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Sedimentation Survey of Lake Decatur's Basin 6, Macon County, Illinois

by

William C. Bogner

Prepared for the City of Decatur

May 2001

Illinois State Water Survey
Watershed Science Section
Champaign, Illinois

A Division of the Illinois Department of Natural Resources

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Abstract

Sedimentation detracts from the use of any water supply lake by reducing lake depth and volume, with a reduction of reserve water supply capacity and possible burying of intake structures. Sedimentation of a reservoir is a natural process that can be accelerated or slowed by human activities in the watershed.

Lake Decatur is located in Macon County, northeast of Decatur, Illinois. The location of the dam is 39° 49’ 28” north latitude and 88° 57’ 30” west longitude in Section 22, T.16N., R.2W., Macon County, Illinois. The dam impounds the Sangamon River in the Sangamon River basin. The watershed is a portion of Hydrologic Unit 07130006 as defined by the U.S. Geological Survey. The lake was constructed in 1922 with a spillway level of 610 feet above mean sea level (feet-msl). In 1956, a set of hydraulic gates was installed on the original spillway to allow variable lake levels from 610 feet-msl to 615 feet-msl. The portion of the lake surveyed for the present study was Basin 6 located above Rea’s Bridge Road. This basin of the lake is the headwater area of the main body of the lake.

Lake Decatur has been surveyed to document sedimentation conditions eight times since 1930. Five of these survey efforts (1936, 1946, 1956, 1966, and 1983) were sufficiently detailed to be termed full lake sedimentation surveys. The present survey is not considered to be a full lake sedimentation survey.

Sedimentation has reduced the basin capacity from 2,797 acre-feet (ac-ft) in 1922 to 1,451 ac-ft in 2000. The 2000 basin capacity was 48.1 percent of the 1922 potential basin capacity. For water supply purposes, these volumes convert to capacities of 911 million gallons in 1922 and 473 million gallons in 2000. Sedimentation rate analyses indicate a decline in annual sediment deposition rates from 35.4 ac-ft for the period 1922-1936 to 8.3 ac-ft annually from 1983-2000. The long-term average annual deposition rate for 1922-2000 was 17.3 ac-ft.

Density analyses of the sediment samples indicate that the unit weight of sediment in the northern (upstream) portions of the lake is greater than the unit weight of sediment in the southern end of the lake. In general, coarser sediments are expected to be deposited in the upstream portion of a lake where the entrainment velocity of the stream is reduced to the much slower velocities of a lake environment. These coarser sediments tend to be denser when settled and are subject to drying and higher compaction rates as a result of more frequent drawdown exposure in the shallow water environment. As the remaining sediment load of the stream is transported through the lake, increasingly finer particle sizes and decreasing unit weight are observed.

Sedimentation Survey of Lake Decatur's Basin 6, Macon County, Illinois

Introduction

The Illinois State Water Survey (ISWS) conducted a sedimentation survey of Basin 6 (northern basin) of Lake Decatur during the Summer of 2000. The survey was undertaken to provide information on the storage and sedimentation conditions of the lake. Lake Decatur is owned and operated by the City of Decatur. The city withdraws water from the lake as the sole raw water source for direct distribution of finished water to the community.

Sedimentation detracts from the use of any water supply lake by reducing depth and volume. As a result, there is a reduction of reserve water supply capacity and possible burying of intake structures.

Sedimentation of a reservoir is a natural process that human activities in the watershed can either accelerate or slow. In general, sedimentation of a lake is presumed to be accelerated unintentionally as a secondary impact of other developments within the watershed. For example, construction and agricultural activities in a lake watershed generally are presumed to increase sediment delivery to the lake due to increased exposure of soil material to erosive forces.

Reductions of the sedimentation rate in a lake due to human impacts almost always are the result of programs intentionally designed to reduce soil and streambank erosion, and they are often the result of implementing lake remediation programs. These programs might include, but are not limited to, the implementation of watershed erosion control practices, streambank and lakeshore stabilization, stream energy dissipaters, and lake dredging.

Sedimentation of a reservoir is the final stage of a three-step sediment transport process. The three steps are watershed erosion by sheet, rill, gully, and/or streambank erosion; sediment transport in a defined stream system; and sediment deposition, in which stream energy is reduced such that the sediment no longer can be transported in suspension or as bed load. Sediment deposition can occur throughout the stream system.

Lake sedimentation occurs when sediment-laden water in a stream enters the reduced flow velocity regime of a lake. As water velocity is reduced, suspended sediment is deposited in patterns related to the size and fall velocity of each particle. During this process, soil particles are partially sorted by size along the longitudinal axis of the lake. Larger, heavier sand and coarse silt particles are deposited in the upper end of the lake; finer silts and clay particles tend to be carried further into the lake.

Several empirical methods have been developed for estimating sedimentation rates in Illinois (ISWS, 1967; Upper Mississippi River Basin Commission, 1970; Singh and Durgunoglu, 1990). These methods use regionalized relationships between watershed size and lake sedimentation rates. As estimates, they serve well within limits. A more precise measure of the sedimentation rate is provided by conducting a sedimentation survey of the reservoir. The sedimentation survey provides detailed information on distribution patterns within the lake and defines temporal changes in overall sedimentation rates.

Acknowledgments

The project was funded by the City of Decatur. Keith Alexander, Director of Water Management was project manager.

Views expressed in this report are those of the author and do not necessarily reflect the views of the sponsor or the Illinois State Water Survey.

This project was conducted by the author as part of his regular duties at the Illinois State Water Survey under the administrative guidance of Derek Winstanley, Chief, and Mike Demissie, Head of the Watershed Science Section. James Slowikowski assisted with the field data collection. Yi Han analyzed the sediment samples. Richard Allgire and Shundar Lin provided technical review. Eva Kingston edited the report. Linda Hascall reviewed the graphics.

Lake Information

Lake Decatur (figure 1) is located in Macon County, northeast of Decatur, Illinois. The location of the dam is 39° 49’ 28” north latitude and 88° 57’ 30” west longitude in Section 22, T.16N., R.2W., Macon County, Illinois. The dam impounds the Sangamon River in the Sangamon River basin. The watershed is a portion of Hydrologic Unit 07130006 as defined by the U.S. Geological Survey (USGS, 1974).

The lake was constructed in 1922 with a spillway level of 610 feet above mean sea level (feet-msl). In 1956, a set of hydraulic gates was installed on the original spillway to allow variable lake levels from 610 feet-msl to 615 feet-msl. The operating plan for these gates and the lake levels maintained have been revised several times since 1956. In 2000, the operating plan designated a winter target pool elevation of 612.5 feet National Geodetic Vertical Datum (NGVD) for the period December to April and a summer target pool elevation of 614.4 feet NGVD for the period May to November.

Fitzpatrick et al. (1987) present a more complete review of the history of the Decatur public water supply system and the development of Lake Decatur.

The portion of the lake surveyed for the present study was Basin 6 located above Rea’s Bridge Road (figure 2). This basin of the lake is the headwater area of the main body of the lake. The Sangamon River enters the lake through this basin.

The USGS streamgaging station for the Sangamon River near Oakley is located approximately 6 stream miles above Rea’s Bridge. This gaging station has a listed watershed area of 774 square miles (sq. mi.). An additional watershed area of approximately 25 sq. mi. is added to the river between these two sites for a total watershed area of 799 sq. mi. for the study area.

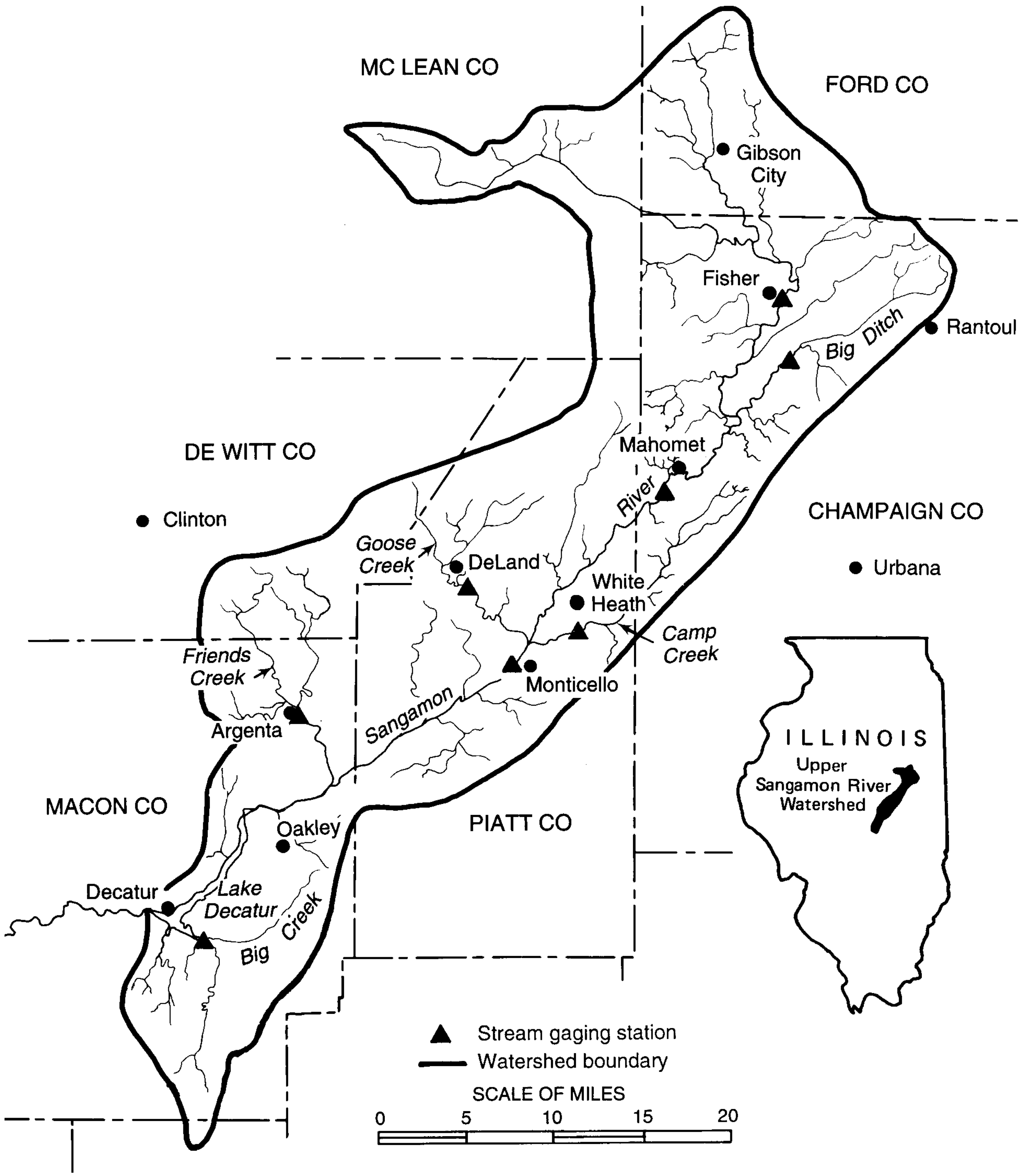


Figure 1. Location and watershed delineation for Lake Decatur

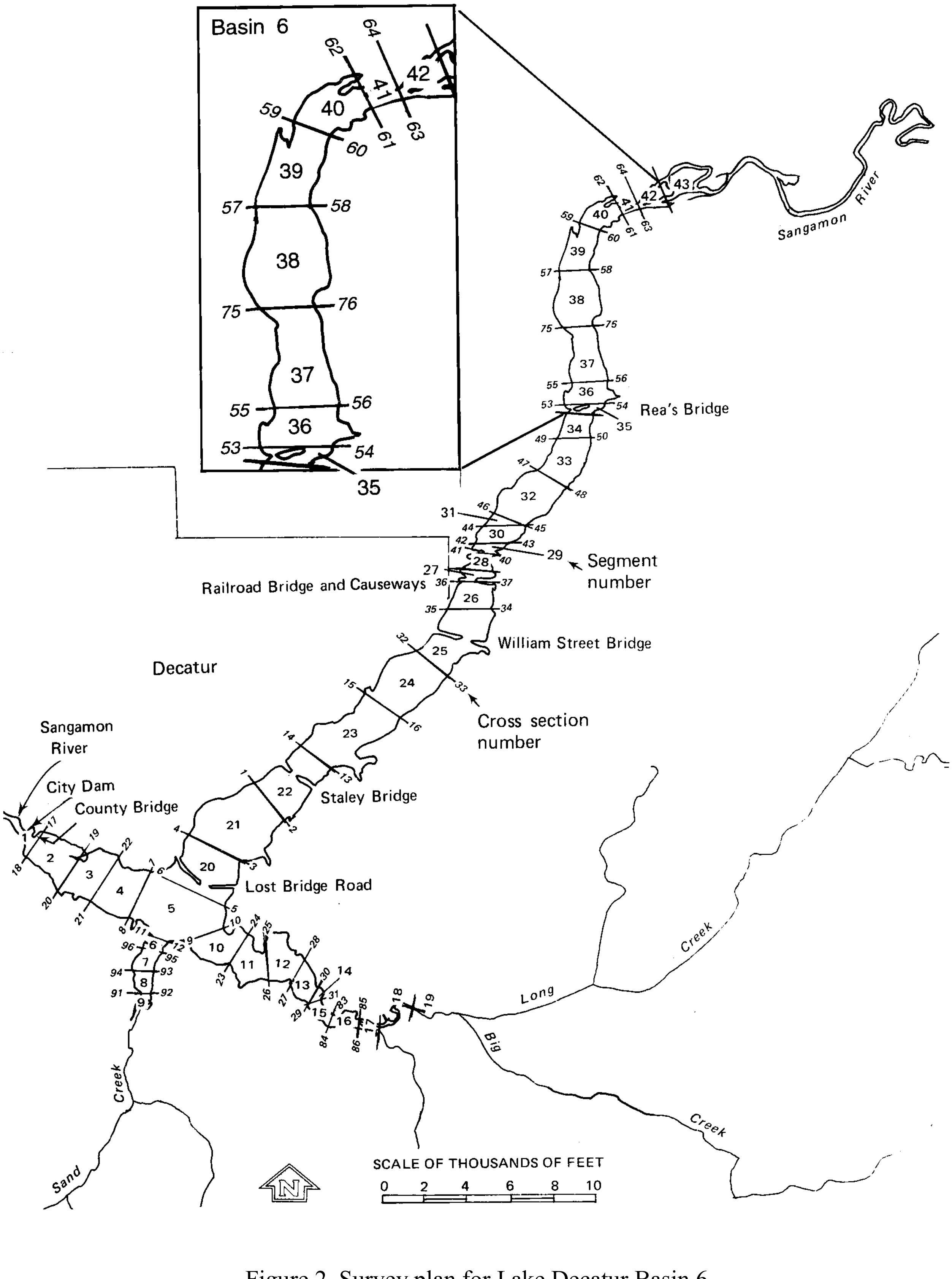


Figure 2. Survey plan for Lake Decatur Basin 6

Reservoir Sedimentation Records for Lake Decatur

Lake Decatur has been surveyed to document sedimentation conditions eight times since 1930. The plan of survey for each of these surveys is shown in figure 2. Five of these survey efforts (1936, 1946, 1956, 1966, and 1983) were sufficiently detailed to be termed full lake sedimentation surveys. These surveys, the year of survey, and the agency responsible for the survey were:

Survey type	*Year*	*Agency*
Reconnaissance survey	1930	Macon County (F.L. Washburn, County Engineer)
Benchmark (initial) survey	1931	ISWS
Re-survey	1936	ISWS, Agricultural Experiment Station
Re-survey	1946	ISWS
Re-survey	1956	ISWS
Re-survey	1966	ISWS
Re-survey	1983	ISWS
Basin 6 re-survey	2000	ISWS

The present survey is not considered to be a full lake sedimentation survey. Work for this study was limited to the seven transects immediately upstream of Rea's Bridge as required by the plan of study. Fitzpatrick et al. (1986) present detailed methodologies for the earlier surveys.

Prior to initiating the lake depth survey, all surviving monumentation established for previous surveys was recovered and located using a differentially corrected Leica 9600 System Geodetic Positioning System (GPS). When all previous monumentatation for a range end was lost, relocation ties were used to determine the location of the range end, and a GPS position was determined.

The 2000 survey was conducted using a marked pole for depth measurement and the differentially corrected Leica 9600 GPS for horizontal control across the transect. All navigation and data logging functions were controlled using HYPACK hydrographic survey software. For navigation purposes, the GPS positions determined for the range ends were entered into the HYPACK system, which then provided guidance for positioning each line at pre-determined intervals. The GPS positions were differentially corrected using Radio Technical Commission for Maritime Services (RTCM) correction signals broadcast by the U.S. Coast Guard from St. Louis, Missouri.

Water depth measurements were spaced at nominal 50-foot intervals along each transect line. The GPS position was recorded at each measuring point, using the HYPACK software and the measured water depth was manually entered into the record. All depth measurements were converted to bed elevations using a daily lake level obtained from the main water treatment plant.

Plots of all surveyed cross sections from 1936, 1946, 1956, 1966, 1983, and 2000 are presented (appendix I).

Basin 6 Volumes and Sedimentation Rates

Calculations of the lake capacities were made using methods described in *the National Engineering Handbook* of the U.S. Soil Conservation Service (USDA-SCS, 1968). This method can determine the original and present volume of each segment by using the surface area of the lake segments, the cross-sectional area and widths of their bounding segments, and a shape factor. These volumes are then summed to determine the total lake volume. The reference elevation used for the lake was the top of the spillway, 614.5 feet NGVD. Table 1 presents the volume calculation results for each survey.

Sedimentation has reduced the basin capacity from 2,797 acre-feet (ac-ft) in 1922 to 1,451 ac-ft in 2000. The 2000 basin capacity was 48.1 percent of the 1922 potential basin capacity. For water supply purposes, these volumes convert to capacities of 911 million gallons in 1922 and 473 million gallons in 2000.

Sedimentation rates for Lake Decatur's Basin 6 were analyzed in terms of deposition rates in the reservoir. Table 1 presents the sedimentation rates for Basin 6 for all available sedimentation periods. These rates indicate a decline in annual sediment deposition rates from 35.4 ac-ft for the period 1922-1936 to 8.3 ac-ft annually from 1983-2000. The long-term average annual deposition rate for 1922-2000 was 17.3 ac-ft.

Table 2 presents capacity loss rates for Basin 6. The capacity loss rates compare the rate of accumulation of sediment in the lake to the original reservoir capacity of the lake. For Lake Decatur Basin 6, the rate of capacity loss has been reduced from 1.3 percent per year for the period 1922-1936 to 0.3 percent per year for the most recent period (1983-2000).

Factors Affecting Lake Sedimentation Rates

Sedimentation rates in a lake can vary over time due to changes in either watershed or in-lake conditions. Changes in watershed conditions, such as altered precipitation patterns, land-use patterns, and streamflow variability, also affect the sediment delivery rates to the lake. In-lake conditions that also affect sedimentation rates involve the variation of trap efficiency (due to reduced storage capacity) and sediment consolidation.

Representative streamflow values for the Sangamon River at Monticello from October 1921-September 1999 are shown (figure 3). The most important plots for analysis of lake sedimentation are the maximum flows and the average flows. High sediment transport rates are closely related to peak water discharge periods (Demissie et al., 1983; Bhowmik et al., 1993). The plots in figure 3 do not indicate any distinct differences in high and average flow characteristics for an individual sedimentation period.

Of interest for water supply yield purposes are the generally lower minimum flows that occurred during the 1922-1936 and 1946-1956 periods. Low flow rates at the Monticello station for the early 1930s and the mid-1950s reflect the severe drought conditions that were prevalent for most Illinois streams during those time periods.

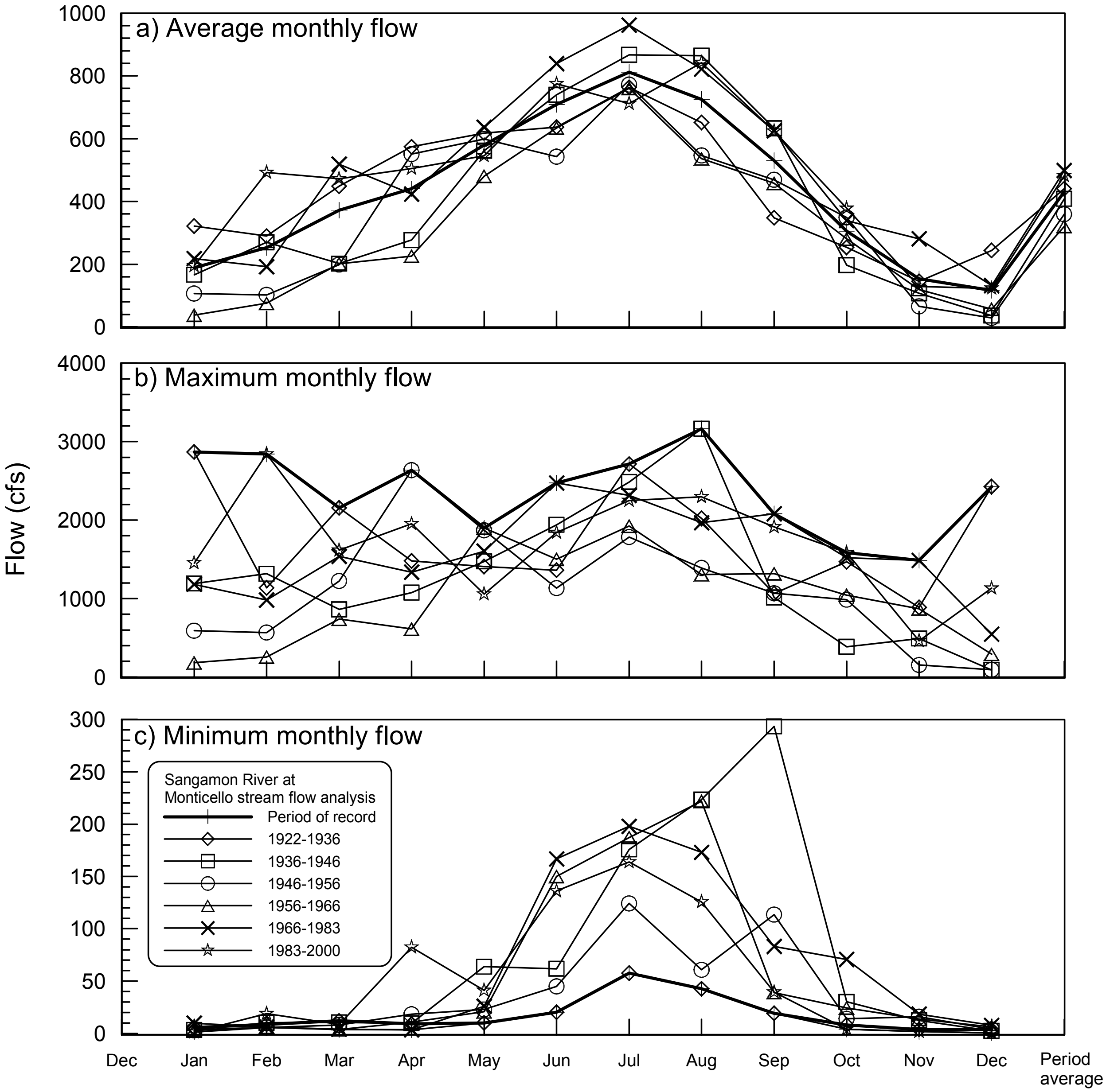
Table 1. Capacity and Capacity Loss Analysis for Basin 6

Period	*Capacity*	*Capacity loss for period*	*Cumulative capacity loss*	*Period annual capacity loss rate*	*Cumulative annual capacity loss rate*
a) Analysis in units of ac-ft					
1922	2,797				
1922-1936	2,302	495	495	35.4	35.4
1936-1946	2,049	253	749	25.3	31.2
1946-1956	1,940	109	858	10.9	25.2
1956-1966	1,769	171	1,029	17.1	23.4
1966-1983	1,592	176	1,205	10.4	19.8
1983-2000	1,451	141	1,346	8.3	17.3
b) Analysis in units of million gallons					
1922	911				
1922-1936	750	161.4	161	11.5	11.5
1936-1946	667	82.6	244	8.3	10.2
1946-1956	632	35.5	280	3.6	8.2
1956-1966	576	55.7	335	5.6	7.6
1966-1983	519	57.4	393	3.4	6.4
1983-2000	473	45.9	439	2.7	5.6

Notes: Basin 6 surface area is 423.3 acres for 2000.
Capacity shown is for the sedimentation survey conducted at the end of the period.

Table 2. Capacity Loss Rates (percent) Relative to Original Lake Capacity

Period	*Per period*	*Cumulative*	*Period annual loss*	*Cumulative annual loss*
1922-1936	17.7	17.7	1.3	1.3
1936-1946	9.1	26.8	0.9	1.1
1946-1956	3.9	30.7	0.4	0.9
1956-1966	6.1	36.8	0.6	0.8
1966-1983	6.3	43.1	0.4	0.7
1983-2000	5.0	48.1	0.3	0.6



Note: Maximum and minimum lines and symbols for sub-periods are hidden when they are coincident with the period of record (heavier line) in the figure.

Figure 3. Comparison of a) average monthly flow, b) maximum monthly flow, and c) minimum monthly flow for the Sangamon River at Monticello for the six sedimentation periods and the full record of the Monticello station (1914-1999)

The trap efficiency (percentage portion of sediment captured by the reservoir) of the lake was determined using a predictive equation developed by Dendy (1974) based on the relationship between the annual capacity to inflow ratio and sediment-holding capacity. The trap efficiency of Basin 6 was 31.5 percent in 1922, which means that only 31.5 percent of all sediment entering the lake was trapped in the lake basin. In general, as sediment accumulation reduces the volume of the lake basin, the holding time for water entering the lake is reduced so that there is less time for sediment to drop out of suspension, and the trap efficiency is reduced. The reduced capacity of Basin 6 has resulted in a trap efficiency of 15.7 percent in 2000.

Gradual consolidation of lake sediments affects the calculated sedimentation rate of the lake by reducing the volume of accumulated sediments. Sediments accumulate on the bottom of the lake in a very loose, fluid mass. These sediments are subject to compaction as they are covered by continued sedimentation or are exposed by occasional lake drawdown. This process reduces the volume of the sediments while increasing their weight per unit volume. Thus, the tonnage of the sediments accumulated during a period of time will not change, but the volume of the sediments may be reduced over time by up to 50 percent. This is also consistent with a reduced volumetric sedimentation rate over time. Consolidation of sediments has been quite pronounced in Basin 6 of Lake Decatur. This process of consolidation most likely has been enhanced by the winter drawdown that has been a part of the operating plan for the lake in recent years.

Overall, sedimentation rates for Basin 6 of Lake Decatur were high for the initial period (1922-1936) with a sedimentation rate of 35.4 acre-feet per year. Sedimentation rates for the basin have gradually reduced with time and for the period (1983-2000) were 8.3 acre-feet per year.

Sediment Distribution

The distribution of sediment in the lake is shown (table 3). This table lists the average sediment thickness and mass distribution for the basin and for each lake calculation segment as shown in figure 2. Sediment thickness ranges from 1.8 to 4.1 feet. The most significant accumulation by either measure, depth or mass, is in segment 37.

Density analyses of the sediment samples (appendix II) indicate that the unit weight of sediment in the northern (upstream) portions of the lake is greater than the unit weight of sediment in the southern end of the lake. In general, coarser sediments are expected to be deposited in the upstream portion of a lake where the entrainment velocity of the stream is reduced to the much slower velocities of a lake environment. These coarser sediments tend to be denser when settled and are subject to drying and higher compaction rates as a result of more frequent drawdown exposure in the shallow water environment. As the remaining sediment load of the stream is transported through the lake, increasingly finer particle sizes and decreasing unit weight are observed.

Sediment Particle Size Distribution

A total of 26 lakebed sediment samples were collected for particle size distribution analysis. Figure 4 and appendix III present the laboratory analyses for these samples. Figure 4A shows particle size distribution plots for samples collected from lines R53-R54, R55-R56, R75-R76,

Table 3. Sediment Distribution in Lake Decatur's Basin 6

Segment from figure 2	*1922 volume (ac-ft)*	*2000 volume (ac-ft)*	*2000 sediment accumulation (ac-ft)*	*2000 sediment weight (tons)*	*2000 sediment thickness (feet)*	*2000 sediment per segment acre (tons)*
36	449	218	232	216,073	3.9	3,628
37	715	346	369	347,024	4.1	3,861
38	772	393	380	409,645	3.2	3,434
39	429	233	196	234,175	2.8	3,395
40	285	172	113	142,898	2.1	2,663
41	146	90	56	71,622	1.8	2,245
Totals	2,797	1,451	1,346	1,421,437		
Averages					3.2	3,358

Note: Averages are for all of Basin 6 and are not column averages.

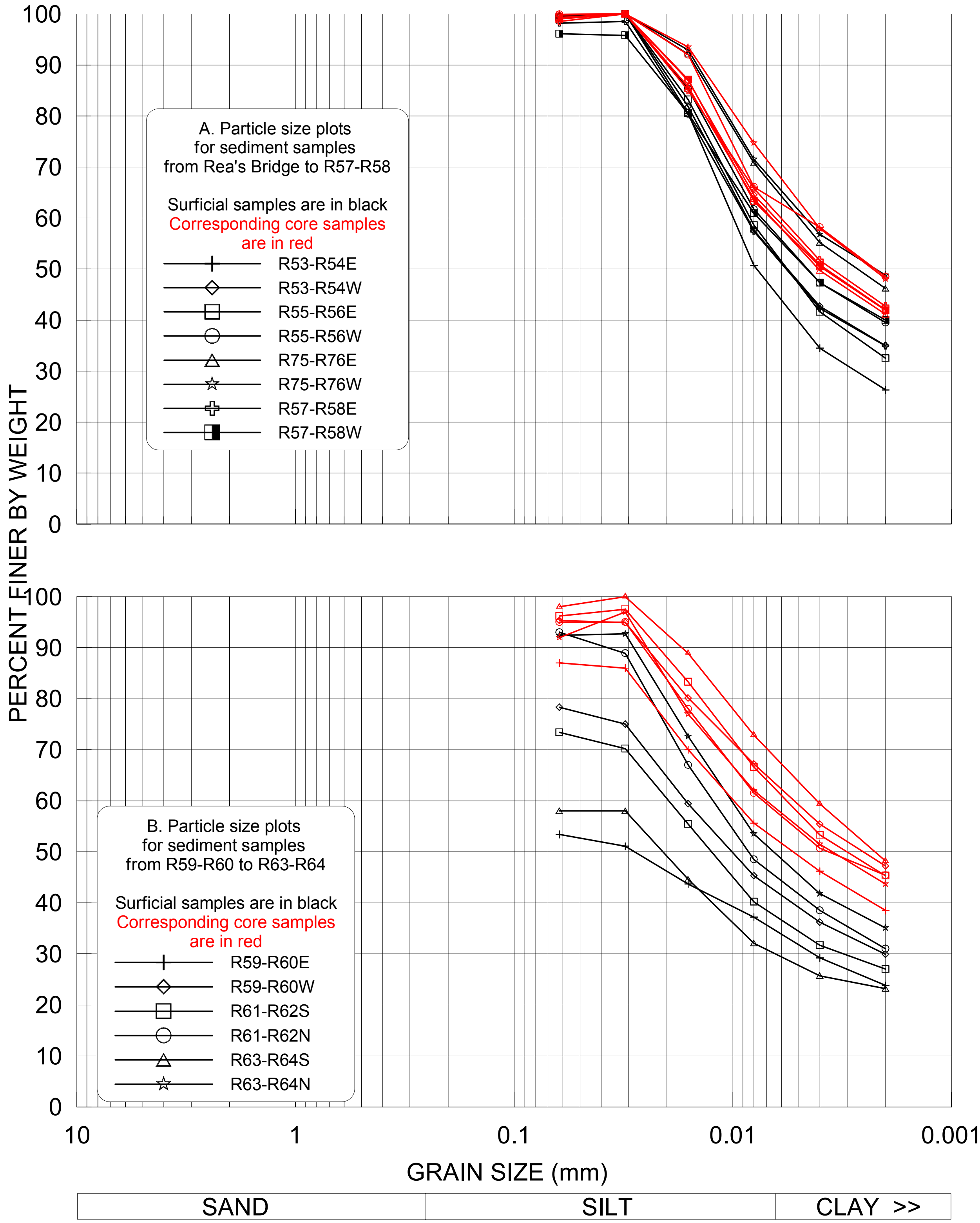


Figure 4. Particle size distributions for Lake Decatur Basin 6 sediment samples

and R57-R58. Figure 4B shows particle size distribution plots for samples collected from lines R59-R60, R61-R62, and R63-R64. Both of the figures show samples collected from the top surface of the accumulated sediments in black and samples collected from core samples in red with the same plotting symbol as the corresponding surficial sample.

In these plots, a downward shift in the position of a line indicates an increase in the particle size of the materials. On a sample to sample basis, the surficial samples do not show the usual tendency for sediment particle size to decrease from upstream to downstream in the lake, a result of the natural sorting of suspended sediments in the lake environment. Coarse sediments are deposited as the inflowing stream water is first slowed upon entering the lake. As the water moves through the lake, the suspended sediments become finer as the coarser sized fractions fall out of suspension. This trend is apparent overall in the significantly higher sand proportions in figure 4B than in figure 4A. The existence of a major sand portion in these samples is also unusual for Illinois lake sediments. Both of these unusual observations may result from the low trap efficiency and large streamflow volumes that apply to this basin.

The particle size distributions of figure 4 do show the common tendency for sediments at any point in the lake to become more coarse with time. The more recent, surficial sediments (shown in black) that have been deposited on top of older sediments (shown in red) are characteristically much more coarse. This observation is consistent with general trends in lake sediments. Surficial sediment, the most recently deposited sediment, tends to be coarser with time at a given point. This is due to the downlake shift in the initial depositional environment of the lake due to the loss of trap efficiency of the upper end of the lake. With time, the initial depositional zone in the lake will move further down the lake because of water volume loss to sedimentation.

Summary

The Illinois State Water Survey has conducted a sedimentation survey of Basin 6 of Lake Decatur in Decatur, Illinois. The lake, originally constructed in 1922, is the raw water source for the Decatur public water supply. Previous lake sedimentation surveys were conducted in 1936, 1946, 1956, 1966, and 1983. The operating elevation for the reservoir is 614.4 feet NGVD during the summer months and 612.5 feet NGVD for the winter months.

Sedimentation has reduced the capacity of Basin 6 of Lake Decatur from 2,797 ac-ft (911 million gallons) in 1922 to 1,451 ac-ft (473 million gallons) in 2000. The sediment accumulation rates in the lake have averaged 17.3 ac-ft per year from 1922 to 2000. Annual sedimentation rates for six separate periods, 1922-1936, 1936-1946, 1946-1956, 1956-1966, 1966-1983, and 1983-2000, were 35.4, 25.3, 10.9, 17.1, 10.4, and 8.3 ac-ft, respectively.

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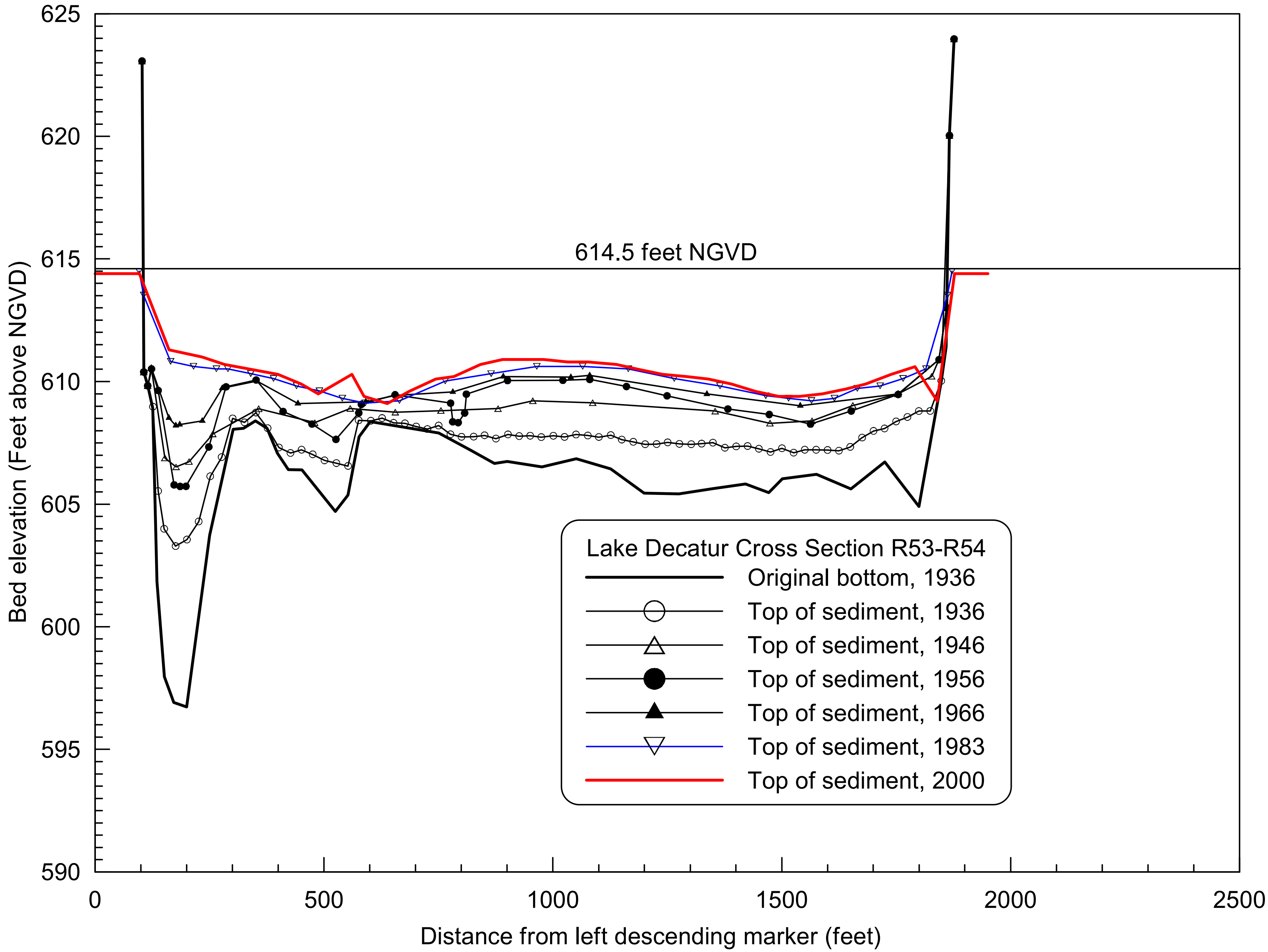
Appendix I. Cross-Section Plots of the Lake Decatur Basin 6 Transects



625
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615
610
605
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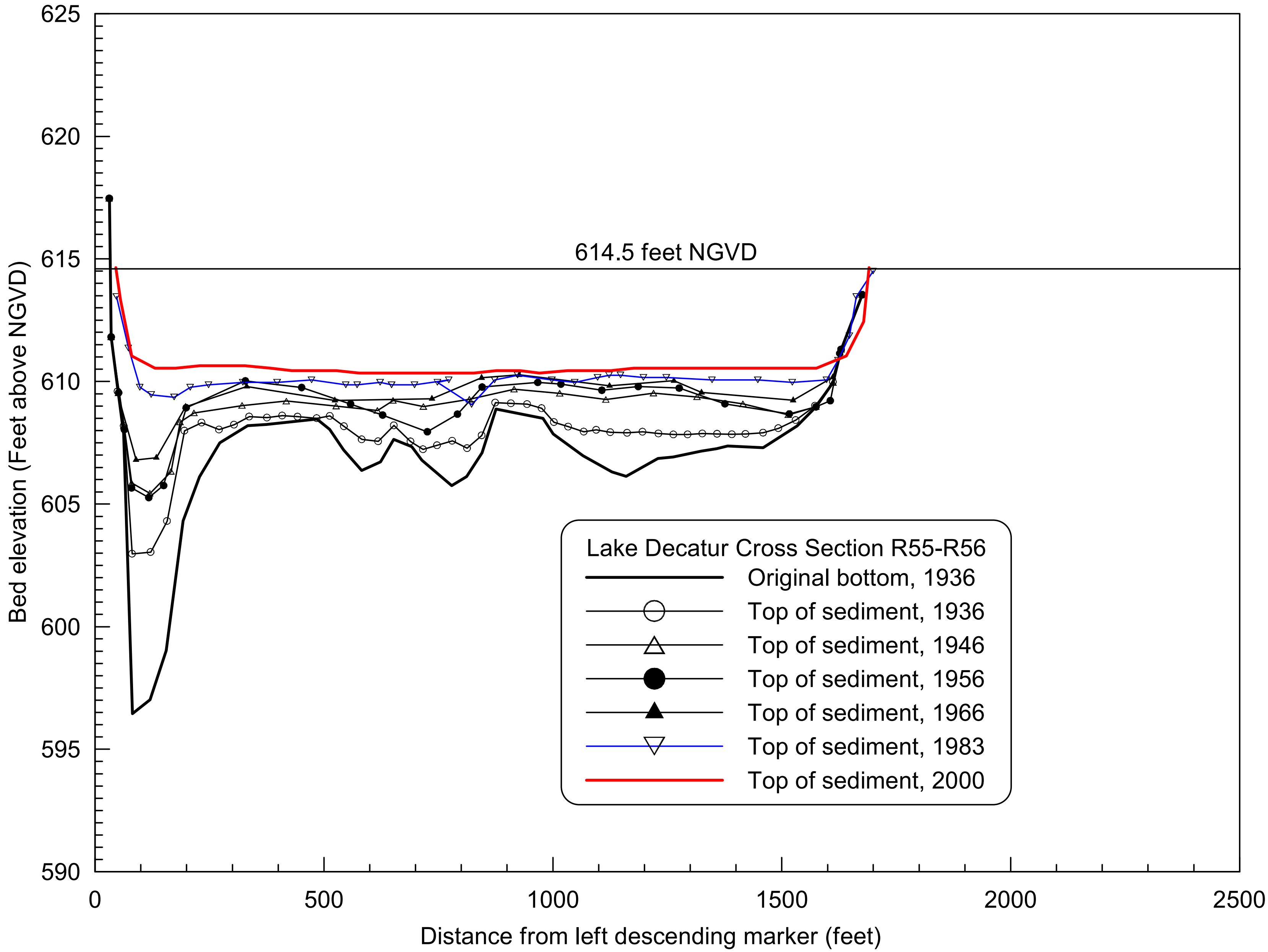
595
590
Bed elevation (Feet above NGVD)
0
500
1000
1500
2000
2500
Distance from left descending marker (feet)
614.5 feet NGVD
Lake Decatur Cross Section R53-R54
Original bottom, 1936
Top of sediment, 1936
Top of sediment, 1946
Top of sediment, 1956
Top of sediment, 1966
Top of sediment, 1983
Top of sediment, 2000



Lake Decatur Cross Section R55-R56
Original bottom, 1936
Top of sediment, 1936
Top of sediment, 1946
Top of sediment, 1956
Top of sediment, 1966
Top of sediment, 1983
Top of sediment, 2000
614.5 feet NGVD
Bed elevation (Feet above NGVD)
Distance from left descending marker (feet)
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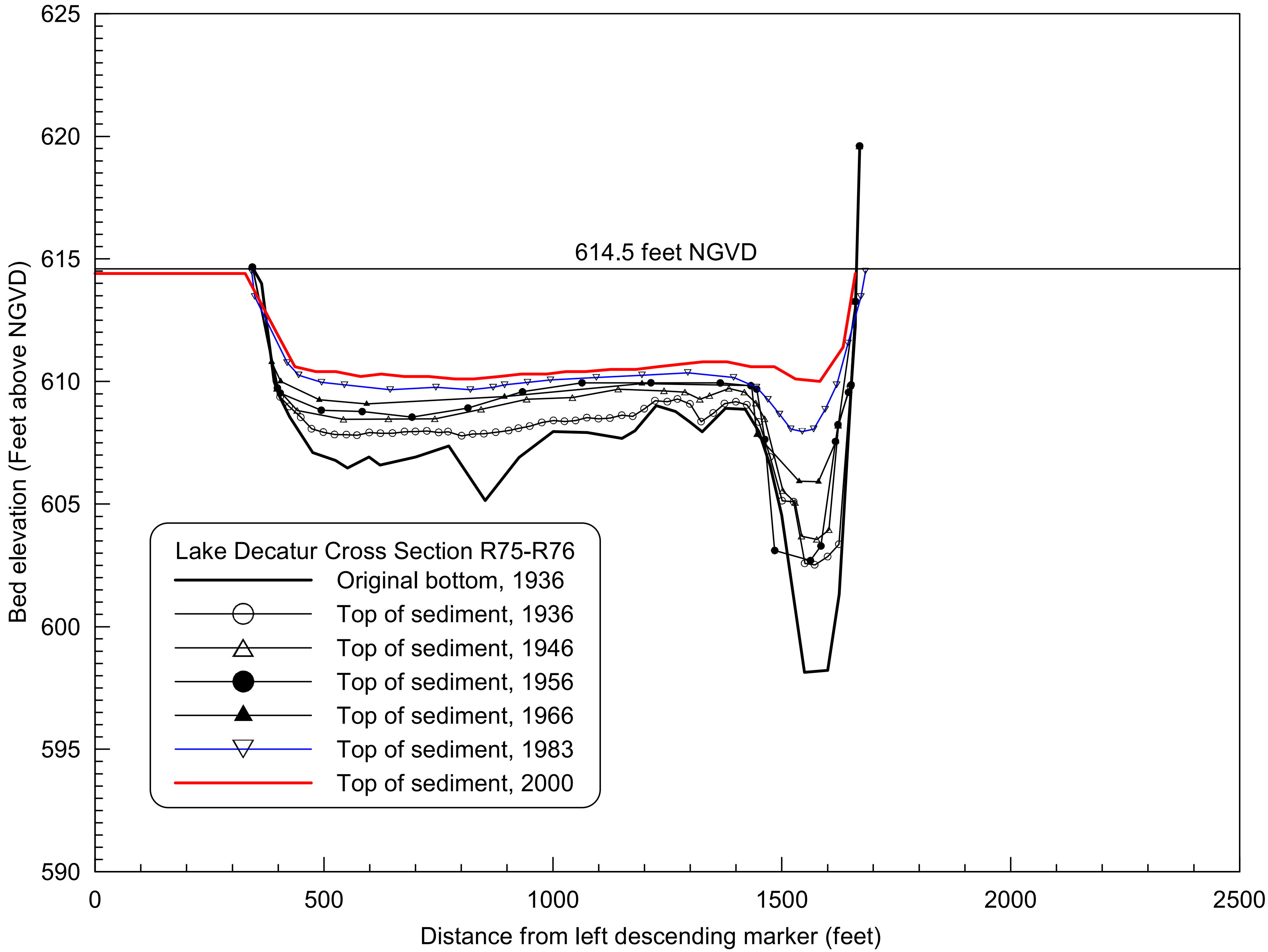

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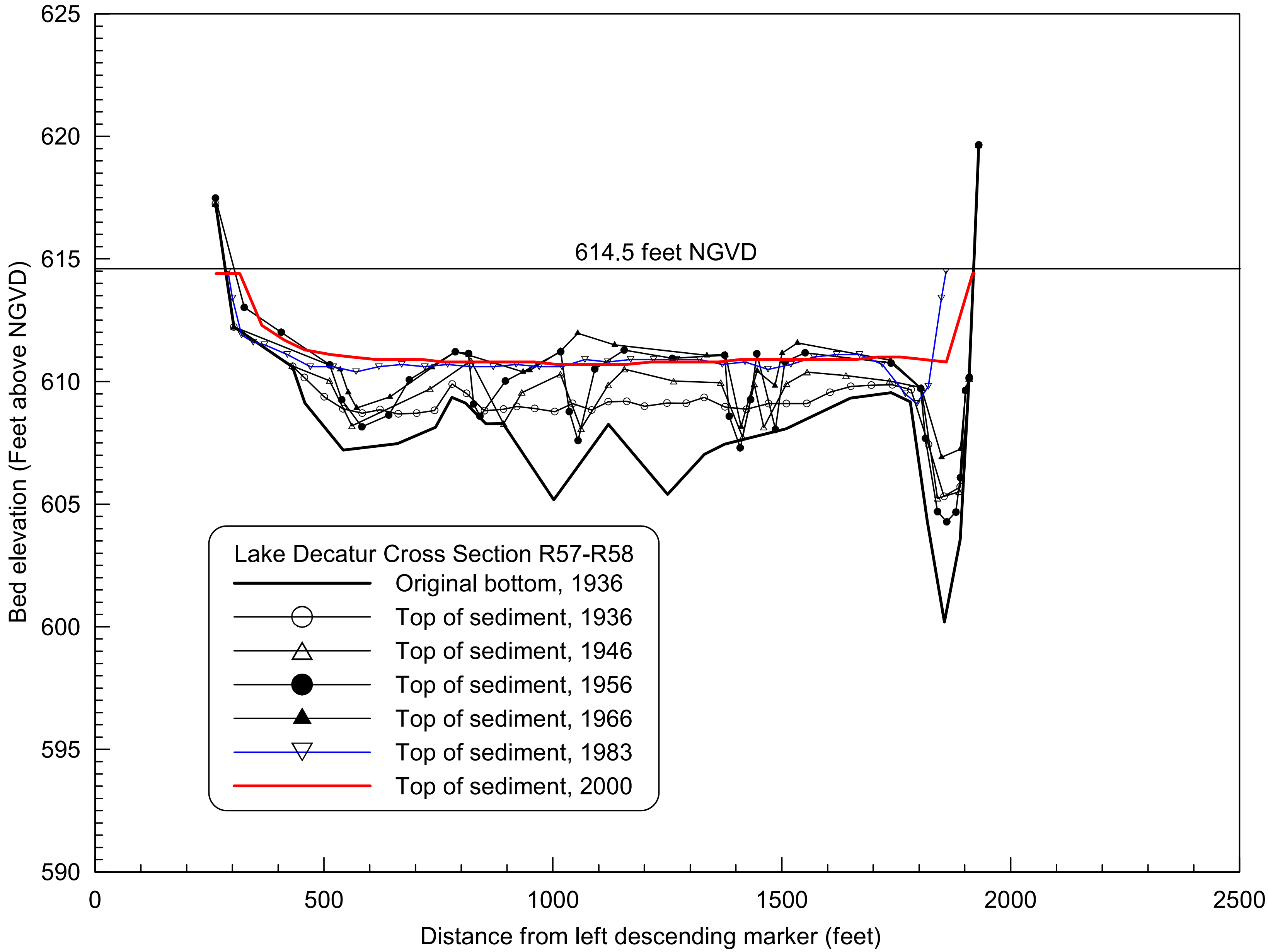
Bed elevation (Feet above NGVD)
Distance from left descending marker (feet)
614.5 feet NGVD
Lake Decatur Cross Section R75-R76
Original bottom, 1936
Top of sediment, 1936
Top of sediment, 1946
Top of sediment, 1956
Top of sediment, 1966
Top of sediment, 1983
Top of sediment, 2000



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Bed elevation (Feet above NGVD)
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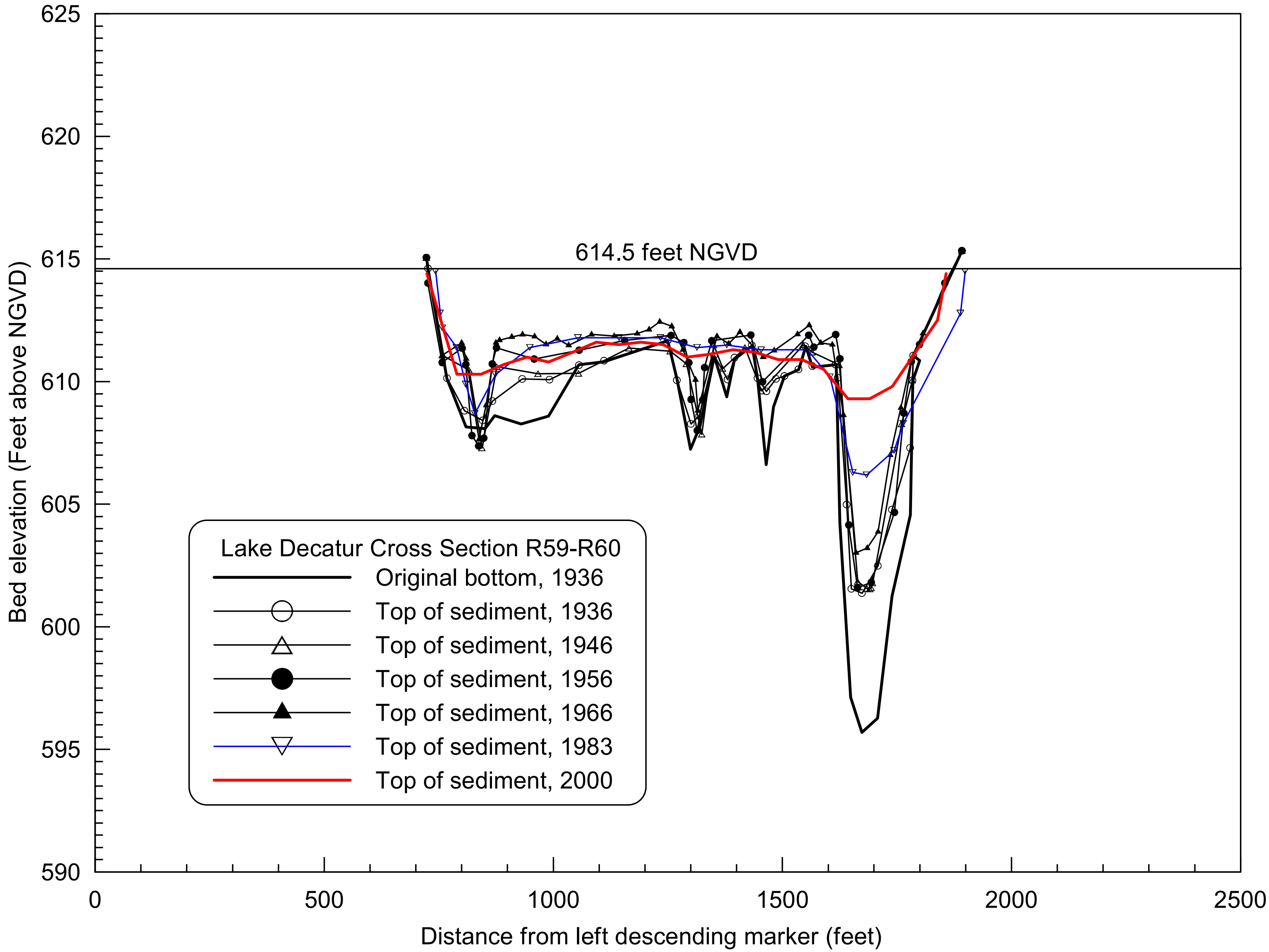
2000
2500
Distance from left descending marker (feet)
614.5 feet NGVD
Lake Decatur Cross Section R57-R58
Original bottom, 1936
Top of sediment, 1936
Top of sediment, 1946
Top of sediment, 1956
Top of sediment, 1966
Top of sediment, 1983
Top of sediment, 2000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Bed elevation (Feet above NGVD)
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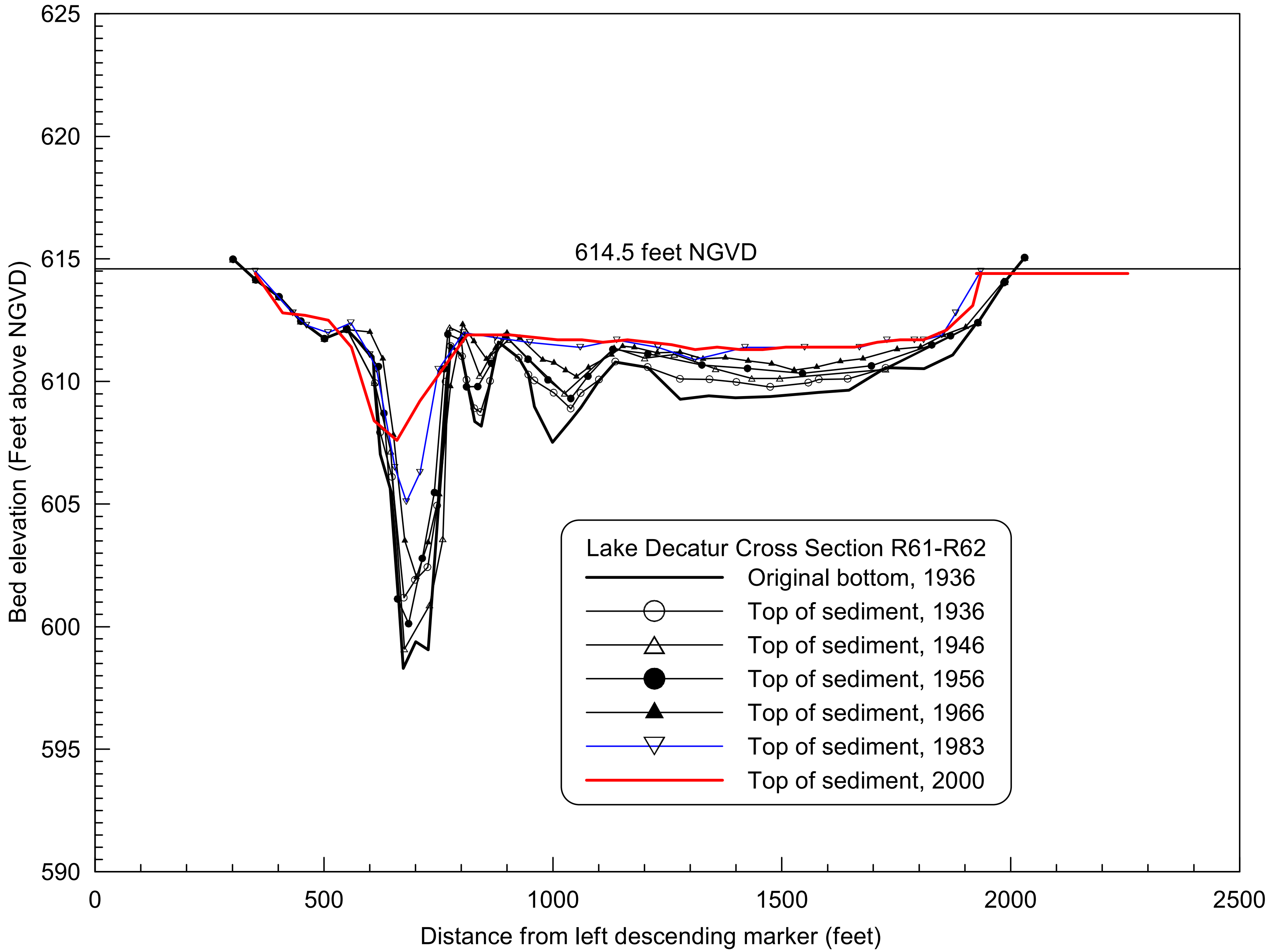
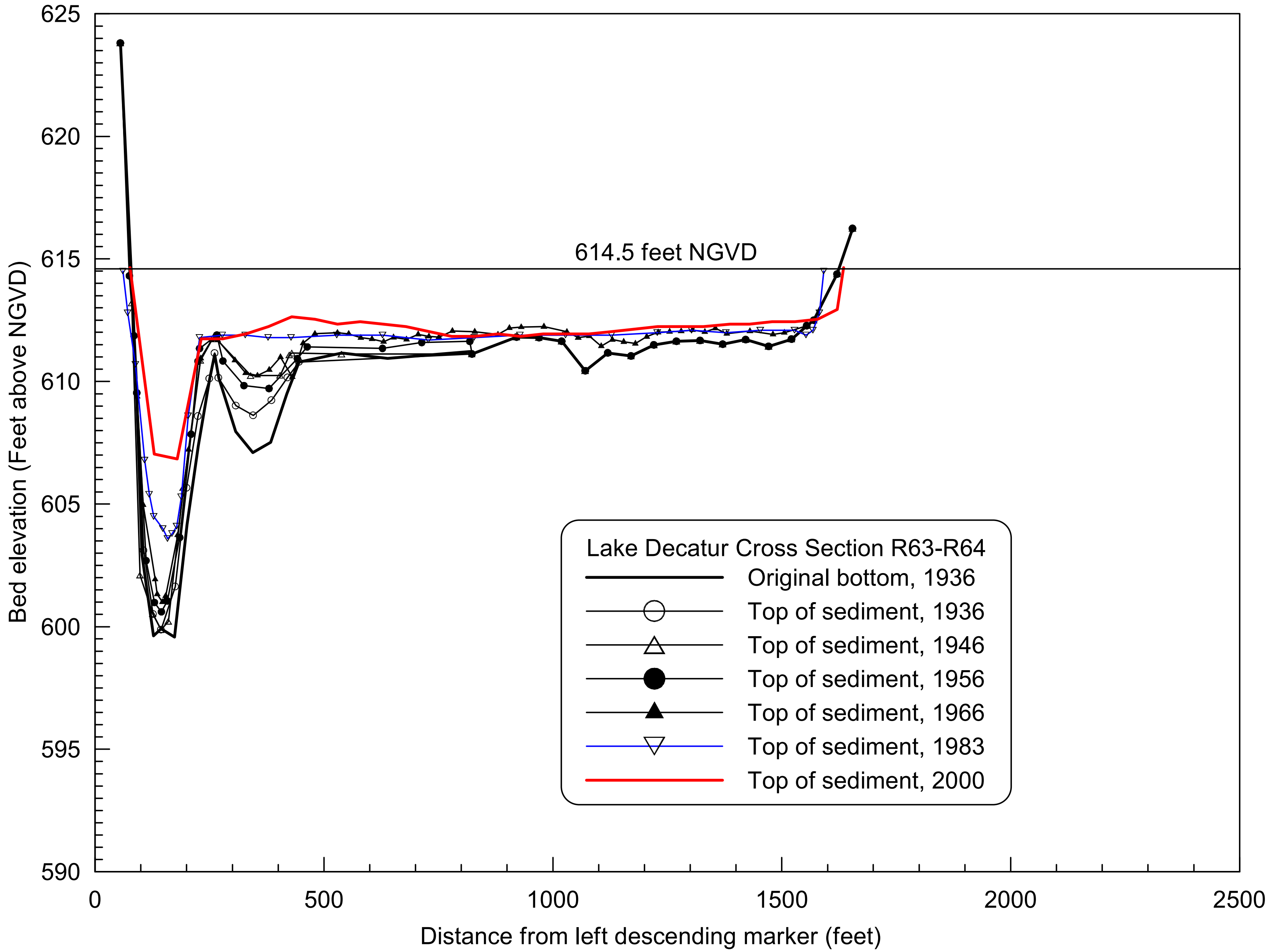
500
1000
1500
2000
2500
Distance from left descending marker (feet)
614.5 feet NGVD
Lake Decatur Cross Section R59-R60
Original bottom, 1936
Top of sediment, 1936
Top of sediment, 1946
Top of sediment, 1956
Top of sediment, 1966
Top of sediment, 1983
Top of sediment, 2000


625
620
615
610
605
600
595
590
Bed elevation (Feet above NGVD)
614.5 feet NGVD
Lake Decatur Cross Section R61-R62
Original bottom, 1936
Top of sediment, 1936
Top of sediment, 1946
Top of sediment, 1956
Top of sediment, 1966
Top of sediment, 1983
Top of sediment, 2000
0
500
1000
1500
2000
2500
Distance from left descending marker (feet)



Bed elevation (Feet above NGVD)
625
620
615
610
605
600
595
590
0
500
1000
1500
2000
2500
Distance from left descending marker (feet)
614.5 feet NGVD
Lake Decatur Cross Section R63-R64
Original bottom, 1936
Top of sediment, 1936
Top of sediment, 1946
Top of sediment, 1956
Top of sediment, 1966
Top of sediment, 1983
Top of sediment, 2000

Appendix II. Sediment Core Sample Unit Weight Results

Sample number	*Location*	*Sediment layers*	*Unit weight (pounds per cubic foot)*
2	R53-R54 W	CORE 3-6	43.7
5	R55-R56 E	CORE 3-6	40.2
7	R55-R56 W	CORE 3-6	44.6
10	R75-R76 E	CORE 4-7	42.0
13	R75-R76 W	CORE 4-7	45.6
16	R57-R58 E	CORE 4-7	48.1
19	R57-R58 W	CORE 4-7	62.4
22	R59-R60 E	CORE 4-7	51.6
25	R59-R60 W	CORE 4-7	57.5
28	R61-R62 S	CORE 5-8	58.6
31	R61-R62 N	CORE 3-6	58.5
32	R61-R62 N	CORE 11-14	63.4
35	R63-R64 S	CORE 7-10	56.0
38	R63-R64 N	CORE 4-7	55.5

Note: N, S, E, and W are north, south, east, and west one-third points, respectively

Appendix III. Sediment Particle Size Distribution Sample Results

Sample number	*Sample point*	*Depth below sediment surface*	*>0.062*	*0.062*	*0.031*	*0.016*	*0.008*	*0.004*	*0.002*
PS1	R53E	Surface	0.8	99.2	100.0	80.5	50.7	34.5	26.3
PS3	R53W	Surface	0.4	99.6	100.0	81.8	57.6	42.7	35.0
PS4	R53W	Core 10-12	0.2	99.8	100.0	86.9	64.5	50.8	42.0
PS6	R55E	Surface	0.7	99.3	100.0	83.2	58.6	41.6	32.5
PS8	R55W	Surface	0.8	99.2	100.0	85.3	61.7	47.3	39.5
PS9	R55W	Core 10-11	0.1	99.9	100.0	92.0	66.1	58.2	48.5
PS11	R75E	Surface	0.4	99.6	100.0	92.1	70.8	55.2	46.2
PS12	R75E	Core 10-11	1.0	99.0	100.0	85.7	63.8	49.7	41.1
PS14	R75W	Surface	0.3	99.7	100.0	92.9	71.5	56.8	48.8
PS15	R75W	Core 8-9	0.1	99.9	100.0	93.5	74.7	57.9	48.1
PS17	R57E	Surface	1.8	98.2	98.5	80.2	57.4	42.3	34.9
PS18	R57E	Core 9-10	1.5	98.5	100.0	85.0	65.8	51.7	42.7
PS20	R57W	Surface	3.9	96.1	95.8	80.5	60.9	47.3	40.0
PS21	R57W	Core 8-9	0.7	99.3	100.0	87.1	63.3	50.5	41.9
PS23	R59E	Surface	46.6	53.4	51.1	43.7	37.2	29.2	23.8
PS24	R59E	Core 12-13	13.0	87.0	86.0	70.0	55.6	46.2	38.5
PS26	R59W	Surface	21.7	78.3	75.0	59.4	45.3	36.2	29.9
PS27	R59W	Core 10-11	4.7	95.3	94.9	80.1	67.2	55.4	47.2
PS29	R61S	Surface	26.6	73.4	70.2	55.4	40.2	31.7	27.0
PS30	R61S	Core 9-11	3.8	96.2	97.5	83.3	66.6	53.3	45.3
PS33	R61N	Surface	7.0	93.0	88.9	67.0	48.5	38.5	31.0
PS34	R61N	Core 14-15	5.0	95.0	95.0	78.0	61.5	50.7	45.4
PS36	R63S	Surface	42.0	58.0	58.0	44.6	32.1	25.7	23.2
PS37	R63S	Core 13-14	2.0	98.0	100.0	88.9	72.9	59.4	48.2
PS39	R63N	Surface	7.6	92.4	92.7	72.6	53.5	41.8	35.1
PS40	R63N	Core 10-11	8.0	92.0	97.0	77.0	62.0	51.5	43.7

Notes: N, S, E, and W are north, south, east, and west one-third points, respectively
Units for depth below sediment surface are in tenths of feet (12=1.2)
Units for particle size are in percent finer than the given particle size (in column heading)

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