# ILLINOIS RIVER SUMMARY

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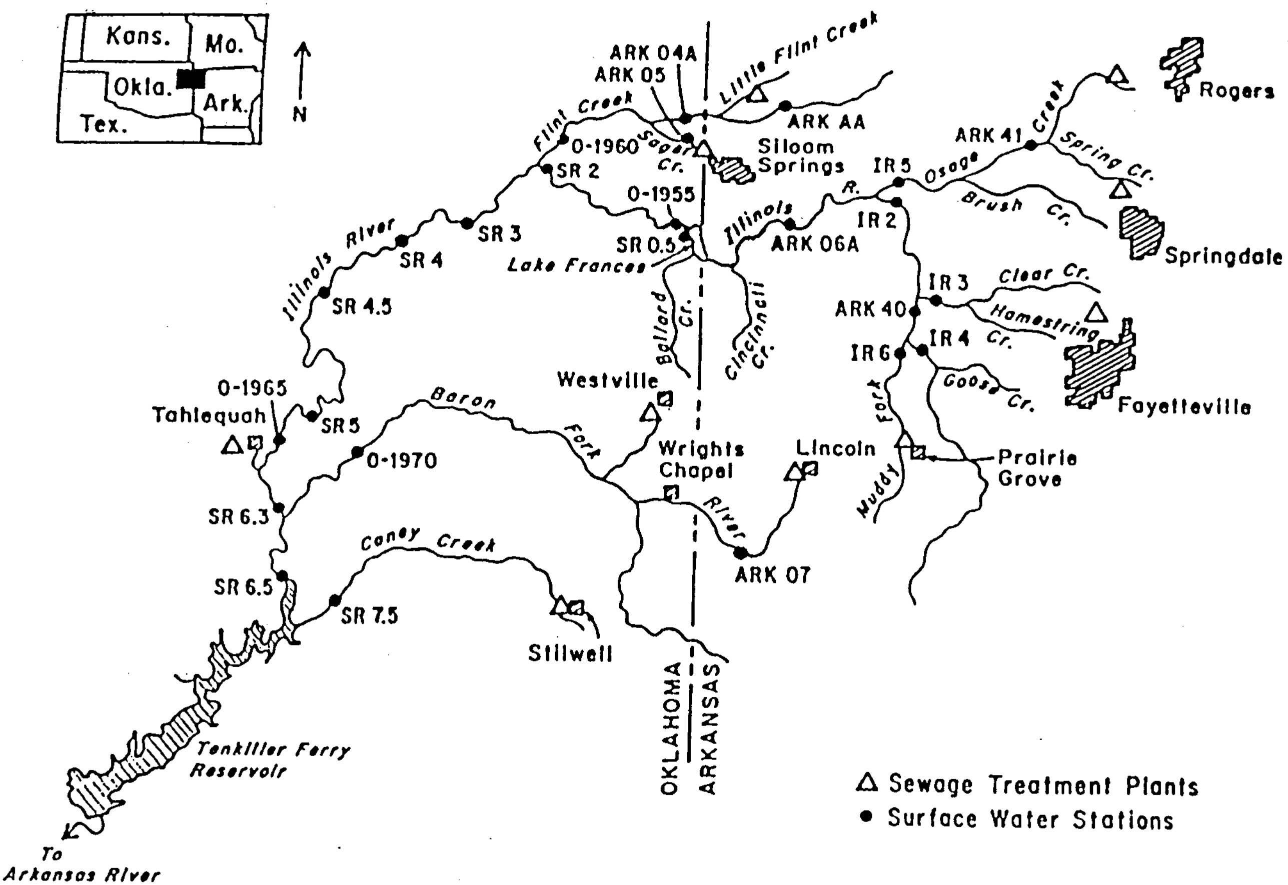

# ILLINOIS RIVER

## Location and Size

The river's headwaters are in the Ozark region of northwestern Arkansas and it flows into northeastern Oklahoma. The watershed is about 1,060,600 acres (429,225 ha) with 45% in Arkansas.

## Land Use

Grassland comprises 45%, forest 44 %, urban 6% and miscellaneous 5% of the river basin.

## Animal Production

| | Arkansas | Oklahoma | Total |
|---|---|---|---|
| Laying hens, breeders | 6,666,160 | 1,273,299 | 7,939,459 |
| Broilers, pullets, cornish | 172,146,167 | 48,018,287 | 220,164,454 |
| Turkeys | 700,760 | 1,452,620 | 2,153,380 |
| Swine | 60,543 | 36,400 | 96,943 |
| Dairy cows | 8,228 | 4,677 | 12,905 |
| Beef cattle | 117,724 | 83,051 | 200,775 |

## River and Tributary Use

- Recreation (swimming, canoeing, fishing)
- Water supply (Siloam Springs, Lincoln, Prairie Grove, AR and Tahlequah, OK)
- 10 cities in Arkansas and Oklahoma release effluent from waste treatment facilities to the Illinois River

## Water Quality Problems

Lincoln and Prairie Grove (and Bob Kidd ?) lakes have been eutrophic with large algae blooms during the summer months. Degradation of the water quality in the Illinois River and Lake Tenkiller (OK) drinking water supply for the Tahlequah area is the primary problem in the basin. The degradation is result of excessive nutrient concentrations, especially TP. Concentrations for TP based on monthly grab samples range from 0.03 (1994) to 0.85 mg/L (1984) for the main stem of the river at the state line but have ranged from 0.09 mg/L (1995) to 5.80 mg/L (1992) for Sager Creek.

## U.S. Supreme Court (Arkansas v. Oklahoma, 1992)

In 1985 Fayetteville applied for a permit for its new waste water treatment plant. EPA granted the permit allowing 3.05 million gals to be discharged into a tributary of the Illinois River. The Illinois River was designated as a state scenic stream in Oklahoma. Oklahoma challenged Fayetteville's NPDES permit claiming the "no degradation" standard for the stream would be violated by the addition of Fayetteville's discharge. Eventually, the case made its way to the U.S. Supreme Court. The Court stated that compliance with a downstream state's water quality laws is required but also stated that EPA's interpretation of "no degradation" to mean nothing measurable.

## 40% Reduction Goal

In 1996, Arkansas and Oklahoma agreed to a 40% reduction of total phosphorus load to Lake Tenkiller (Illinois River) (227,625 kg/yr) based on monthly grab samples from 1980-1993. For Arkansas, the baseline for reduction is the average annual TP load of the river and its tributaries at the state line. For the river the baseline is 190,577 kg/yr and the goal for 40% reduction is 114,346 kg/yr. Changes are based on comparison of a running average of the last five years, e.g., the 1993-1997 average was 146, 690 kg/yr (i.e., about 23% reduction).

## BMPs

Point source reduction of TP accounts for about half of the decrease in TP load; thus, non-point sources also account for about half of the decrease. Using discharge values for point sources, point sources contribute 45% of the total load, non-point sources 40% and natural sources 15%. Portions of the basin have been the focus of water quality and BMP programs (Arkansas Cooperative Extension Service, Arkansas Soil and Water Conservation Commission, U.S. Agricultural Stabilization and Conservation Service, U.S. Environmental Protection Agency and U.S. Soil Conservation Service [SCS]). A field scale (0.6 to 1.5 ha) demonstration project in the watershed showed significant decreases in TP over time when managed according to SCS recommendations. Flow-weighted mean concentrations for TP decreased from about 3.2 to 1.6 mg/L and for phosphate decreased from about 2.4 to 0.8 mg/L for runoff events from 1991 to 1994 (Fig. 1). Decreasing trends for TP and phosphate concentrations were also demonstrated for stream stations in during base flow (Fig. 2). More recently decreasing trends for TP during storm flow have been observed in one of the streams draining this area.

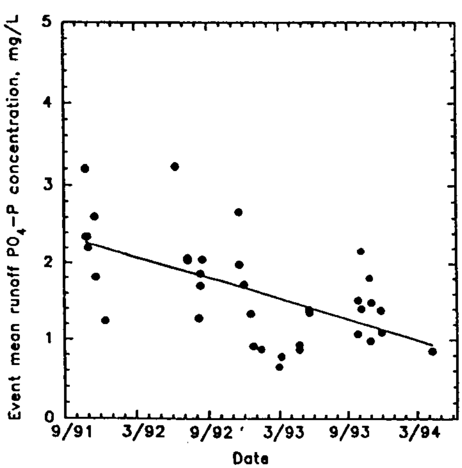


Figure 1. Event runoff phosphate for managed field.

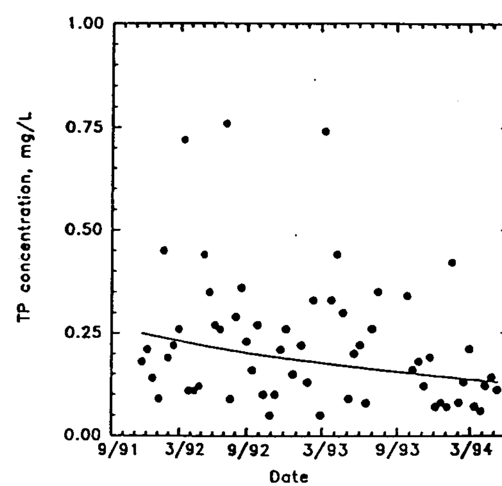


Figure 2. TP concentrations for upper Moores Creek site 2.

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## OPTIMUM TIMING AND NUMBER OF SAMPLES

A project to determine the optimum timing for sample collection and the number of samples necessary to best represent storm loads was begun in the fall of 1997 on the Illinois River at the state line. The 1997 TP load was 114,000 kg/yr based on monthly grab samples. Detailed sampling produced a load of 127,000 kg/yr; however, in January 1998 a single storm transported about this amount of TP. Not only does the omission of storm data affect loads (Fig. 3), but significant errors can occur even over a sampling period of a few hours (Fig 4).

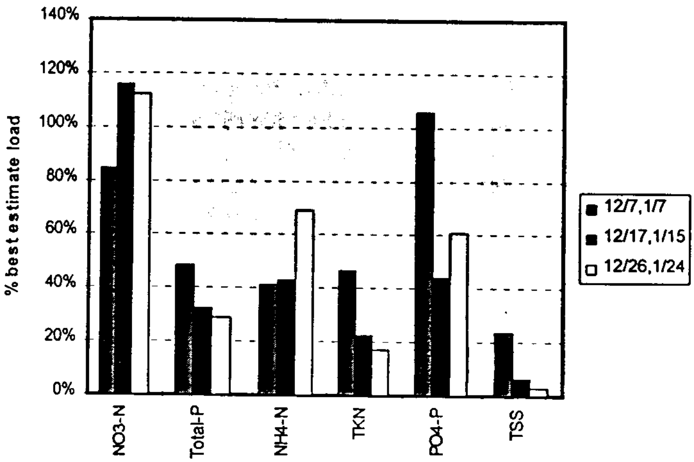


Figure 3. Percent of best estimate load by monthly sampling.

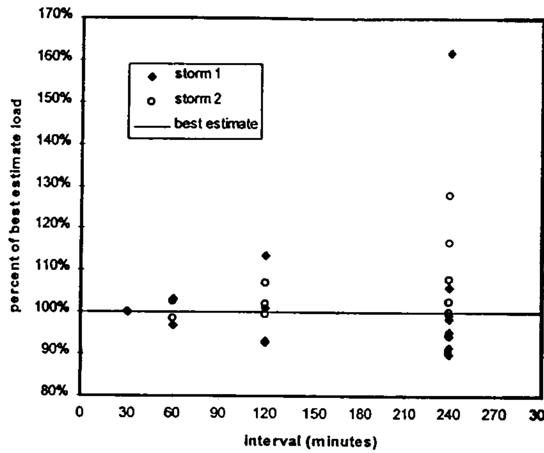


Figure 4. Percent of true TSS load versus sampling interval.

## Selected Bibliography


Maner, Martin, 1998, Recent total phosphorus loads in the Illinois River watershed in Arkansas compared to loads in 1980-1993, Arkansas Department of Pollution Control and Ecology, Little Rock.

Vendrell. P.F., Nelson, M.A., Cash, L.W., Steele, K.F.,. McNew R.W, Murdock J.F. and Edwards, D.R., 1997, Continuation of Illinois River water quality-Monitoring of Moores Creek, Arkansas Water Resources Center Misc. Pub, University of Arkansas, Fayetteville, AR.

Edwards, D.R., Daniel, T.C., Scott, H.D., Murdock, J.F., Habiger, M.J. and Burks, H.M., 1996, Stream quality impacts of best management practices in a Northwest Arkansas basin, Water Resources Bulletin, 32, 499-509.

Soerens, T.S., Parker, D.G. and Nelson, M.A., Phosphorus transport in the Illinois River: preliminary results of intensive sampling. Arkansas Water Resources Center Misc. Pub., University of Arkansas, Fayetteville, AR.

U.S. Soil Conservation Service, 1991, Illinois River Cooperative River Basin—Resource Base Report, Arkansas and Oklahoma Soil Conservation Service and U.S. Forest Service.

Nelson, M. A., and Soerens, T.S., 1997, Pollutant Loads at Arkansas Highway 59 Bridge, Arkansas Water Resources Center Misc. Pub., University of Arkansas, Fayetteville, AR.