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Lower Susquehanna River Reservoir System Bathymetry

In cooperation with - Pennsylvania Dept. of Environmental Protection
- Susquehanna River Basin Commission
- Lower Susquehanna River Keeper

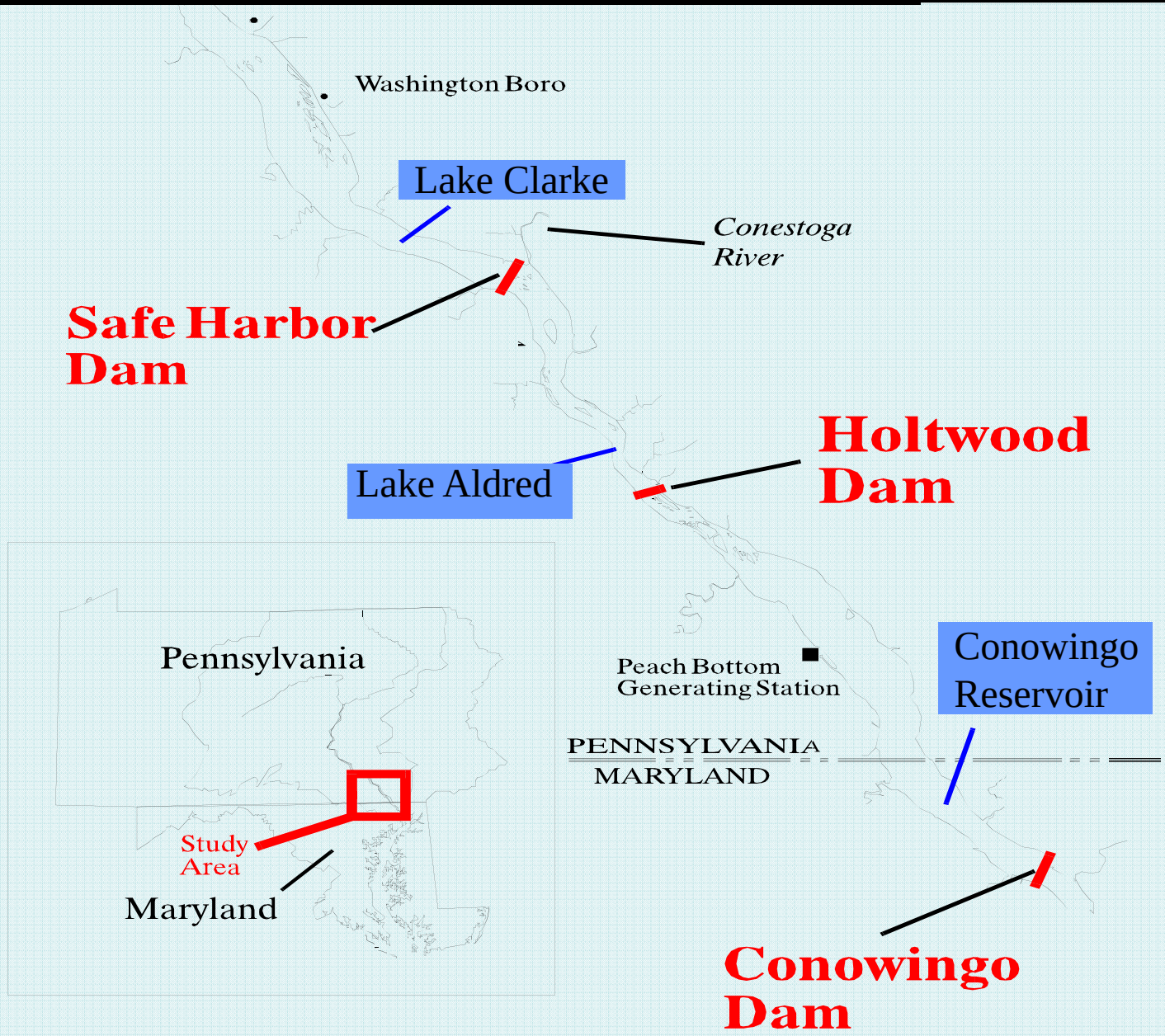
Problem / Background

- Reservoirs filling with sediment and associated nutrients reducing capacity for sediment storage
- Approximately 55-60% of the sediment and 40% of the phosphorus is being trapped
- Revised estimate in 2001 of 25-30 years of remaining sediment storage capacity (SSC)
- At capacity sediment and phosphorus loads may increase significantly to the upper Chesapeake Bay

Project Objectives

- Collect bathymetry data to update and map bottom-surface profiles
- Provide updated estimates of remaining capacity for sediment storage
- Provide information useful to consider appropriate management options

Lower Susquehanna River Reservoirs



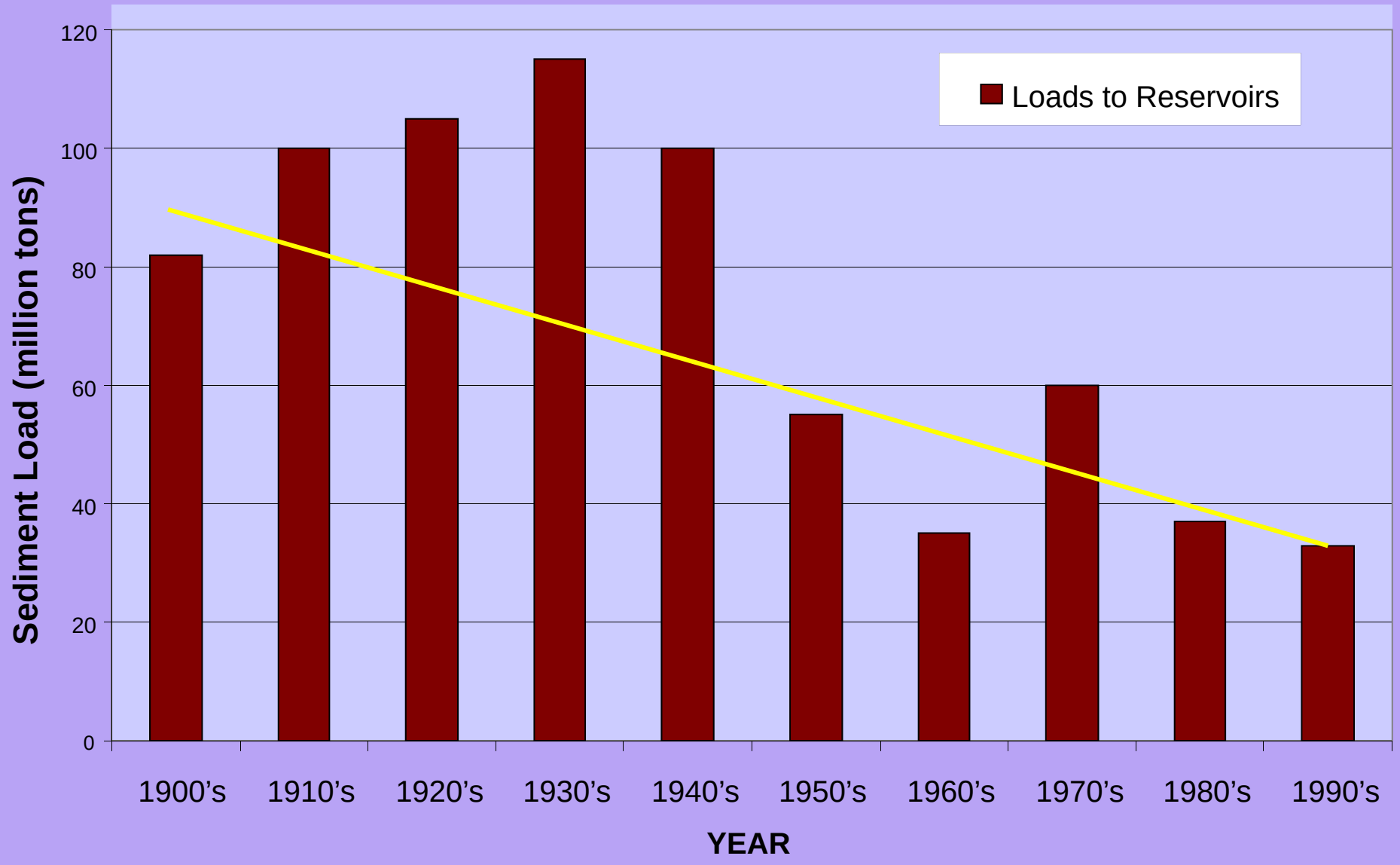
Courtesy Exelon Corp.

Susquehanna River Sediment Transport

- Historical and current trends
- Reservoir Transport and Dynamics
  - importance
  - implications for predicting reservoir capacity
- Reservoir Filling and Remaining Capacity

Estimated Sediment Loads to Reservoirs 1900-1999

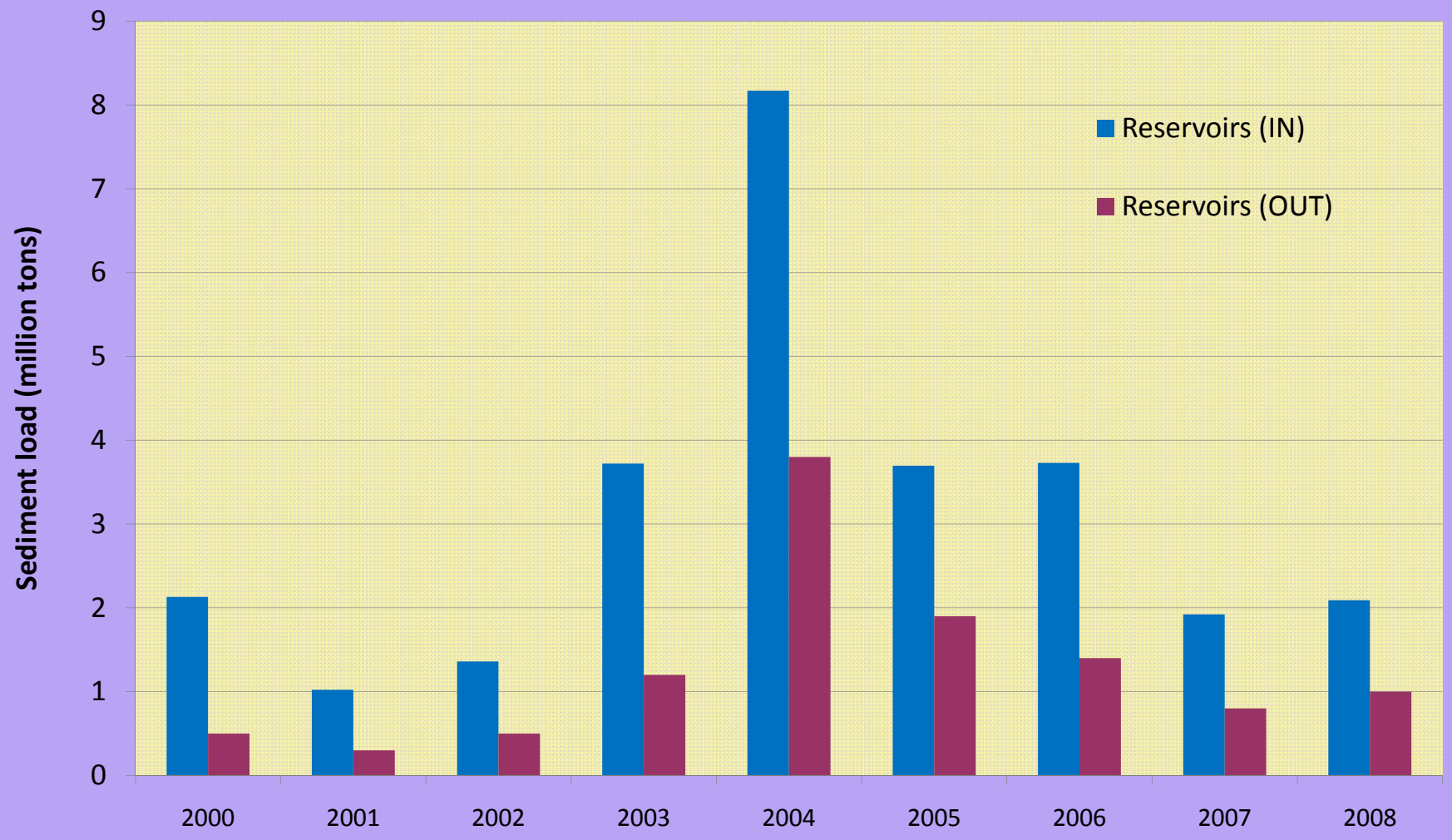
Significant decrease in sediment loads



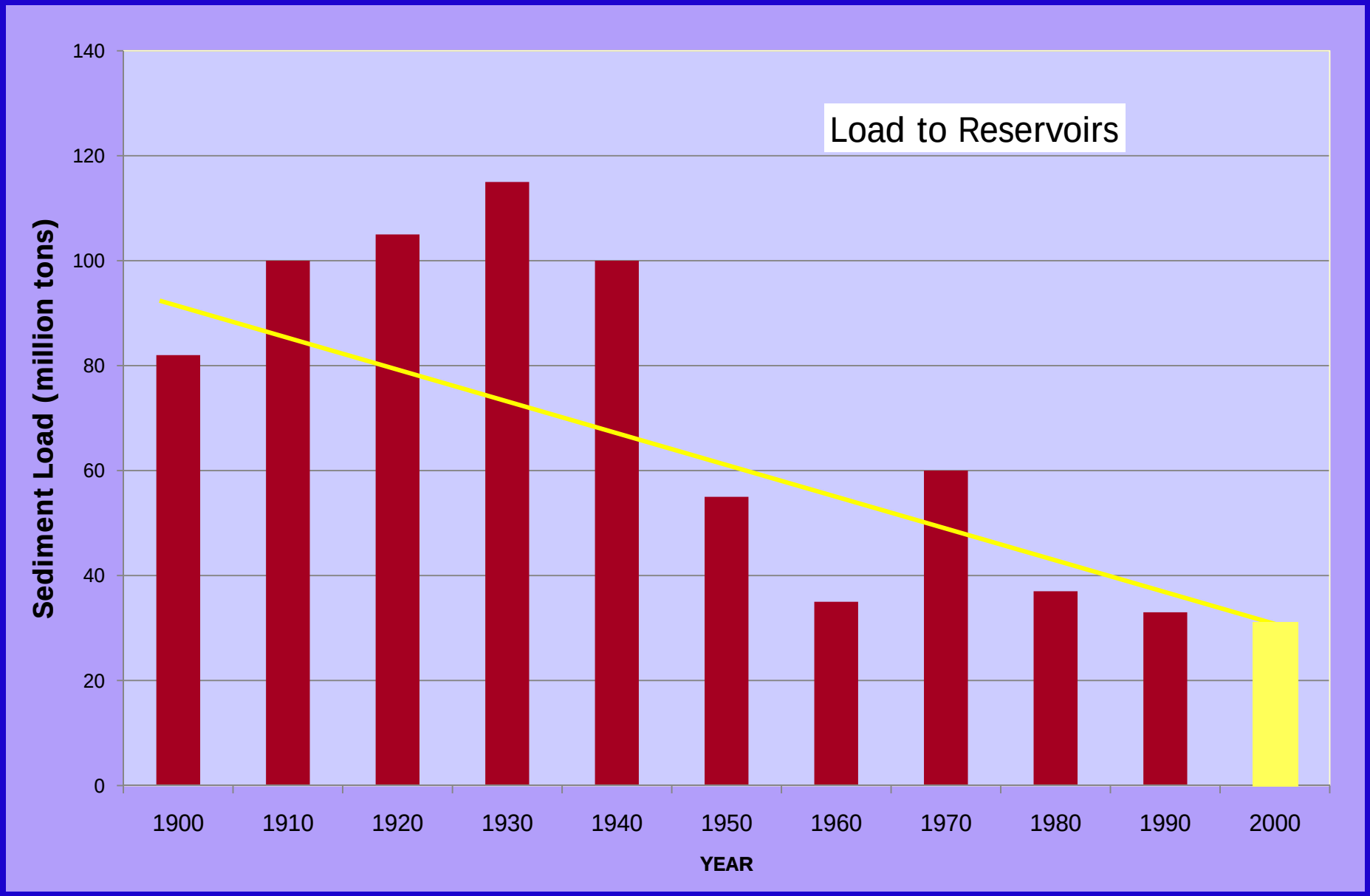
Current “trends” in sediment loads

From 2000-2008 (avg 3.1 Mt in, 1.2 Mt out, 55% trap w/scour)

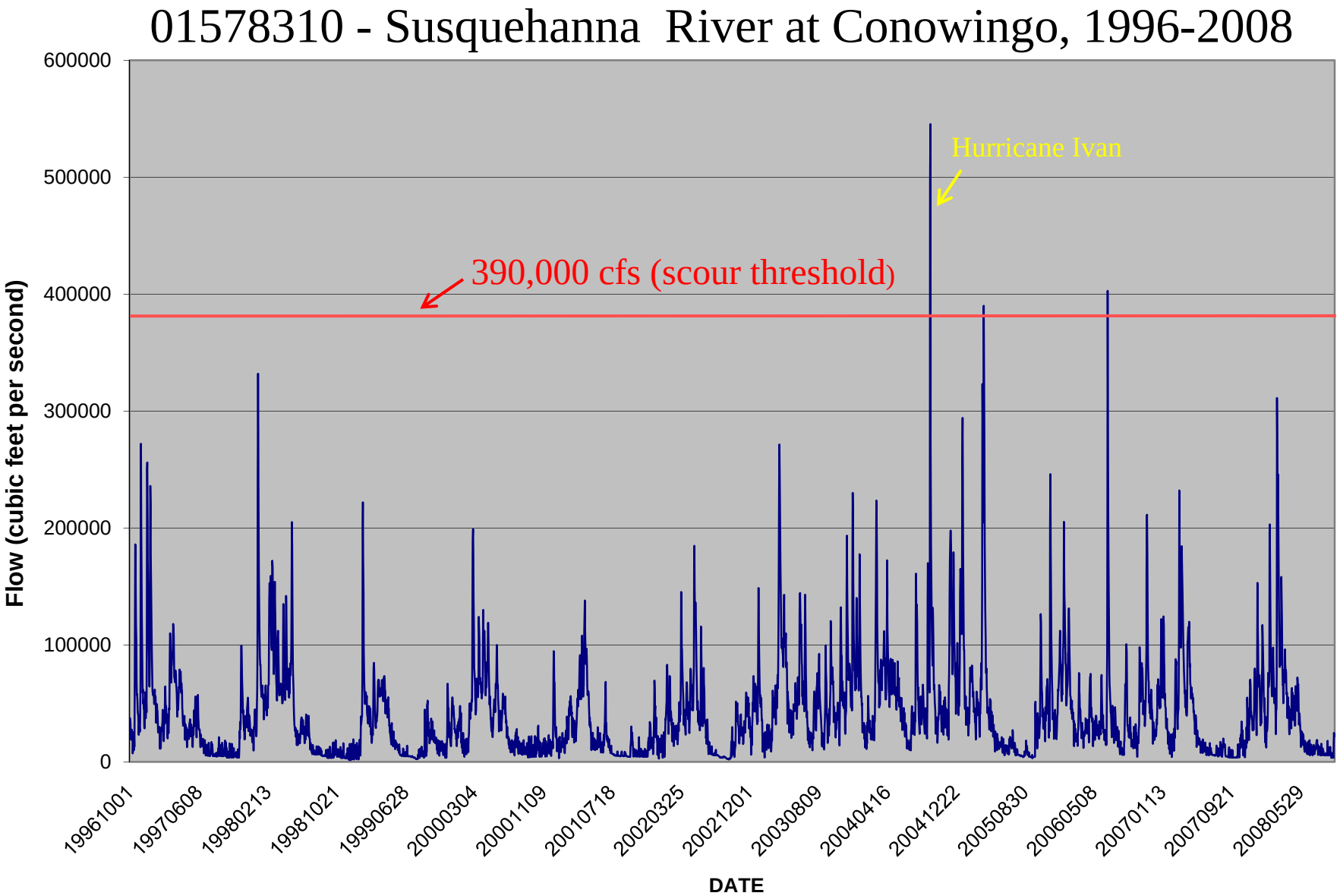
Longer-term AVG (1980-1999) (3.2 Mt in, 1.2 Mt out, 55% trap w/scour)



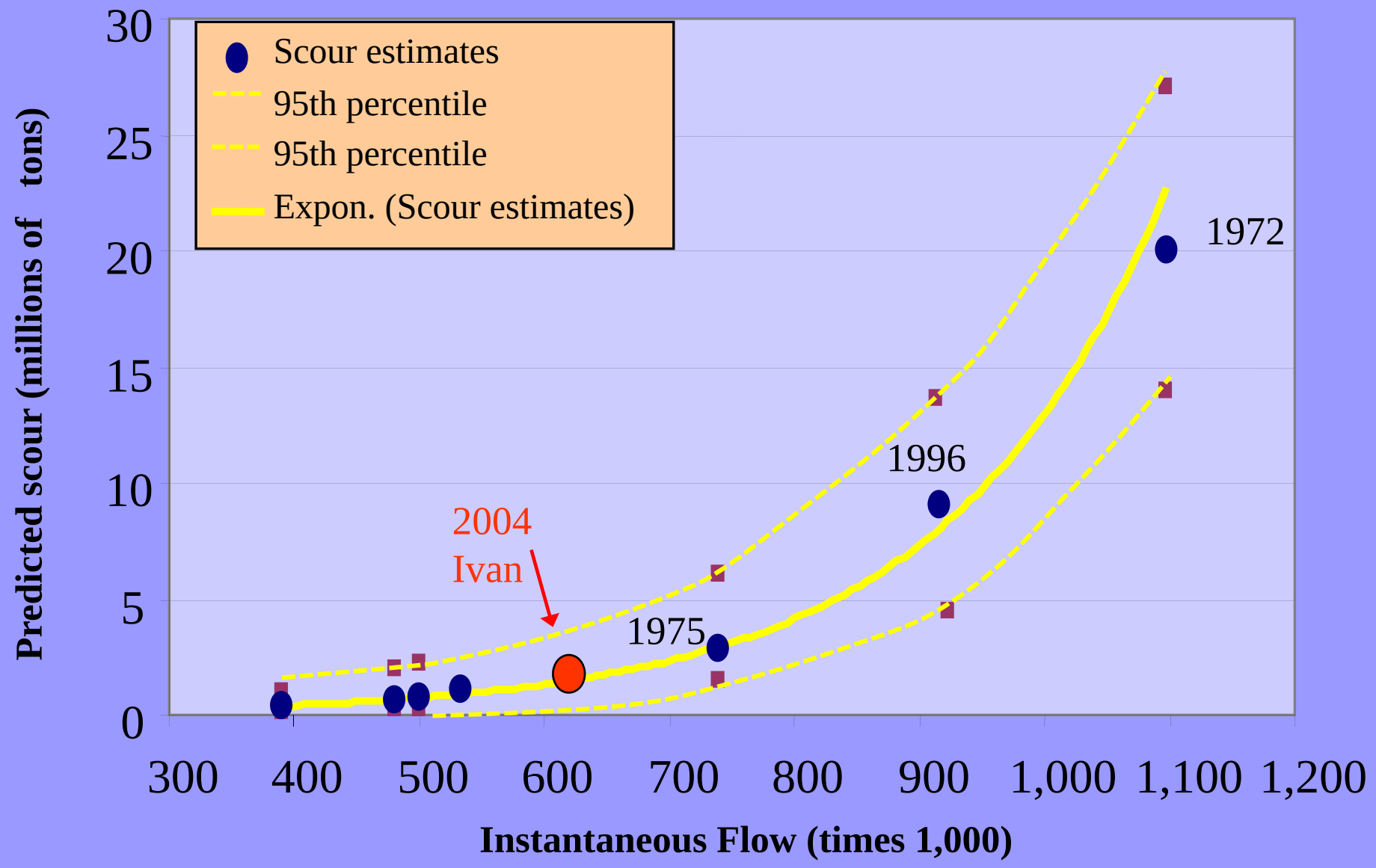
Estimated Sediment Loads to Reservoirs 1900-2008



Streamflow Hydrograph



Predicted Sediment Scour vs. Flow



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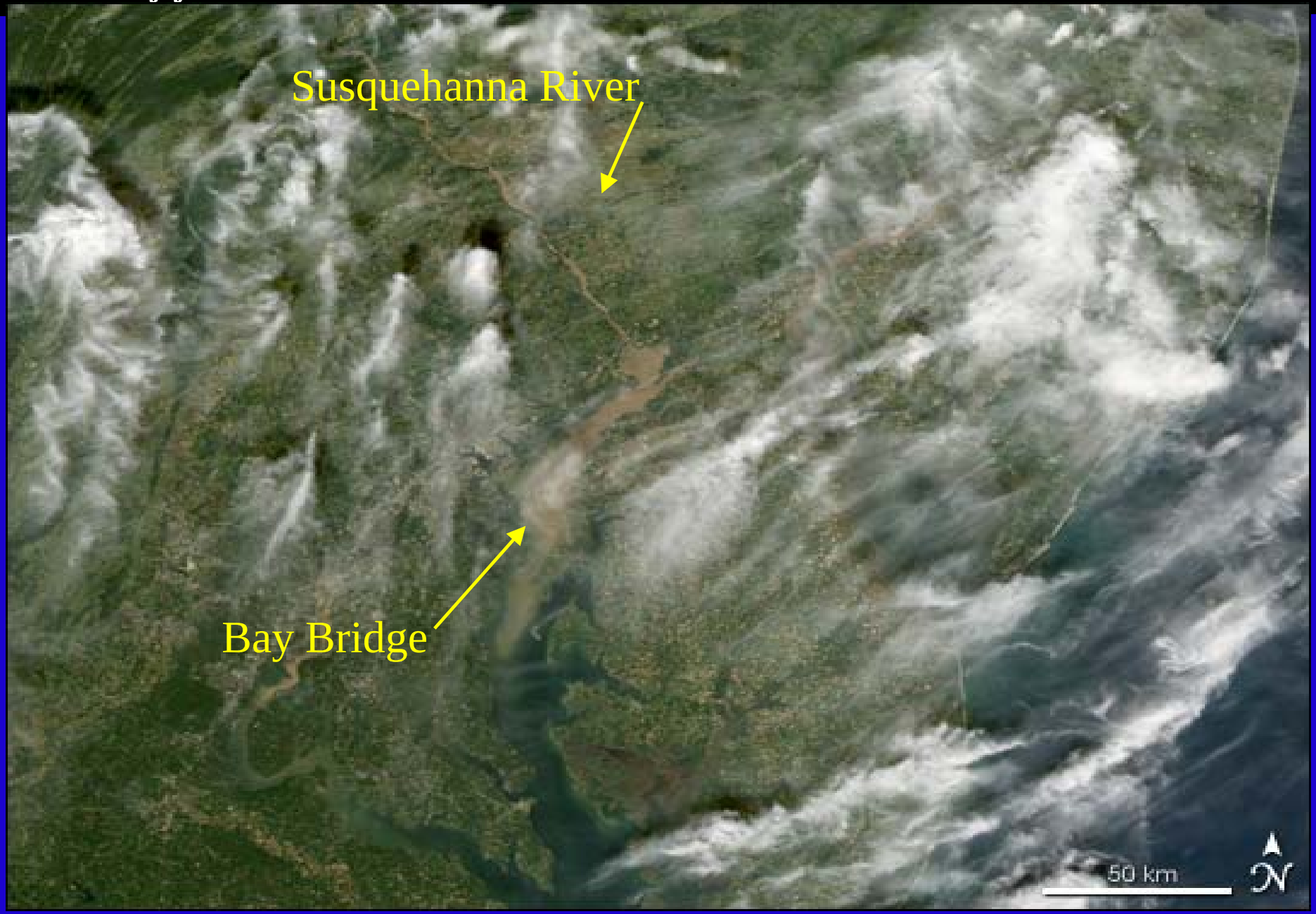
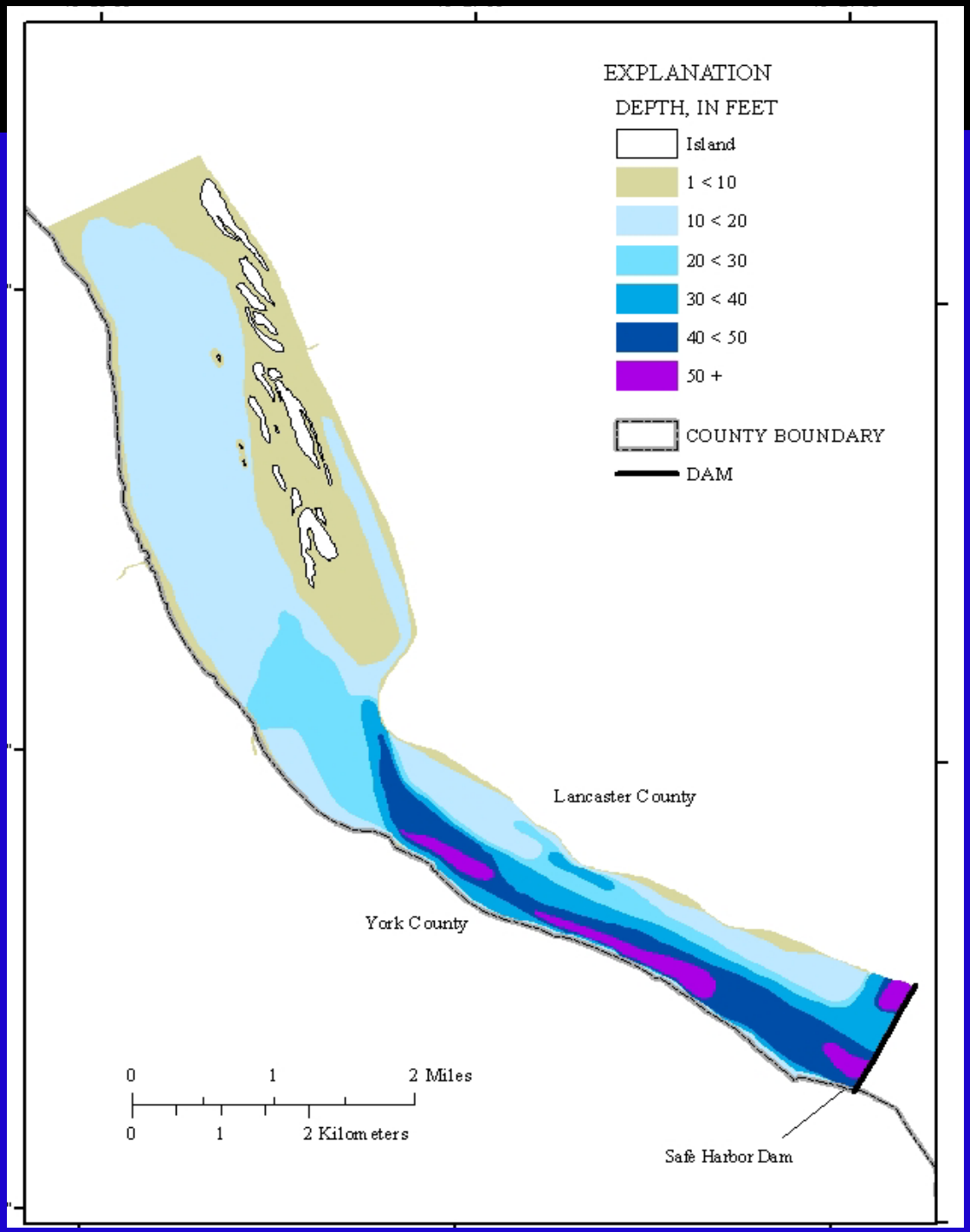
Hurricane Ivan – September 2004



Safe Harbor Dam (Lake Clarke)

- 1.7 M tons deposited
- Total 92 M tons
- Deepest areas near the dam (turbine and spill gates) and along an old canal



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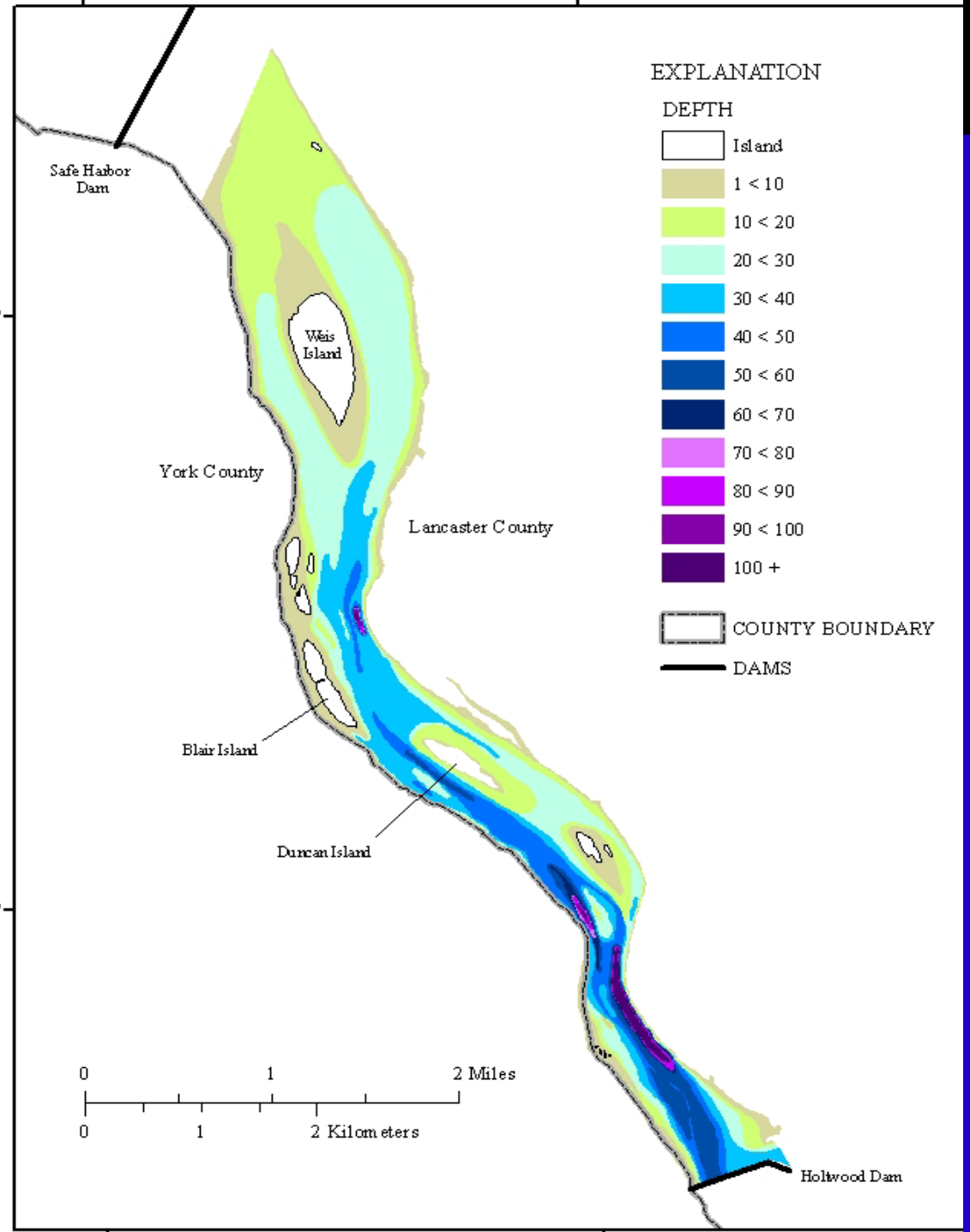
Holtwood Dam (Lake Aldred)

- 1 M tons deposited
- Total 14 M tons
- Deepest areas near sides of natural narrow channels (hydraulic scour areas)
- Notice sediment depths near dam



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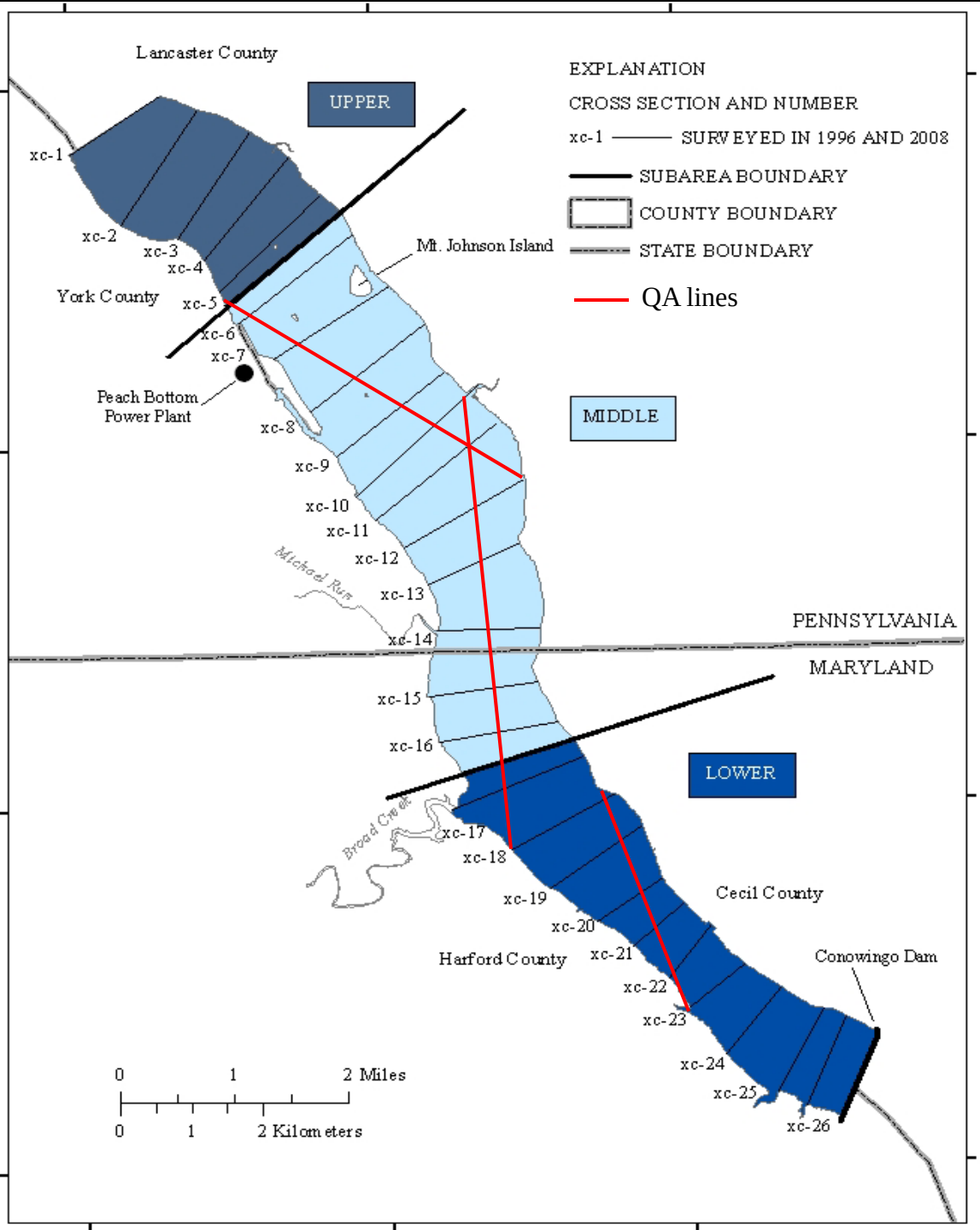
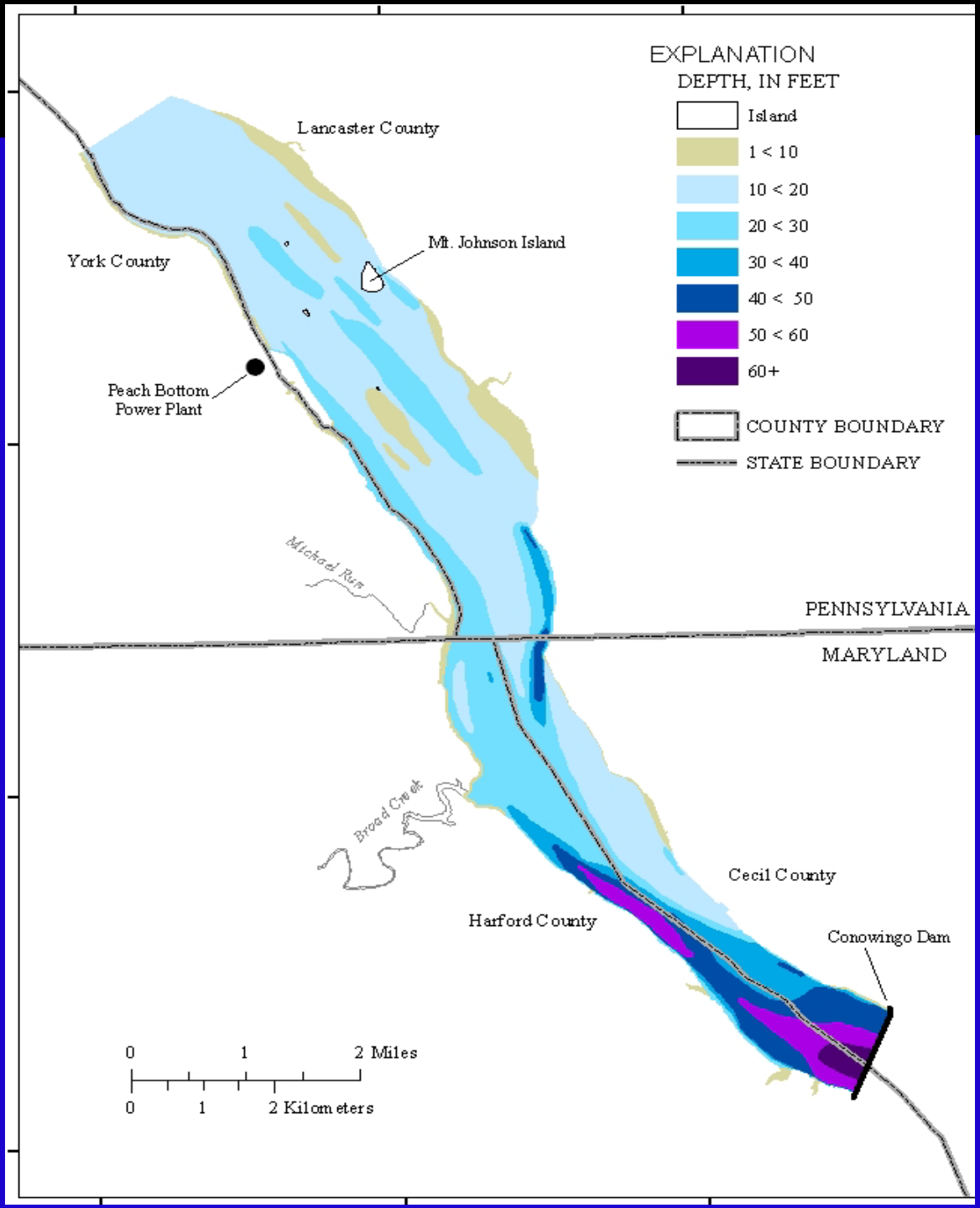
Current Bathymetry 2008

Conowingo Dam (Conowingo Reservoir)

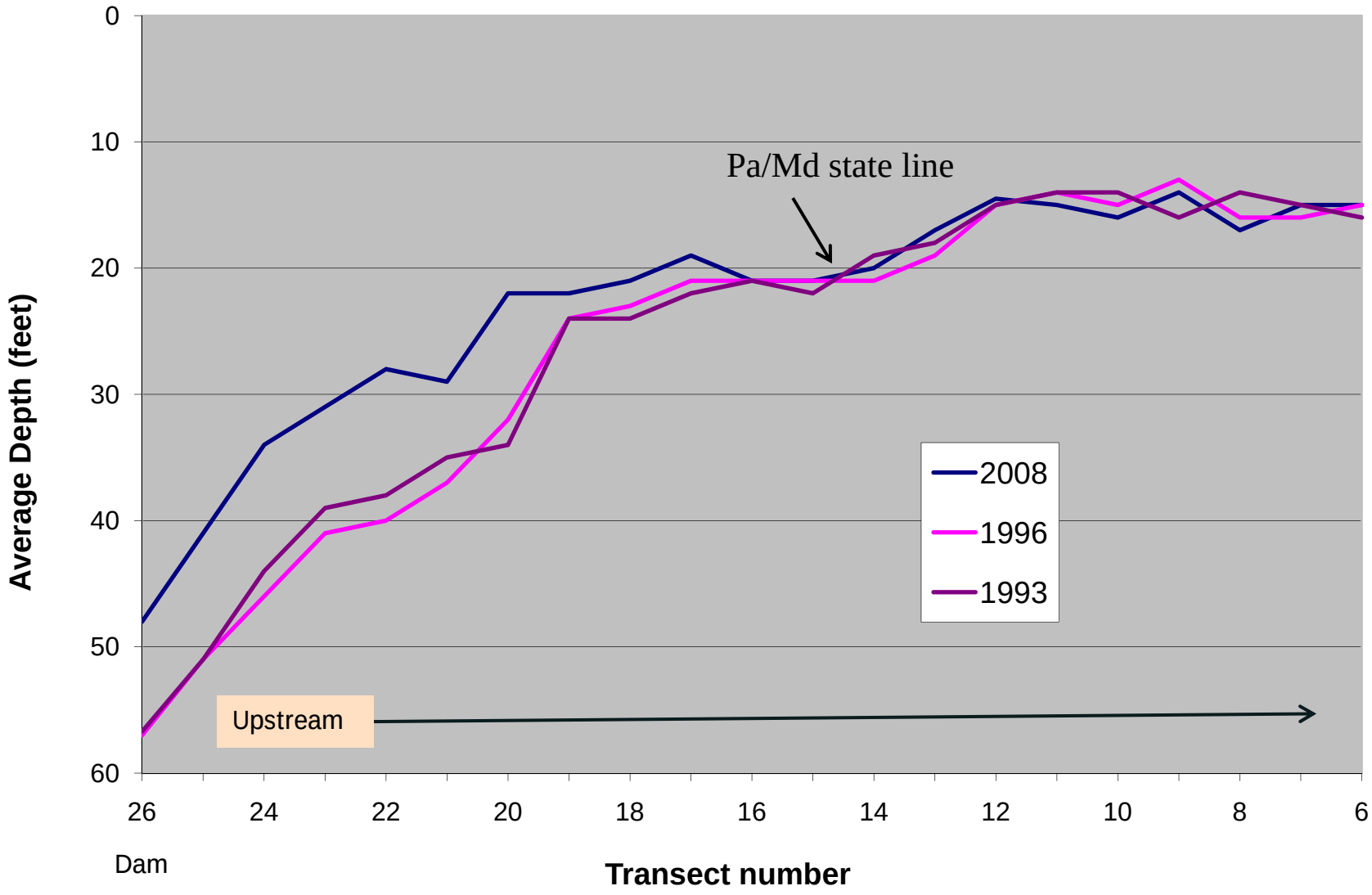


Conowingo Dam (Conowingo Reservoir)

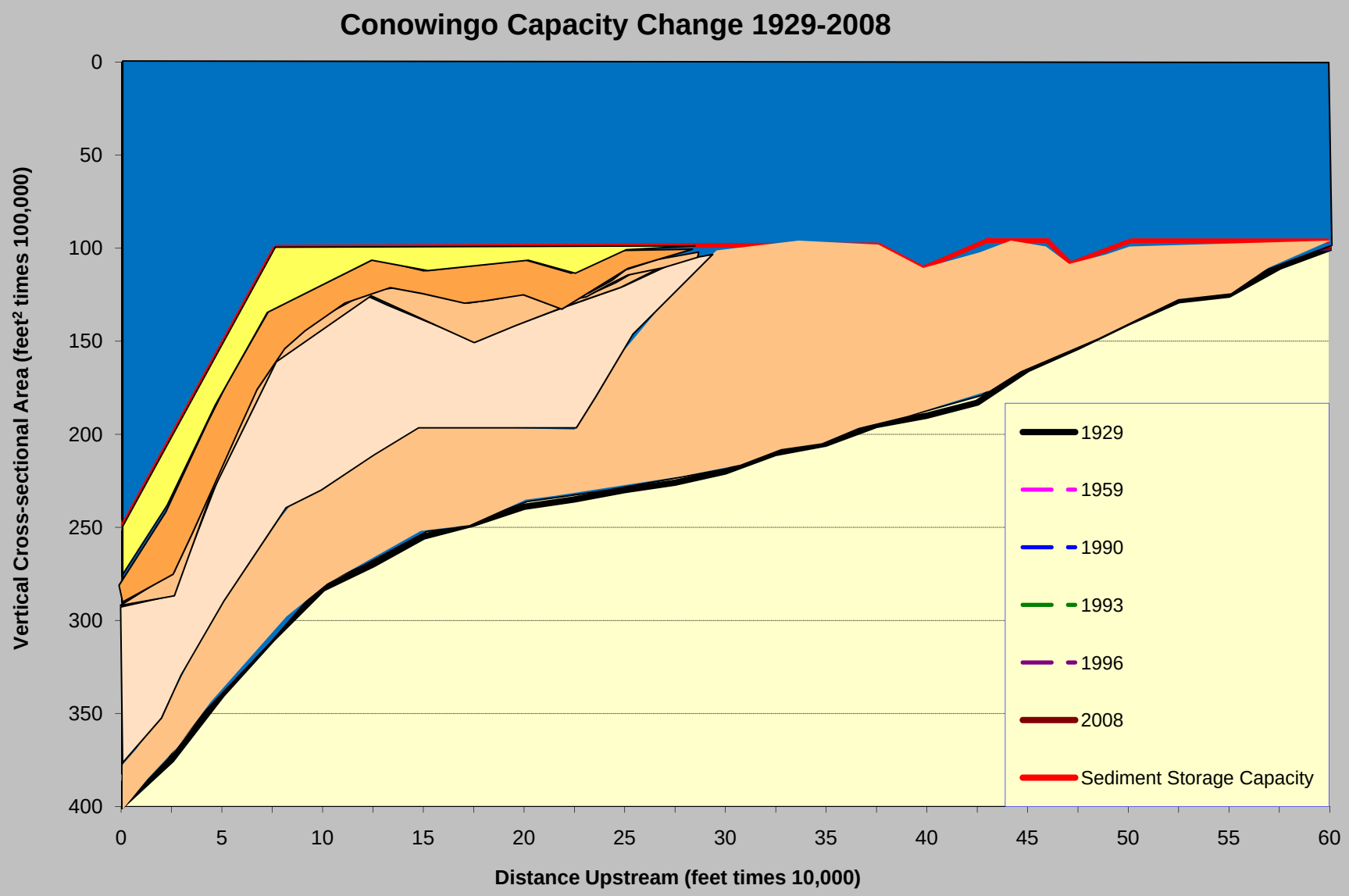
- 12 M tons deposited, all in lower third
- Total 174 M tons
- Total storage 204 M tons (SSC)
- Approx 30 Mt remain
- Deepest areas near the dam (turbine and spill gates) and natural hydraulic scour areas



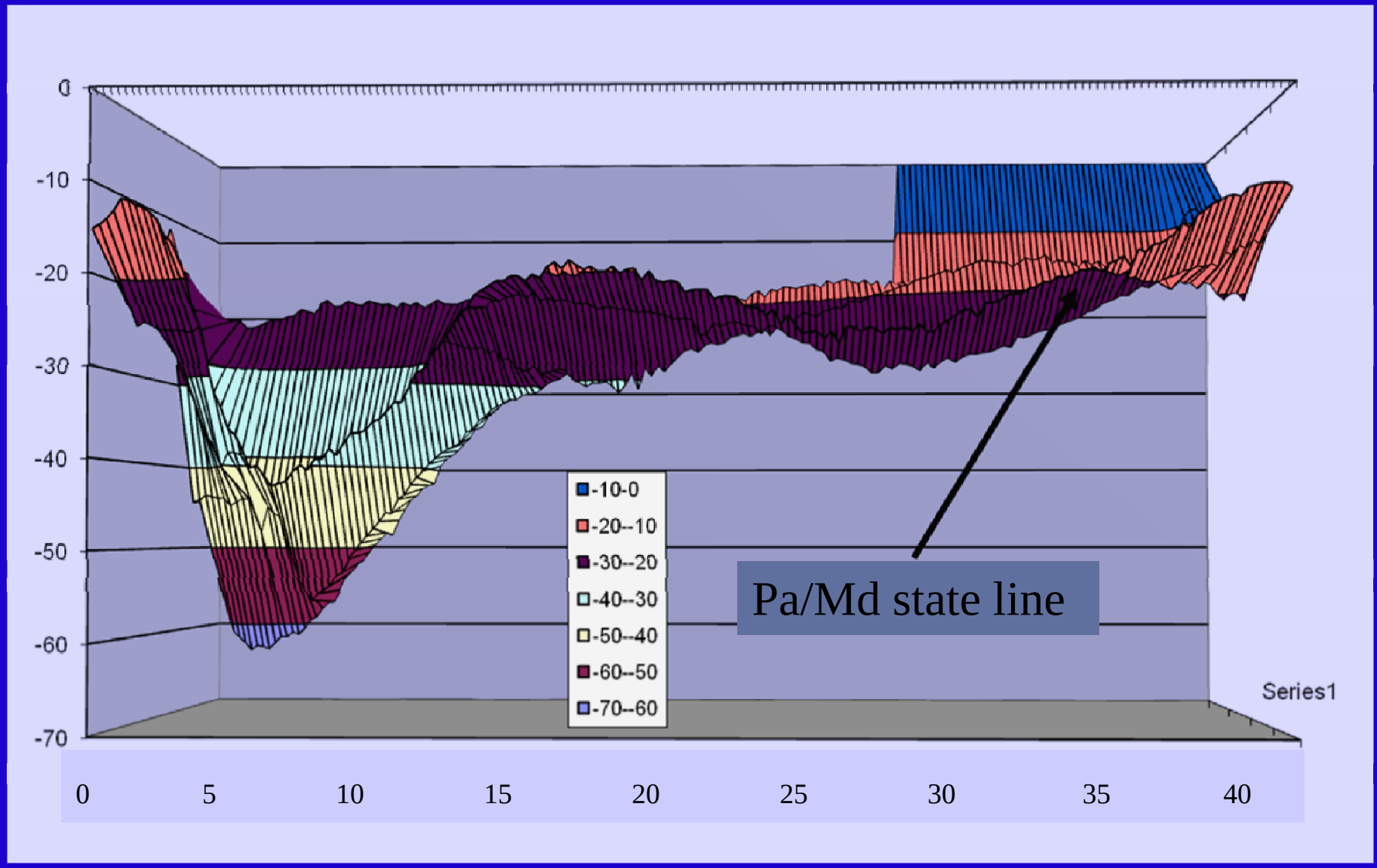
Change in depth by transect - Conowingo



Loss of sediment-storage capacity with time



Conowingo 3-D Longitudinal Profile



SSC Predictions

- From 1996-2008, 14.7M tons deposited
- Approximately 30M tons remain before SSC
- Predictions at steady state -- 15-20 years

- Predictions with future change
  - decrease transport (3.2 to 2.5), add 5 years
  - statistically expected scour removal, add 5 years
  - trapping efficiency of 55%, add 0 years
- 25-30 years with future change

Summary

- From 1996-2008, sediment loads approximate 20 year average
- Less scour producing events resulting in slightly lower sediment transport to upper BAY
- Remaining capacity of 30M tons
- Under current conditions, 15-20 years to SSC
- Could be extended to 25-30 years considering future scenarios
- Encourage bathymetry be conducted more frequently

Where Do We Go From Here

- Work with other Federal and State agencies and other partners considering solutions (USACE, USGS USEPA, PADEP, MDDNR, SRBC)
- USACE new study
- Reconvene the Sediment Task force (STF)
- Some solutions under consideration include (from STF)

  - reservoir sediment removal

  - reduce sediment transport from source areas (BMP's stream stabilization, wetlands, buffers, etc.)

  - use of floodplains to dissipate stream energy and store sediment

The ultimate *DESTINY* of all reservoirs is to fill with sediment

- Linsley and others, 1992

Thank You