USGS
science for a changing world

Results of data analysis on Nitrogen, Phosphorus, and Suspended Sediment fluxes from the Susquehanna River to the Bay in Tropical Storm Lee, 2011

Based on a report by:
Robert M. Hirsch,
Research Hydrologist, USGS
Presentation by Scott Phillips

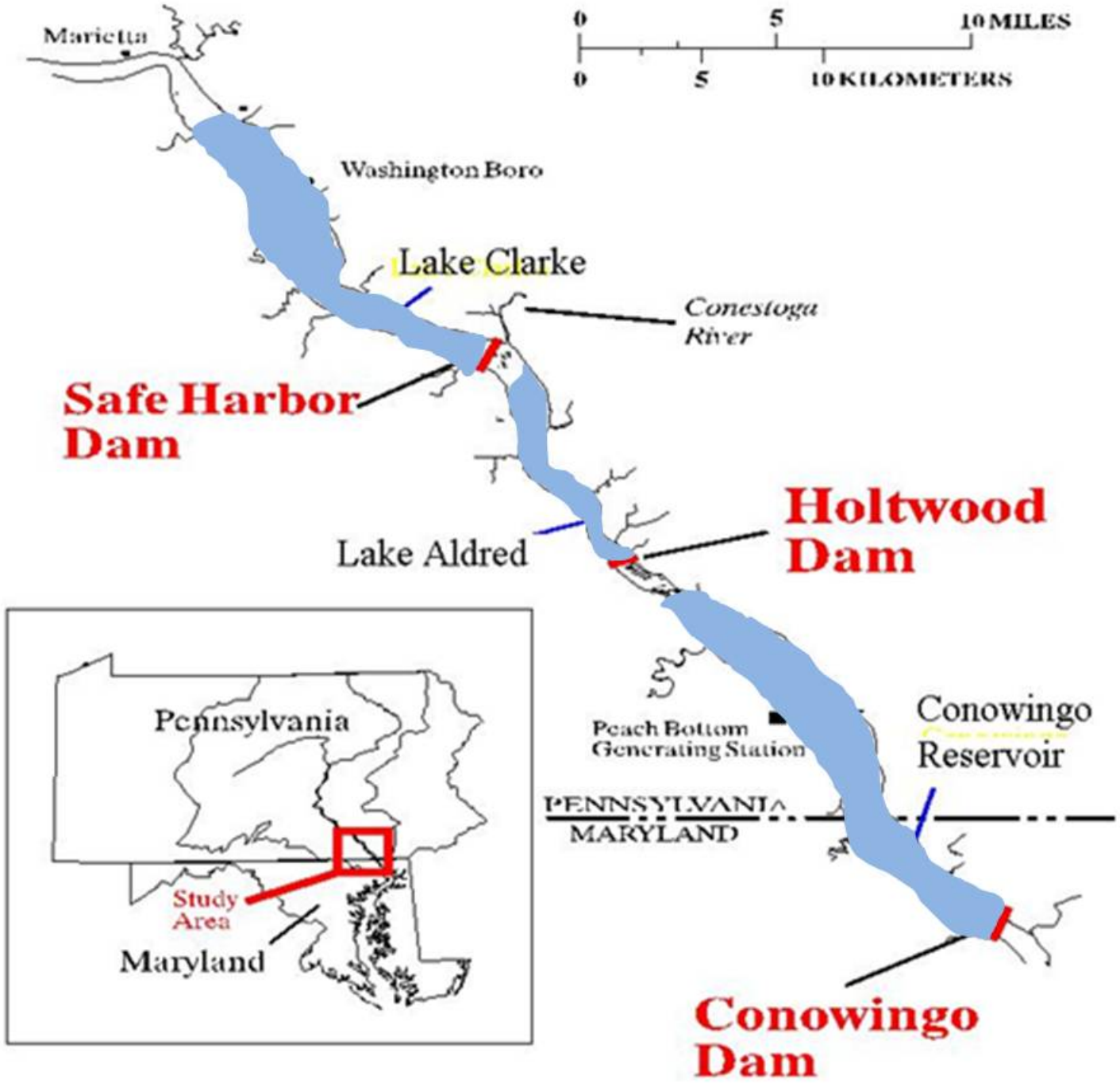
Report

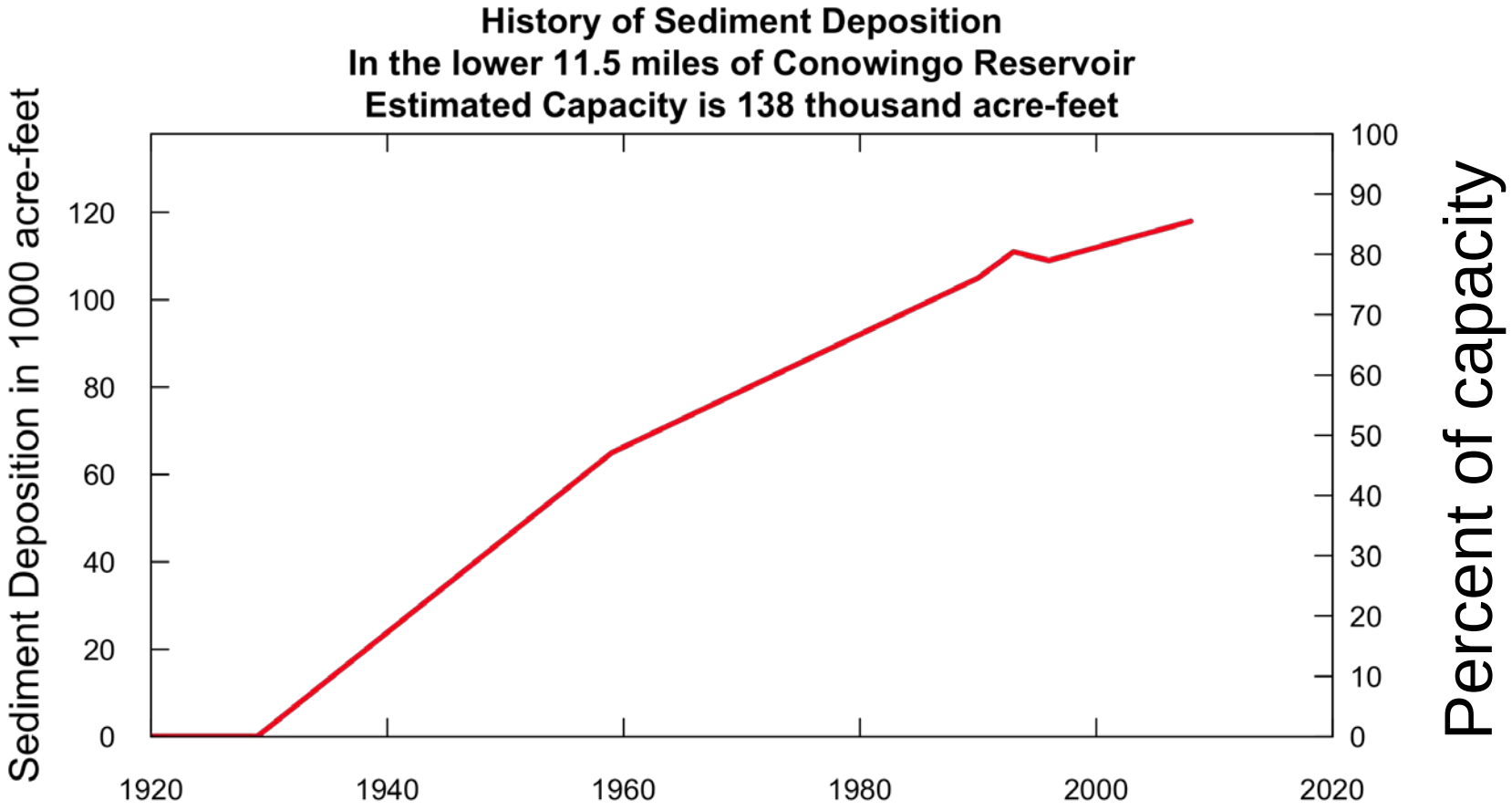
- TS Lee
- Loads
- Influence of reservoirs

Photo credit:
NASA MODIS,
Sept. 13, 2011

USGS

	T.S. Lee as a % of 2011	T.S. Lee as a % of last decade	T.S. Lee as a % of full record (1978)
Time	2%	0.2%	0.06%
Flow	12%	1.8%	0.6%
Total Nitrogen	31%	5%	1.8%
Total Phosphorus	61%	22%	9%
Suspended Sediment	78%	39%	22%

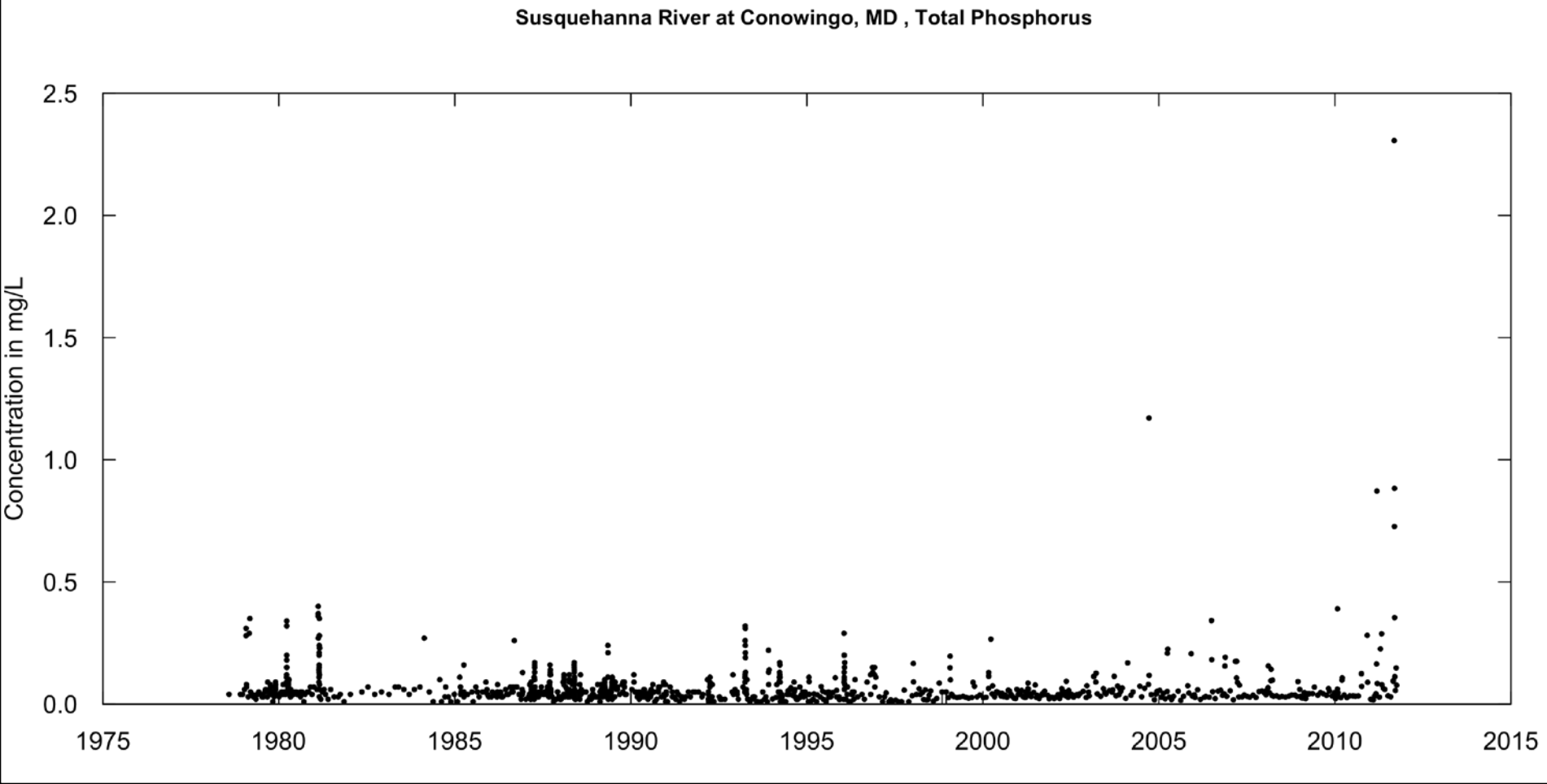

Marietta
0 5 10 MILES
0 5 10 KILOMETERS
Washington Boro
Lake Clarke
Conestoga River
Safe Harbor Dam
Holtwood Dam
Lake Aldred
Pennsylvania
Study Area
Maryland
Peach Bottom Generating Station
Conowingo Reservoir
PENNSYLVANIA
MARYLAND
Conowingo Dam



Source: Langland, 2009, USGS
http://pubs.usgs.gov/sir/2009/5110/

Two techniques to estimate trends:

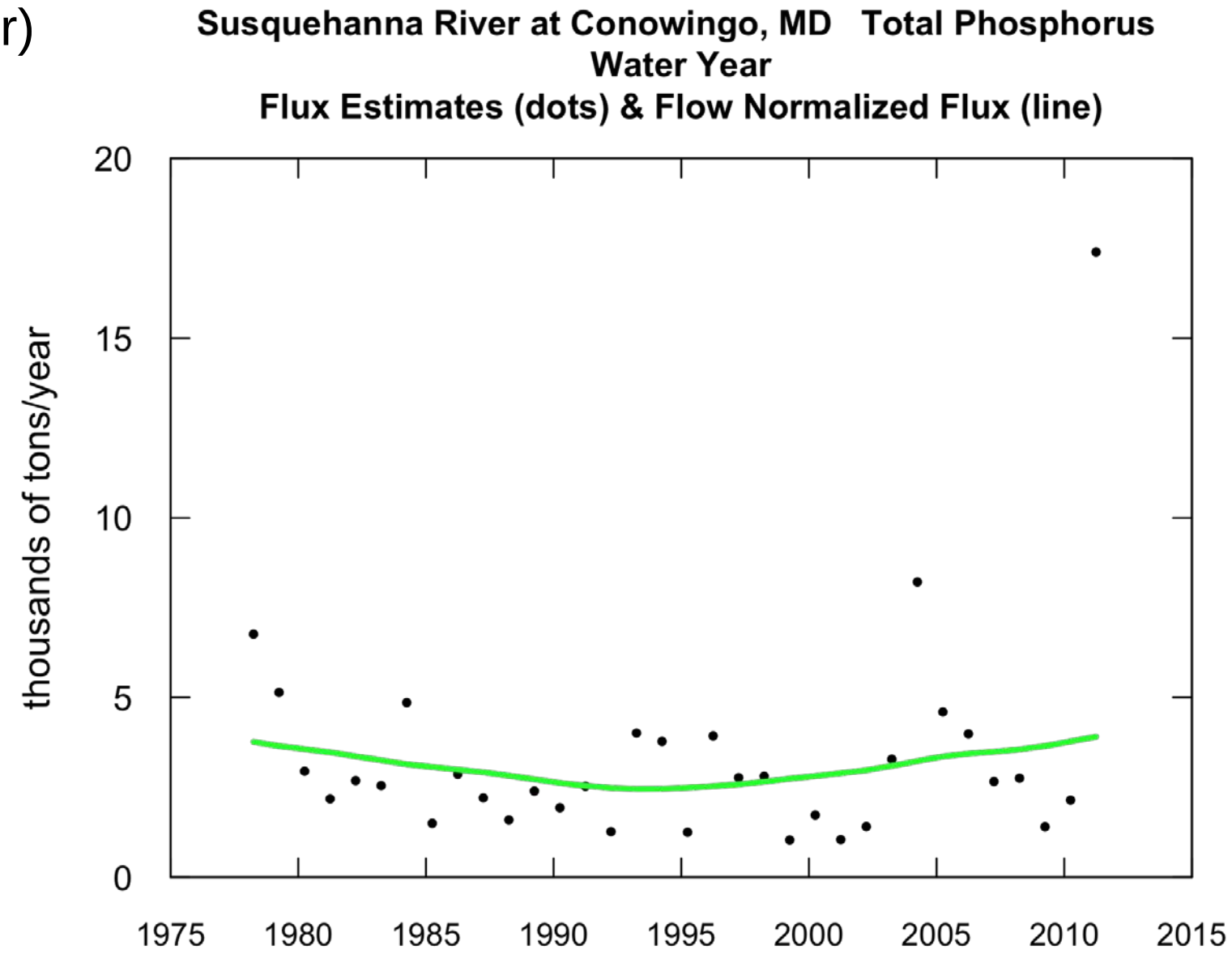
- Concentration or “levels in water”
- Flux/loads or “total amount”(new technique)
- Both adjust for variability in flow



Annual Load of Phosphorus

(In 10^3 tons/yr)

Flow Normalized Load Up 55% Since 1996



Messages about TP and Sediment

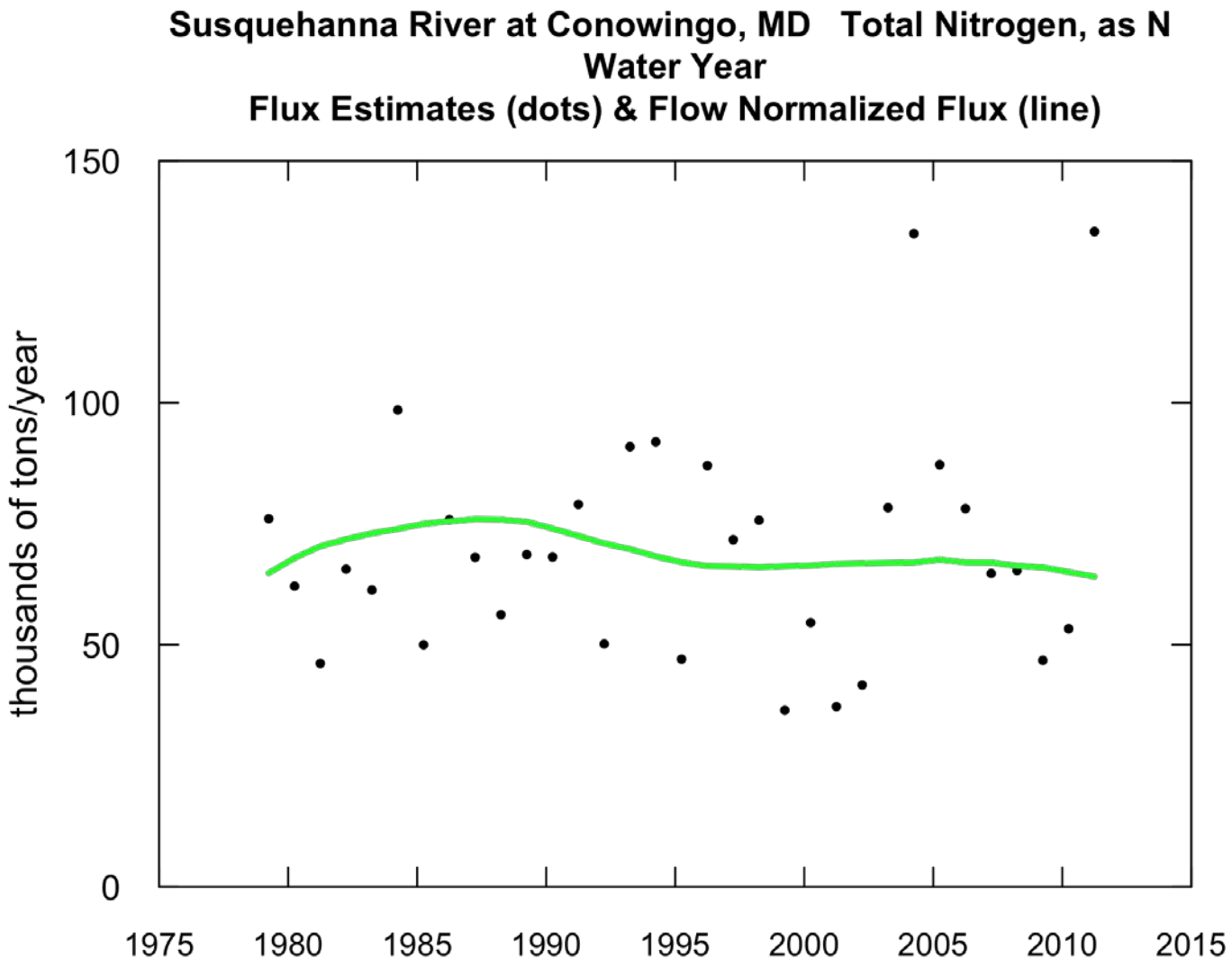
- Concentrations are relatively stable at moderate and low flows, increasing during storms
- 2011: highest recorded loads for TP and sediment
- Loads risen since mid-1990s: TP: 55%: Sed: 97%
- Conowingo Reservoir not trapping as much sediment
- Upstream river sites show TP decreases
- Practices are working in many areas of Susq. but may be counter balanced by reservoir filling.

USGS

Annual Load of Nitrogen

(In 10^3 tons/yr)

Flow Normalized Load Change Since 1996 -3%



Take home messages: TN

- Total Nitrogen concentrations are continuing to decline at most discharges, but some increase during storms.
- 2011 was near record, and load getting more variable over time.
- Flow-normalized flux continues to decline.
  - -Down about 3% since 1996.
  - -16 % since mid 1980s
  - -Management practices working

USGS

Potential impacts when Conowingo reaches capacity

	Change since 1996	Predicted change when reservoirs "filled"
TN	-3%	+2%
TP	+55%	+70%
SS	+97%	+250%

USGS

Implications:

- As the reservoirs fill:
  - This leads to more frequent scour of sediment/TP
  - Decrease in the amount of sediment and TP that can be trapped
- Increase in sediment and phosphorous loads
- Upstream practices to reduce P and sediment may be counter balanced by reservoir effects
- More difficult to achieve standards in upper Bay
  - Water clarity most impacted; less for DO

USGS

Next steps and Questions

- USACE study on options addressing reservoirs
- Nutrient and sediment allocations
  - 2017 assessment of TMDL
- New USGS report on trend in loads
- chesapeake.usgs.gov

USGS