Nutrient status and trends for Lake Erie tributaries, 1975-2004

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The information presented below is based on data collected at the Water Quality Lab's monitoring stations on Ohio and Michigan tributaries. Annual loads were calculated using Autobeale, a version of the Beale Ratio Estimator that automatically determines an optimal stratification for each year and parameter. Flow-weighted mean concentrations were calculated by dividing the annual loads by the annual discharge as determined by the U.S. Geological Survey. Results are expressed on a water year basis. The results for WY2004 are based on provisional flow data, and may be revised slightly once final flow data are available. Trend results are derived from LOWESS smooths (using a 20% smoothing span) of daily average concentrations and loads. The bottom line is that while many trends between 1975 and 1995 were toward lower concentrations and loads, most recent trends are toward higher concentrations and loads. Some of this, at least, can be explained by higher flows on average in the last decade. Regardless of the cause(s), increased loads to Lake Erie are probably partly responsible for renewed hypoxia and toxic algal blooms. Trends toward deteriorating water quality must be reversed!

Table 1. Station information

River USGS # Earliest data	Drainage Area above Station (sq.mi.)	Land use above station, by percent*			
		Agri-culture**	Urban	Wooded	Other***
R. Raisin above Monroe, MI USGS 04176500 1982	1,042	78.8	2.5	13.9	4.8
Maumee R. at Waterville, OH USGS 04193500 1975	6,330	89.9	1.2	7.3	1.6
Sandusky R. near Fremont, OH USGS 04198000 1975	1,253	84.1	0.9	13.0	2.0
Cuyahoga R. at Independence, OH USGS 04208000 1982	708	30.4	9.6	50.1	9.9
Grand R. at Painesville, OH USGS 04212100 1988	686	40.0	0.9	45.2	13.1

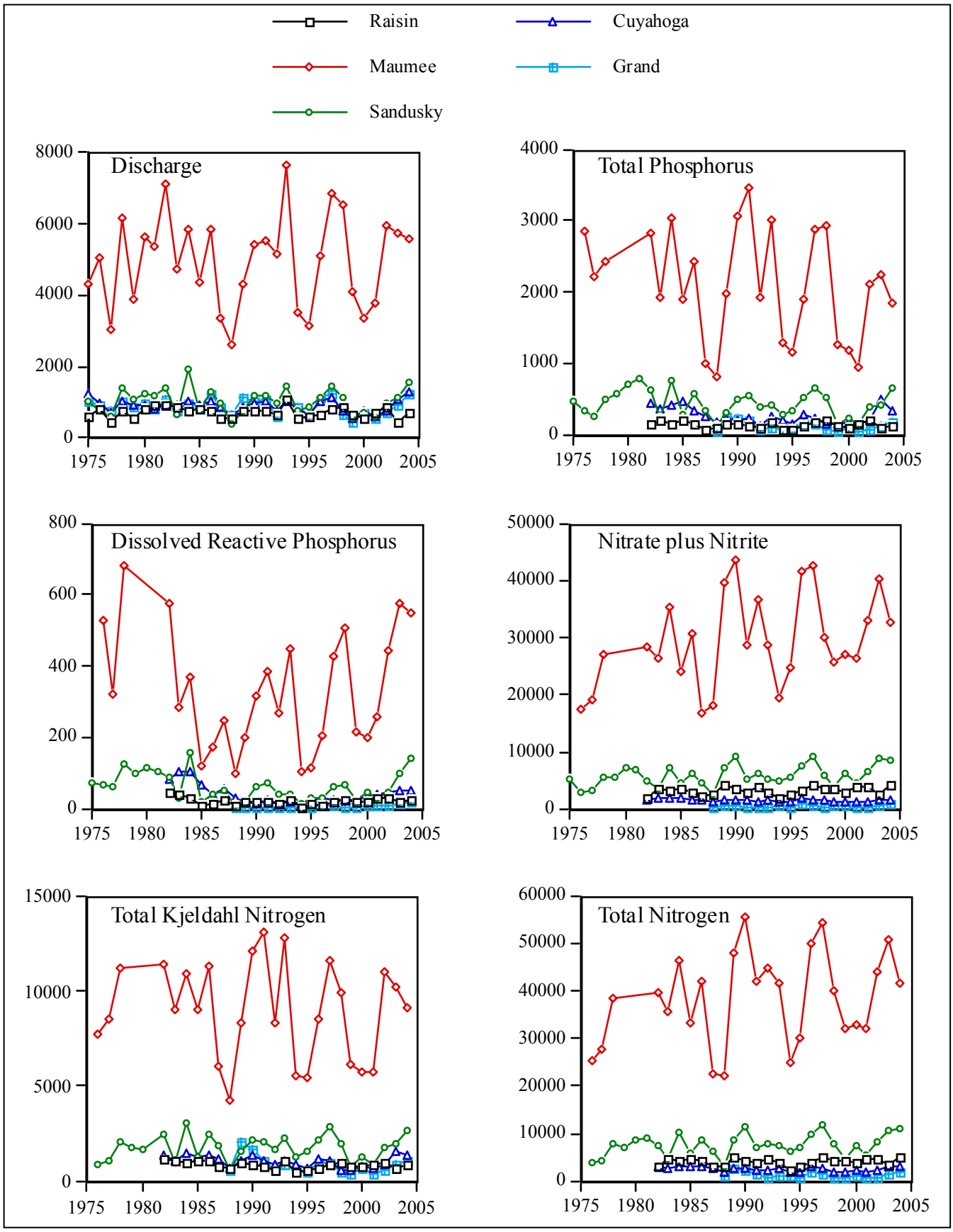

Figure 1. Annual loads (discharge in million cubic meters, loads in metric tons)

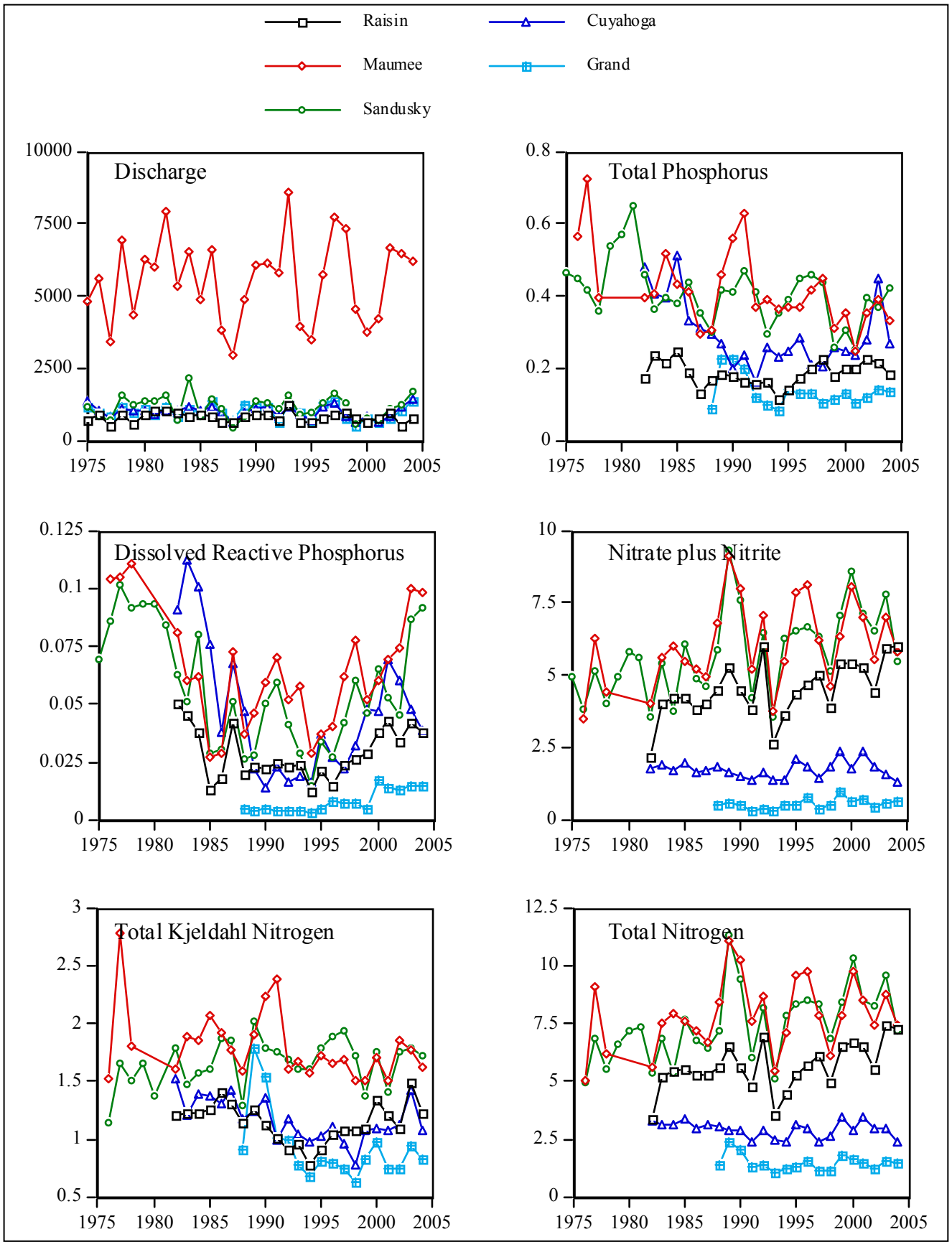

Figure 2. Annual average flow (cfs) and flow-weighted mean concentrations (mg/L)

Table 2. Trends in loads. In each cell, the upper number is the change from the starting date shown to the present, and the lower number is the change since January 1, 1995.

River	Discharge	Total phosphorus	Dissolved reactive phosphorus	Total nitrogen	Nitrate plus nitrite	Total Kjeldahl Nitrogen
Raisin 3/6/1982	-16% -6%	-22% **+22%**	-41% **+80%**	**+19%** **+24%**	**+20%** **+23%**	**+1%** **+27%**
Maumee 1/10/1975	**+10%** **+5%**	-20% -3%	-29% **+49%**	-35% **+6%**	**+10%** -2%	-50% **+18%**
Sandusky 10/2/1974	**+38%** **+25%**	**+19%** **+19%**	**+24%** **+149%**	-6% **+38%**	**+71%** **+33%**	-31% **+34%**
Cuyahoga 11/4/1981	**+47%** **+85%**	-21% **+104%**	-46% **+189%**	**+17%** **+73%**	**+10%** **+42%**	**+14%** **+124%**
Grand 2/16/1988	**+14%** **+62%**	**+3%** **+75%**	**+242%** **+251%**	-3% **+69%**	**+13%** **+59%**	-8% **+84%**
All five together 1/1/1982	**+13%** **+22%**	-9% **+16%**	**+17%** **+98%**	**+14%** **+20%**	**+15%** **+17%**	**+3%** **+31%**

Table 3. Trends in concentrations. In each cell, the upper number is the change from the starting date shown to the present, and the lower number is the change since January 1, 1995.

River	Flow	Total phosphorus	Dissolved reactive phosphorus	Total nitrogen	Nitrate plus nitrite	Total Kjeldahl Nitrogen
Raisin 3/6/1982	-16% -6%	-33% **+20%**	-44% **+102%**	**+55%** **+41%**	**+66%** **+41%**	**+11** **+32**
Maumee 1/10/1975	**+10%** **+5%**	-43% -8%	-44% **+81%**	**+12%** **+6%**	**+14%** **+2%**	-23% **+12%**
Sandusky 10/2/1974	**+38%** **+25%**	-19% **+13%**	-24% **+206%**	**+36%** **+35%**	**+77%** **+37%**	-9% **+15%**
Cuyahoga 11/4/1981	**+47%** **+85%**	-51% **+23%**	-59% **+71%**	-20% -9%	-18% -20%	-17% **+33%**
Grand 2/16/1988	**+14%** **+62%**	-15% **+34%**	**+146%** **+164%**	-6% **+27%**	**+6%** **+9%**	-15% **+32%**
All five together 1/1/1982	**+13%** **+22%**	-24% **+5%**	-8% **+108%**	**+10%** **+11%**	**+17%** **+10%**	-6% **+17%**