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SEDIMENT CONDITIONS IN THE SANGANOIS CONSERVATION AREA, CASS AND MASON COUNTIES, ILLINOIS

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SEDIMENT CONDITIONS IN THE SANGANOIS CONSERVATION AREA, CASS AND MASON COUNTIES, ILLINOIS

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Background .

This study was conducted as a part of a cooperative agreement between the Illinois Department of Conservation (IDOC) and the Illinois State Water Survey (ISWS). The IDOC has need of information relating to the sedimentation problems in the Sanganois Conservation Area. The purpose of this study was to determine the sedimentation rate and deposition pattern in the Sanganois Conservation Area and to evaluate the performance of levees as a management alternative.

Acknowledgments

This work described here was performed by the author as part of his regular duties at the Illinois State Water Survey. The project was conducted under the administrative guidance of Michael L. Terstriep, Head, Surface Water Section, and Stanley A. Changnon, Jr., Chief of the State Water Survey.

The map information was provided by Mr. Robert Roads of the Illinois Department of Conservation. Many Water Survey employees helped in the preparation of this report. William Fitzpatrick and Dave Friedland helped in the tabulation of the data. John Brother, Jr., Linda Riggin, and William Motherway prepared the illustrations. Pamela Lovett, Kathleen

Brown and Lynn Weiss typed the manuscript. J. Loreena Ivens edited the report.

Description of Study Area

The Sanganois Conservation Area is located in Cass and Mason Counties approximately eight miles northeast of Beardstown (see figure 1), Illinois. The area is in the region of the fluvial deposition delta between the Illinois River and the Sangamon River. The land owned by the Illinois Department of Conservation is about 8500 acres. The area consists of many backwater sloughs and lakes, timbered areas, and a multi-leveed area.

The Sangamon River once flowed into the Illinois River through the Conservation Area (see figure 1). In 1950, the U.S. Corps of Engineers diverted the Sangamon River through Muscooten Bay into the Illinois River to eliminate the flooding problems in the lower reach of the Sangamon River (State of Illinois, 1952; Corps of Engineers, 1948; Jenkins et al., 1950). As a result, the sediment load carried by the Sangamon River has been deposited in Muscooten Bay and its adjacent areas (Corps of Engineers, 1.976). Since the operation and maintenance of the Conservation Area is closely related to the water depth in the area, it is very important to know what the sedimentation rate is in the area.

Sedimentation Rate Assessment

Two sets of topographic maps which cover the Sanganois Conservation Area are available. The first set of maps is the 1902-1904 Woermann Maps (1904). These maps were based on Memphis datum and have 1-foot contour intervals. The second set of maps is the 1973 IDOC topographic maps that were developed from aerial photographs. These maps have 1-foot contour intervals and were developed from the mean sea level datum amended in 1929

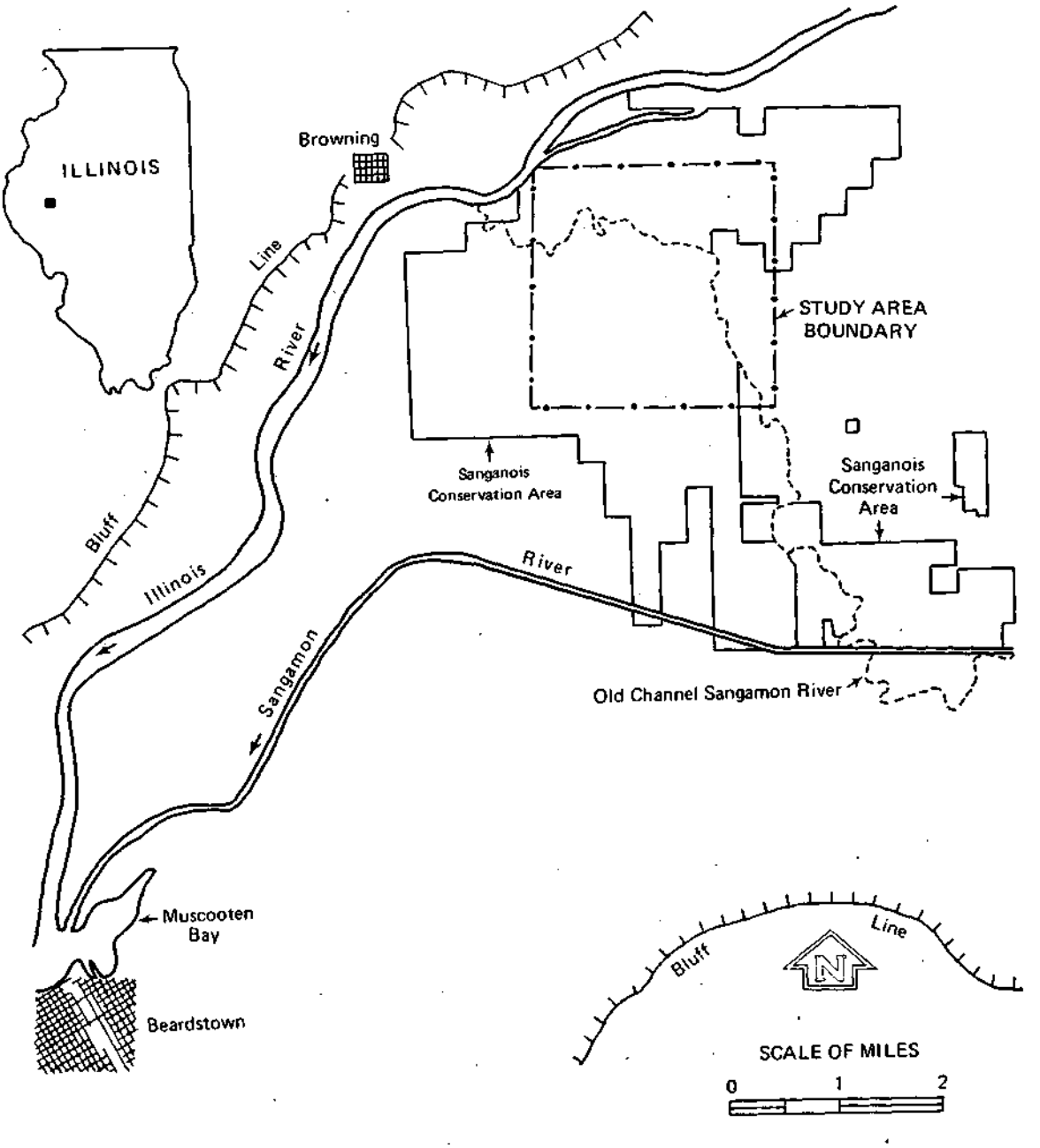

Figure 1. Location of Sanganois Conservation Area and Study Area

(McKibben and Schmidt, 1954). Since the area of interest to the Illinois Department of Conservation is in the leveed areas, only the area near Eagle Prairie (indicated as the study area on figure 1) was selected for further study.

The study area is approximately 2885 acres. This area is surrounded by a series of low earth levees (see figure 1). In order to study the sedimentation rate in the area, a 26 x 27 grid system was developed to overlay the 1902-1904 Woermann Maps and 1978 topographic maps. The grid size is 440 feet. The depth of sediment accumulated over 75 years (from 1903 to 1978) was defined as the difference in elevations at each grid point by subtracting the 1903 elevation from the 1978 elevation. The sediment thicknesses at these grid points were then used to develop a sedimentation isopachous map in the unit of feet as shown in figure 2. Based on this iso-thickness map, the sediment volume was determined by multiplying the deposition areas by their associated thicknesses.

There are a few problems in interpreting the ground elevation. First, the 1978 topographic maps did not include the water depth soundings in the lake and slough areas. If the grid points fell on a lake area, the water depths had to be estimated. Since the precise water soundings were not available, the water depths in the lake areas were assumed to be 1 foot in accord with some recent cross-section data. The second problem in our procedure is that there are a few borrow pits scattered along the levees. These areas could be misinterpreted as severe erosion areas. Precise identification of these pits is very difficult. However, the acreage of these areas is relatively small, so the percent of grid points falling into this category is small.

The whole study area was divided into four subareas. They are: central, southwest, northeast, and gun club areas as shown in figure 2. The surface areas of these four subareas are shown in table 1. The surface areas of these four subareas are 1696 acres for central area, 546 acres for the southwest area, 457 acres for the northeast, and 184 acres for the gun club area. The total surface acreage in the study is-2885 acres. The total amount of sediment accumulation during the past 75 years has been 1907 acre-feet. The average annual sedimentation rate amounts to 0.106 inch per year. The sedimentation rates in the central and southwest areas, (0.1310 and 0.1200 inch per year) are somewhat higher than those in the northwest and gun club subareas. This may be because the northeast and gun club are surrounded by old levees. The water and sediment inflows were curtailed in the low and median water stage so that lesser amounts of sediment were carried into the leveed areas.

Table 1. Summary of Sedimentation Rates in the Study Area, Sanganois Conservation Area

Area	Acreage	1903-1978 Accumulated sediment volume (ac-ft)	Average annual sediment rate (in/yr)
Central	1696	1391	0.1310
Southwest	546	411	0.1200
Northeast	457	25	0.0087
Gun Club	184	81	0.0072

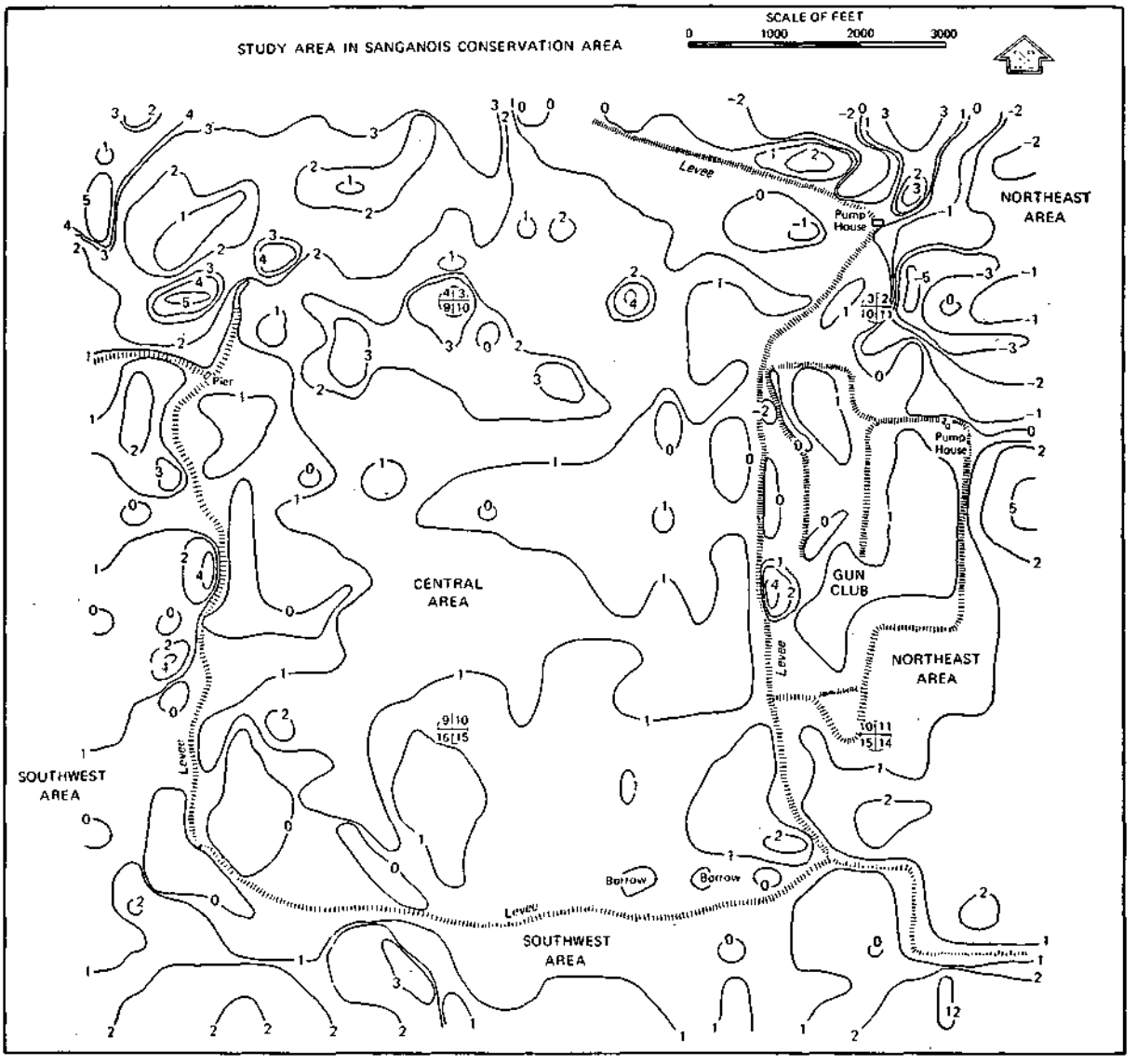

Figure 2. Deposition Patterns in Study Area Between 1903 and 1978

Discussion

The average sedimentation rate for the study area could be compared with those found in some of the previous studies. Auby, Oglesby, Robek, and Bartolomucci (1976) studies the sedimentation rates for two small areas. The first area was four 40 acre tracts located east of the study area and north of Beardstown. The average sedimentation rate at these four tracts was 0.078 inch per year which is slightly less than that of the Sanganois Conservation Area as shown in table 2.

Table .2. A Comparison of Sedimentation Rate Near Sanganois Conservation Area, Adjacent Areas, and Batchtown Conservation Area.

Location	Study Period	Average Sedimentation Rate (in/yr)	Area (acres)
Sanganois Conservation	1903-1978	0.106	2885
Four-40 acre tracts near Beardstown	1976	0.078	160
Sangamon River near Bearstown	1976	0.34 to 0.55	10-mile reach
Mascooten Bay Beardstown, IL	1903-1974	1.12	172
Lake Chautauqua Havana, IL	1903-1976	0.33	3562
Batchtown Conservation Area, Batchtown, IL	1903-1976	0.77	2067

The second area which was studied by Auby et al. (1976) was the 10-mile reach of the Sangamon River near Beardstown. The results showed that the sedimentation rates varied from 0.34 to 0.55 inch per year. It is reasonable that these areas could have higher sedimentation rates because

the sediment is carried into the area directly from upstream and also from the Illinois River during flood stages.

As shown in table 2, the sedimentation rate in a typical leveed backwater lake such as Lake Chautangua (Lee and Stall, 1976 and 1977) could be as high as 0.33 inch per year. The reason Lake Chautaugua has this high sedimentation rate may be its closeness to the Illinois River. The lake could receive more sediment inputs in terms of amount and frequency.

Table 2 also shows that Muscooten Bay has the highest sedimentation rate of 1.12 inches per yar. This sedimentation rate was mostly due to the channelization of the Sangamon River in 1950 (Lee and Stall, 1976 and 1977; U.S. Army Corps of Engineers, 1976).

The Batchtown Conservation Area (Lee, 1978) could be used to indicate the sedimentation condition in the backwater area along the Mississippi River. The high sedimentation rate (0.77 inch per year) could be related to the much heavier sediment load and a more dynamic river than the Illinois River.

The results of this comparison indicated the complexities of the cause and effects of sedimentation in backwater areas along a river. The natural processes and man-made changes are intermingled. Future research should focus on the interaction among the external factors (such as river sediment load, streamflow, river geometry, and vegetation) and the internal factors (such as levee height and water level control in the area). All the results presented here clearly indicate that the understanding of the sedimentation rate and its impacts in these areas still needs a great deal of research.

Summary

According to our assessment, the average sedimentation rate in the Sanganois Conservation Area is 0.106 inch per year. Within the area, the sedimentation rates vary from 0.072 to 0.131 inch per year. A comparison with the sedimentation rates in other backwater lakes along the Illinois and Mississippi Rivers indicates that the Sanganois Conservation Area has a relatively small sedimentation rate. The possible reason is that this area receives less direct sediment inputs from the river.

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