



## Water Quality Lab

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## Reports from the Ohio Tributary Monitoring Program

A preliminary comparison of water quality  
in the Maumee and Vermilion Watersheds

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This report presents information on sediment and nutrients in the Maumee and Vermilion rivers from October 1, 2000 to June 1, 2001. The Vermilion station, located at Mill Hollow south of Vermilion, was activated in October 2001 in connection with the Ohio Conservation Reserve Enhancement Program (CREP). This report is the first preliminary comparison of nutrient and sediment data in the two watersheds.

### Approach

All raw data values for the two stations were dumped into Excel files, and reduced to a common data set with samples at both stations at the same time on the same day. This set of paired samples was compared by scatterplots, regression analysis, and comparisons of selected percentiles in the distribution of each parameter. Flow data are not available for the Vermilion station yet, so possible effects of flow on the data can not be evaluated at this time, nor can loading comparisons be made.

### Results and Discussion

Figure 1 presents graphical comparisons of concentrations of suspended solids, total phosphorus, soluble reactive phosphorus, nitrate, and total Kjeldahl nitrogen at the two stations. The lines are least-squares regression lines. The regression relationships are given in Table 1. Note that for several parameters the regression line does not pass through the origin. This means that when concentrations in one river (typically the Vermilion) reach zero, concentrations in the other river are still well away from zero.

Table 2 presents selected summary statistics (concentrations corresponding to selected percentiles) for the same parameters, as well as the ratio of the Maumee concentration to the Vermilion concentration at a selected percentile.

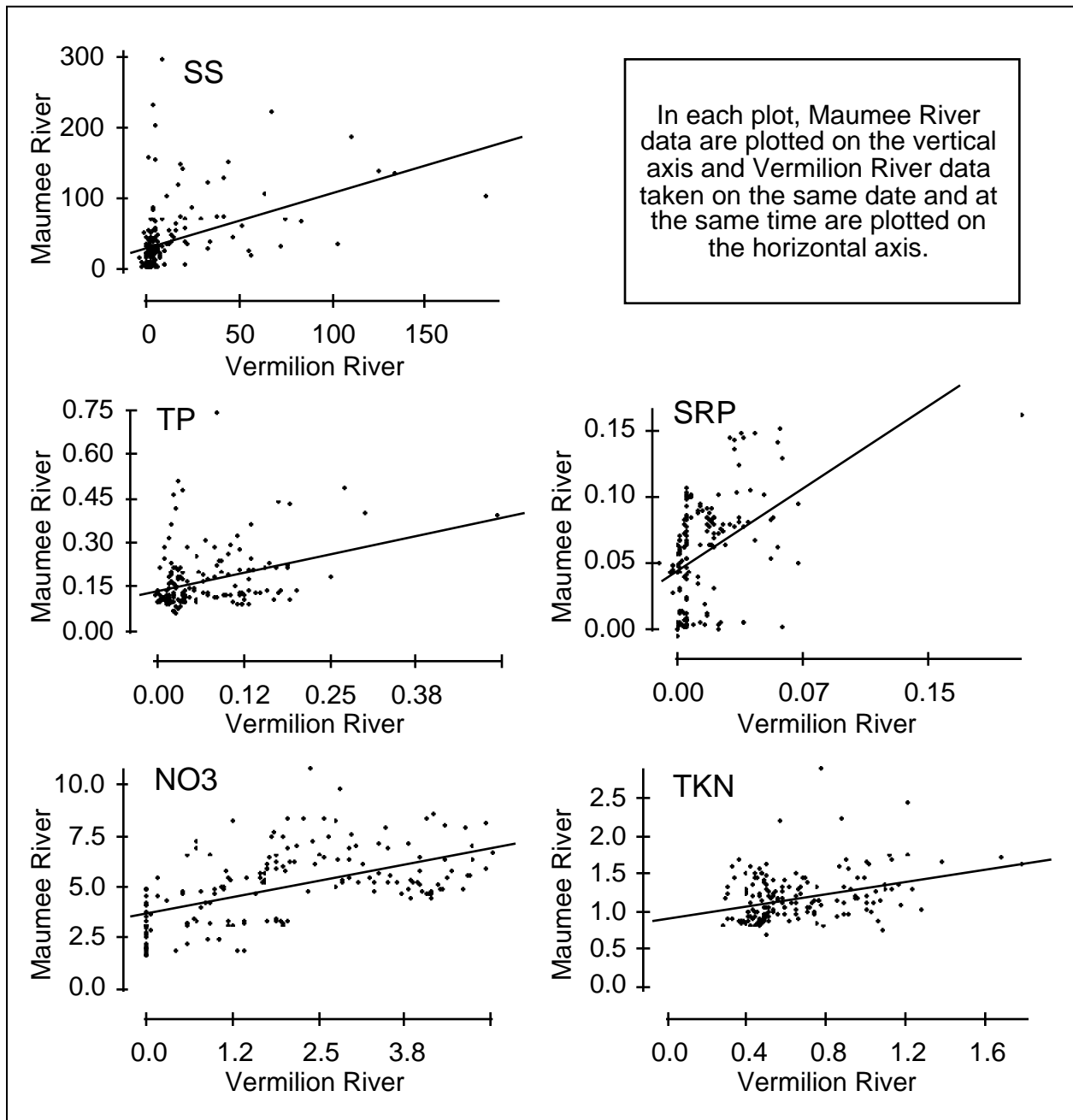


Figure 1. Scatterplots comparisons of concentrations of sediment and nutrients at the Maumee and Vermilion stations, October 2000 through May 2001.



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Table 1. Regression relationships between Maumee concentrations and Vermilion concentrations.

Parameter	Regression relationship
Suspended solids	Maumee = 0.78 • Vermilion + 31.0
Total phosphorus	Maumee = 0.50 • Vermilion + 0.18
Soluble reactive phosphorus	Maumee = 0.82 • Vermilion + .043
Nitrate	Maumee = 0.65 • Vermilion + 3.75
Total Kjeldahl nitrogen	Maumee = 0.39 • Vermilion + 0.94

Table 2. Concentrations corresponding to selected percentiles in the distributions of each parameter at the two stations, and the ratios of those concentrations.

Parameter	River	Mean	Median	90 <sup>th</sup> percentile	Maximum
Suspended solids	Maumee	45.7	28.9	118	342
	Vermilion	13.3	3.86	40.4	183
	<b>Ratio</b>	<b>3.4</b>	<b>7.5</b>	<b>2.9</b>	<b>1.9</b>
Total phosphorus	Maumee	0.180	0.142	0.305	0.743
	Vermilion	0.064	0.036	0.153	0.495
	<b>Ratio</b>	<b>2.8</b>	<b>3.9</b>	<b>2.0</b>	<b>1.5</b>
Soluble reactive phosphorus	Maumee	0.060	0.064	0.104	0.161
	Vermilion	0.017	0.007	0.040	0.207
	<b>Ratio</b>	<b>3.5</b>	<b>9.1</b>	<b>2.6</b>	<b>0.78</b>
Nitrate	Maumee	5.30	5.34	7.91	10.91
	Vermilion	2.01	1.88	4.18	5.04
	<b>Ratio</b>	<b>2.6</b>	<b>2.8</b>	<b>1.9</b>	<b>2.2</b>
Total Kjeldahl nitrogen	Maumee	0.95	1.15	1.59	2.95
	Vermilion	0.65	0.54	1.05	1.79
	<b>Ratio</b>	<b>1.5</b>	<b>2.1</b>	<b>1.5</b>	<b>1.6</b>

It is clear from these plots and tables that concentrations of sediment and nutrients in the Vermilion River tend to be substantially lower than those in the Maumee River. Only for the maximum value of soluble reactive phosphorus is the ratio less than one. It will be interesting to see if this pattern is still valid when more data are in hand. Differences between the two stations are greatest for sediment and the phosphorus forms, somewhat less for nitrate, and least for total Kjeldahl nitrogen.



For a given parameter, differences in the central tendencies (means and medians) tend to be greater than differences in the extreme values (90<sup>th</sup> percentiles and

maxima). Detailed conclusions about these differences are probably premature, given the short period of record of the Vermilion station, but the general pattern is already clear that the Vermilion River tends to have lower sediment and nutrient concentrations than the Maumee.

The concentration differences tentatively identified above probably reflect differences in land use, soil type, and riparian corridor. The Vermilion watershed is thought to have coarser soils, and has a well-developed riparian corridor along substantial portions of its lower reaches. Although land use analysis was not available for the Vermilion at the time of this writing, it is expected that the Vermilion watershed will have lower levels of agricultural land use and higher levels of forested land use than the Maumee.