



Illinois State Water Survey
HYDROLOGY DIVISION

SWS Contract Report 508

**COMPARISON OF 1987 AND 1989 BED PROFILE
SURVEYS OF THE LOWER CACHE RIVER**

by Richard Allgire
Office of Sediment and Wetland Studies

Prepared for the
Illinois Department of Energy and Natural Resources

Champaign, Illinois

April 1991



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INTRODUCTION

The Lower Cache River lies in Johnson and Pulaski Counties in extreme southern Illinois (figure 1) and extends from the Mississippi River (river mile 0.0) to the levee on the Upper Cache River at river mile 36.2. The Lower Cache River Natural Area (LCRNA), commonly referred to as "Buttonland Swamp," is located between the rock dam at river mile 26.9 and the levee at river mile 36.2.

Within the LCRNA, the river can flow both southwesterly to the Mississippi River and eastward into the Upper Cache River through two 48-inch-diameter culverts in the Cache River levee. The Upper Cache River discharges into the Ohio River via the Post Creek cutoff. The location of the east-west flow divide in Buttonland Swamp varies, depending on the level of the river and the amount of water that the tributaries are discharging into the wetlands. For additional information on the hydraulics of the LCRNA, refer to Illinois State Water Survey Contract Report 484, *Cache River Basin: Hydrology, Hydraulics, and Sediment Transport, Volume 1: Background, Data Collection, and Analysis*.

A bed profile was first prepared for the Lower Cache River Natural Area in March 1987. The bed profile was surveyed to determine the thalweg or lowest elevation of the riverbed and assess the drainage potential of the Lower Cache River and the adjacent wetlands in the event of any channel alteration. Figure 2 shows a topological map of the area surrounding the profiled section of the Lower Cache River. The results of the 1987 bed profile survey are shown in figure 3.

The Lower Cache River was profiled a second time in October and November 1989, and the results are shown in figure 4. The second profile was undertaken to identify those areas significantly affected by erosion or sediment deposition during the previous two years. The portion of the Lower Cache River extending west from the low-water rock structure (rock dam) at river mile 26.9 to the Cache Chapel Road

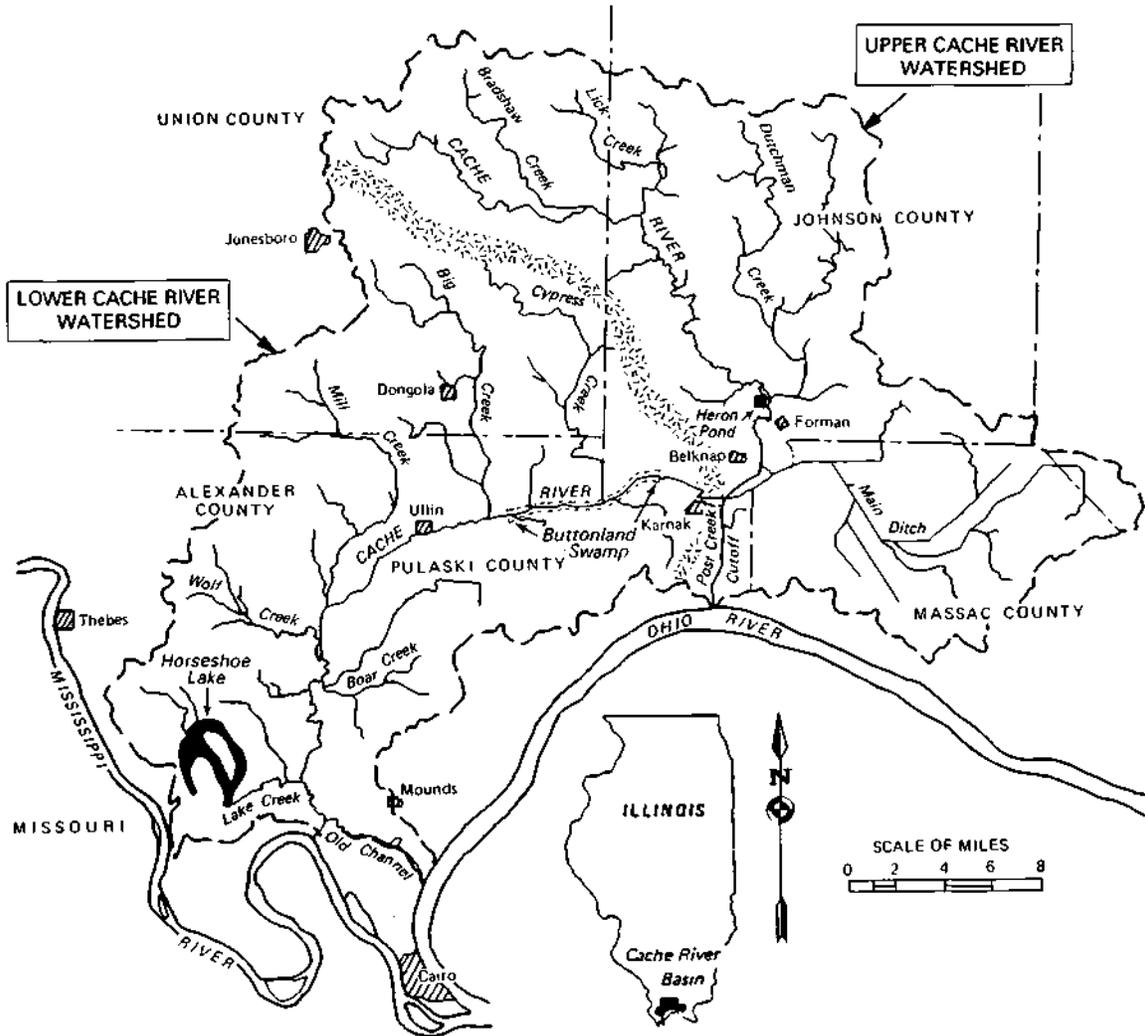


Figure 1. Location of the Cache River

bridge at river mile 25.0 was included in the second survey. However, since this portion was not included in the original investigation, the effects of scour or deposition in the interim could not be analyzed.

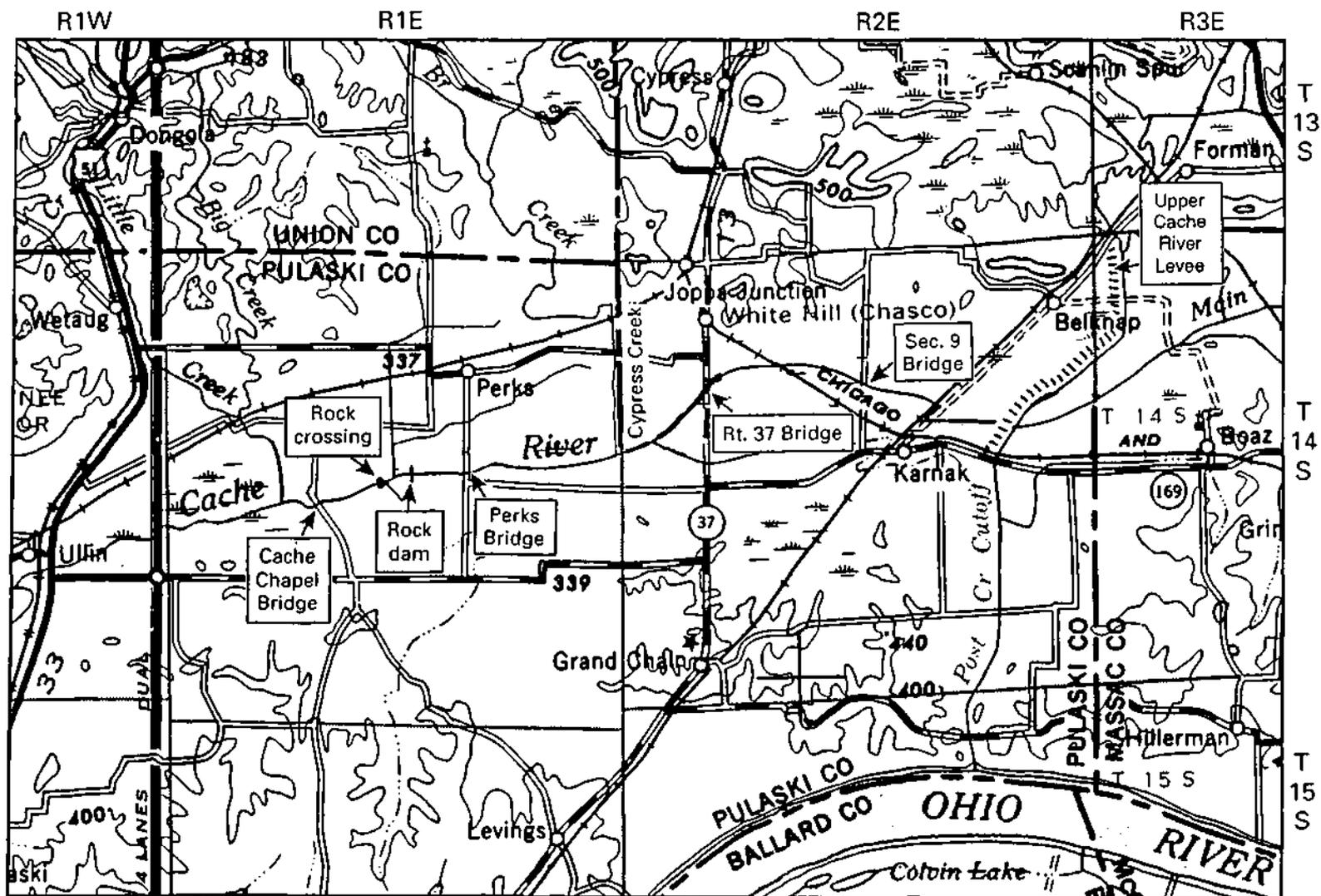


Figure 2. Topological map of the Lower Cache River area

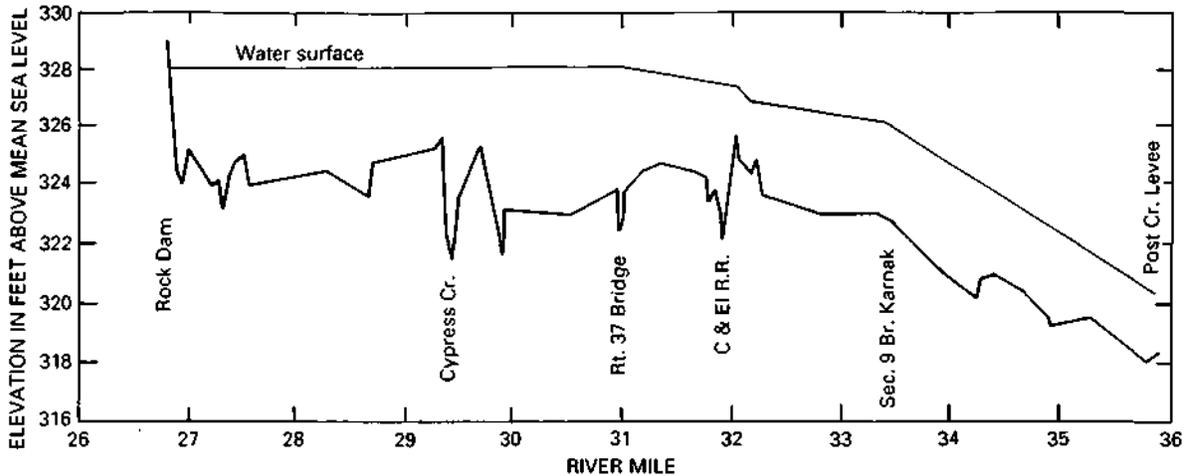


Figure 3. Bed profile of the Lower Cache River, March 1987

Acknowledgments

This survey was conducted as part of the Cache River project, which is being funded by the Illinois Department of Conservation with Marvin Hubbell as project manager. From the Water Survey, Mike Demissie served as principal investigator of the Cache River project, William Fitzpatrick coordinated the 1987 survey, Laurie Talkington edited the report, and illustrations were prepared by John Brother and David Cox.

SURVEY RESULTS

The bed profile identified in the second survey has been divided into five segments: 1) the Cache Chapel Road bridge to the rock dam; 2) the rock dam to Cypress Creek; 3) Cypress Creek to Route 37; 4) Route 37 to the section 9 bridge; and 5) the section 9 bridge to the levee on the Upper Cache River. For discussion purposes, all river miles and elevations have been adjusted to the nearest tenth of a mile and tenth of a foot.

Segment 1: The Cache Chapel Road Bridge to the Rock Dam

The segment from the Cache Chapel Road bridge at river mile 25.0 to the low-water rock structure (rock dam) at river mile 26.9 was not included in the 1987 bed profile but was included in the 1989 profile. Since this segment was not included in

the original profile, the changes that have occurred since then cannot be discussed.

The most significant feature in this section, located at river mile 26.0, apparently used to be a low-water rock crossing for machinery. The crossing is at an elevation of 326.2 feet above mean sea level (msl). Scour holes 5.0 feet deep occur on the west side and 3.3 feet deep on the east side.

A creek enters the river from the north at river mile 26.5. The creek appears on the profile as a scour hole in the bed at its confluence with the river.

Segment 2: The Rock Dam to Cypress Creek

The low-water rock dam located at river mile 26.9 formed the west end of the 1987 bed profile. This dam, which was designed to have an elevation of 328.4 feet msl, is intended to maintain a certain amount of water in both the Cache River channel and the adjacent wetland area during low-water periods.

Segment 2 of the profile includes the stretch from the rock dam to the mouth of Cypress Creek at river mile 29.4. This segment of the river showed little to no significant change between the two profiling efforts. The 1989 survey showed that the sediment buildup east of Perks Bridge had increased by 0.2 foot over the 1987 elevation. This increase can likely be attributed to the beaver dam that was built at that location early in the summer of 1989. At the time of the 1989 survey, however, the center of the beaver dam had been damaged, and the sediment buildup had thus increased only slightly.

Continuing east, the riverbed is stable to the mouth of Cypress Creek at river mile 29.4. A silt bar is located on the west side of the confluence of Cypress Creek and the Cache River. In 1987 the silt bar was at an elevation of 325.5 feet msl, while the 1989 survey includes a beaver dam with an elevation of 326.9 feet msl. This 1.4-foot increase in elevation is accounted for by the dam itself, while the actual silt bar rose by only 0.1 foot. The increase in the height of the silt bar can likely be attributed to the localized sediment-trapping properties of the dam.

Segment 3: Cypress Creek to Route 37

The 1989 profile of segment 3 extends from Cypress Creek to Route 37. The silt bar east of Cypress Creek, which was at an elevation of 325.2 feet msl in 1987, has accumulated an additional 0.2 foot of sediment. Farther east, near river mile 29.9, is the confluence of Kitchell Slough with the Cache River. The most significant change in this area is the buildup of localized debris and silt at the east edge of the

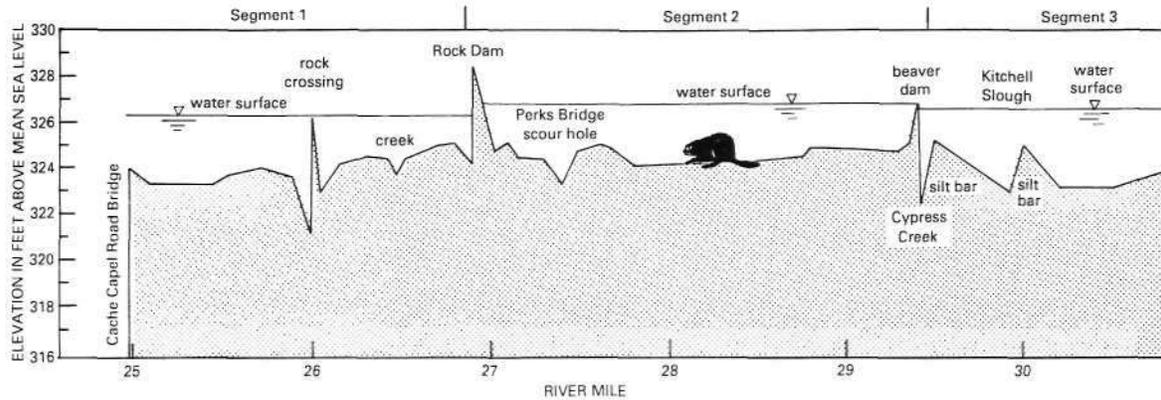


Figure 4. Bed profile of the Lower Cache River, October-November 1989

Kitchell Slough confluence. This localized silt and debris bar added 1.9 foot to the 1987 elevation of 323.1 feet msl.

A beaver dam was built just west of the Route 37 highway bridge early in the fall of 1989. The crest of the dam was 326.9 feet msl, which put the top of the dam 3.1 feet above the level of the 1987 bed elevation. The scour hole beneath the Route 37 bridge remained stable during the interim at an elevation of 322.8 feet msl.

Segment 4: Route 37 to the Section 9 Bridge

Segment 4 of the river contained the most significant changes found during the 1989 profile survey. The section 9 bridge is located on the line dividing sections 9 and 10 at river mile 33.4. The area is referred to locally as "Porter Bottoms." The silt bar at river mile 32.0, east of the Chicago and Eastern Illinois Railroad bridge, is the key to maintaining water levels as far west as the rock dam at river mile 26.9. This silt bar has not eroded since 1987, primarily due to the presence of three successive beaver dams before river mile 32.1. The elevation of the channel bed through the silt bar is 325.1 feet msl.

The crest of the first of two beaver dams at river mile 32.0 was 326.6 feet msl. The second at that site and a third dam, at river mile 32.1, both had high-point elevations of 326.8 feet msl. These beaver dams likely contribute to the stability of the silt bar by preventing scouring. More importantly, these dams have also been instrumental in maintaining water levels as far west as the rock dam during low-flow periods.

The riverbed east of the silt bar remained virtually unchanged until near the center of section 9 at river mile 32.9. A fourth beaver dam was built at this point

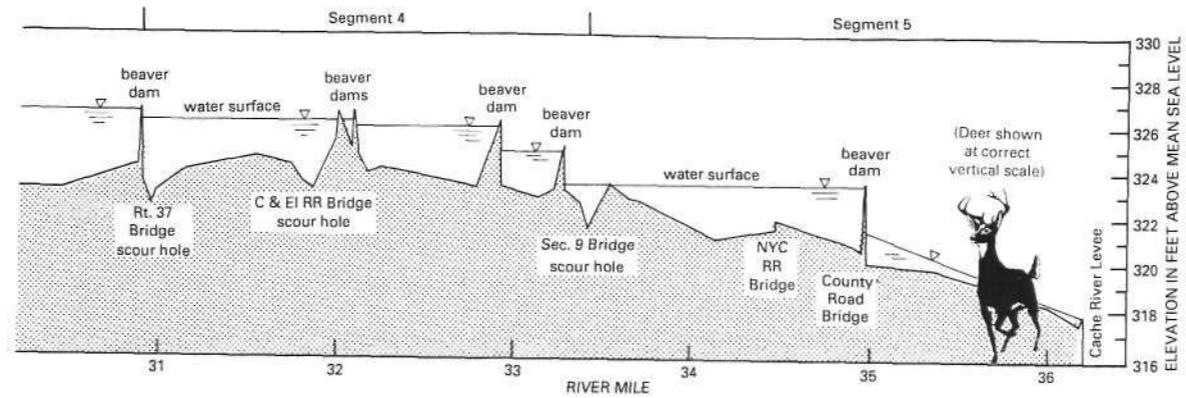


Figure 4, concluded

with a crest of 326.6 feet msl. In the event that the beaver dams at river miles 32.0 and 32.1 ever failed, this dam could prevent the wetland area upstream from draining.

A short distance farther downstream, at river mile 33.3, a smaller beaver dam was constructed. This dam had a crest of 325.3 feet msl over the 1987 bed elevation of 322.9 feet msl.

Segment 5: The Section 9 Bridge to the Levee on the Upper Cache River

The section 9 bridge scour hole at river mile 33.4 remained unchanged from the 1987 survey to the 1989 survey. Downstream of the section 9 bridge, near river mile 33.6, tree and log jams have trapped sediment and debris over a period of time and produced a buildup. Farther downstream, near river mile 34.5, is the New York Central Railroad bridge. Beneath the railroad bridge, rock riprap has been applied to the riverbed to prevent scour from undermining the railroad tressel. The elevation of this rock riprap is 321.8 feet msl. Although this suggests a 1.0-foot increase in bed elevation since 1987, the riprap is easily reworked by both high-flow velocities and human activities.

The riverbed remained stable until just past the county road bridge outside the town of Karnak. A beaver dam is located near river mile 35.0, with a crest elevation of 323.6 feet msl. Some localized deposition has occurred around the dam.

Downstream to the levee on the Upper Cache River the profile continued to be stable during the period between the two surveys, and no appreciable changes were noted.

SUMMARY AND CONCLUSION

The Lower Cache River from the rock dam at river mile 26.9 to the levee on the Upper Cache River was surveyed in March 1987 to establish the riverbed profile. The riverbed was surveyed again in the fall of 1989 to identify any significant changes. The most significant of them consisted of the development of two debris jams and associated silt bars and the construction of eight beaver dams.

The two most notable debris jams occurred near river miles 29.9 and 33.6. These localized increases in the bed level occurred as logs and brush accumulated, created a jam, and trapped sediment from the river flow. These jams are susceptible to change by floods and increased river flow velocities at various times of the year.

Construction of eight beaver dams represented the most noticeable changes in the bed profile since 1987. The dams are located near river miles 29.4, 31.0, 32.0 (two), 32.1, 32.9, 33.3, and 35.0. Figure 4 illustrates the importance of the beaver dams at river miles 32.0 and 32.9 in maintaining water levels in the wetland area during periods of low flow.

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