



# **Nitrogen, Phosphorus, and Suspended Sediment Loads from the Susquehanna River to the Bay in Tropical Storm Lee, 2011 and Effects of Reservoir Sedimentation**

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**Based on a report by:**

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# Report

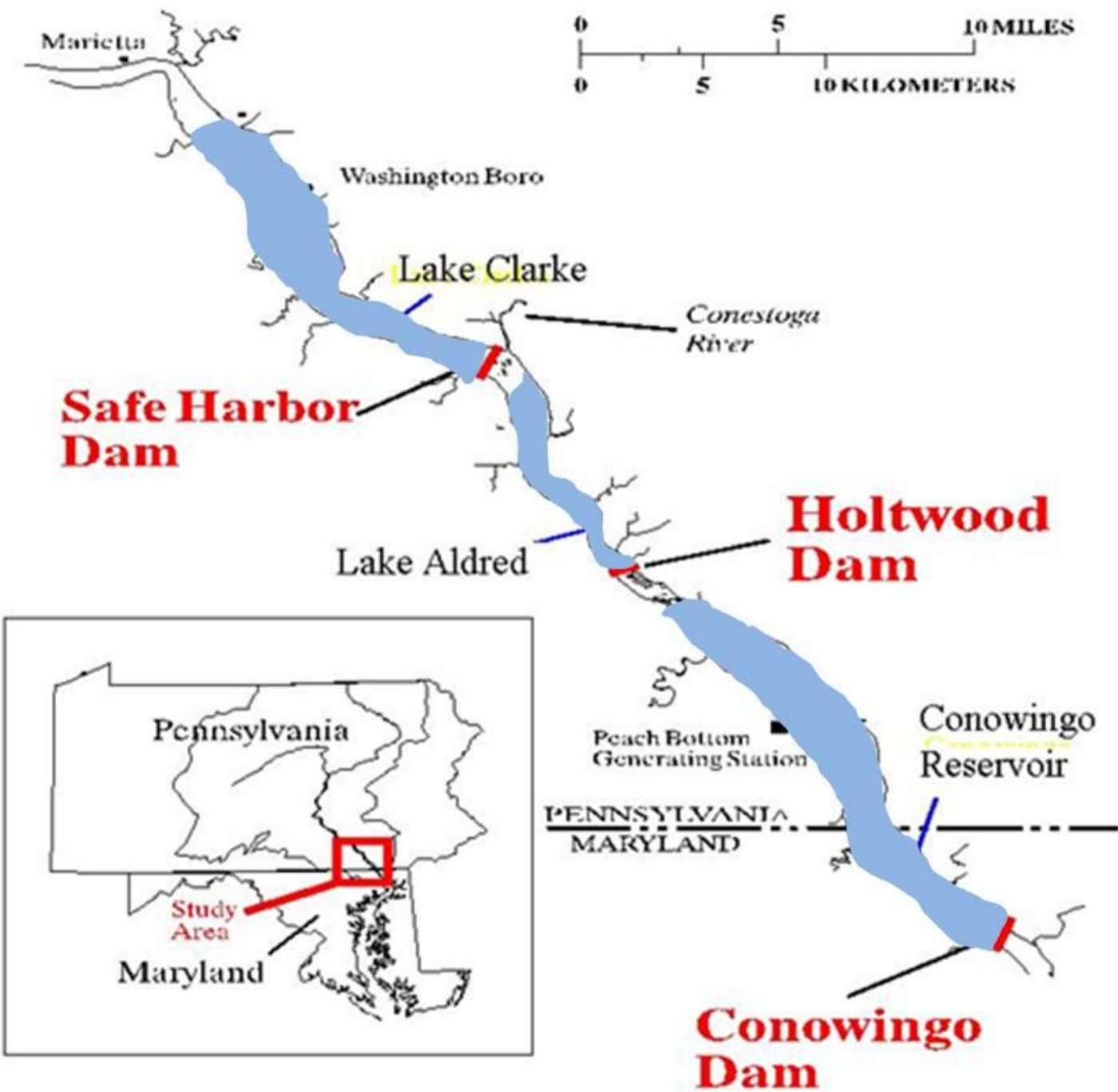
- TS Lee
- Loads
- Influence of reservoirs

## Susquehanna:

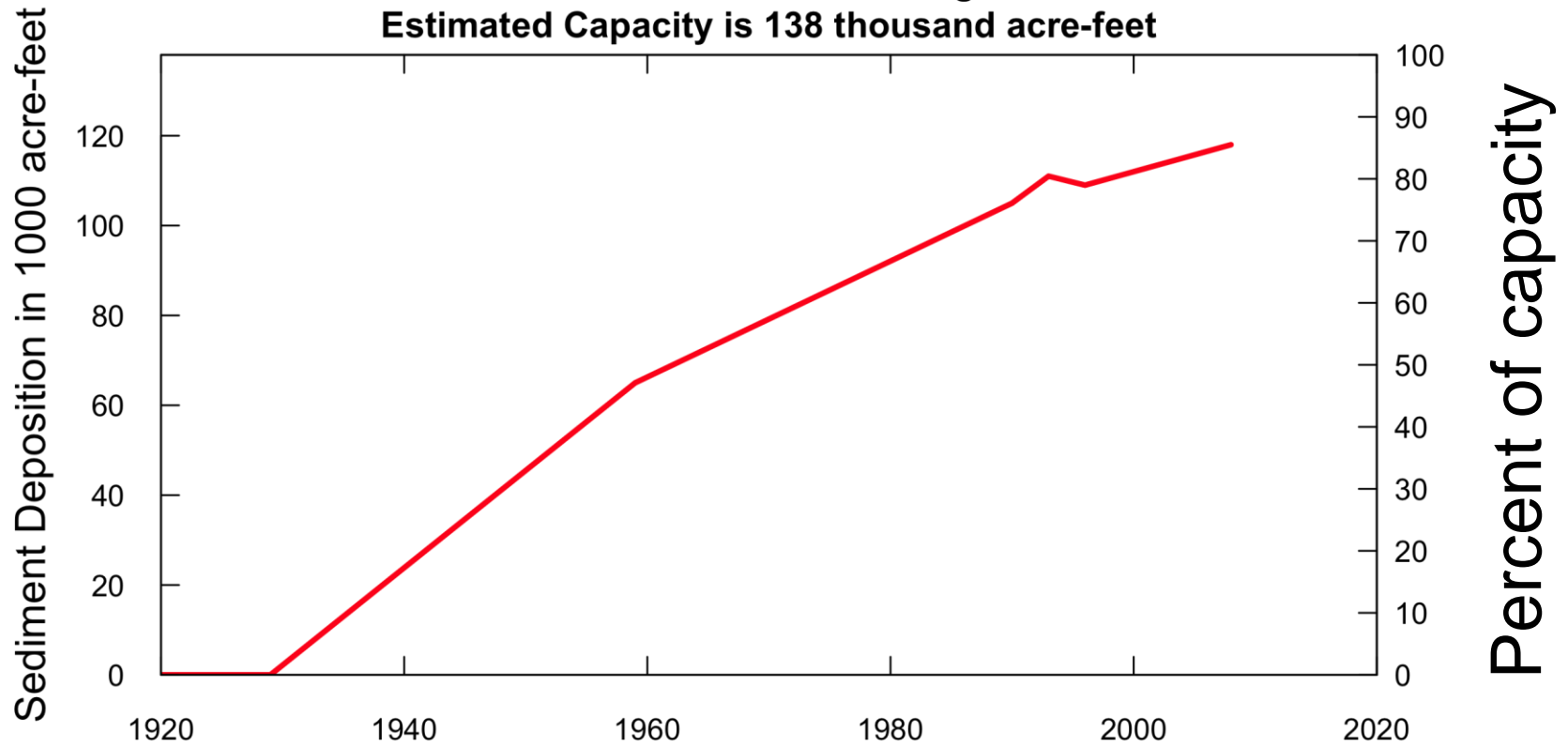
- 41% of N
- 25% of P
- 27% of Sed.



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



**History of Sediment Deposition  
In the lower 11.5 miles of Conowingo Reservoir  
Estimated Capacity is 138 thousand acre-feet**

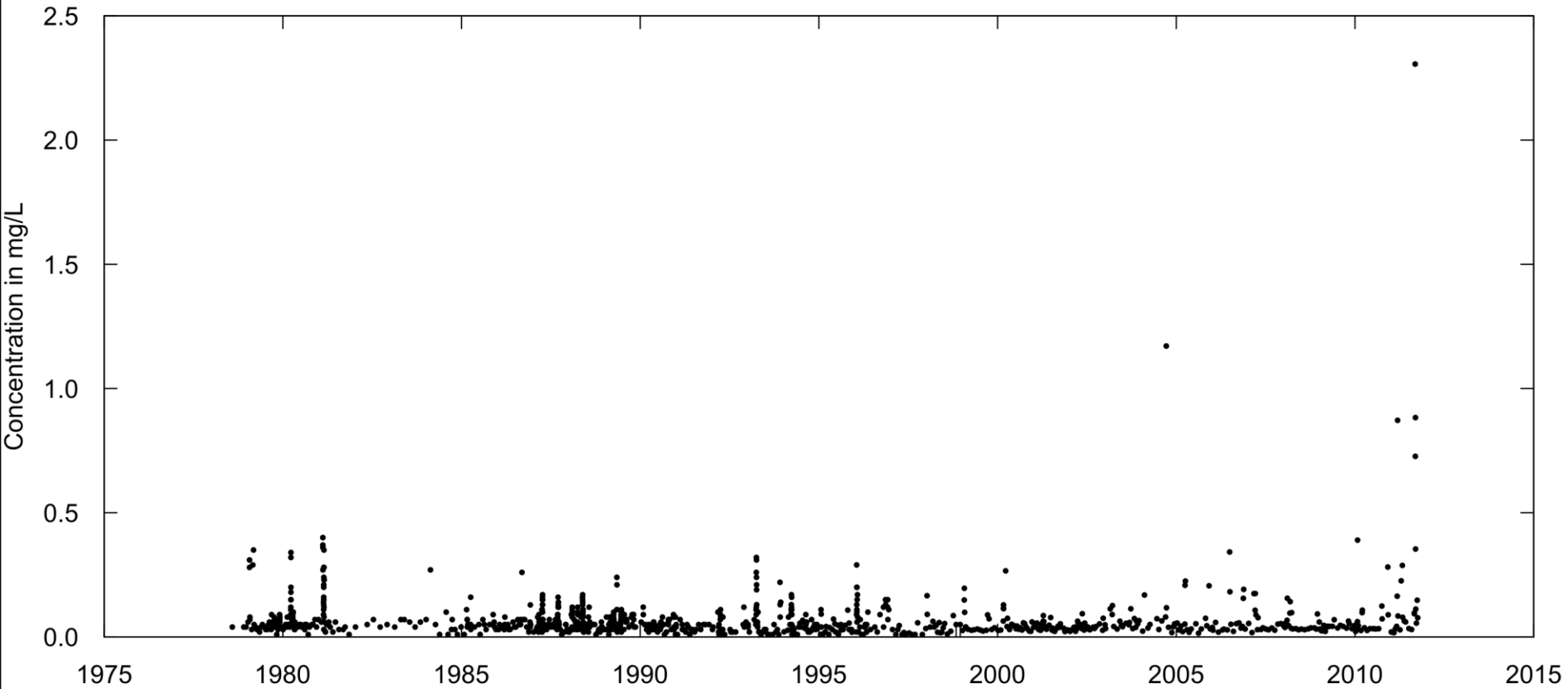


Source: Langeland, 2009, USGS  
<http://pubs.usgs.gov/sir/2009/5110/>

# Concentrations increasing during storms

- Loads affected by concentration and flows

Susquehanna River at Conowingo, MD , Total Phosphorus

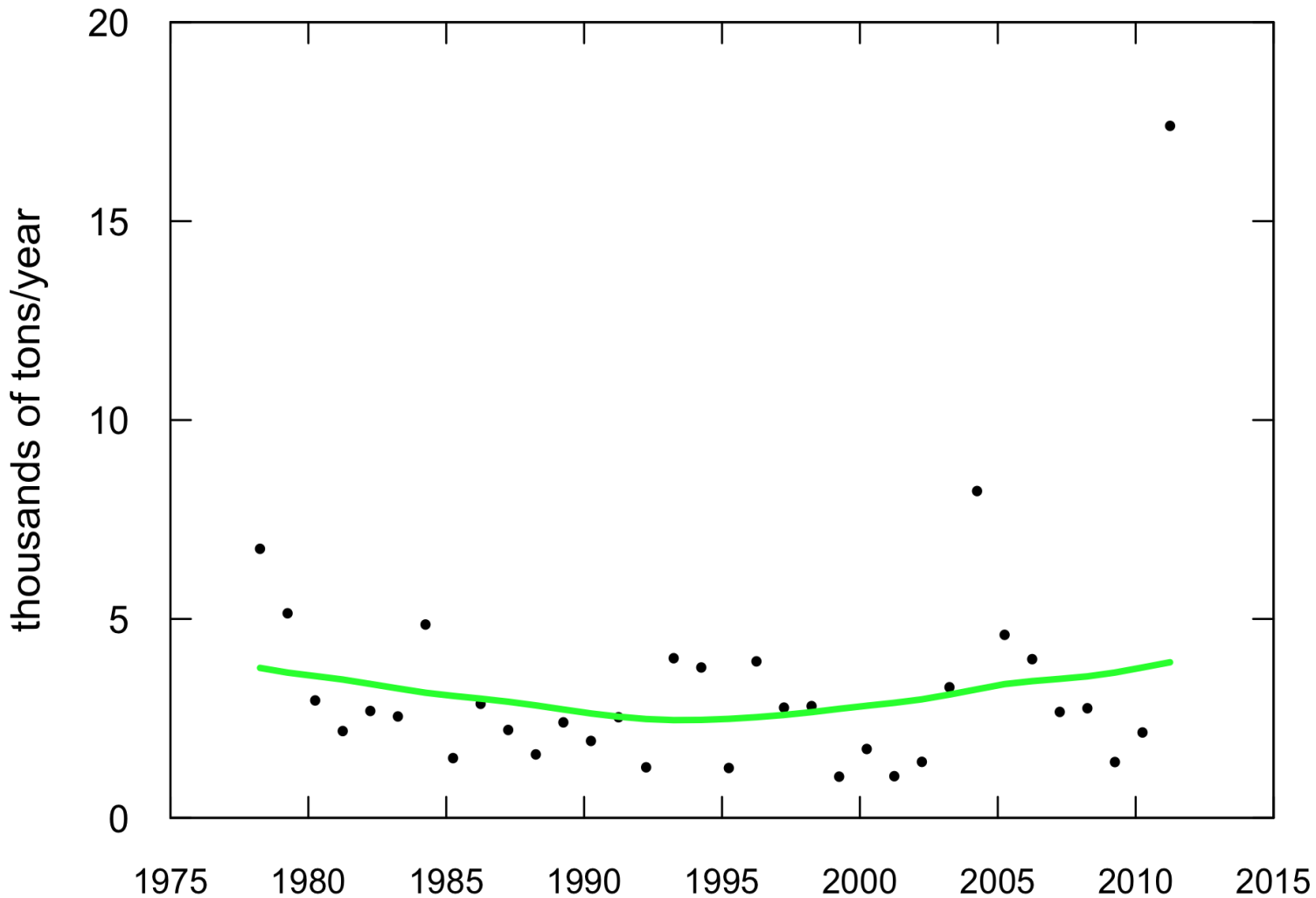


# Annual Load of Phosphorus

(In  $10^3$  tons/yr)

Susquehanna River at Conowingo, MD Total Phosphorus  
Water Year

Flux Estimates (dots) & Flow Normalized Flux (line)



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.

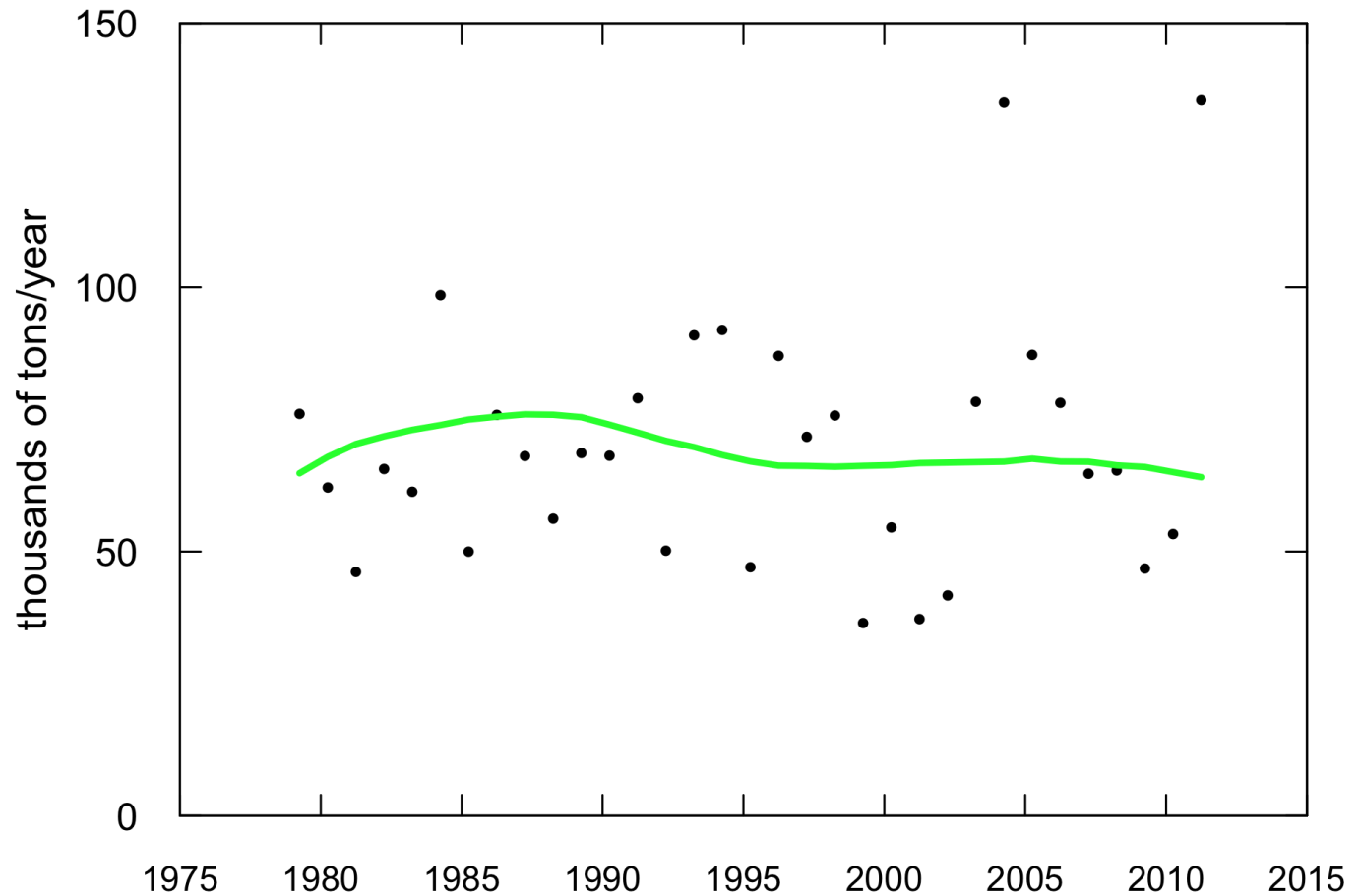


# Annual Load of Nitrogen

(In  $10^3$  tons/yr)

Susquehanna River at Conowingo, MD Total Nitrogen, as N  
Water Year

Flux Estimates (dots) & Flow Normalized Flux (line)



Flow  
Normalized  
Load Change  
Since 1996  
-3%

# Take home messages: TN

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

# Potential impacts when Conowingo reaches capacity

	Change since 1996	Predicted change when reservoirs “filled”
<b>TN</b>	<b>-3%</b>	<b>+2%</b>
<b>TP</b>	<b>+55%</b>	<b>+70%</b>
<b>SS</b>	<b>+97%</b>	<b>+250%</b>

# 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

# Management Options and Follow up

- USACE study on watershed options
  - CBC: request funding to support study
- Science activities
  - CBC: Inform others of your support
- FERC relicensing
  - CBC: work with MD and Exelon on potential actions
- 2017 Mid-Point Assessment of TMDL
  - CBC: Exercise leadership at all levels of CBP
- More information: [chesapeake.usgs.gov](http://chesapeake.usgs.gov)