

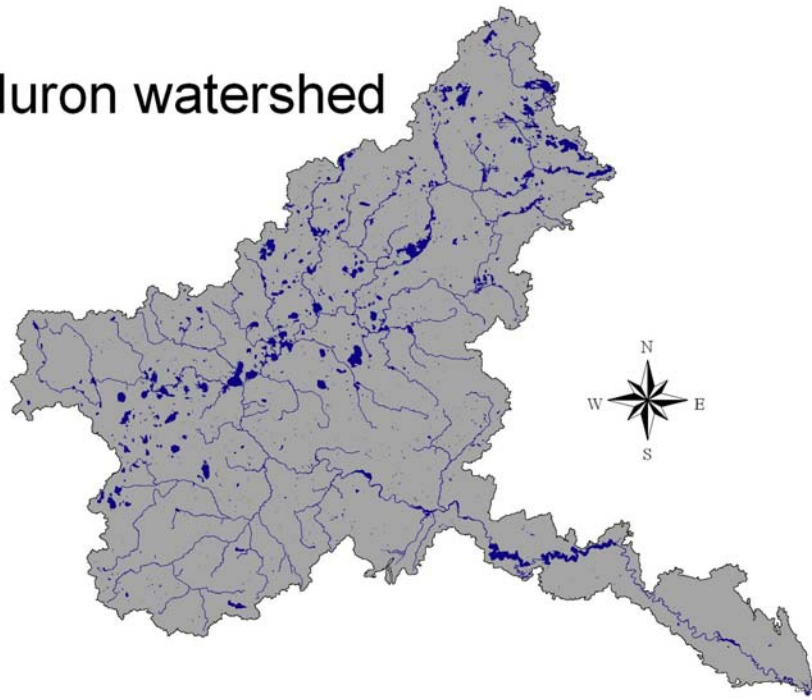
# **An analysis of catchment nutrient inputs compared to riverine exports**

Nathan Bosch  
J. David Allan

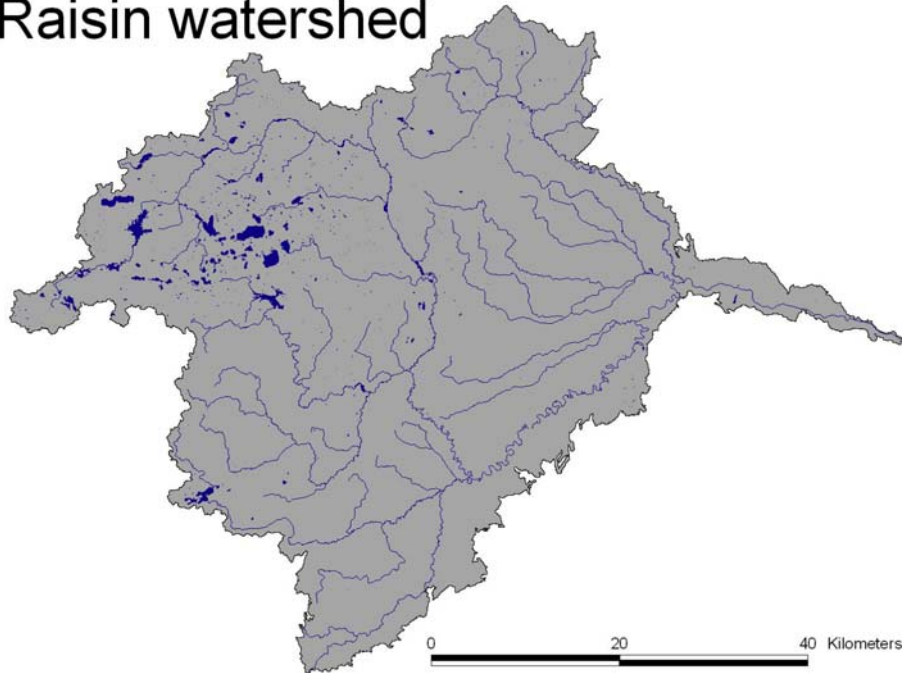
March 18, 2008



Huron watershed



Raisin watershed



	Huron	Raisin
Forest	28%	11%
Agriculture	42%	75%
Urban	10%	4%
Number of impoundments	88	14
Residence time (days)	139	9

# Nitrogen budgeting:

## Inputs

Atmospheric  
deposition



Fertilizer use



N fixation



SYSTEM

Watershed

## Outputs

Volatilization



Food &  
Feed export



River export



# Phosphorus budgeting:

## Inputs

Precipitation



Fertilizer use



Manure



Sludge



Point source



SYSTEM

Watershed  
soil and  
water

## Outputs

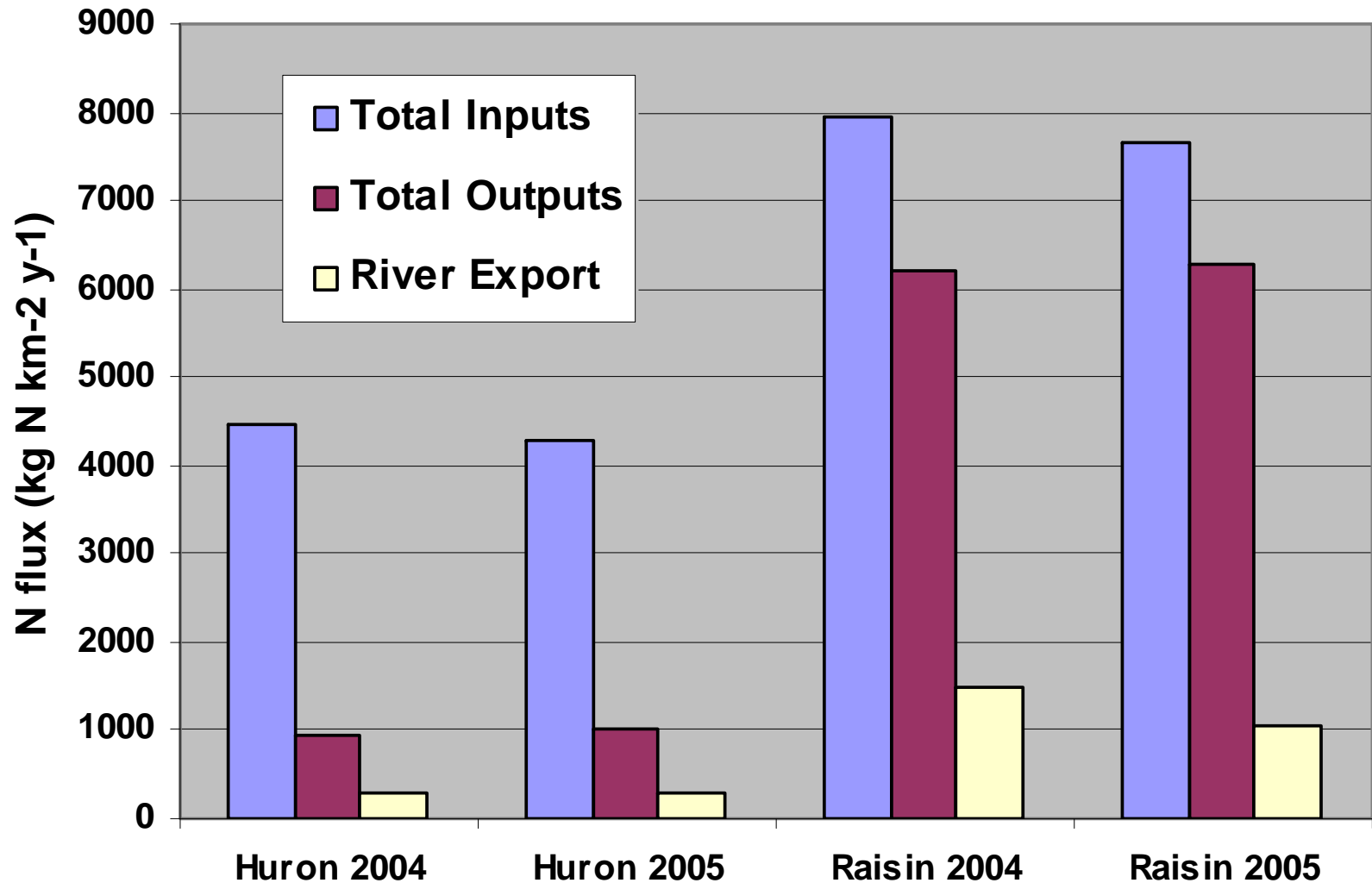
Crop export



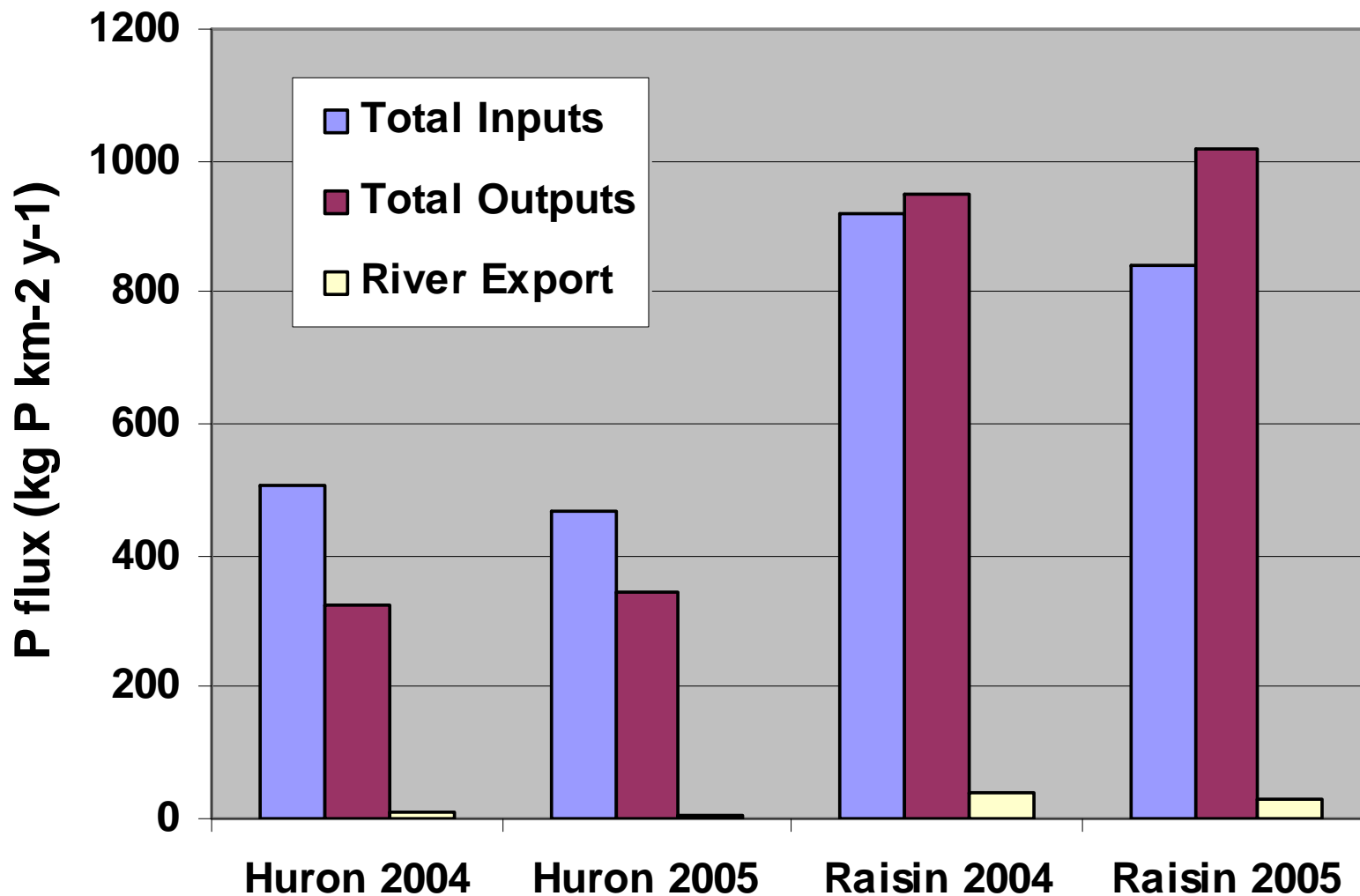
River export



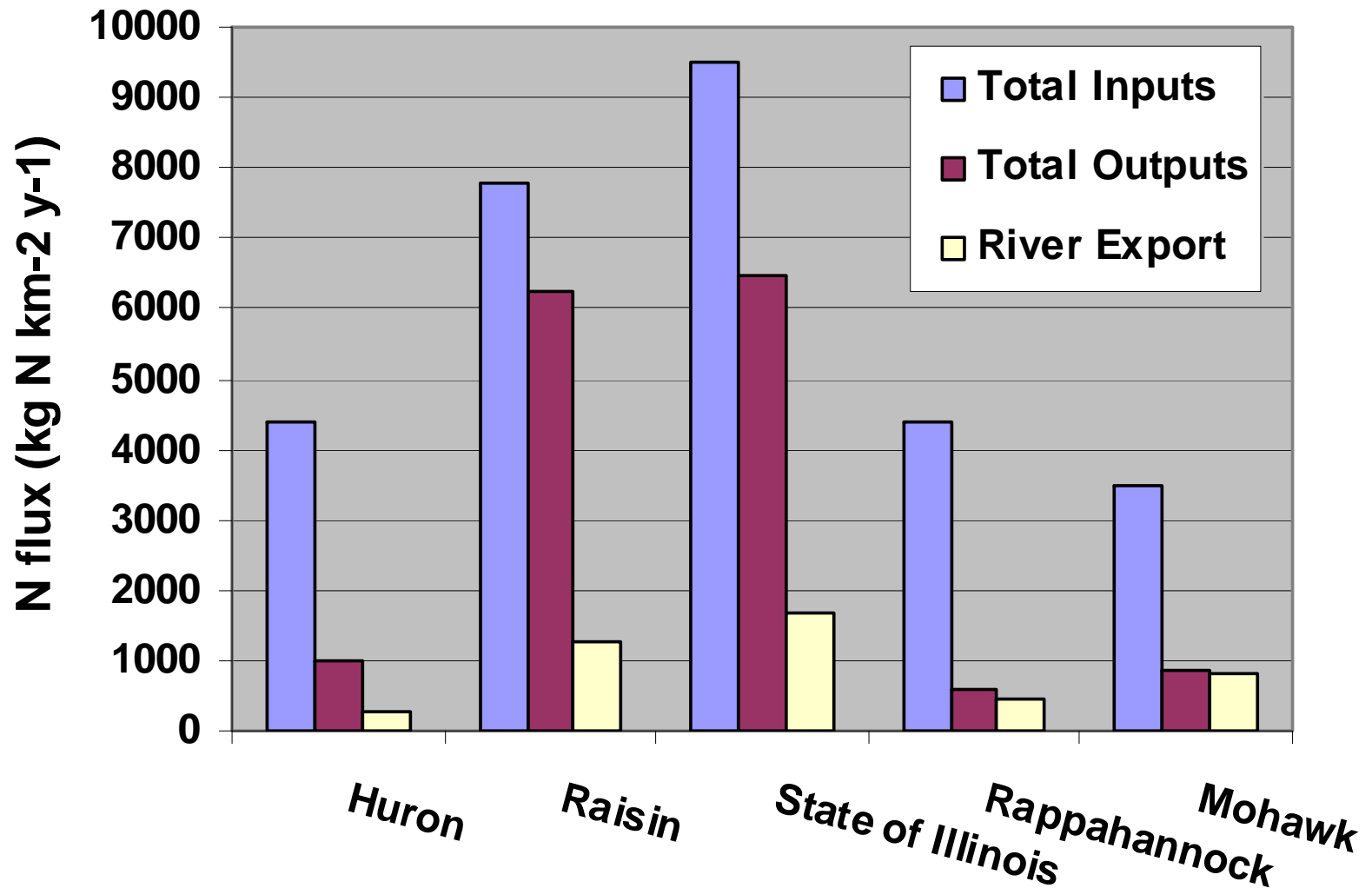
# Nitrogen budget results:



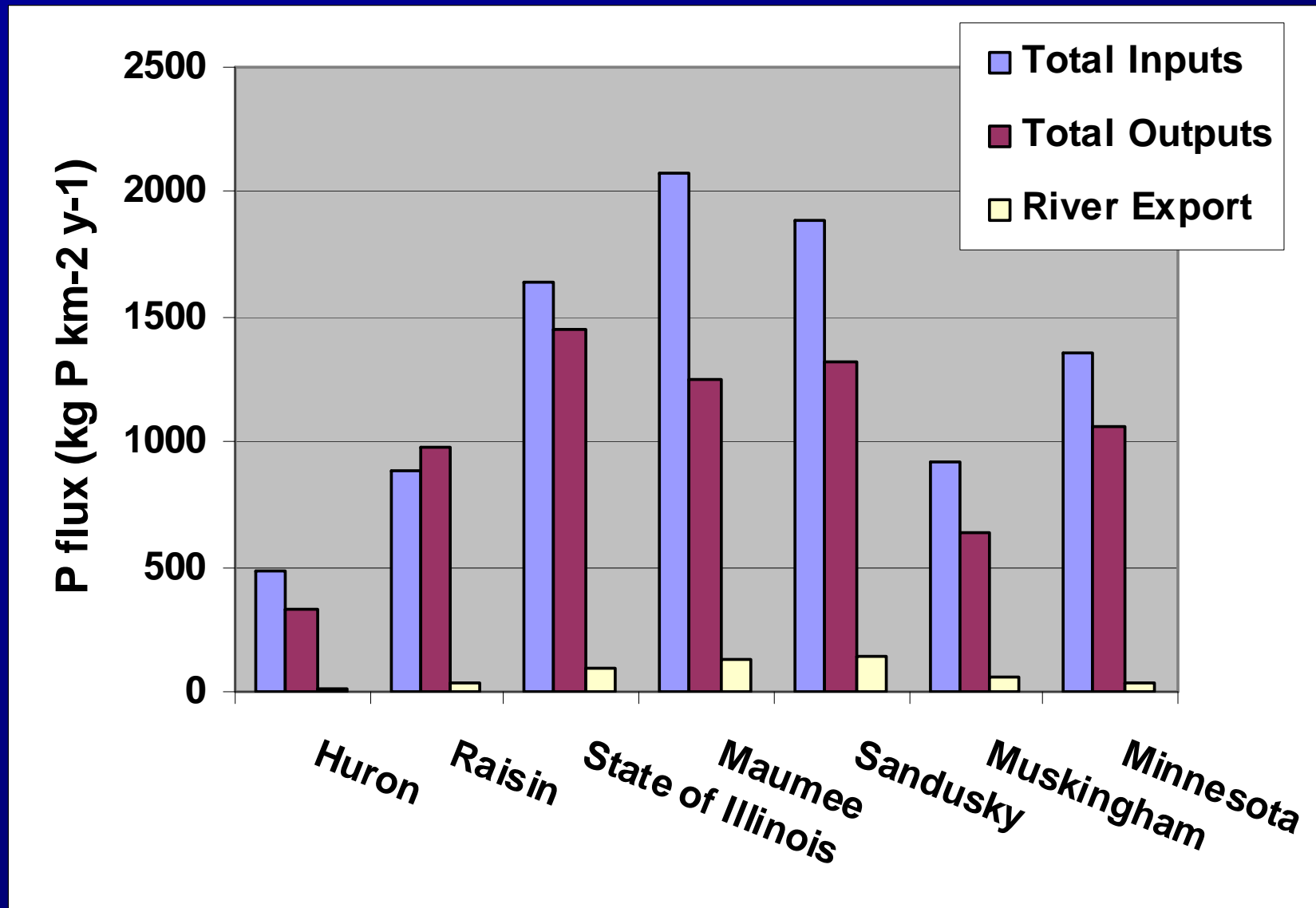
# Phosphorus budget results:



# Nitrogen budget comparisons:



# Phosphorus budget comparisons:





# N budgets

Geographic unit	Atm Dep	Fert App	N Fix	Food & feed import	Total N inputs	Vol	Food & feed export	River exp	Total N outputs	% N inputs exp by rivers
Huron	954	1846	1586		4386	37	659	288	984	6.6%
Raisin	954	4171	2663		7788	55	4928	1268	6250	16.3%
Mohawk	1130	411	1309	624	3474	56		795	851	22.9%
Rappahannock	1028	1030	1716	607	4381	134		470	604	10.7%
All NE U.S.	1067	474	907	748	3196	108		718	826	22.5%
State of Illinois	520	5930	3050		9500	77	6240	1670	6484	17.6%

Taken from Table 9 in Bosch & Allan (2008)

# P budgets

Geographic unit	Prec	Fert App	Manure	Sludge	Pnt sourc disch	Total P in	Crop exp	Riv exp	Total P out	% P in exp by rivers
Huron	14	275	90	103	6	489	326	7	333	1.3%
Raisin	14	630	172	62	3	881	949	34	983	3.9%
Maumee	14	1550	450	43	14	2071	1115	135	1250	6.5%
Sandusky	14	1470	360	27	10	1881	1175	140	1315	7.4%
State of Illinois	14	1180	240	136	68	1638	1353	100	1453	6.1%
Muskingham	14	322	372	151	66	925	581	61	642	6.6%
Minnesota	14	872	460	5	5	1356	1028	32	1060	2.4%
Mississippi	14	346	336	41	20	757	466	42	507	5.5%

Taken from Table 8 in Bosch & Allan (2008)

# Uncertainty/Limitations

- Budgeting
  - Septic tanks
  - Denitrification
  - Different approaches
- Nutrient processing
  - Terrestrial (land-use, BMPs, etc)
  - Aquatic (wetlands, impoundments, etc)

# Take-home messages

- Huron River exports relatively less of the nutrient inputs to its watershed, compared with the Raisin (impoundments, LULC)
- Combining data from other studies, rivers export an average of 16% and 5% of total N and P watershed inputs respectively
- Variation in export due to budgeting approach and watershed processing

# Acknowledgments



- Tom Johengen, U. Michigan
- Haejin (Jinny) Han, U. Michigan
- Pete Richards, Heidelberg College