 350,000 cubic feet per second at the end of a 50-year simulation for three alternatives

Channel alternative					
No action		80,000 ft^2		100,000 ft^2	
Depth interval, feet	Percent	Depth interval, feet	Percent	Depth interval, feet	Percent
0- 1	7.14	0- 1	7.81	0- 1	7.67
1- 2	7.76	1- 2	8.49	1- 2	8.50
2- 3	9.25	2- 3	10.65	2- 3	10.37
3- 4	24.58	3- 4	27.99	3- 4	31.46
4- 5	34.71	4- 5	40.78	4- 5	40.39
5- 6	39.37	5- 6	49.21	5- 6	48.72
6- 7	48.96	6- 7	63.61	6- 7	59.37
7- 8	56.58	7- 8	72.81	7- 8	70.64
8- 9	64.45	8- 9	77.59	8- 9	78.14
9- 10	73.11	9- 10	81.65	9- 10	82.41
10- 11	79.14	10- 11	86.65	10- 11	87.79
11- 12	84.38	11- 12	88.46	11- 12	88.67
12- 13	84.91	12- 13	89.09	12- 13	89.09
13- 14	85.44	13- 14	89.63	13- 14	89.44
14- 15	89.99	14- 15	91.24	14- 15	90.22
15- 16	91.88	15- 16	91.76	15- 16	90.90
16- 17	92.55	16- 17	92.42	16- 17	91.45
17- 18	93.06	17- 18	92.87	17- 18	92.01
18- 19	93.49	18- 19	93.15	18- 19	92.49
19- 20	94.13	19- 20	93.52	19- 20	92.92
20- 21	94.55	20- 21	93.81	20- 21	93.05
21- 22	94.86	21- 22	94.02	21- 22	93.26
22- 23	95.31	22- 23	94.43	22- 23	93.52
23- 24	95.47	23- 24	94.57	23- 24	93.81
24- 25	95.62	24- 25	94.73	24- 25	93.97
25- 26	95.81	25- 26	94.96	25- 26	94.16
26- 27	96.01	26- 27	95.08	26- 27	94.29
27- 28	96.11	27- 28	95.17	27- 28	94.43
28- 29	96.18	28- 29	95.24	28- 29	94.50
29- 30	96.24	29- 30	95.32	29- 30	94.54
30- 31	96.32	30- 31	95.46	30- 31	94.61
31- 32	96.38	31- 32	95.55	31- 32	94.76
32- 33	96.51	32- 33	95.70	32- 33	94.83
33- 34	96.67	33- 34	95.77	33- 34	94.89
34- 35	96.73	34- 35	95.89	34- 35	95.03
35- 36	96.80	35- 36	95.95	35- 36	95.12
36- 37	96.93	36- 37	96.15	36- 37	95.36
37- 38	97.08	37- 38	96.25	37- 38	95.66
38- 39	97.17	38- 39	96.36	38- 39	96.18
39- 40	97.32	39- 40	96.51	39- 40	96.54

Table 6.--(Continued)

		Channel alternative			
No action		80,000 ft^2		100,000 ft^2	
Depth interval, feet	Percent	Depth interval, feet	Percent	Depth interval, feet	Percent
40- 41	97.43	40- 41	96.61	40- 41	96.77
41- 42	97.50	41- 42	96.92	41- 42	96.80
42- 43	97.60	42- 43	97.03	42- 43	97.16
43- 44	97.68	43- 44	97.18	43- 44	97.38
44- 45	97.74	44- 45	97.36	44- 45	97.72
45- 46	97.88	45- 46	97.49	45- 46	97.91
46- 47	98.00	46- 47	97.74	46- 47	98.03
47- 48	98.10	47- 48	97.82	47- 48	98.09
48- 49	98.16	48- 49	97.94	48- 49	98.31
49- 50	98.24	49- 50	98.09	49- 50	98.46
50- 51	98.33	50- 51	98.14	50- 51	98.53
51- 52	98.39	51- 52	98.26	51- 52	98.64
52- 53	98.46	52- 53	98.40	52- 53	98.74
53- 54	98.54	53- 54	98.52	53- 54	98.90
54- 55	98.63	54- 55	98.64	54- 55	98.96
55- 56	98.67	55- 56	98.77	55- 56	99.04
56- 57	98.73	56- 57	98.84	56- 57	99.10
57- 58	98.77	57- 58	98.92	57- 58	99.19
58- 59	98.87	58- 59	99.06	58- 59	99.23
59- 60	98.90	59- 60	99.11	59- 60	99.27
60- 61	98.98	60- 61	99.18	60- 61	99.33
61- 62	99.02	61- 62	99.22	61- 62	99.37
62- 63	99.04	62- 63	99.28	62- 63	99.45
63- 64	99.09	63- 64	99.33	63- 64	99.51
64- 65	99.15	64- 65	99.39	64- 65	99.53
65- 66	99.23	65- 66	99.45	65- 66	99.55
66- 67	99.29	66- 67	99.50	66- 67	99.58
67- 68	99.33	67- 68	99.55	67- 68	99.61
68- 69	99.39	68- 69	99.59	68- 69	99.63
69- 70	99.46	69- 70	99.63	69- 70	99.69
70- 71	99.49	70- 71	99.67	70- 71	99.70
71- 72	99.53	71- 72	99.69	71- 72	99.74
72- 73	99.58	72- 73	99.74	72- 73	99.78
73- 74	99.61	73- 74	99.76	73- 74	99.80
74- 75	99.63	74- 75	99.81	74- 75	99.81
75- 76	99.66	75- 76	99.81	75- 76	99.85
76- 77	99.67	76- 77	99.84	76- 77	99.86
77- 78	99.72	77- 78	99.85	77- 78	99.87
78- 79	99.75	78- 79	99.87	78- 79	99.90
79- 80	99.77	79- 80	99.88	79- 80	99.92

Table 6.-- (Continued)

Channel alternative					
No action		80,000 ft^2		100,000 ft^2	
Depth interval, feet	Percent	Depth interval, feet	Percent	Depth interval, feet	Percent
80- 81	99.80	80- 81	99.89	80- 81	99.92
81- 82	99.81	81- 82	99.89	81- 82	99.94
82- 83	99.83	82- 83	99.92	82- 83	99.94
83- 84	99.84	83- 84	99.95	83- 84	99.96
84- 85	99.85	84- 85	99.95	84- 85	99.96
85- 86	99.85	85- 86	99.96	85- 86	99.96
86- 87	99.86	86- 87	99.98	86- 87	99.96
87- 88	99.88	87- 88	99.98	87- 88	99.97
88- 89	99.89	88- 89	99.98	88- 89	99.97
89- 90	99.90	89- 90	99.98	89- 90	99.97
90- 91	99.91	90- 91	99.98	90- 91	99.97
91- 92	99.95	91- 92	99.98	91- 92	99.98
92- 93	99.95	92- 93	99.98	92- 93	99.98
93- 94	99.95	93- 94	99.98	93- 94	99.98
94- 95	99.96	94- 95	99.98	94- 95	99.98
95- 96	99.96	95- 96	99.98	95- 96	99.99
96- 97	99.96	96- 97	99.99	96- 97	99.99
97- 98	99.97	97- 98	99.99	97- 98	99.99
98- 99	99.97	98- 99	99.99	98- 99	99.99
99-100	99.97	99-100	99.99	99-100	99.99
100-101	99.97	100-101	99.99	100-101	99.99
101-102	99.97	101-102	99.99	101-102	99.99
102-103	99.97	102-103	99.99	102-103	99.99
103-104	99.97	103-104	99.99	103-104	99.99
104-105	99.97	104-105	99.99	104-105	99.99
105-106	99.97	105-106	99.99	105-106	99.99
106-107	99.97	106-107	99.99	106-107	99.99
107-108	99.97	107-108	99.99	107-108	100.00
108-109	99.99	108-109	100.00		
109-110	100.00				

Table 7.--Depth-frequency table for all cross sections below mile 53.19 for flow of 630,000 cubic feet per second at the end of a 50-year simulation for three alternatives

Channel alternative					
No action		80,000 ft^2		100,000 ft^2	
Depth interval, feet	Percent	Depth interval, feet	Percent	Depth interval, feet	Percent
0- 1	4.47	0- 1	4.50	0- 1	4.89
1- 2	4.51	1- 2	4.56	1- 2	4.93
2- 3	4.55	2- 3	4.56	2- 3	4.94
3- 4	4.59	3- 4	4.63	3- 4	5.02
4- 5	4.62	4- 5	4.70	4- 5	5.10
5- 6	4.76	5- 6	4.99	5- 6	5.31
6- 7	5.04	6- 7	5.44	6- 7	5.94
7- 8	5.94	7- 8	6.79	7- 8	7.31
8- 9	16.13	8- 9	17.98	8- 9	22.30
9- 10	22.91	9- 10	26.10	9- 10	28.07
10- 11	25.83	10- 11	31.37	10- 11	33.35
11- 12	31.21	11- 12	41.09	11- 12	41.08
12- 13	36.81	12- 13	46.40	12- 13	50.16
13- 14	42.35	13- 14	49.65	13- 14	54.21
14- 15	53.75	14- 15	62.55	14- 15	65.20
15- 16	65.16	15- 16	73.16	15- 16	77.53
16- 17	73.84	16- 17	85.46	16- 17	88.78
17- 18	85.25	17- 18	92.38	17- 18	92.26
18- 19	92.62	18- 19	93.82	18- 19	92.66
19- 20	93.98	19- 20	94.25	19- 20	93.23
20- 21	94.56	20- 21	94.70	20- 21	93.72
21- 22	94.99	21- 22	95.02	21- 22	94.12
22- 23	95.40	22- 23	95.47	22- 23	94.59
23- 24	95.71	23- 24	95.66	23- 24	94.93
24- 25	96.17	24- 25	95.86	24- 25	95.13
25- 26	96.40	25- 26	96.06	25- 26	95.20
26- 27	96.62	26- 27	96.24	26- 27	95.39
27- 28	96.89	27- 28	96.43	27- 28	95.63
28- 29	96.98	28- 29	96.55	28- 29	95.76
29- 30	97.13	29- 30	96.66	29- 30	95.87
30- 31	97.25	30- 31	96.76	30- 31	95.98
31- 32	97.34	31- 32	96.85	31- 32	96.08
32- 33	97.42	32- 33	96.90	32- 33	96.14
33- 34	97.47	33- 34	96.96	33- 34	96.19
34- 35	97.52	34- 35	97.00	34- 35	96.24
35- 36	97.57	35- 36	97.10	35- 36	96.30
36- 37	97.61	36- 37	97.16	36- 37	96.37
37- 38	97.72	37- 38	97.24	37- 38	96.42
38- 39	97.79	38- 39	97.26	38- 39	96.46
39- 40	97.83	39- 40	97.36	39- 40	96.56

Table 7.--(Continued)

Channel alternative					
No action		80,000 ft^2		100,000 ft^2	
Depth interval, feet	Percent	Depth interval, feet	Percent	Depth interval, feet	Percent
40- 41	97.89	40- 41	97.44	40- 41	96.67
41- 42	97.97	41- 42	97.56	41- 42	97.02
42- 43	98.10	42- 43	97.64	42- 43	97.18
43- 44	98.19	43- 44	97.68	43- 44	97.40
44- 45	98.26	44- 45	97.78	44- 45	97.72
45- 46	98.30	45- 46	97.92	45- 46	97.77
46- 47	98.36	46- 47	98.03	46- 47	97.83
47- 48	98.41	47- 48	98.09	47- 48	98.14
48- 49	98.47	48- 49	98.25	48- 49	98.32
49- 50	98.55	49- 50	98.32	49- 50	98.53
50- 51	98.64	50- 51	98.41	50- 51	98.57
51- 52	98.68	51- 52	98.59	51- 52	98.65
52- 53	98.76	52- 53	98.64	52- 53	98.74
53- 54	98.81	53- 54	98.70	53- 54	98.86
54- 55	98.88	54- 55	98.74	54- 55	98.98
55- 56	98.92	55- 56	98.87	55- 56	99.01
56- 57	98.95	56- 57	98.93	56- 57	99.10
57- 58	99.00	57- 58	98.99	57- 58	99.23
58- 59	99.05	58- 59	99.11	58- 59	99.27
59- 60	99.10	59- 60	99.17	59- 60	99.31
60- 61	99.13	60- 61	99.23	60- 61	99.36
61- 62	99.16	61- 62	99.29	61- 62	99.41
62- 63	99.22	62- 63	99.38	62- 63	99.45
63- 64	99.24	63- 64	99.43	63- 64	99.50
64- 65	99.29	64- 65	99.46	64- 65	99.54
65- 66	99.32	65- 66	99.51	65- 66	99.58
66- 67	99.35	66- 67	99.53	66- 67	99.61
67- 68	99.39	67- 68	99.57	67- 68	99.65
68- 69	99.42	68- 69	99.61	68- 69	99.67
69- 70	99.47	69- 70	99.64	69- 70	99.69
70- 71	99.50	70- 71	99.68	70- 71	99.70
71- 72	99.55	71- 72	99.70	71- 72	99.71
72- 73	99.58	72- 73	99.73	72- 73	99.75
73- 74	99.62	73- 74	99.75	73- 74	99.78
74- 75	99.65	74- 75	99.77	74- 75	99.79
75- 76	99.69	75- 76	99.80	75- 76	99.81
76- 77	99.72	76- 77	99.84	76- 77	99.84
77- 78	99.73	77- 78	99.85	77- 78	99.86
78- 79	99.75	78- 79	99.87	78- 79	99.88
79- 80	99.78	79- 80	99.87	79- 80	99.89

Table 7.--(Continued)

Channel alternative

No action: Depth interval, feet	No action: Percent	80,000 ft^2: Depth interval, feet	80,000 ft^2: Percent	100,000 ft^2: Depth interval, feet	100,000 ft^2: Percent
80- 81	99.79	80- 81	99.88	80- 81	99.90
81- 82	99.79	81- 82	99.90	81- 82	99.92
82- 83	99.82	82- 83	99.92	82- 83	99.93
83- 84	99.85	83- 84	99.93	83- 84	99.94
84- 85	99.86	84- 85	99.93	84- 85	99.94
85- 86	99.87	85- 86	99.94	85- 86	99.96
86- 87	99.89	86- 87	99.95	86- 87	99.96
87- 88	99.89	87- 88	99.97	87- 88	99.97
88- 89	99.90	88- 89	99.97	88- 89	99.97
89- 90	99.90	89- 90	99.97	89- 90	99.97
90- 91	99.90	90- 91	99.98	90- 91	99.97
91- 92	99.91	91- 92	99.98	91- 92	99.98
92- 93	99.92	92- 93	99.99	92- 93	99.98
93- 94	99.93	93- 94	99.99	93- 94	99.98
94- 95	99.94	94- 95	99.99	94- 95	99.98
95- 96	99.96	95- 96	99.99	95- 96	99.98
96- 97	99.96	96- 97	99.99	96- 97	99.98
97- 98	99.96	97- 98	99.99	97- 98	99.98
98- 99	99.97	98- 99	99.99	98- 99	99.98
99-100	99.97	99-100	99.99	99-100	99.98
100-101	99.97	100-101	99.99	100-101	99.98
101-102	99.97	101-102	99.99	101-102	99.99
102-103	99.97	102-103	99.99	102-103	99.99
103-104	99.98	103-104	99.99	103-104	99.99
104-105	99.98	104-105	99.99	104-105	99.99
105-106	99.98	105-106	99.99	105-106	99.99
106-107	99.98	106-107	99.99	106-107	99.99
107-108	99.98	107-108	99.99	107-108	99.99
108-109	99.98	108-109	99.99	108-109	99.99
109-110	99.98	109-110	99.99	109-110	99.99
110-111	99.98	110-111	99.99	110-111	99.99
111-112	99.98	111-112	99.99	111-112	99.99
112-113	99.99	112-113	99.99	112-113	99.99
113-114	99.99	113-114	99.99	113-114	100.00
114-115	99.99	114-115	100.00		
115-116	100.00				

Inundated-Area Relations

Figures 7-15 show inundated-area relations for each channelization alternative for flows from 50,000 to 630,000 ft^3/s. Inundated area is a computed figure available by specifying a computer program option. The value is obtained by integrating areas using the product of flow top widths, for given discharge at all cross sections, and the reach lengths between cross sections. Results are shown at end of each 10-year period through the 50-year simulation. The trends in inundated area are plotted over similar trend relations obtained from a physical model study made by the U.S. Army Corps of Engineers (1973) for most flows. The Atchafalaya model trends, which begin from floodway geometry in 1973 (after the significant flood in that year) indicate inundated area increases slightly through time for flows at 300,000 ft^3/s or less. For flow rates of 350,000 ft^3/s or more, the mathematical model shows a marked increase in inundated area through time. At lower discharges the mathematical model indicates the no-action alternative results in a smaller area of inundated floodway. This probably is due to channel widening for the center-channel alternatives or model error. However at higher discharges the mathematical model shows the center-channel alternatives produce less floodway inundation, probably due to improved channel efficiency in carrying flood flows. These relations are consistent with mathematical model results shown in tables 2-4 which indicate a general trend of increasing aggradation, (in the main channel and the floodway overbanks) from cross section to cross section at the end of the 50-year simulation. The drastic differences between physical model and mathematical model trends is inexplicable.

Water-Surface Profiles

Water-surface profiles over the entire length of the center channel are given in figures 16-18 at the beginning of the study and in figures 19-21 at the end of the 50-year simulation. The profiles for all 10 flows show the effects of the two channelization alternatives as opposed to the no-action alternative. To show more exactly the water-surface elevations above m.s.l. for the three alternatives, elevation values are tabulated in table 8 at selected cross sections for flow rates of 50,000; 250,000; and 630,000 ft^3/s. These values are after 50 years of simulation.

These results show increased water-surface elevations for all alternatives but lower water-surface elevations for the two channelization alternatives as compared with the no-action alternative. For flows above 100,000 ft^3/s and in the middle and upper reaches, the elevations are about 2.0 ft lower for the 80,000 ft^2 alternative at the beginning and end of the study period. For the same flows and reach locations, the 100,000 ft^2 channel would lower the stage about 4.0 ft at the beginning and about 2.5 ft at the end of the study period as compared to the no-action alternative. For lower discharges in each alternative, the stage decline is smaller. However, in the upper reaches an anomaly, perhaps attributable to model error, in the 50,000 ft^3/s flow rate exists at the end of the simulation for the 80,000 ft^2 channel. In this case the profile is lower than the profile for the 100,000 ft^2 channel. This anomaly also shows up in the inundated-area relations. The reason has not been determined.

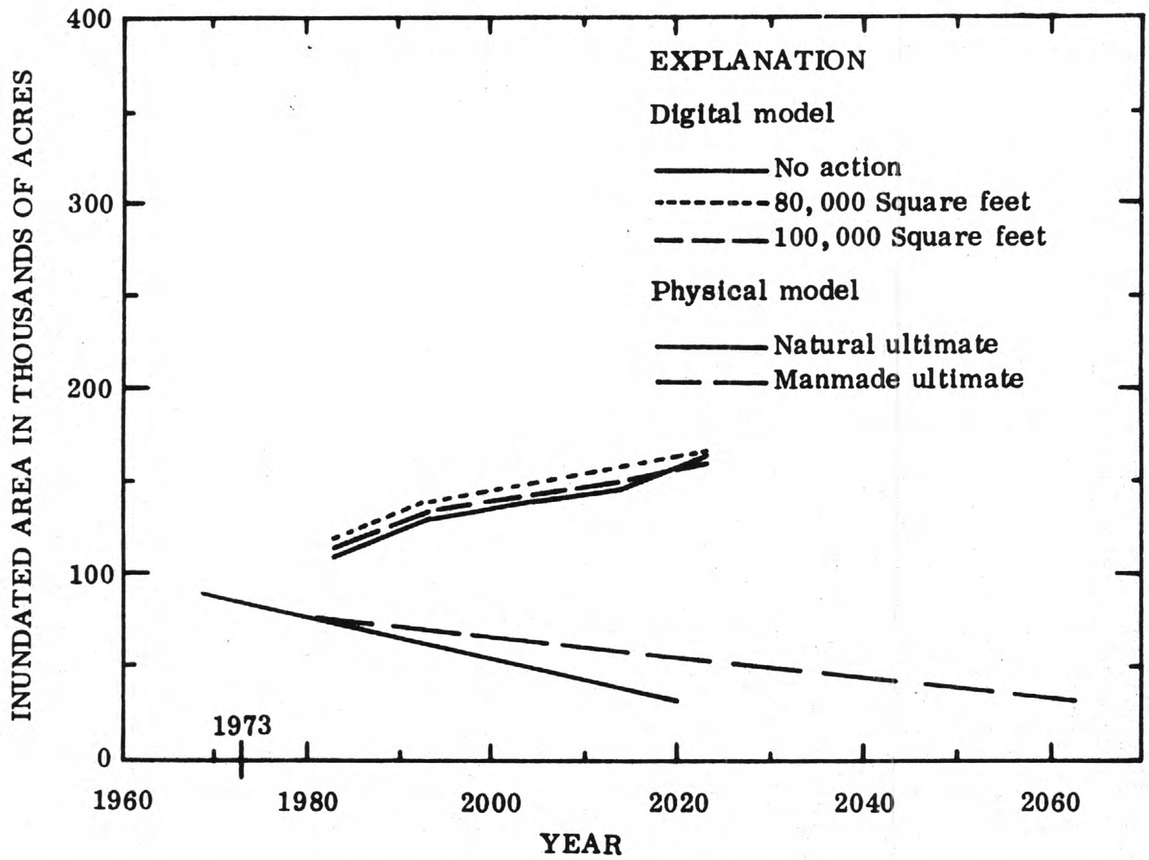


Figure 7. Inundated-area relationships showing trend for flow of 50,000 cubic feet per second for three channelization alternatives. Physical model results are from Corps of Engineers (1973)

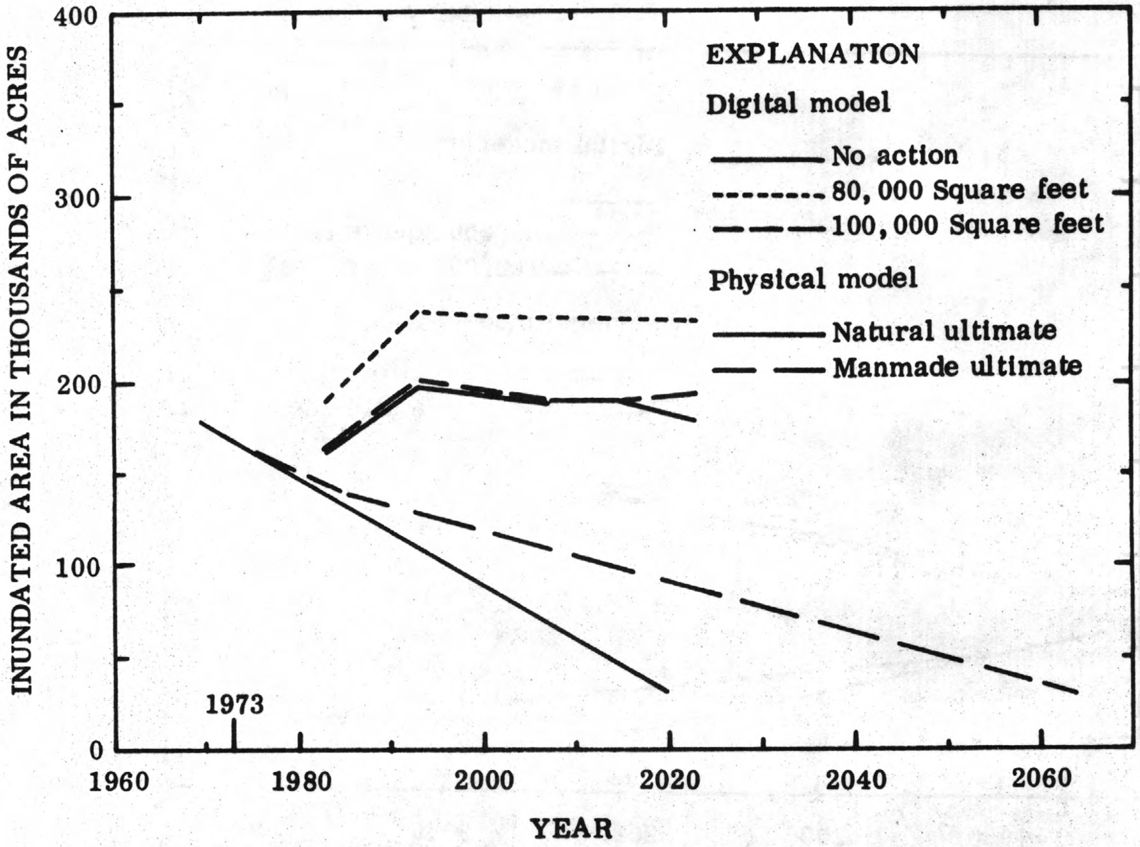


Figure 8. Inundated-area relationships showing trend for flow of 100,000 cubic feet per second for three channelization alternatives. Physical model results are from Corps of Engineers (1973)

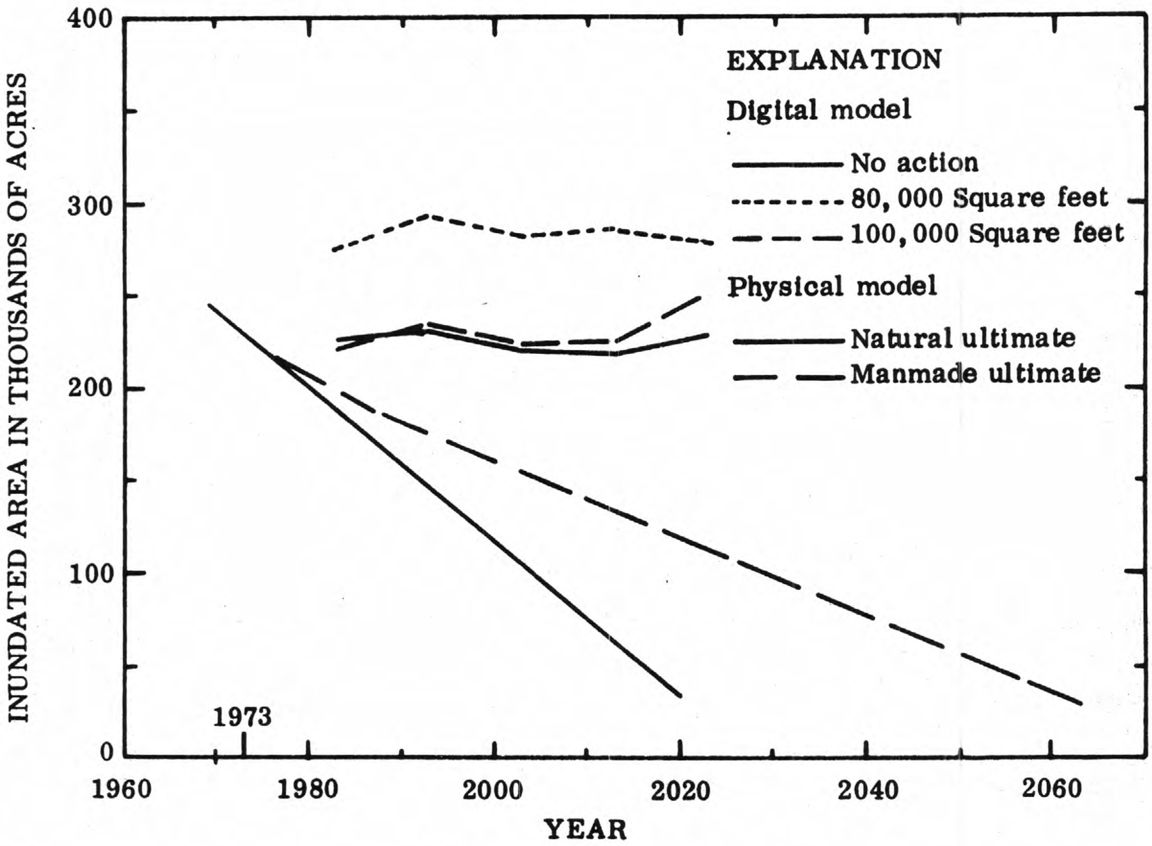
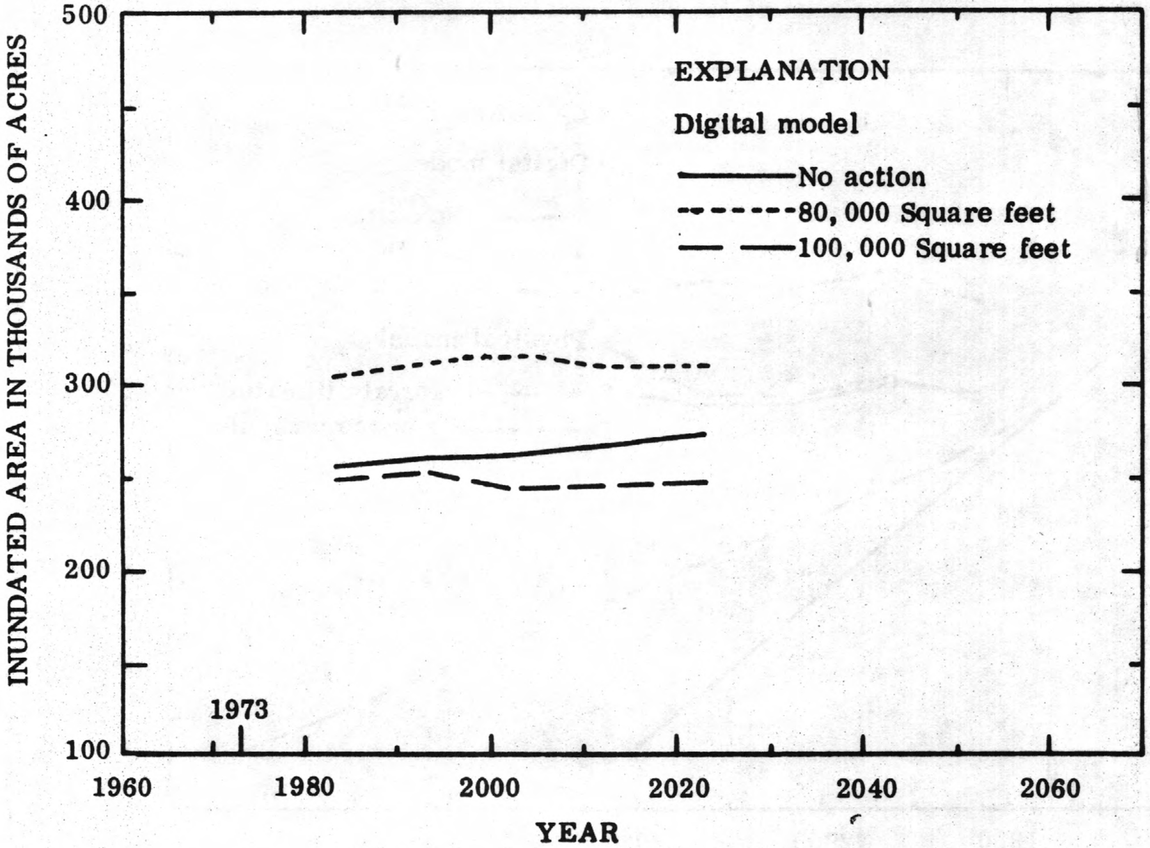


Figure 9. Inundated-area relationships showing trend for flow of 150, 000 cubic feet per second for three channelization alternatives. Physical model results are from Corps of Engineers (1973)



Note: Physical model results are not available for this flow rate

Figure 10. Inundated-area relationships showing trend for flow of 200,000 cubic feet per second for three channelization alternatives.

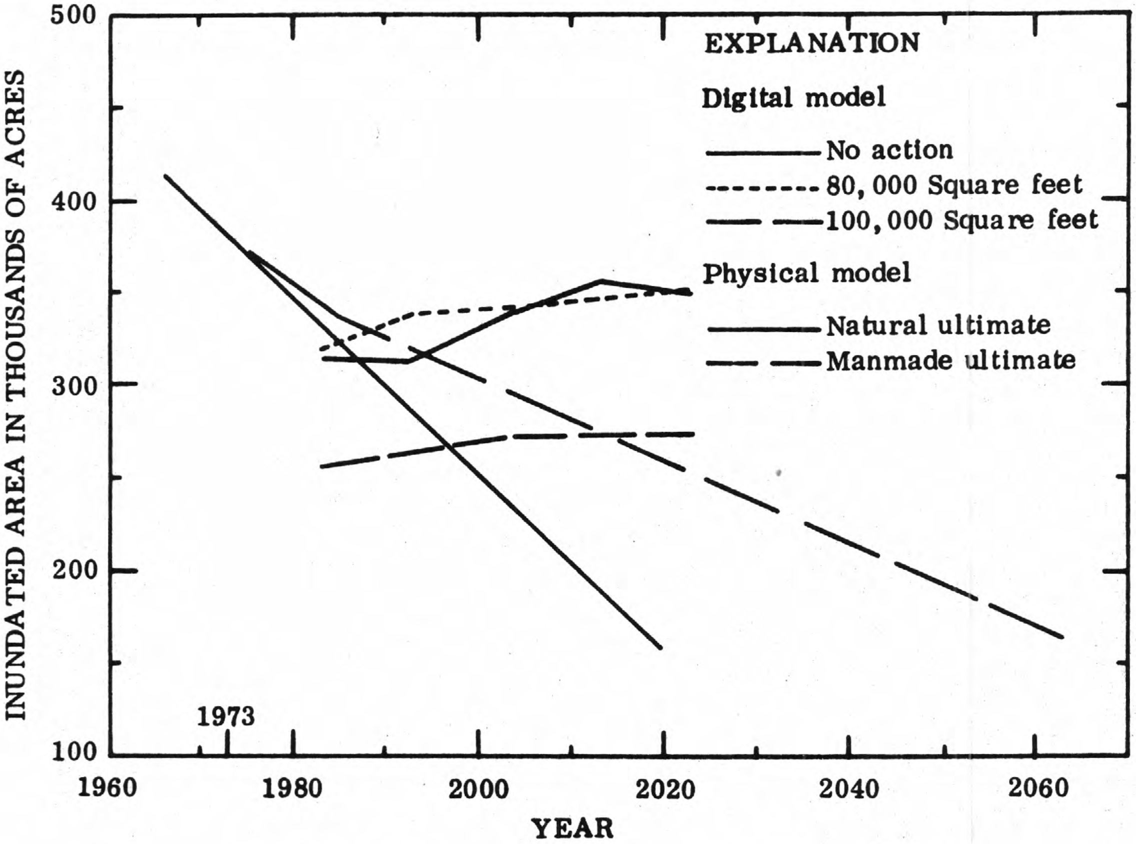
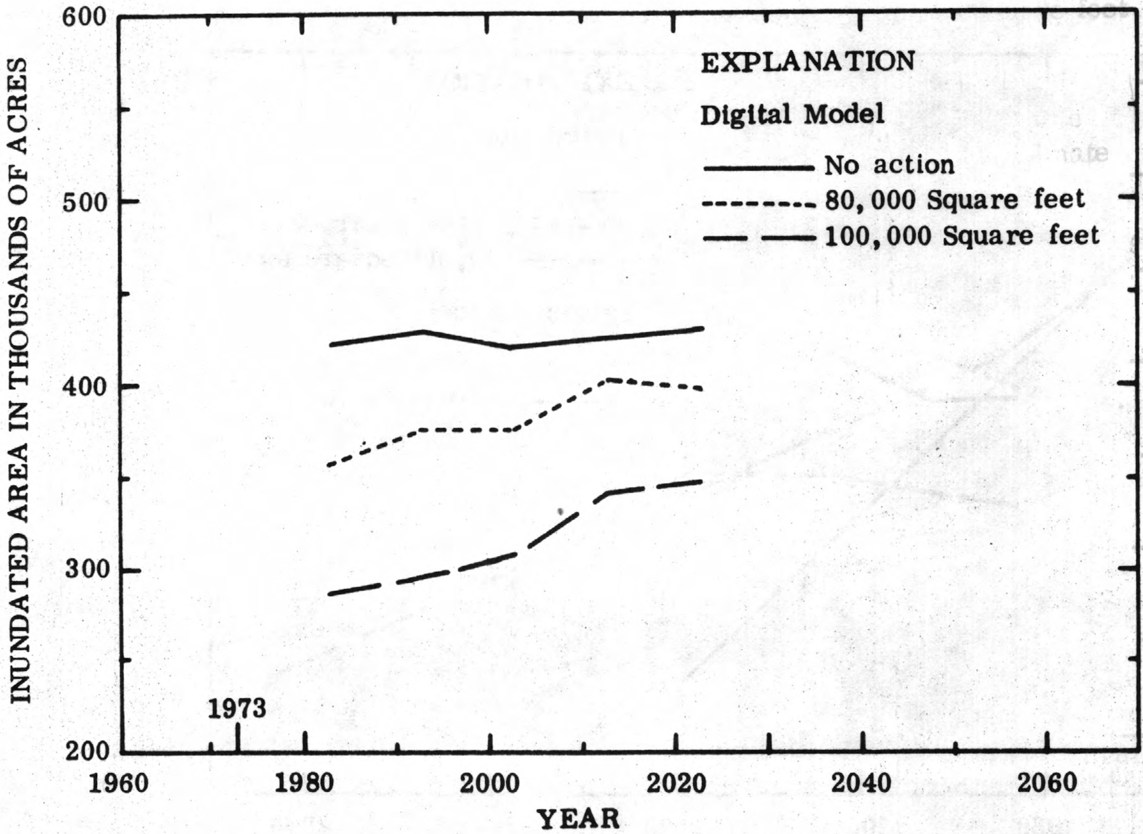


Figure 11. Inundated-area relationships showing trend for flow of 250, 000 cubic feet per second for three channelization alternatives. Physical model results are from Corps of Engineers (1973)



Note: Physical model results not available for this flow rate

Figure 12. Inundated-area relationships showing trend for flow of 300,000 cubic feet per second for three channelization alternatives.

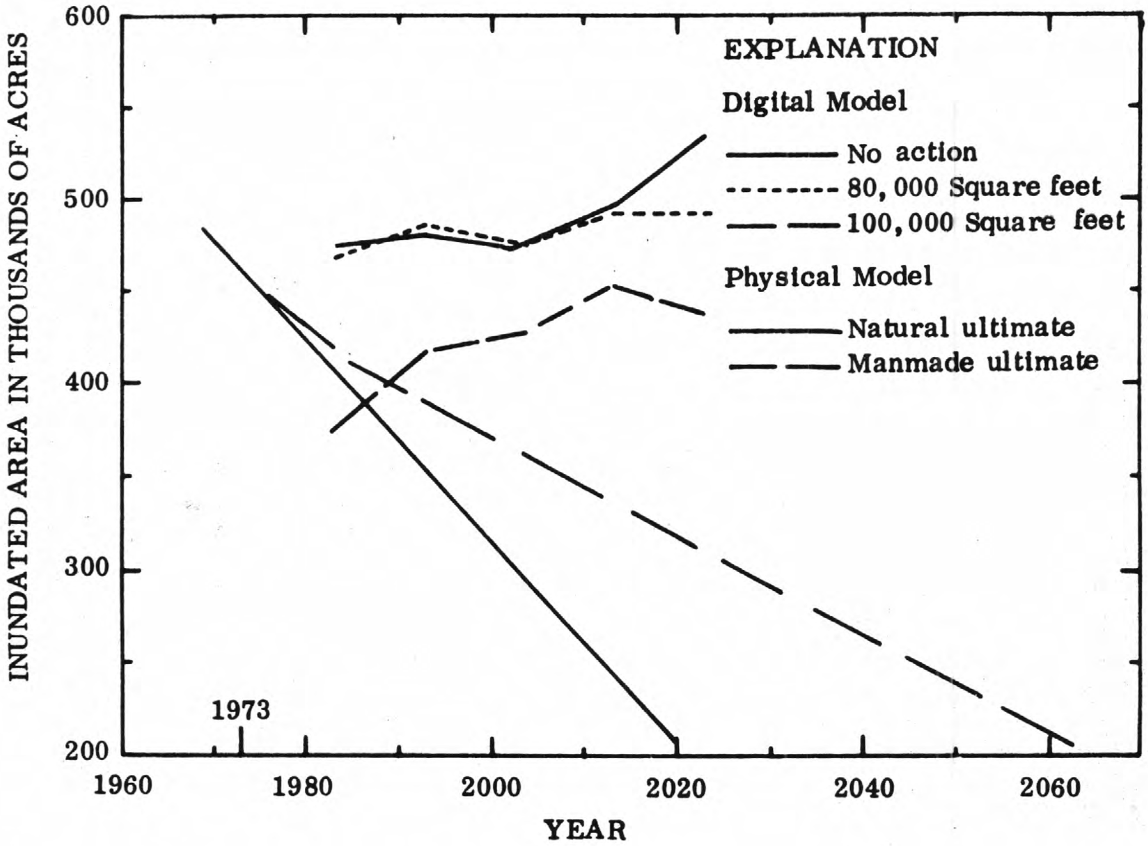


Figure 13. Inundated-area relationships showing trend for flow of 350,000 cubic feet per second for three channelization alternatives. Physical model results are from Corps of Engineers (1973)

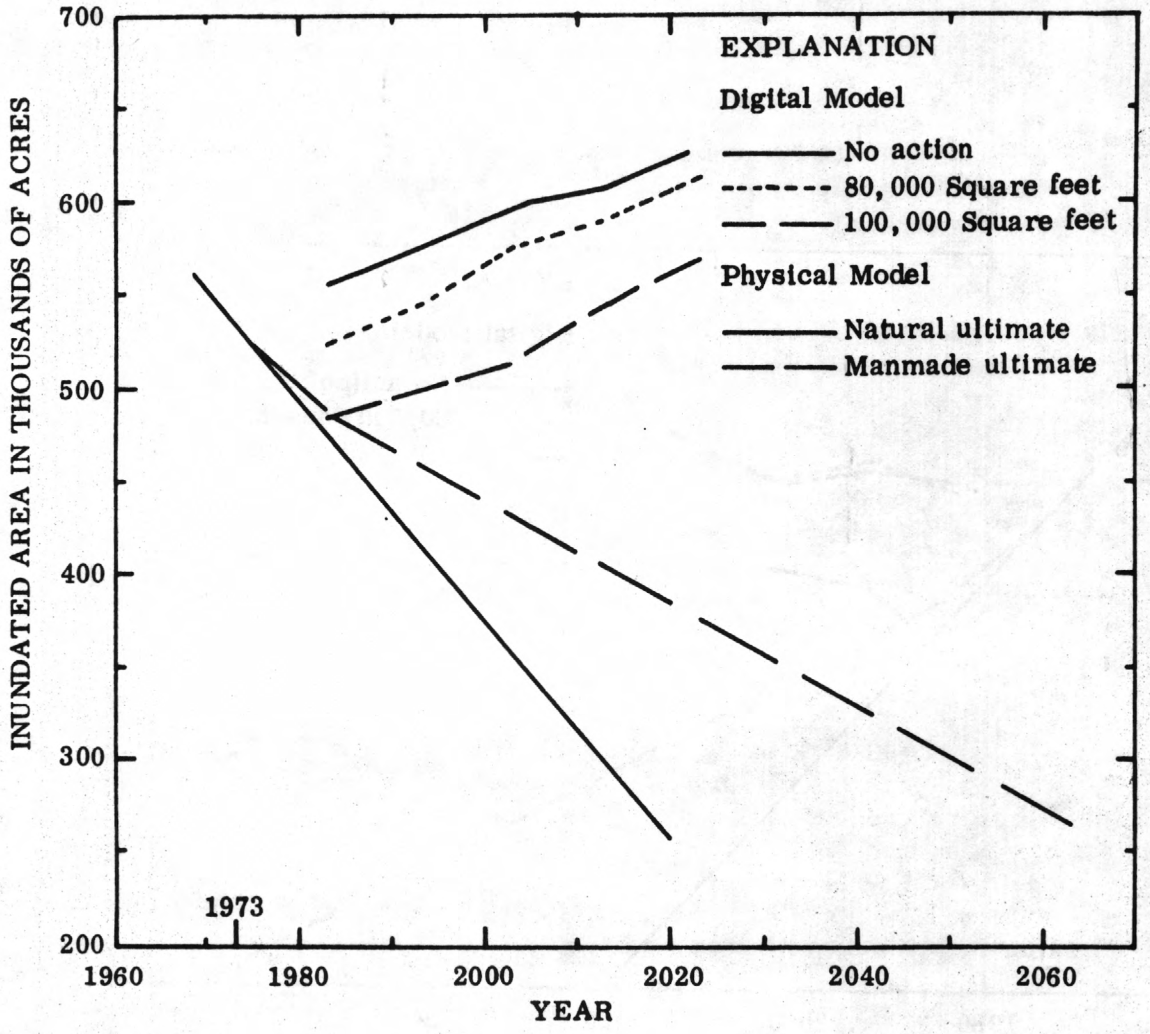


Figure 14. Inundated-area relationships showing trend for flow of 450,000 cubic feet per second for three channelization alternatives. Physical model results are from Corps of Engineers (1973)

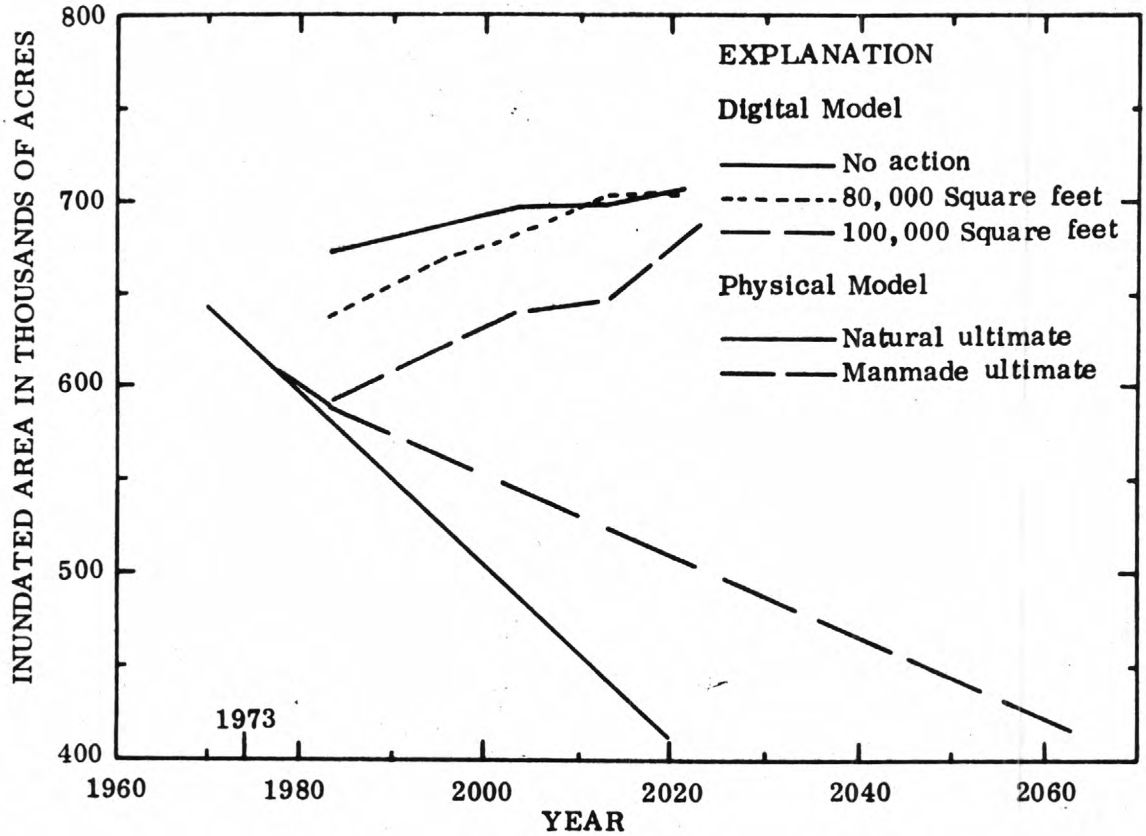


Figure 15. Inundated-area relationships showing trend for flow of 630,000 cubic feet per second for three channelization alternatives. Physical model results are from Corps of Engineers (1973)

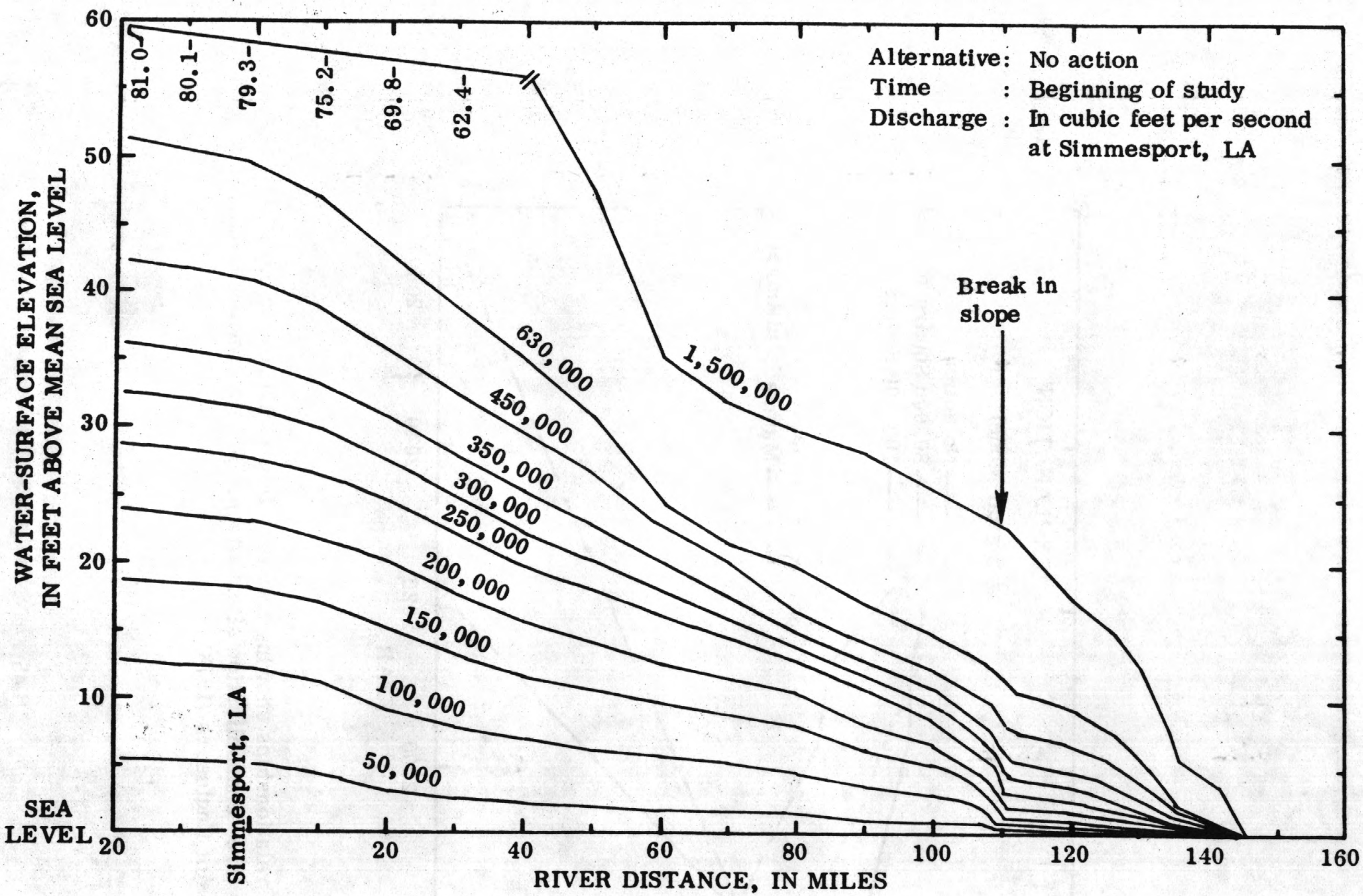


Figure 16. Water-surface profiles of center channel at the beginning of the study period for the no action alternative

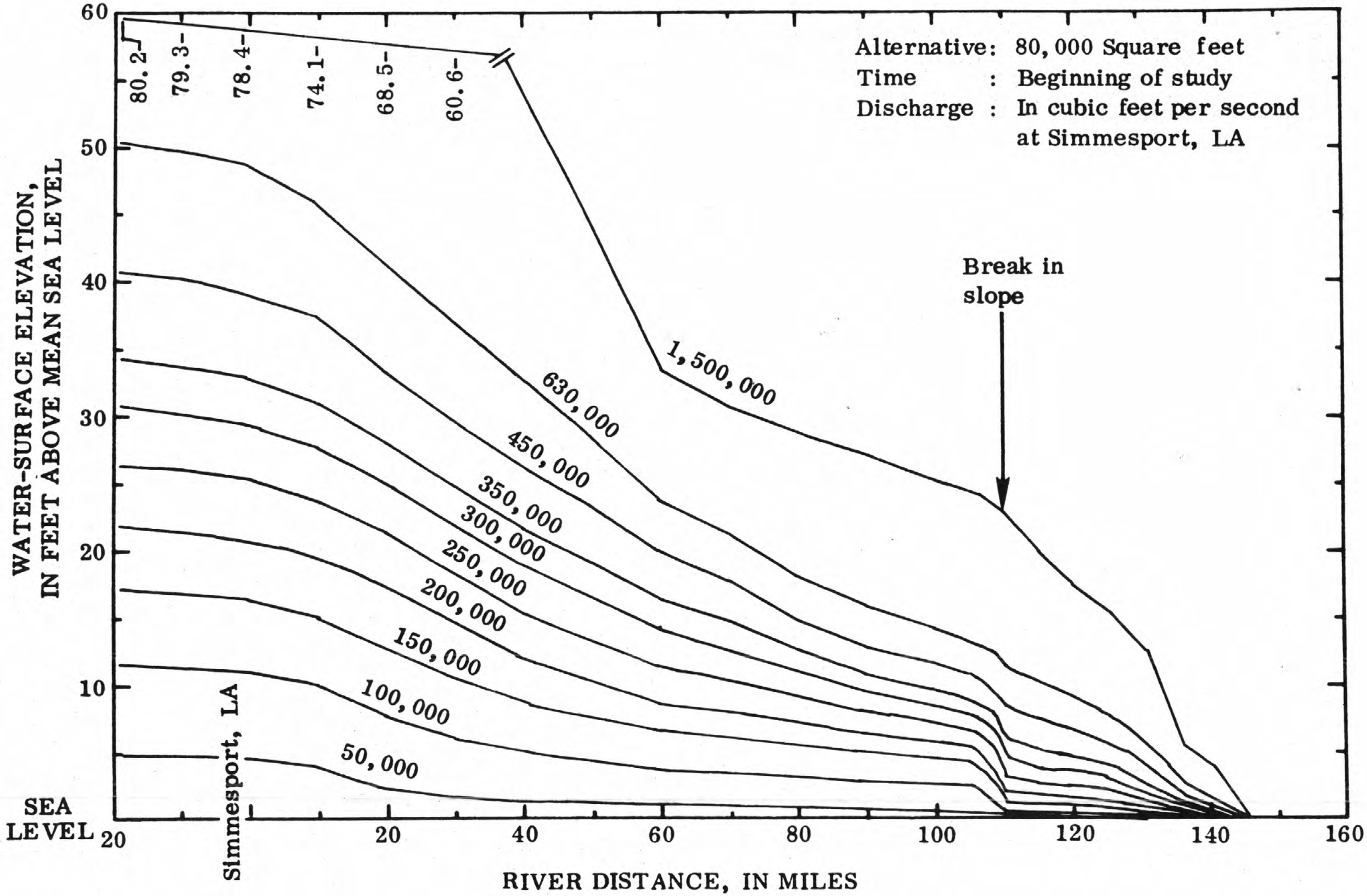


Figure 17. Water-surface profiles of center channel at the beginning of the study period for the 80,000 square feet channelization alternative

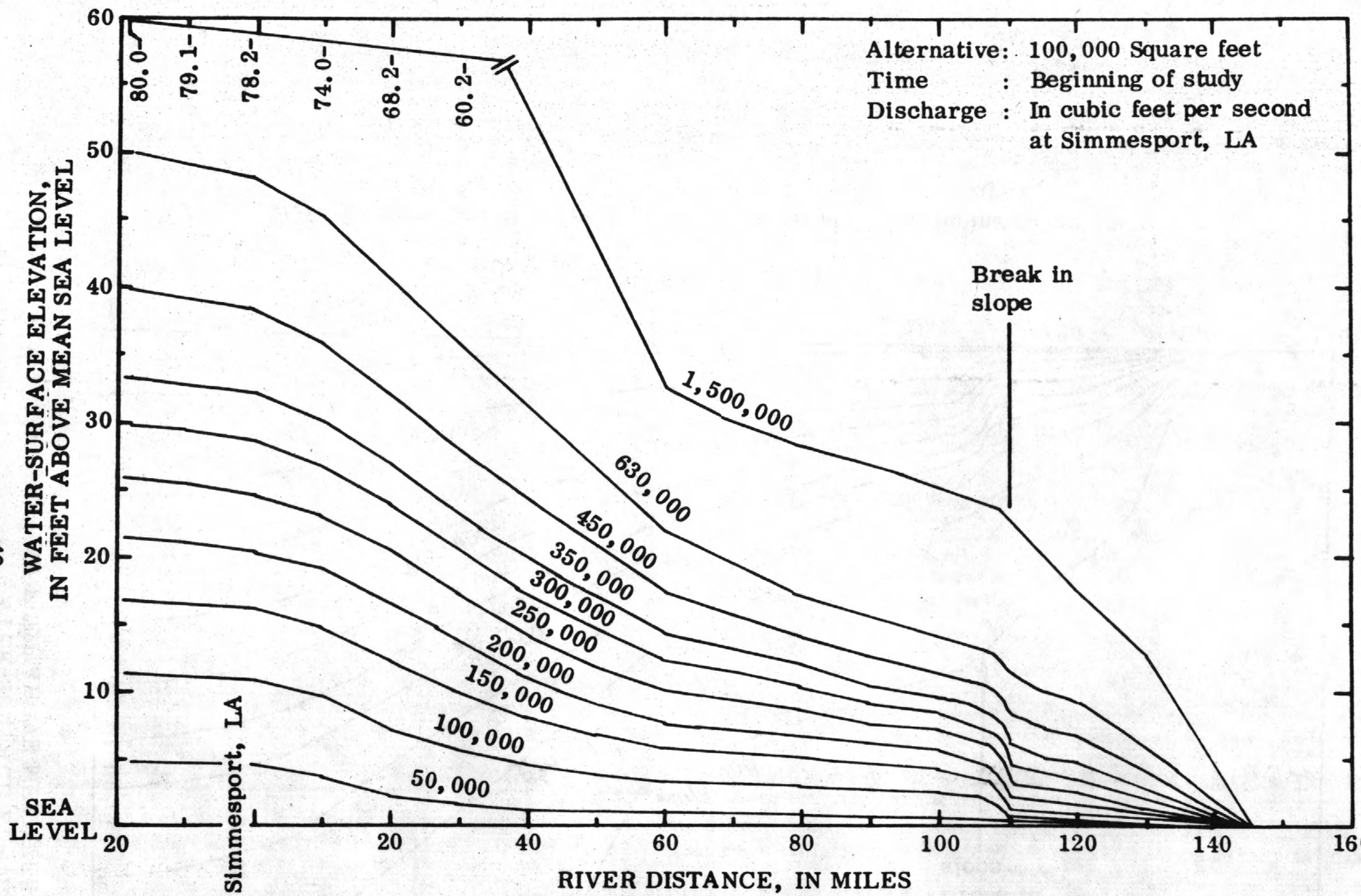


Figure 18. Water-surface profiles of center channel at the beginning of the study period for the 100,000 square feet channelization alternative

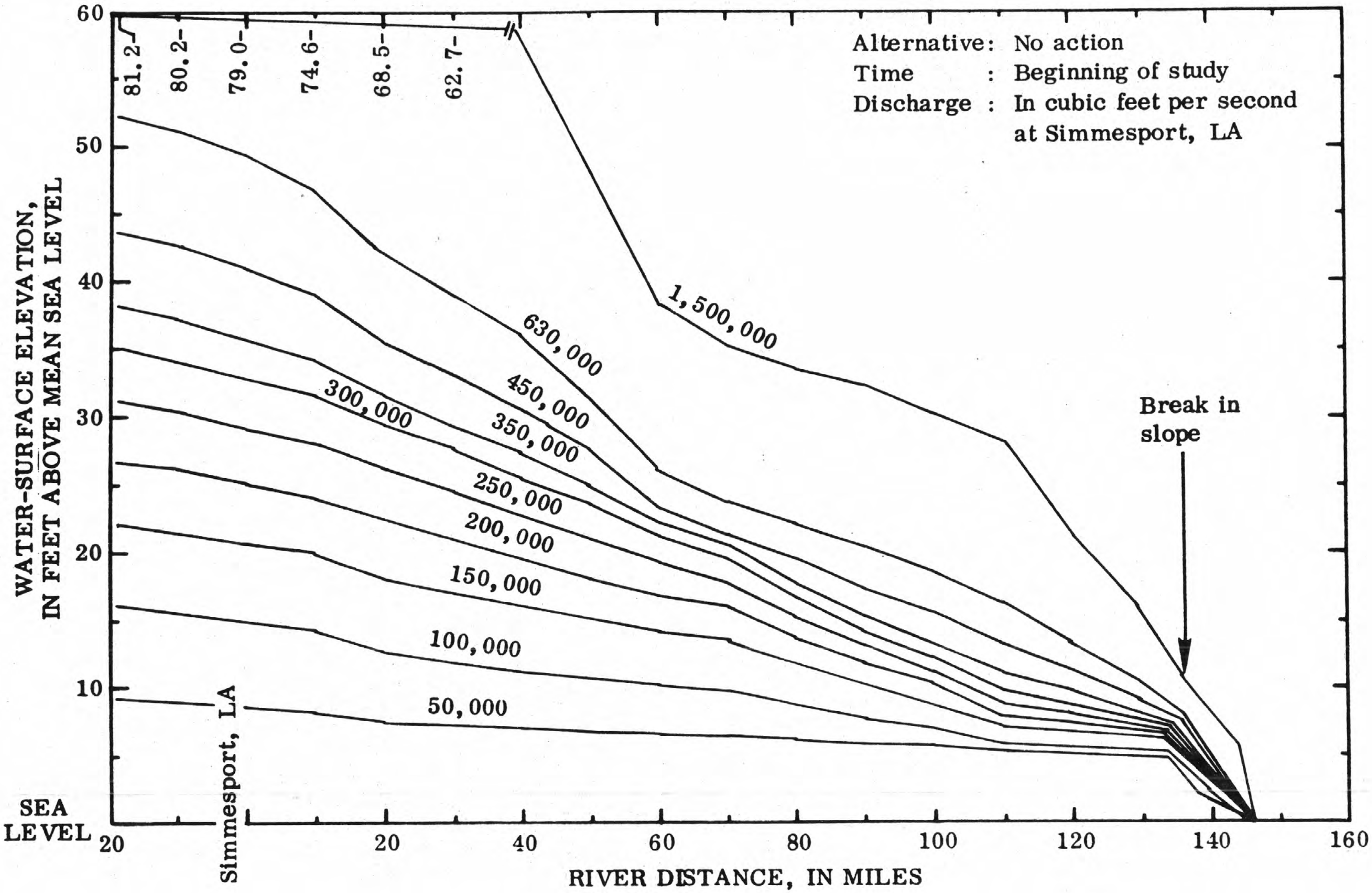


Figure 19. Water-surface profiles of center channel at the end of a 50-year simulation for the no action alternative

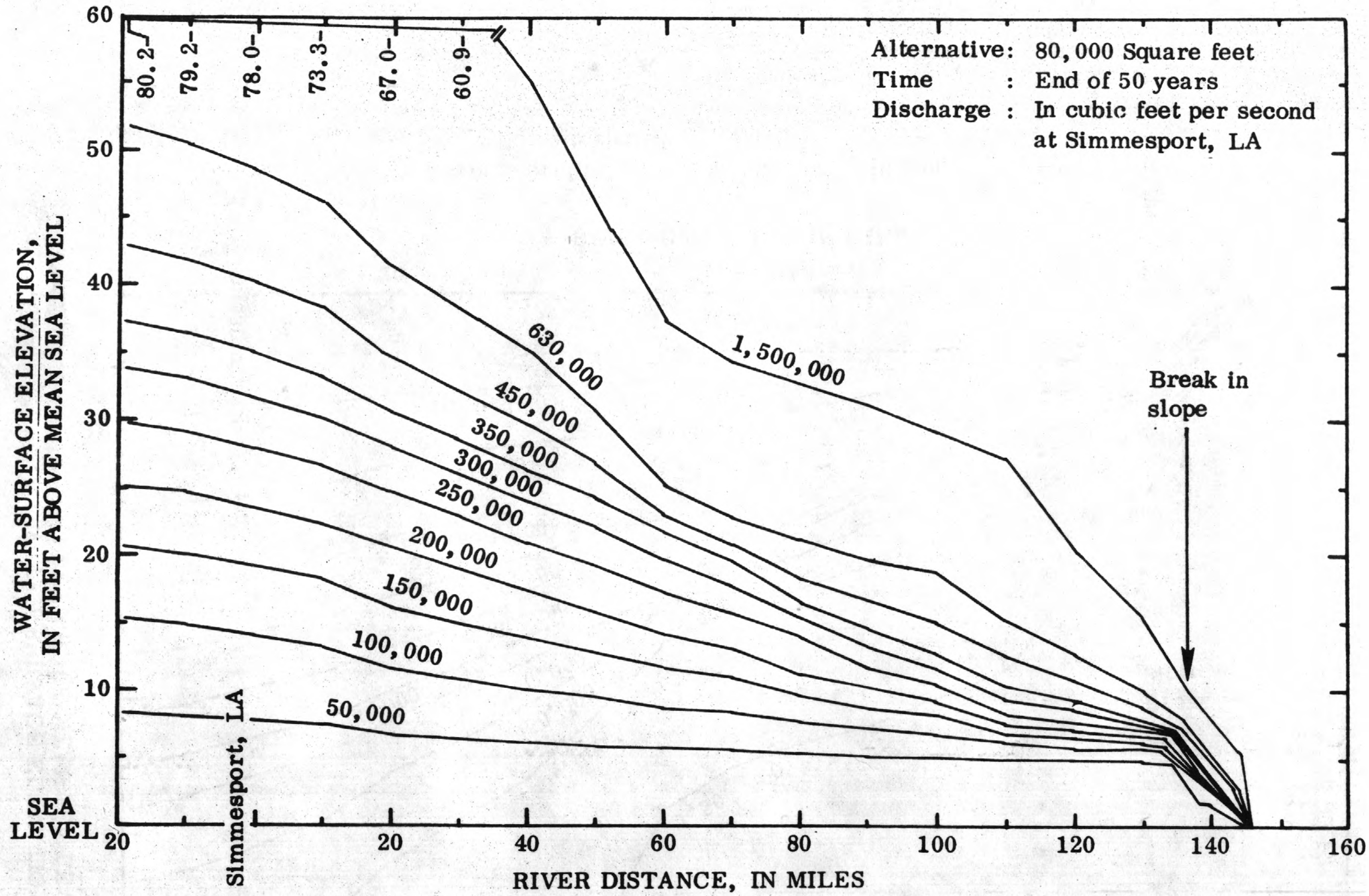


Figure 20. Water-surface profiles of center channel at the end of 50-year simulation for the 80,000 square feet channelization alternative

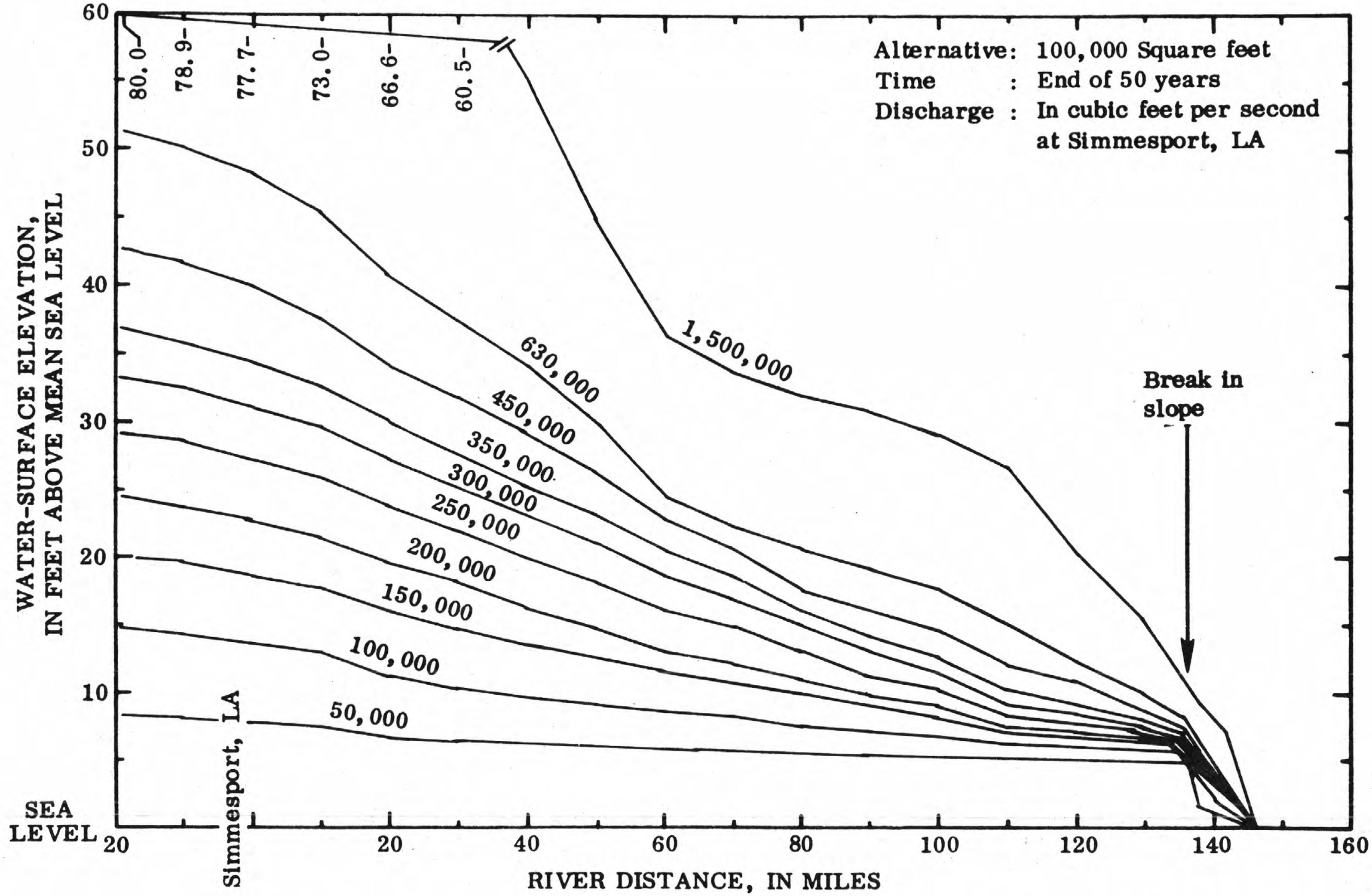


Figure 21. Water-surface profiles of center channel at the end of 50-year simulation for the 100,000 square feet channelization alternative

Table 8.--Center channel water-surface elevations (above mean sea level in feet) for selected cross sections and discharges at end of 50-year simulation for three alternatives

River distance in miles from Simmesport, La.	50,000 ft^3/s Alternative			250,000 ft^3/s Alternative			630,000 ft^3/s Alternative		
	No action	80,000 ft^2 channel	100,000 ft^2 channel	No action	80,000 ft^2 channel	100,000 ft^2 channel	No action	80,000 ft^2 channel	100,000 ft^2 channel
-19.0	9.25	8.37	8.40	31.27	29.95	29.31	52.43	51.78	51.38
-10.0	8.97	8.16	8.22	30.48	29.24	28.62	51.08	50.46	50.06
- 1.0	8.70	7.88	7.95	29.34	28.05	27.39	49.57	48.94	48.50
9.8	8.35	7.50	7.57	28.18	26.77	26.04	46.79	46.10	45.59
19.6	7.52	6.61	6.71	26.43	24.85	24.01	42.32	41.53	40.92
30.5	7.24	6.33	6.44	24.53	22.88	22.00	38.92	38.15	37.49
40.7	7.01	6.11	6.23	22.60	20.90	19.98	35.79	35.05	34.38
49.8	6.87	5.96	6.08	21.07	19.30	18.35	31.63	30.91	30.18
60.15	6.71	5.75	5.88	19.22	17.05	16.15	26.21	25.19	24.15
69.97	6.59	5.63	5.77	17.93	15.79	15.06	23.77	22.92	22.43
79.35	6.25	5.40	5.59	15.42	14.01	13.23	22.76	21.35	20.73
90.23	5.93	5.20	5.44	13.11	11.69	11.60	20.51	19.69	19.18
99.99	5.72	5.09	5.35	11.38	10.52	10.48	18.63	17.98	17.59
107.0	5.49	4.90	5.21	9.84	9.14	9.10	17.14	16.33	16.11
108.9	5.42	4.84	5.17	9.25	8.74	8.75	16.76	15.94	15.72
110.4	5.38	4.80	5.14	8.88	8.34	8.35	16.23	15.36	15.11
115.4	5.36	4.79	5.13	8.55	8.10	8.15	15.01	14.28	14.11
120.22	5.34	4.77	5.11	8.22	7.81	7.87	13.46	12.85	12.72
125.63	5.31	4.75	5.09	7.83	7.46	7.53	11.97	11.53	11.48
130.5	5.27	4.71	5.05	7.29	6.98	7.09	10.31	9.98	9.98
136.0	5.20	4.64	4.99	6.71	6.47	6.59	8.22	8.08	8.10
140.0	1.78	1.70	1.70	3.46	3.38	3.38	5.32	5.23	5.23
146.0	.20	.20	.20	.20	.20	.20	.20	.20	.20

A comparison of the profiles in the lower reach shows a different pattern of changes. These profiles are shown in figure 22. In this section of the reach, the stages for all three alternatives are comparable at any point in time; however, the stages have a pattern of change with time and along the channel. The stages increased with time and the break in the water-surface profile moves downstream during the first 10 years. The break was stationary during the last 40 years of simulation.

The comparatively lower stages for the two channelization alternatives reflects the increased channel conveyance. It is important to note that in the middle and upper reaches channel conveyance is maintained in time. However in the lower reach, channel conveyance is considerably reduced by the deposition of sediment near the mouth. This caused the stage to increase in time and the break in the water-surface profile to move downstream. The break in the water-surface profiles may have moved farther downstream if the water-surface elevation in Atchafalaya Bay, specified by NOD as 0.2 ft m.s.l. at river mile 146, had been designated farther downstream.

CONCLUSIONS

Selected mathematical model simulation results, using a modified version of computer program HEC-6, U.S. Army Corps of Engineers (1976), flow-sediment model for the Atchafalaya River Basin floodway in Louisiana, have been presented. The mathematical model, because it is of the movable-bed type, (that is, channel and overbanks are continuously changed by flow of the water-sediment mixture through time), offers advantages over fixed-bed, physical models. However, the mathematical model described in this report was only weakly calibrated and verified. In addition, the model has limitations that must be recognized. Thus, any analysis of the simulation results presented must be carefully weighed and the logic of reasonableness applied.

The model results show a general increasing trend of aggradation or deposition in the basin (especially in the lower floodway), both in the main channel and in the overbanks. The trend shows more floodway area being inundated through time, especially at discharges above 300,000 ft^3/s. Less area is inundated by center-channel alternatives than for the no-action alternative. Water-surface profiles in the basin for a range of flows are consistent with the inundated-area relations. The profiles are slightly flatter for center-channel alternatives than for the no-action alternative. Plots of depth-frequency relations, perhaps because of averaging, show small differences among alternatives at the end of the 50-year simulation.

This report in no way exhaust the possibility for analysis of the Atchafalaya model results--very large computer files of sediment transport, cross-section geometry, water-surface profiles and other data at numerous time points at all 143 locations for the three alternatives have been accumulated. However, more extensive model calibration, verification, and evaluation should precede further analysis of simulation results.

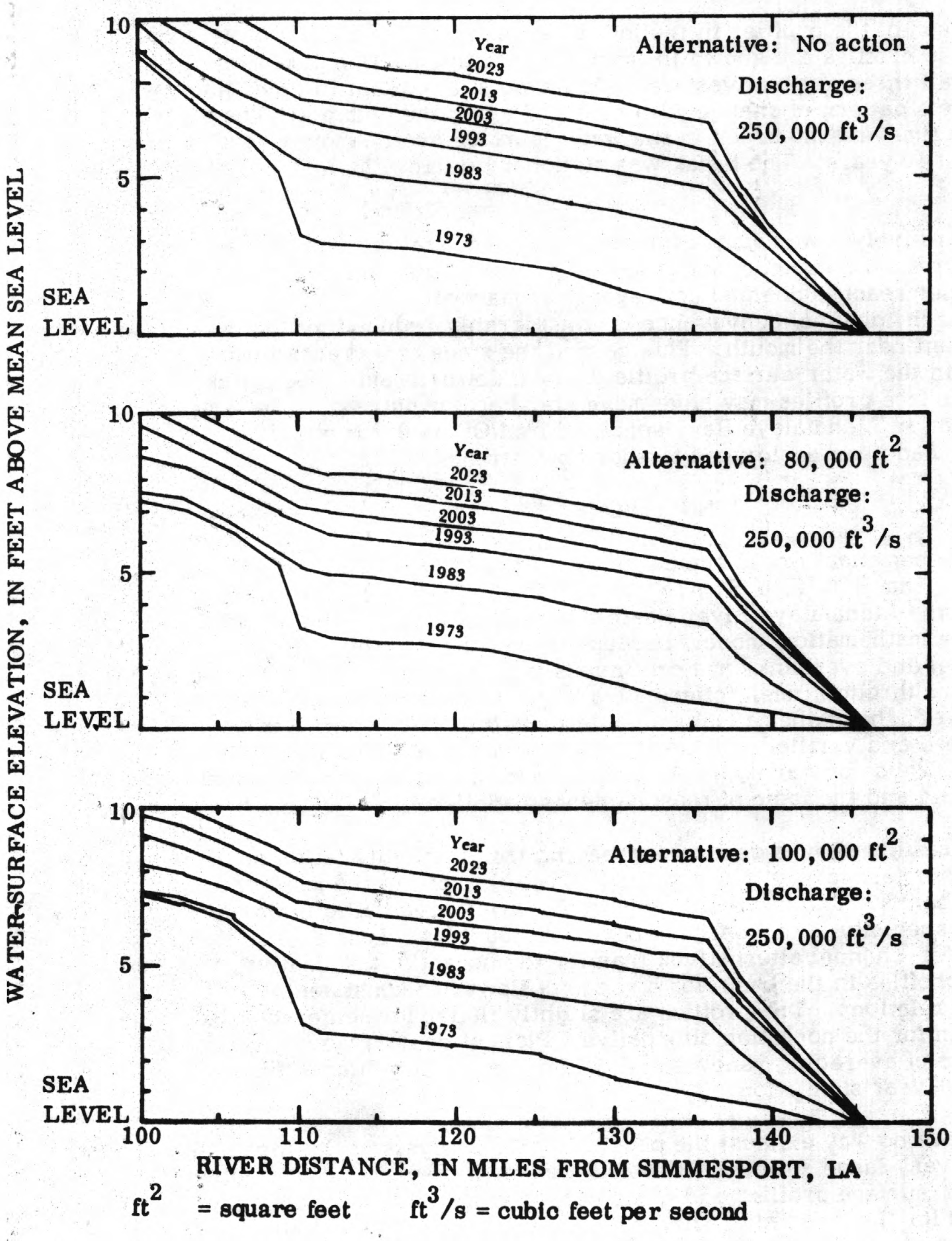


Figure 22. Lower reach water-surface profiles at 10-year intervals for no action and two channelization alternatives

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