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Reports from the Ohio Tributary Monitoring Program

Trends in Suspended Sediment Loads, Sandusky River, 1980-1999

This report presents information on trends in suspended sediment loads in the Sandusky River, one of the most important Lake Erie tributaries. The report covers calendar years 1980 to 1999.

Approach

Daily and annual loads of suspended sediments were calculated for the period of interest using existing programs developed by the Water Quality Lab (WQL). These programs have been extensively tested for accuracy and have been subjected to external peer review. The program used to calculate annual loads is approved by the U.S. EPA for use nationwide for such calculations.

The daily loads were analyzed for trends using a standardized approach developed by the WQL and based closely on methods of the United States Geological Survey. This approach has been used previously to determine trends for sediment and nutrient parameters for the period 1975-1995; results of that study are in a paper in final preparation for submission to the Journal of Environmental Quality. In this approach, the data are log-transformed, adjusted for effects of flow on load, and adjusted for seasonal differences in loads. A straight line is fit by regression analysis to the adjusted data, and the rate of change is used to calculate an estimate of the percent of change in the daily loads over the period of record.

In addition, a smooth curve was fit through the daily load data to show times of major change and times of relatively constant conditions.

The annual loads are presented in tabular form so that year-to-year differences can be evaluated. These year-to-year differences are primarily related to weather patterns, and indicate the difficulty of detecting long-term trends in such data.

Results and Discussion

Annual loads for the 20-year period are shown in Table 1. The smooth curve fit to the daily loads is shown in Figure 1.

Table 1. Annual Loads of Suspended Sediment, Sandusky River, 1980-1999. Loads are given in metric tons per year.

Year	Load	95% Confidence interval	Year	Load	95% Confidence interval
1980	424,100	31,400	1990	260,600	25,400
1981	584,600	120,500	1991	248,000	18,500
1982	377,700	52,000	1992	245,300	35,100
1983	86,000	8,700	1993	238,200	35,400
1984	280,300	64,700	1994	134,800	23,300
1985	160,100	21,800	1995	174,800	30,900
1986	278,000	17,200	1996	284,100	48,300
1987	155,300	13,700	1997	379,600	50,400
1988	60,000	7,300	1998	213,100	33,300
1989	201,300	29,700	1999	49,100	14,300

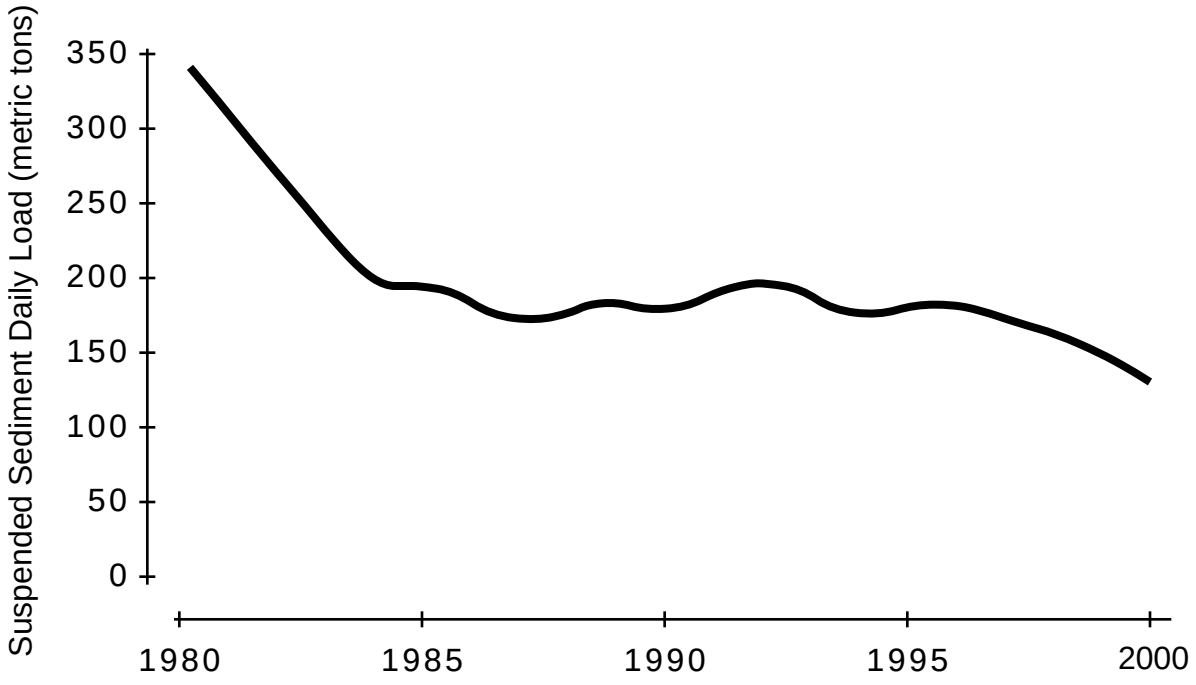

Figure 1. Smoothed daily load data showing times of change.

The regression analysis indicates that sediment loads in the Sandusky have decreased significantly during the period 1980-1999. The estimated amount of change in the average daily load is 21.5%. In ten years, the estimated amount of change is 10.75%.

The curve in Figure 1 indicates that most of the decrease in loads occurred during the period 1980-1985, and that further decrease occurred during 1995-1999. The ten-year period in the middle was one of fluctuation ups and downs with no overall direction of change.

The list of annual loads shows that the last five years have been a time of considerable year-to-year variation. The load for 1997 was the third highest of the 20-year period and the highest since 1982. The load for 1999 was the lowest of the 20-year period. The 1997 load was 670% larger than the 1999 load. These differences are due almost entirely to differences in the intensity, timing, and total amount of precipitation and resulting erosion and runoff. By comparison, the period 1989-1993 had annual loads, all of which were rather similar. In this five-year period, the largest load was only 30% larger than the smallest.

In addition to changes in sediment loads, the low lake levels and low flow rate of the Sandusky River during the last year have led sediments deposited in earlier years to be covered with shallower water or to emerge in some locations. Erosion of some of these in-river sediments may well occur during future high flow periods in the river.

Further sources of information:

Richards, R. Peter and David B. Baker. 1998. Twenty Years of Change: The Lake Erie Agricultural Systems for Environmental Quality (LEASEQ) Project. In *Proceedings: National Watershed Water Quality Project Symposium*, pp. 223-229. EPA/625/R-97/008.

Richards, R. Peter and David B. Baker. 1993. Trends in nutrient and sediment concentrations in Lake Erie tributaries, 1975-1990. *Journal of Great Lakes Research*. 19, 200-211.

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