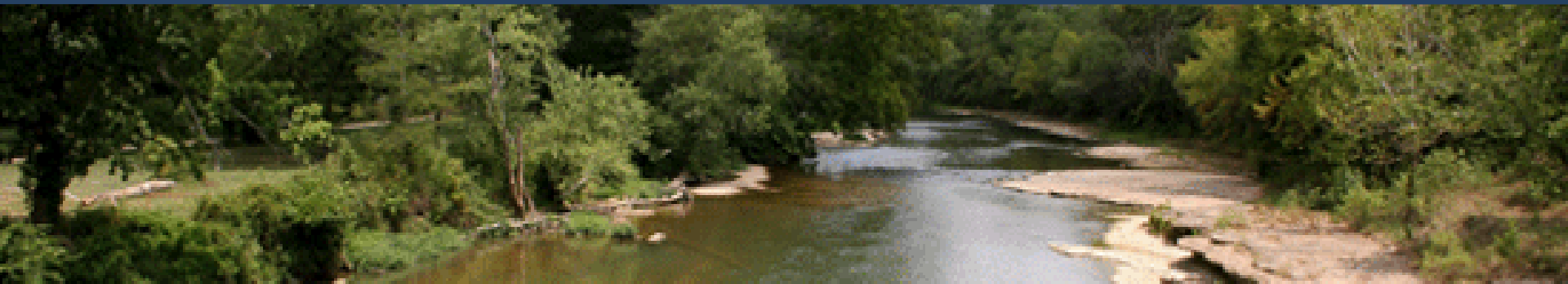


Water Quality Sampling, Analysis and Annual Load Determinations for the Illinois River at Arkansas Highway 59 Bridge, 2008

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UA Division of Agriculture**



Summary 2008

Loads and Flow-Weighted Concentrations

Parameter	Base Load (kg)	Storm Load (kg)	Total Load (kg)
Chloride (Cl)	5,100,000	3,610,000	8,710,000
Sulfate (SO ₄)	5,210,000	5,570,000	10,800,000
Ammonia (NH ₃ -N)	4,770	106,000	111,000
Nitrate (NO ₃ -N)	1,150,000	1,360,000	2,510,000
Soluble Reactive Phosphorus (SRP; PO ₄ -P)	25,800	108,000	134,000
Total Nitrogen (TN)	1,180,000	1,740,000	2,920,000
Total Phosphorus (TP)	34,700	391,000	426,000
Total Suspended Solids (TSS)	2,410,000	165,000,000	167,000,000

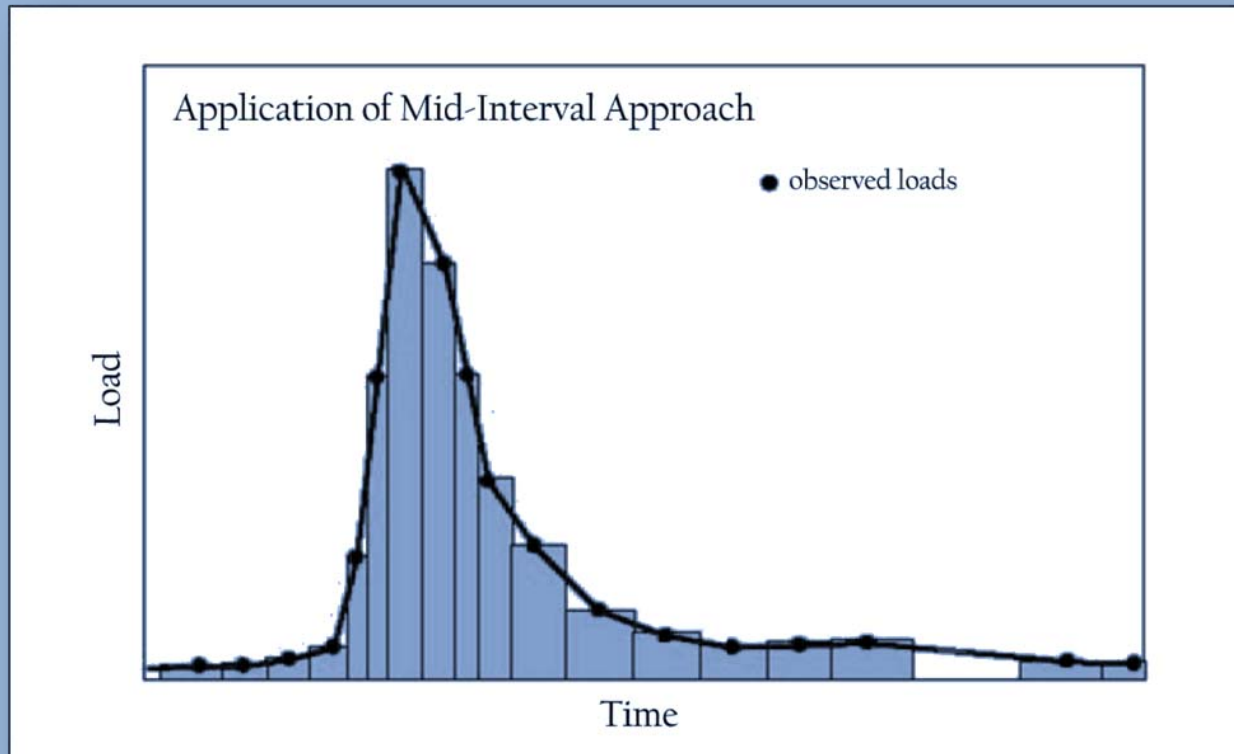
Parameter	Base FWC (mg L ⁻¹)	Storm FWC (mg L ⁻¹)	Overall FWC (mg L ⁻¹)
Chloride (Cl)	13.71	5.65	8.61
Sulfate (SO ₄)	14.02	8.71	10.66
Ammonia (NH ₃ -N)	0.01	0.17	0.11
Nitrate (NO ₃ -N)	3.09	2.12	2.48
Soluble Reactive Phosphorus (SRP; PO ₄ -P)	0.01	0.17	0.13
Total Nitrogen (TN)	3.18	2.71	2.89
Total Phosphorus (TP)	0.09	0.61	0.13
Total Suspended Solids (TSS)	6.5	257	165

Water samples were collected at the AR Highway 59 Bridge during base flow and storm flow events.



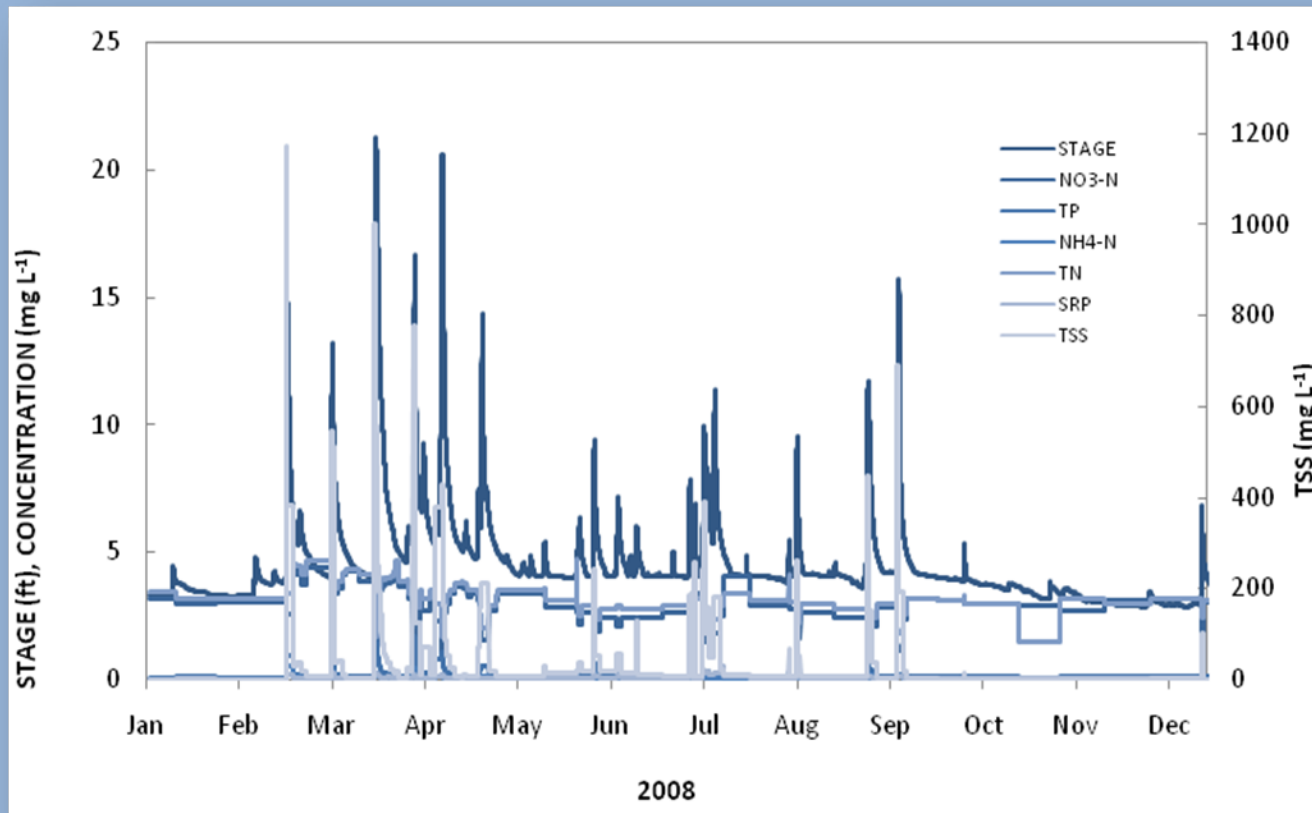
- Stage recorded in 30 min intervals by U.S. Geological Survey to estimate discharge.
- Water samples were collected every other week during base flow, plus composite samples during storm events (i.e., stage exceeded 5 ft).
- Water samples were analyzed at the AWRC WQL for:
 - $\text{NO}_3\text{-N}$
 - $\text{NH}_3\text{-N}$
 - TN
 - TP
 - SRP
 - TSS
 - SO_4
 - Cl
- Annual loads and flow-weighted concentrations of select constituents were calculated for 2008.

Load Determination & Mean Concentration



- Loads (kg)
 - Calculated using the mid-interval approach, and summed into monthly and annual.
- Flow-weighted concentration (mg L^{-1})
 - Total load divided by discharge volume during selected time period (e.g., annual).

Discharge and constituent concentrations were variable throughout the year.



- Total discharge: 1,010,000,000 m³
 - Base flow: 37%
 - Storm flow: 63%
- 26 samples were collected during base flow
- 26 composite samples during storm events

Cl, SO₄, NO₃-N, TN flow-weighted concentrations were greater during base flow.

Parameter	Base FWC (mg L⁻¹)	Storm FWC (mg L⁻¹)	Overall FWC (mg L⁻¹)
Chloride (Cl)	12.12	6.78	8.92
Sulfate (SO₄)	13.45	10.15	11.48
Nitrate (NO₃-N)	2.91	2.03	2.38
Total Nitrogen (TN)	3.03	2.38	2.64

And, SRP, TP, NH₃-N, and TSS flow-weighted concentrations were greater during storm flow.

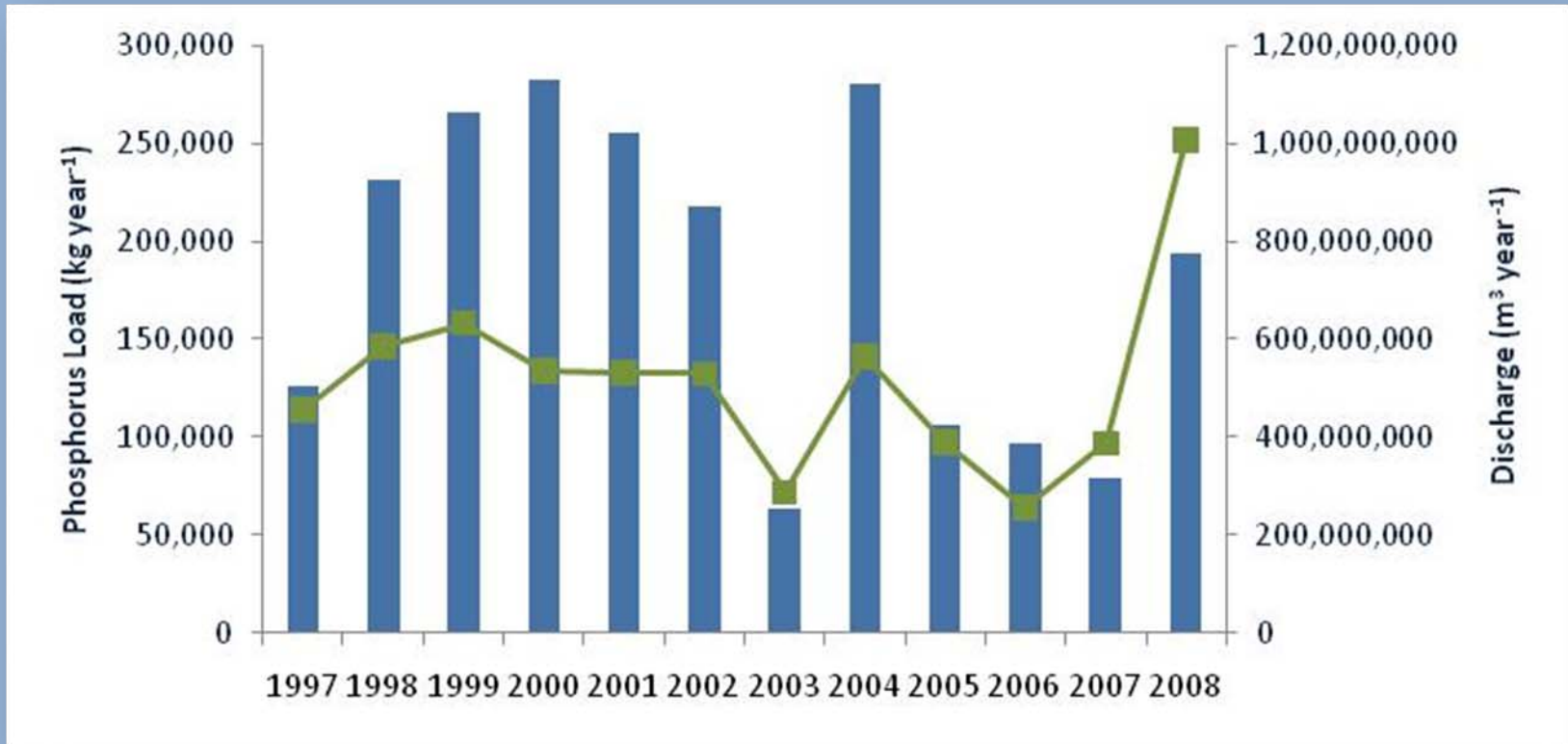
Parameter	Base FWC (mg L⁻¹)	Storm FWC (mg L⁻¹)	Overall FWC (mg L⁻¹)
Ammonia (NH₃-N)	0.02	0.08	0.05
Soluble Reactive Phosphorus (SRP)	0.05	0.13	0.09
Total Phosphorus (TP)	0.07	0.29	0.20
Total Suspended Solids (TSS)	6.65	70.24	44.73

The constituent loads at Illinois River varied by orders of magnitude between months.

Month	Base Flow Loads			Storm Flow Loads			Total Loads		
	Total Nitrogen (TN, kg)	Total Phosphorus (TP, kg)	Total Suspended Solids (TSS, kg)	Total Nitrogen (TN, kg)	Total Phosphorus (TP, kg)	Total Suspended Solids (TSS, kg)	Total Nitrogen (TN, kg)	Total Phosphorus (TP, kg)	Total Suspended Solids (TSS, kg)
January	62,400	1,030	21,000	0	0	0	62,400	1,030	21,000
February	102,000	1,770	138,000	182,000	35,600	14,500,000	284,000	37,400	14,700,000
March	113,000	2,330	143,000	586,000	176,000	66,800,000	699,000	179,000	67,000,000
April	31,400	746	60,700	609,000	135,700	54,700,000	640,000	136,000	54,700,000
May	159,000	5,400	528,000	15,300	997	190,000	174,000	6,390	717,000
June	115,000	5,023	569,000	56,500	8,720	2,550,000	171,000	13,700	3,120,000
July	111,000	3,240	346,000	128,000	11,000	8,120,000	239,000	14,320	8,460,000
August	107,000	3,740	318,000	22,800	4,800	1,990,000	129,000	8,540	2,310,000
September	123,000	3,480	175,000	127,000	16,600	15,500,000	250,000	20,100	15,600,000
October	126,000	4,390	50,900	2,410	84	12,000	129,000	4,470	62,800
November	65,700	2,000	20,500	0	0	0	65,700	2,000	20,500
December	67,800	1,590	42,400	7,750	1,580	323,000	75,500	3,160	366,000

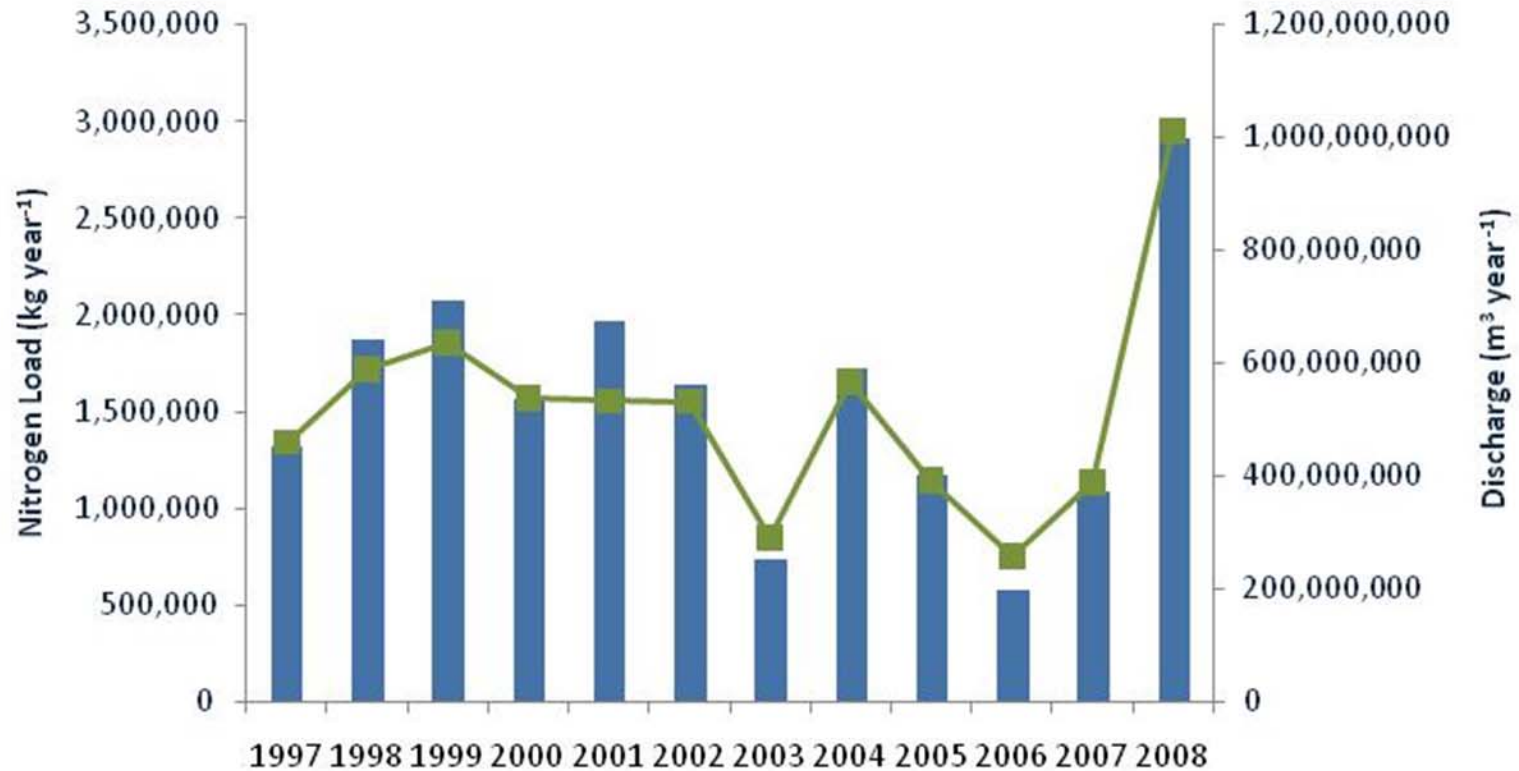
- Monthly loads were variable depending on the frequency of storm event during the month.
 - Greatest loads during spring (March & April)
 - Lowest loads during fall and winter
 - No storms in January or November

Phosphorus loads have been variable following the general trend in annual discharge.

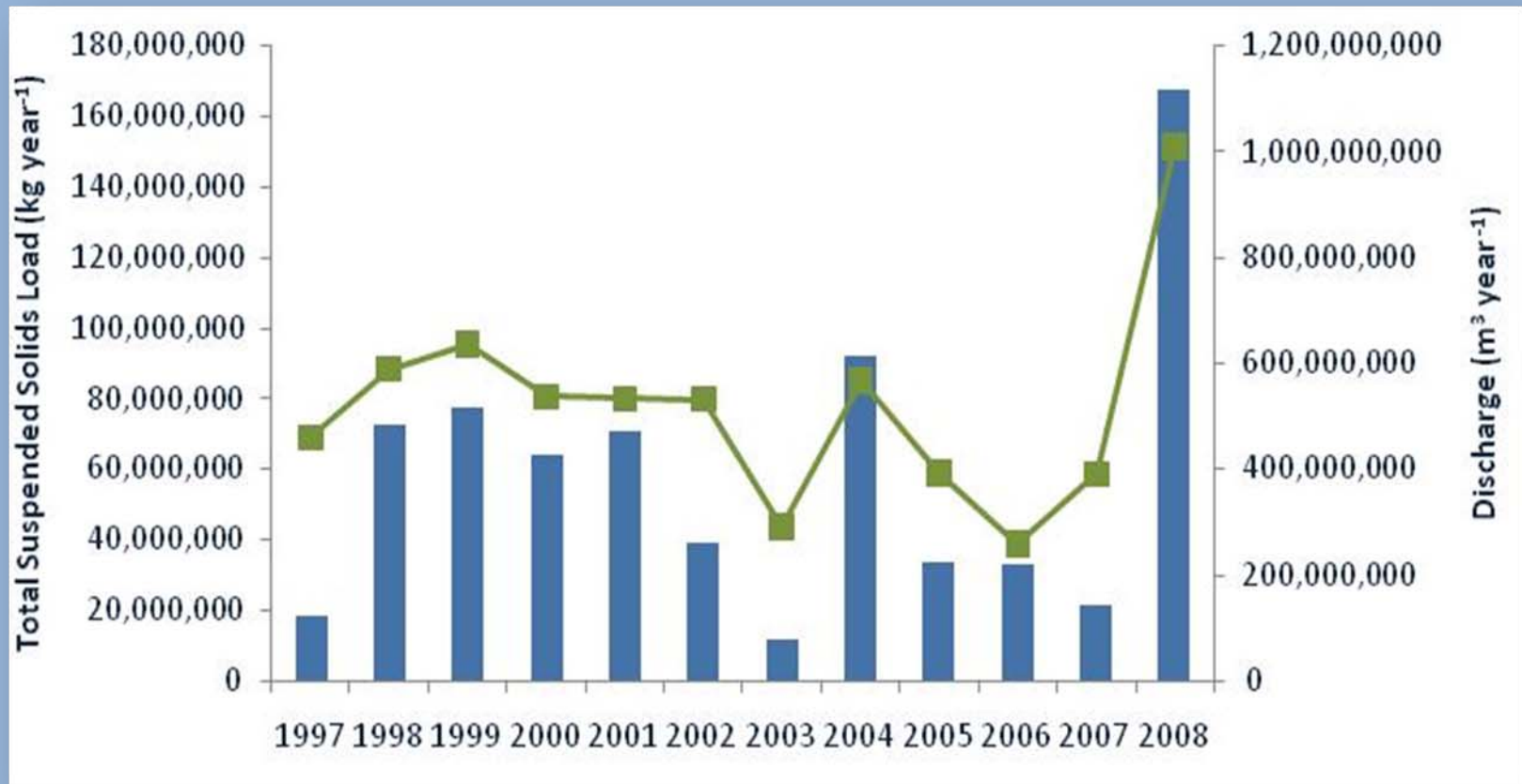


Phosphorus loads in 2008 were 2.5 times greater than 2007 loads, but were less than those reported in 1998 through 2002.

Nitrogen loads in 2008 were the greatest since monitoring started in 1997.



Total suspended solids loads in 2008 were also the greatest since monitoring started.



Summary 2008

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Soluble Reactive Phosphorus (SRP; PO ₄ -P)	0.01	0.17	0.13
Total Nitrogen (TN)	3.18	2.71	2.89
Total Phosphorus (TP)	0.09	0.61	0.13
Total Suspended Solids (TSS)	6.5	257	165

What about the data collected from January to June 2009?

Parameter	Base Load (kg)	Storm Load (kg)	Total Load (kg)
Chloride (Cl)	2,280,000	1,900,000	4,180,000
Sulfate (SO ₄)	2,530,000	2,850,000	5,380,000
Ammonia (NH ₃ -N)	3,260	22,300	25,600
Nitrate (NO ₃ -N)	548,000	570,000	1,120,000
Soluble Reactive Phosphorus (SRP; PO ₄ -P)	8,550	36,000	44,500
Total Nitrogen (TN)	570,00	669,000	1,239,000
Total Phosphorus (TP)	13,600	80,800	94,300
Total Suspended Solids (TSS)	1,250,00	19,700,000	20,990,000

- Total discharge was 469,000,000 m³
 - Base flow: 40%
 - 13 base flow samples collected
 - Storm flow: 60%
 - 22 composite storm sampled

Monitoring is on-going at this site.

- Water quality sampling and load estimation is being continued at the Illinois River.
- The monitoring program has changed, collecting more frequent samples on fixed intervals (i.e., weekly) plus storm chasing.
- The partial loads from 2009 combined with the continued monitoring data will be used to calculate annual loads for CY 2009.

Take Home Message: Total constituent loading is dependent on annual discharge volume which is closely tied to the frequency and duration of storm events.

QUESTIONS?

