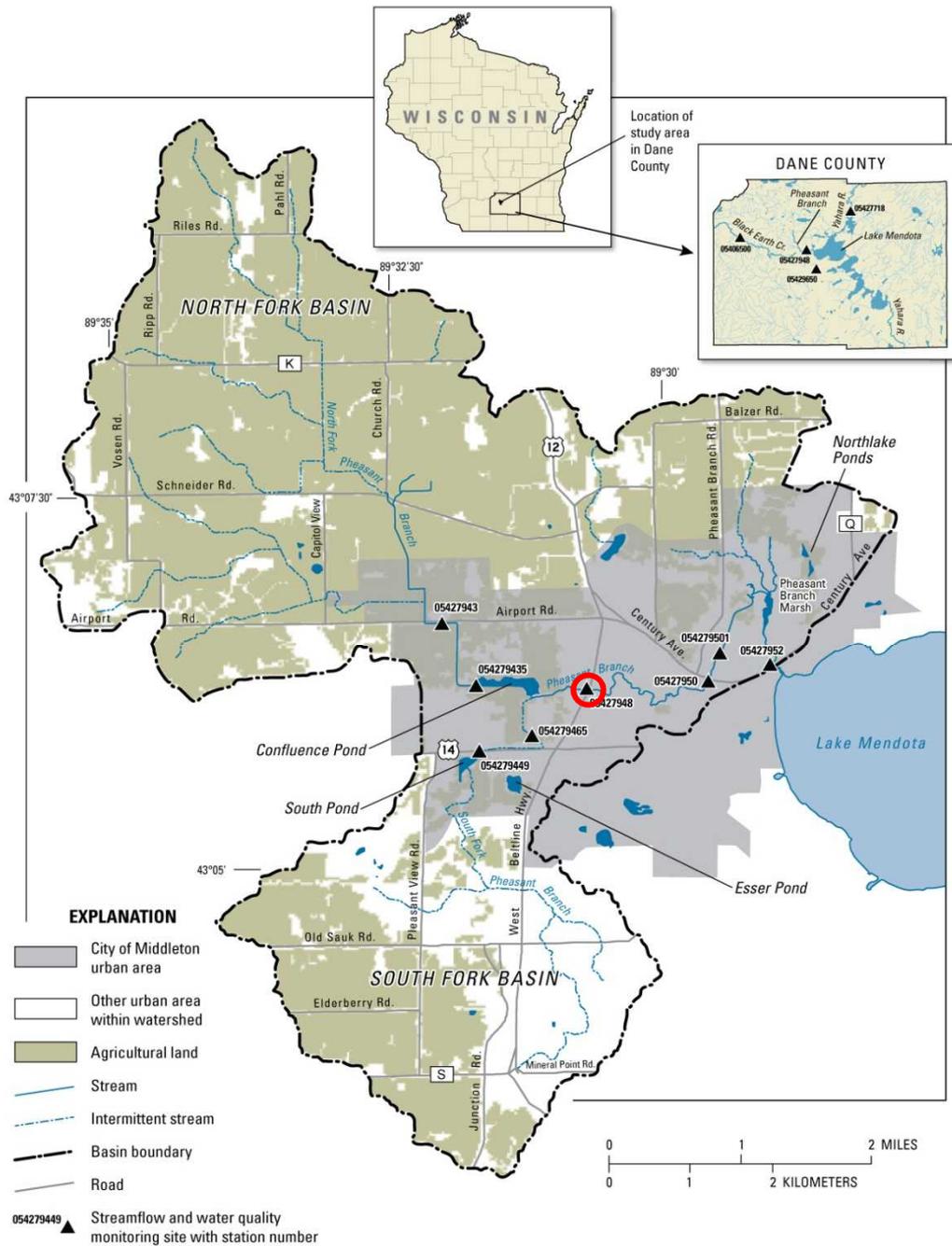


**History of Storm Water  
Management Activities and Trends  
in Streamflow and Water Quality,  
Dane County, Wis. 1975-2008**

By W. A. Gebert, W. J. Rose and H. S. Garn

# Purpose

- Review storm water management practices over the past 33 years
- Analyze streamflow and water quality trends in the context of implemented structural and non-structural best management practices



# Problems / Concerns

Pheasant Branch is a rapidly urbanizing basin which could result in:

- increased flood peaks
- increased flow volumes
- reduced GW recharge
- increased channel erosion
- increased pollutant loading





# Middleton Water Resource Commission

- Created in 1970 to protect and enhance the water resources of Middleton
- Developed a stormwater runoff ordinance in 1975
- Funded USGS streamflow and water-quality gaging station in 1975

# Stormwater Runoff Management Practices Implemented

- **Structural Facilities**
  - 100 ponds and basins
  - 25 residential rain gardens
- **Nonstructural BMP Activities**
  - Increased sweeping of city streets
  - Required sweeping of commercial parking lots

# Confluence Pond on Pheasant Branch with V-notch weir outlet structure



# Bioretention Basin at commercial parking lot



# Water Quality Retention Basin at North Lake Subdivision



# Rain garden at car dealership on Airport Road

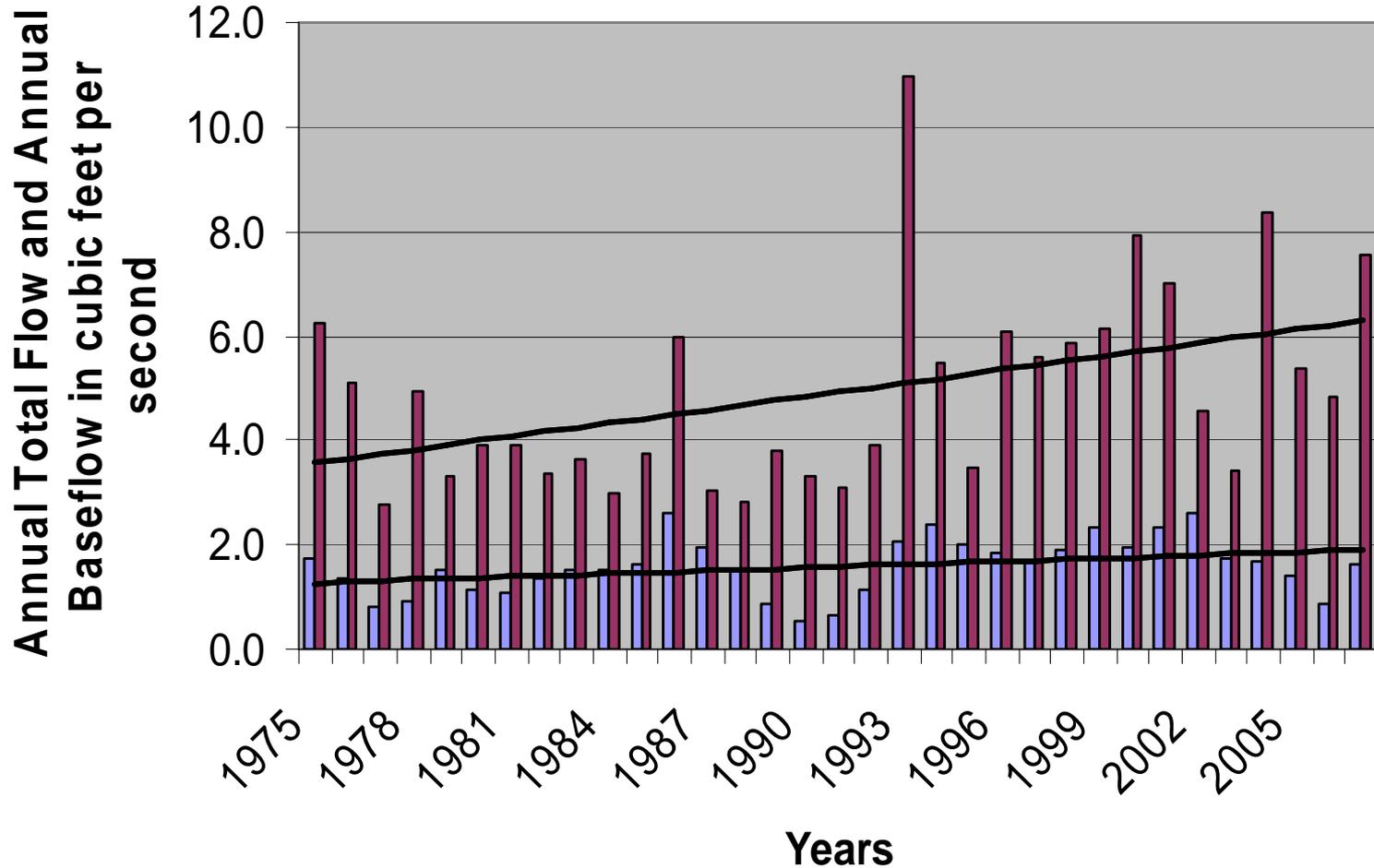


# Streamflow Characteristics

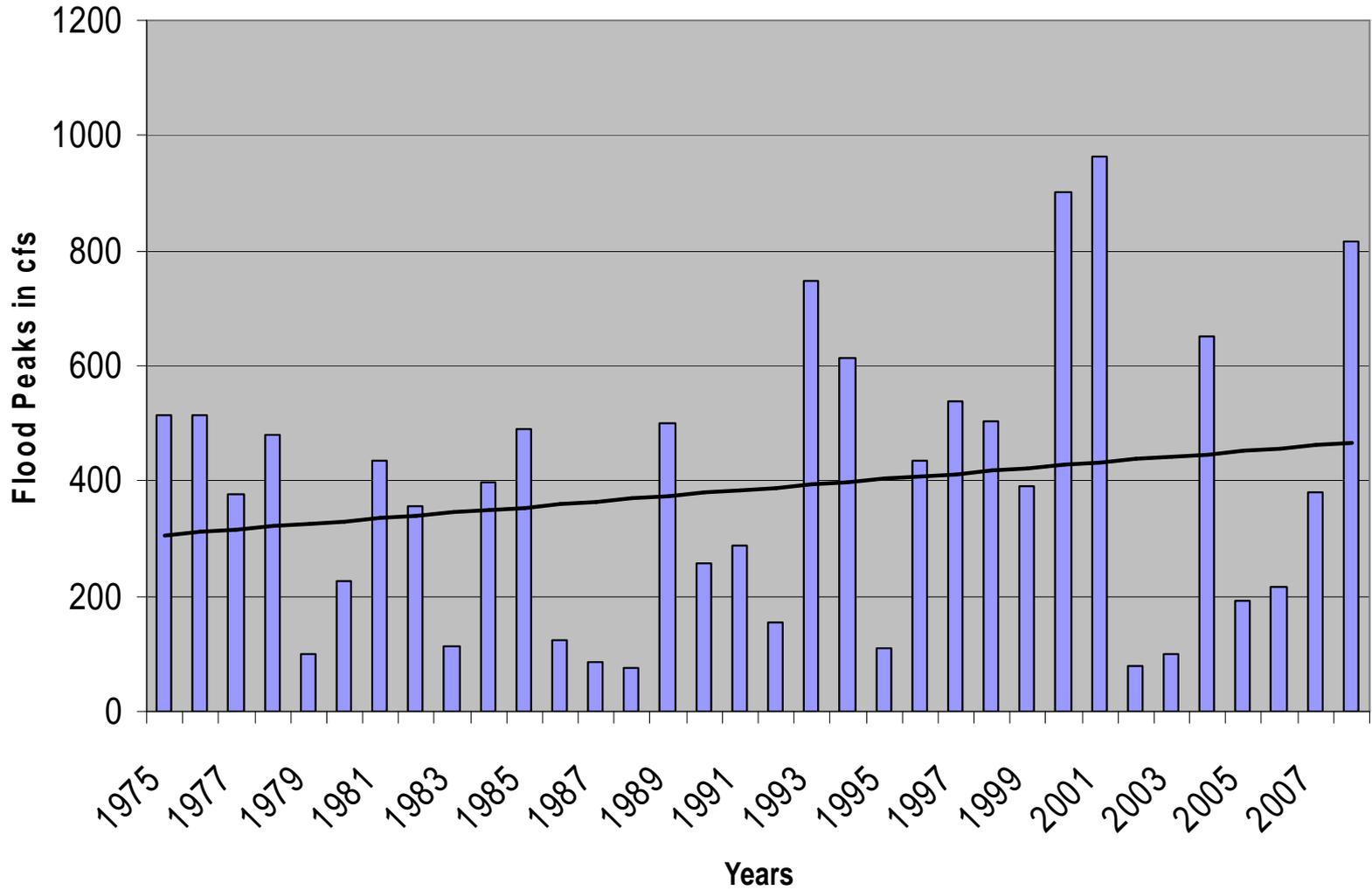
- Total flow
- Base flow
- Flood peaks

Period of record used for analysis: 1975-  
2008

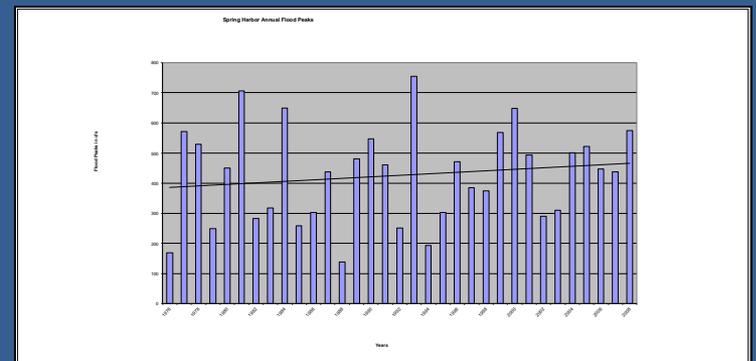
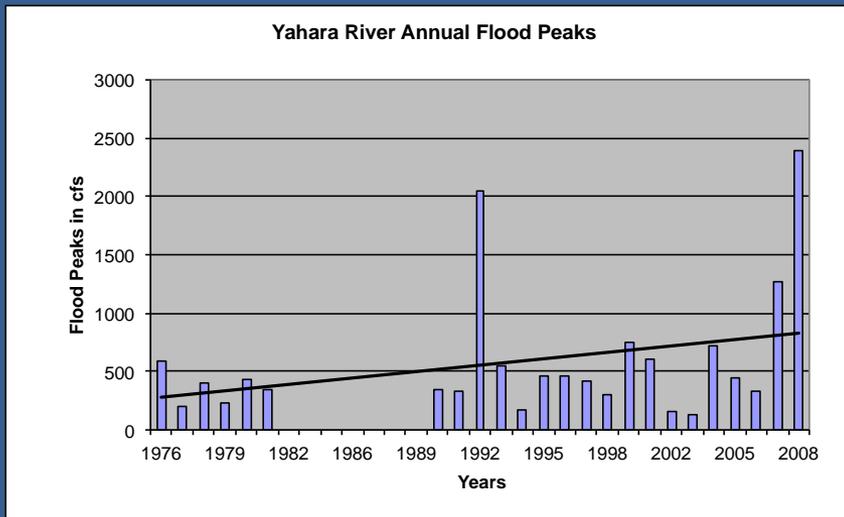
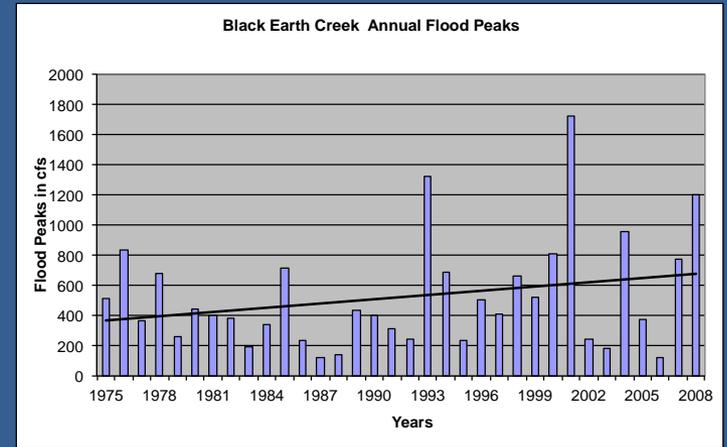
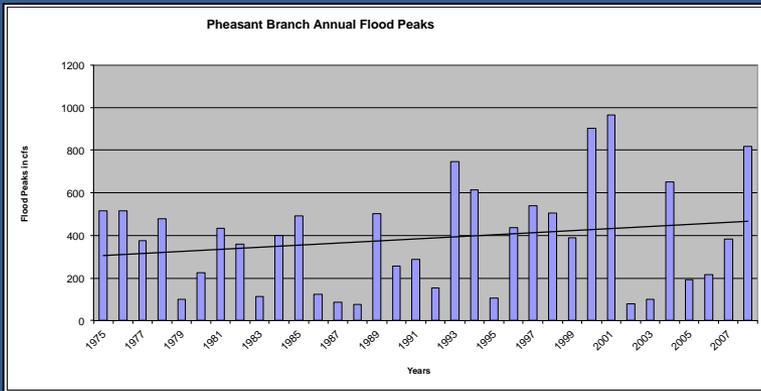
# Pheasant Branch At Middleton, Annual Total Flow and Annual Baseflow



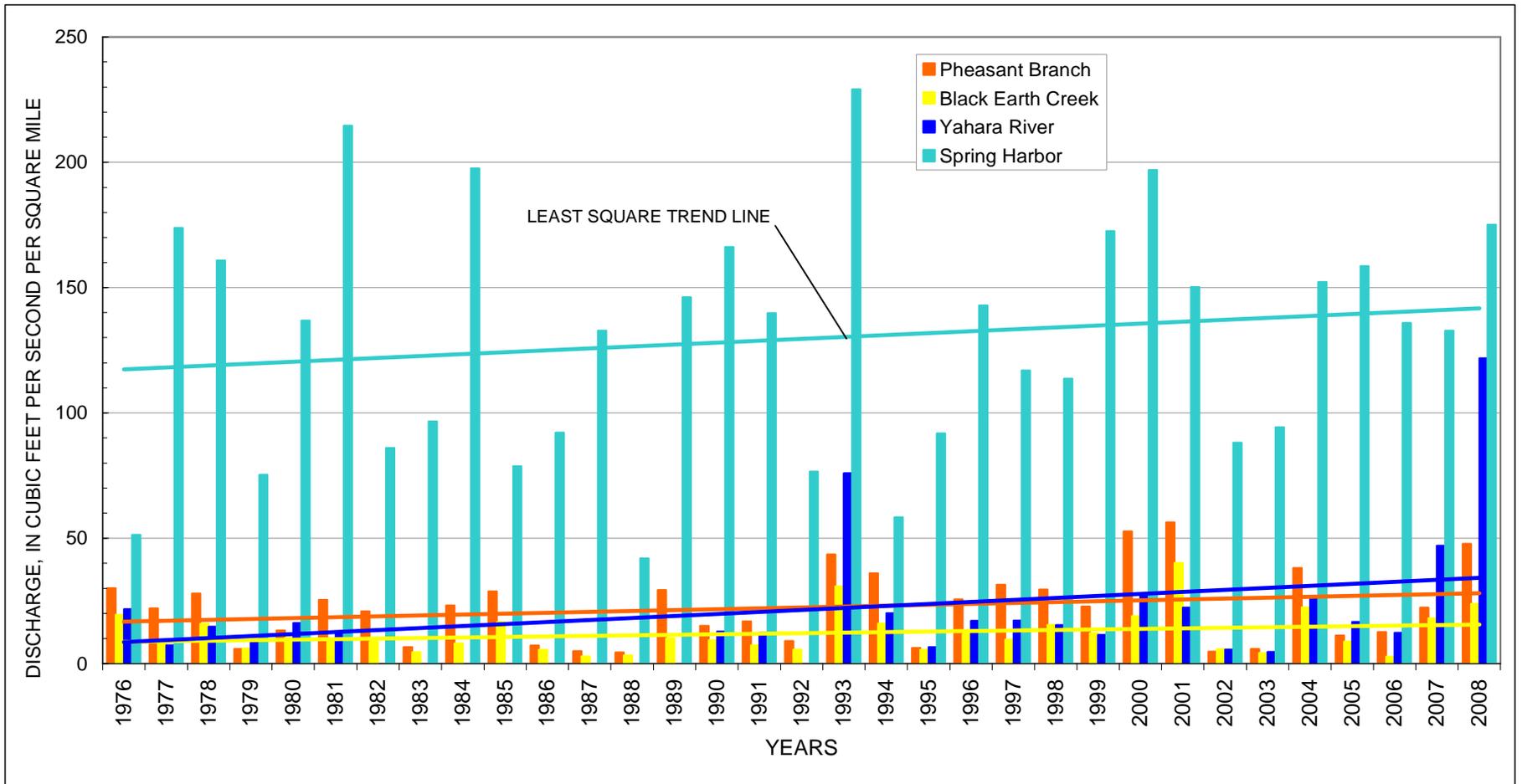
# Pheasant Branch Annual Flood Peaks



# Comparison of Annual Flood Peaks



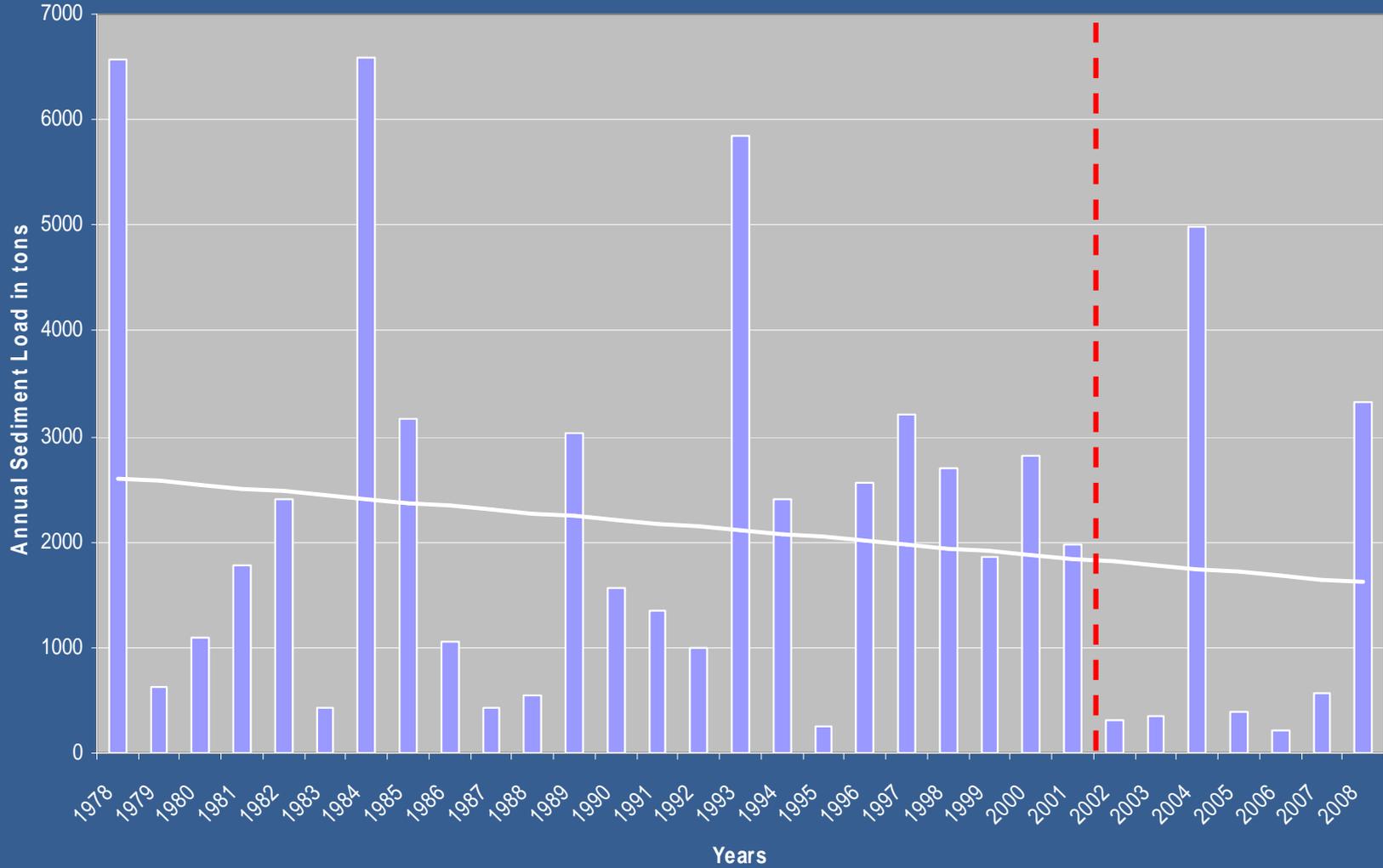
# Comparison of Flood Peaks



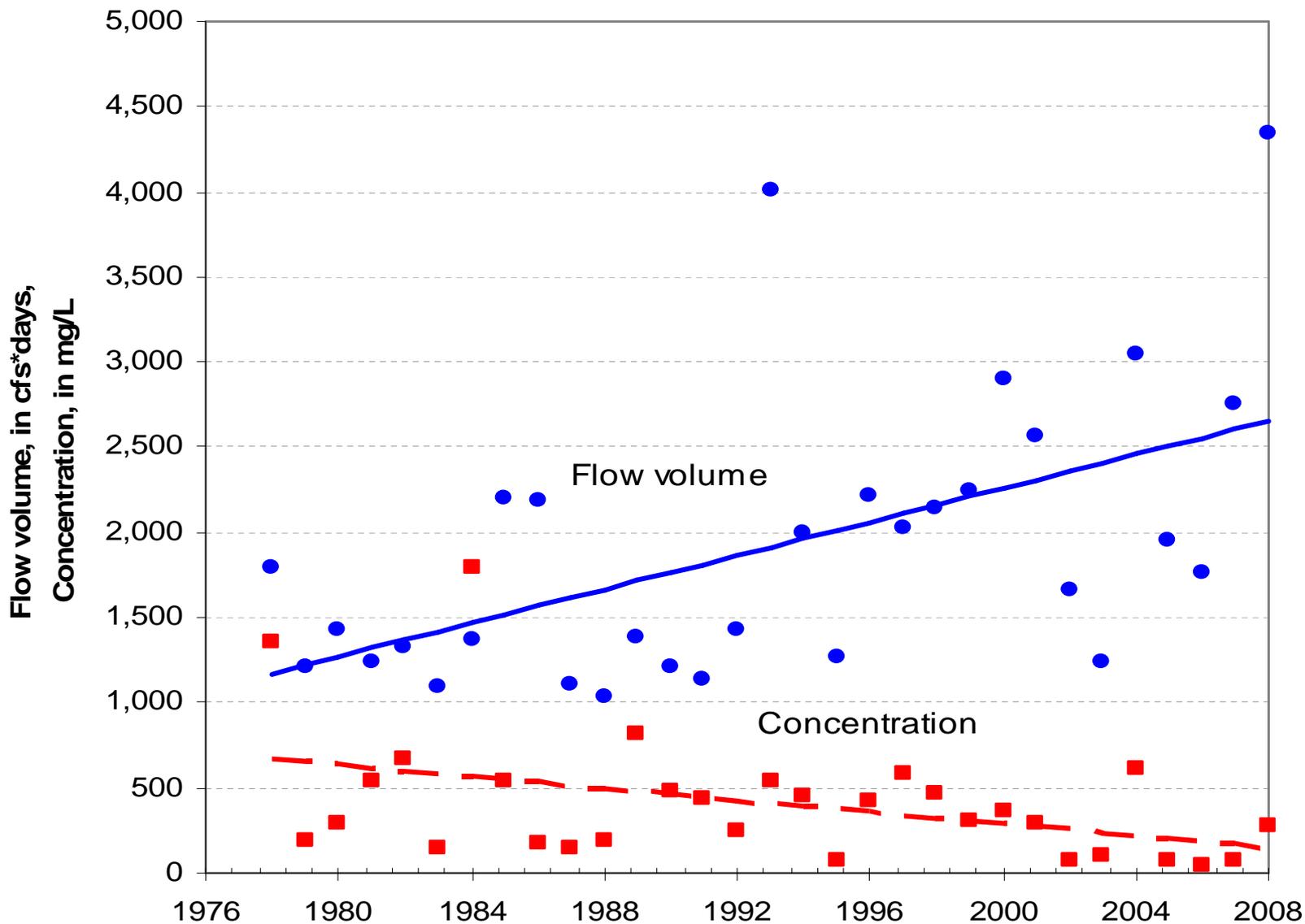
# Water Quality Characteristics

- Sediment concentrations and annual loads
- Total Phosphorus concentrations and annual loads

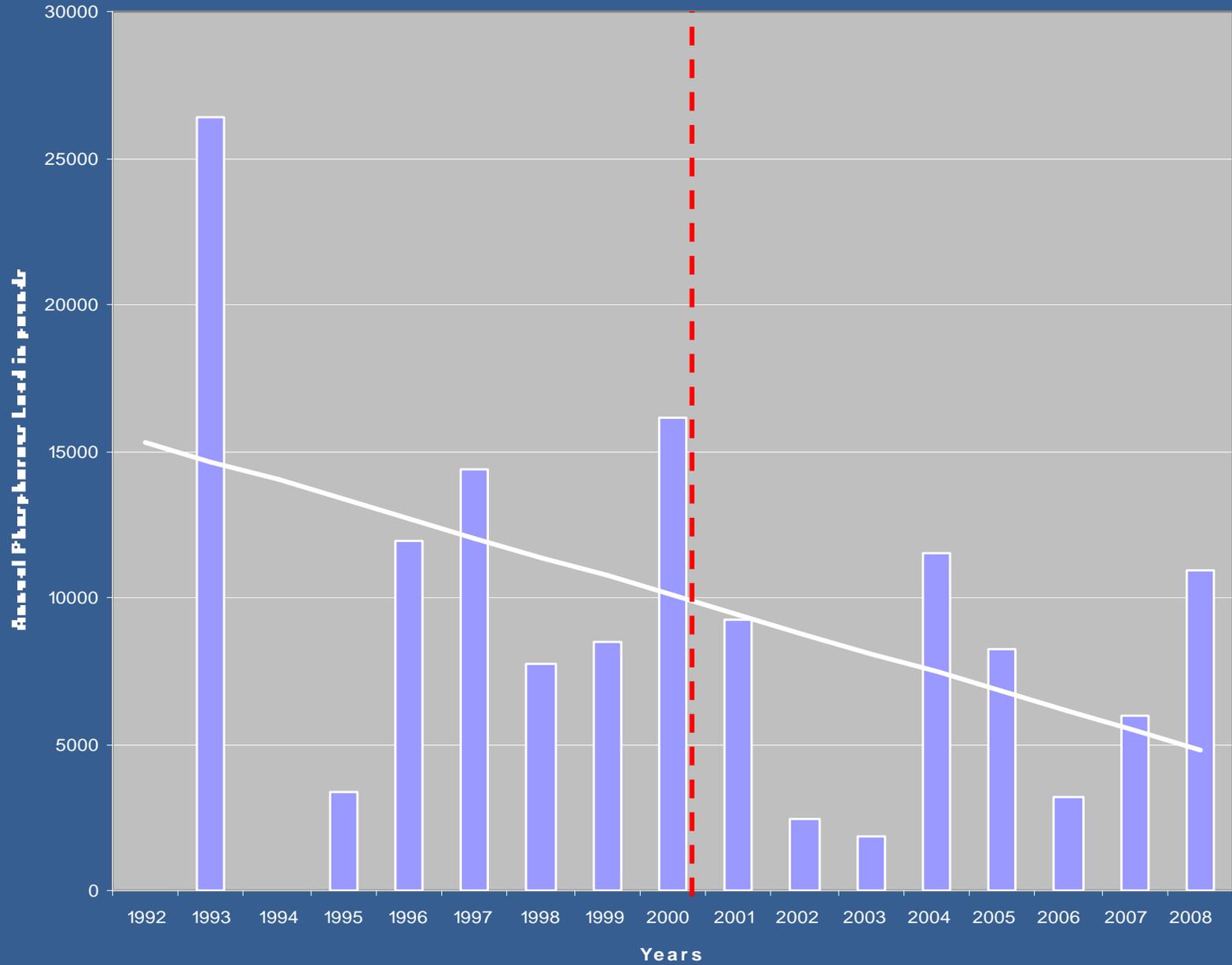
### Pheasant Branch at Middleton Annual Sediment Load



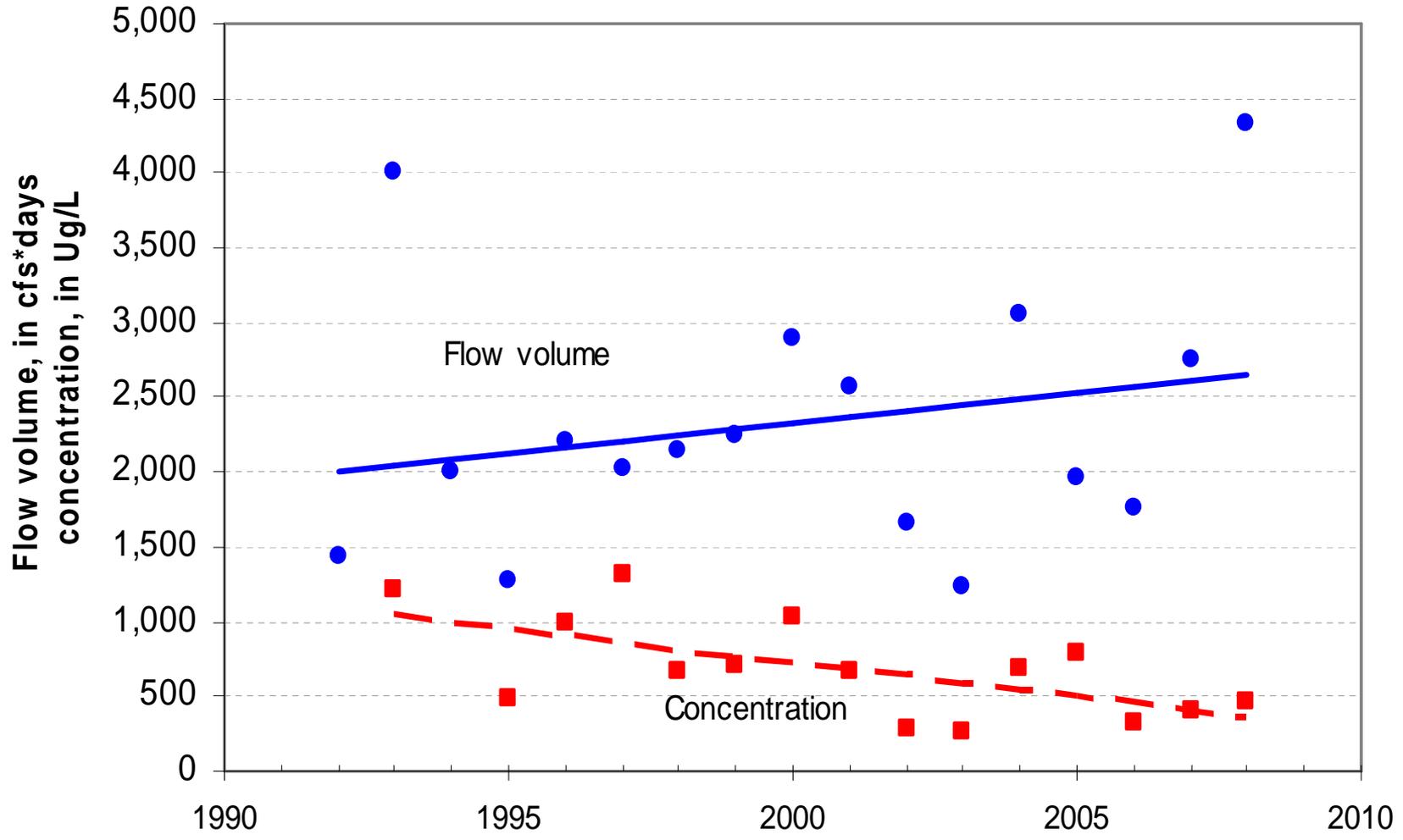
# Trends in annual flow volume and average suspended-sediment concentration for Pheasant Branch, 1978 -2008



# Pheasant Branch Annual Phosphorus Load



Trends in annual flow volume and average phosphorus concentration for Pheasant Branch, 1993-2008



# Annual Sediment and Phosphorus Load for Three Major Streams Tributary to Lake Mendota

Station Number	Stream Name	Contributing Drainage Area (sq mi)	Time Period	Annual Sediment Load (tons)	Annual Sediment Yield (tons per sq mi)	Annual Phosphorus Load (pounds)	Annual Phosphorus Yield (pounds per sq mi)
05427948	Pheasant Branch at Middleton	17.1	1993-2001	2,653	155	12,208	713
			2002-2008*	1450	84.7	6300	368
05427965	Spring Harbor Storm Sewer	3.29	1993-2001	321	97.6	Not Available	Not Available
			2002-2008*	287	87.2	Not Available	Not Available
05427718	Yahara River at Windsor	37.0	1993-2001	2,456	66.3	15,700	424
			2002-2008*	2,010	54.3	15,30	413

\* Runoff was 56% greater for the 2002-08 period compared to the 1993-2001 period.

# Streamflow Characteristics Summary

- Total annual flow increased substantially
- Annual baseflow increased
- Annual flood peaks increased
- Frequency of flood peaks increased
- Flooding trends in Pheasant Branch behave similarly to rural streams contrary to increased urbanization

# Water-Quality Characteristics Summary

- Sediment loads have decreased by 45%
- Phosphorus loads have decreased by 48%

# Conclusions

- Middleton's introduction of BMP's over past 33 years likely has improved streamflow and water quality characteristics

## **Information available in the following report:**

USGS SIR 2012-5014

Evaluation of the Effects of City of Middleton Stormwater –Management Practices on Streamflow and Water-Quality Characteristics of Pheasant Branch, Dane County, Wisconsin, 1975-2008.

Warren A. Gebert, William J. Rose, and Herbert S. Garn