

Status of Inter-agency Erosion and Sediment Studies in Indiana

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Abstract

Indiana streams erode, transport, and deposit a variety of sediments. About 10 years ago an inter-agency committee was formed to accelerate investigations of these sediments. This committee consists of representatives from federal and state agencies. Recent fluvial sediment studies on selected streams indicate a range in sediment yield of from 30 to 880 tons annually per square mile of drainage area. Studies of sediment deposited in selected reservoirs indicate that the area draining into these impoundments is eroded at rates of from 3 to 22 acres annually. The reservoirs studied are losing storage capacities at the rate of from 0.1 to 2.9 percent annually.

Water-transported sediments have been the subject of study in Indiana for many years. Observations of fluvial sediments—those in transit in flowing streams—date back at least to 1906. Early studies consisted of observations only and included no precise measurements, however (3).

Impounded sediments—those relatively stationary in natural lakes and reservoirs—have been measured since about 1930. The first such recorded measurements were made on Winona Lake and Tippecanoe Lake, both natural lakes formed during the Pleistocene Epoch or ice age (3).

Winona Lake is estimated to have decreased in depth from 127 feet to 79 feet from the time it was left by the glacier to 1930. In this period of time the surface area and volume of Winona Lake were reduced 37.4 and 43.6%, respectively. During this period the maximum depth of Tippecanoe Lake decreased from 164 feet to 123 feet, and the original surface area and volume were reduced 20.8 and 31.9%, respectively.

Recent fluvial sediment studies have been carried out cooperatively by the Geological Survey of the United States Department of the Interior (USGS) and the Indiana Department of Natural Resources (IDNR). The first of these studies began in 1953 on the St. Mary's River near Ft. Wayne (1). The location of the suspended sediment sampling stations are shown in Figure 1, and Table 1 lists available data obtained from these studies.

The fluvial sediment studies show that each square mile contributes from 30 to 880 tons of sediment annually. The size of drainage area that contributes to the measurement sites varies greatly. The larger the drainage area the smaller the proportion of transported sediment that reaches a measuring point. The fluvial sediment studies are of insufficient duration, however, to provide more than a general estimate of the average annual sediment discharge for the streams.

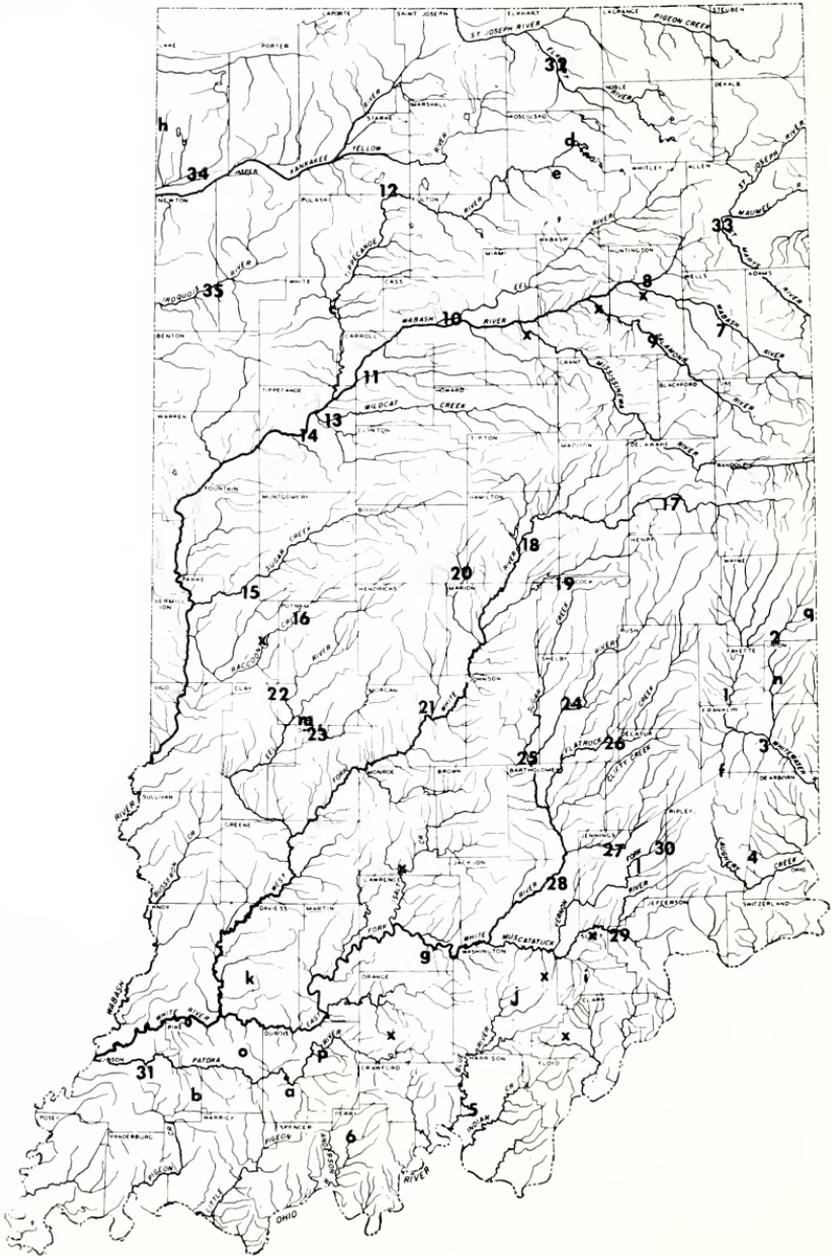


FIGURE 1. *Indiana sediment survey stations.*

About 10 years ago several interested agencies and organizations banded together to form a rather loosely organized inter-agency committee to study erosion and sedimentation in Indiana. This committee proposed two distinct types of studies, comprehensive studies and limited studies.

TABLE 1. Average annual suspended sediment discharge from some Indiana streams.¹

Map No.	Station Name	Type of Record	Period of Record	Drainage Area (Sq. Mi.)	Sediment Tons/yr./mile ²	Bed ² Load
1.	Whitewater R. near Alpine	Periodic	7-68 to date	529	242	S
2.	E. Fk. Whitewater R. at Abington	"	4-67 "	198	172	"
3.	E. Fk. Whitewater R. at Brookville	"	10-63 to 6-68	380	250	"
4.	S. Hogan Cr. near Dillsboro	"	7-69 to date	38.2	—	M
5.	Blue R. near White Cloud	"	7-68 "	461	49.2	"
6.	M. Fk. Anderson R. at Bristow	"	3-64 "	41.9	122	"
7.	Wabash R. at Bluffton	"	7-68 to 10-71	532	209	"
8.	Little R. near Huntington	"	7-69 "	263	357	"
9.	Salamonie R. near Warren	"	10-63 "	425	184	M
10.	Eel R. near Logansport	"	7-68 " 8-69	789	92	"
11.	Deer Creek near Delphi	Daily	8-69 " date	—	308	S
12.	Tippicanoe R. near Ora	Periodic	7-69 "	278	53	"
13.	Wildcat Creek near Lafayette	"	7-68 "	889	161	"
14.	Wabash R. at Lafayette	"	7-68 " 7-78	7,247	286	M
15.	Sugar Creek near Byron	"	7-68 " date	668	208	S
16.	Big Raccoon Cr. near Fincastle	Daily	8-59 "	132	877	"
17.	White R. at Muncie	Periodic	1-68 " 2-69	241	82	"
18.	White R. near Noblesville	"	7-68 " date	828	—	S
19.	Fall Creek near Fortville	"	7-63 " 7-68	169	73.4	"
20.	Eagle Creek at Zionsville	"	7-69 " date	103	316	M
21.	White River near Centerton	"	7-63 " 7-68	2,444	134	"
22.	Big Walnut near Reelsville	"	7-69 " date	326	235	S
23.	Mill Creek near Catawaet	"	7-69 " date	245	395	"
24.	Big Blue R. at Shelbyville	"	7-68 " date	421	225	M
25.	Sugar Creek near Edinburg	"	7-68 "	474	124	"
26.	Flatrock R. at St. Paul	"	7-69 "	303	229	M
27.	Sand Creek near Brewersville	"	7-69 "	155	428	"
28.	East Fk. White R. at Seymour	Daily	7-56 "	2,341	200	S
29.	Muscatauck R. near Deputy	Periodic	7-68 "	293	147	M
30.	Brush Creek near Nebraska	"	7-63 " 7-68	11.4	608	"
31.	Patoka River near Princeton	Periodic	7-63 " 7-68	815	103	"
32.	Elkhart River near Goshen	"	7-63 " 7-68	580	29.6	"
33.	St. Marys River near Ft. Wayne	Daily	5-53 "	762	216	"
34.	Kankakee River at Shelby	Periodic	7-63 " 7-68	1,753	75	"
35.	Iroquois River near Foresman	"	7-68 "	452	97	S

¹Data supplied by the U.S. Geol. Surv. and Indiana Dept. of Natural Resources.

Data from this table should be used in conjunction with the report by L. E. Johnson, 1970.

²M—minimal; S—possibly significant.

The comprehensive studies were to interrelate many environmental factors related to erosion and sedimentation. Such disciplines as biology, geology, meteorology, soil conservation, hydrology and sedimentology were to be involved in each watershed and lake study. The limited study was planned to include the measurement of sediment in a lake and a study of the erosion taking place in the area draining to the lake.

Unfortunately, no comprehensive studies have been made because of lack of funds and personnel, but numerous limited studies have been undertaken.

The inter-agency committee includes representatives of the U.S. Geological Survey, Indiana Department of Natural Resources, U. S. Army Corps of Engineers, the U. S. Department of Agriculture's Agricultural Research Service (ARS) and Soil Conservation Service (SCS), the Water Resource Research Centers at Indiana University and Purdue University and the Indiana Department of Natural Resources' Geological Survey (IGS).

The major effort of the committee has been in arranging for and conducting reservoir sediment studies. To date studies have been made at 15 reservoirs in the state. Locations of these reservoirs are shown in Figure 1, and pertinent data obtained from these studies are given in Table 2. The procedures employed in these studies have been previously reported (2).

The results of the reservoir surveys indicate soil losses ranging from 3 to 22 tons annually, and losses of original storage capacity of from less than 0.1 to 2.9% per year. As in the case of the suspended-sediment studies, data are insufficient to allow complete evaluation.

Additional reservoir studies are being planned, and resurveys are anticipated. It is normal procedure to allow a 10-year period after construction of a reservoir before the first sediment survey. The Corps of Engineers has installed, or is in the process of installing sediment ranges on Lakes Huntington, Salamonie, and Mississinewa. Continuing studies are being made on Cataract, Mansfield and Monroe Lakes by the Corps. The IDNR has installed sediment ranges on Deems Lake in Clark County and on the Quick Creek Reservoir in Scott County. The SCS has recently completed a sediment survey on Lake Salinda, a water-supply reservoir for Salem, Indiana (Table 2). Sediment ranges have been installed by SCS on the Elk Creek fish and game reservoir in Washington County and on the French Lick Creek fish and game reservoir in Orange County.

At the time of this writing, two Purdue University students, L. J. Lund and Manuel Poulet, are preparing a paper on some pedologic features of reservoir sedimentation. This study involves 14 Indiana and Illinois reservoirs and their drainage areas.

The long-range plan of the committee calls for resurvey of most of the reservoirs after ten years of additional sedimentation, or more frequently if conditions warrant. Ideally, a survey should be made immediately before and after a large sediment producing storm. Such storms usually occur at ten-year intervals.

TABLE 2. Summary of reservoir survey data.

Reservoir ¹	Nearest Town	Year Built ²	Surface Area in Acres	Drainage area in Sq. Mi.	Years Between Surveys	Original Storage Capacity Acre-feet	Annual Yield Tons/Sq. Mi.	Capacity Loss		Agency
								%/Year	No Data	
Huntingburg (a)	Huntingburg	1894	24.5	0.67	46.3	137	537	0.28	No Data	S.C.S.
Oakland City (b)	Oakland City	1921	80.0	0.52	43.9	851	3897	0.11	No Data	S.C.S.
Lake Shafer (c)	Monticello	1923	1291.0	1700.00	28.0	15486	38	0.16	No Data	S.C.S.
Tippecanoe Lake (d)	Oswego	1930	1133.0	118.00	5.0	39197	No Data	No Data	No Data	I.U.
Winona Lake (e)	Warsaw	1930	562.0	32.10	5.0	27492	No Data	No Data	No Data	I.U.
Mollenkramer (f)	Batesville	1930	40.0	6.53	20.2	208	870	2.00	No Data	S.C.S.
Spring Mills (g)	Mitchell	1938	28.0	15.03	9.9	178	1420	2.90	No Data	S.C.S.
Bode-man Res. (h)	Brunswick	1947	10.7	2.73	13.0	52	284	0.01	No Data	S.C.S.
Scottsburg Lake (i)	Scottsburg	1949	92.0	3.13	12.0	749	1357	0.40	No Data	S.C.S.
Lake Salinda (j)	Salem	1949	112.0	5.70	21.0	891	1310	0.59	No Data	S.C.S.
Graham Lake (k)	Washington	1950	20.0	0.34	6.0	105	105	0.07	No Data	S.C.S.
Brush Creek (l)	Butler-ville	1953	186.0	14.30	9.6	2067	1643	0.97	No Data	U.S.G.S.
Cata-ract Lake (m)	Cloverdale	1953	4840.0	295.00	9.2	788	742	0.01	No Data	Army Engr.
White-water Lake (n)	Liberty	1954	180.0	19.29	8.8	3590	1666	0.55	No Data	S.C.S.
Jones Pond (o)	Otwell	1954	1.9	0.03	1.5	11	2972	0.67	No Data	S.C.S.
Beaver Lake (p)	Dubois	1955	200.0	3.95	9.0	2486	3023	0.34	No Data	S.C.S.
Richmond Lake ⁴ (q)	Richmond	1961	175.0	48.14	6.5	3250	725	0.99	No Data	S.C.S.

¹Letters refer to site locations on Figure 1.²Time of first study if a natural lake.³Estimated that 67% of drainage area indirect—through sink holes.⁴Richmond water supply reservoir, Richmond, Indiana.

The Indiana Inter-agency Committee on Erosion and Sedimentation has provided much useful data, but its work is just beginning. Any and all interested groups or agencies, not already involved, are encouraged to join the committee's activities.

Literature Cited

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