Changes in Conowingo Reservoir Bathymetry and Resultant Changes in Sediment Loads, Deposition, and Capacity, 2008-11

USGS

Acknowledgements

- Joel Blomquist - USGS MDWSC
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- Gary Lemay – Gomez and Sullivan Engineers (Exelon hired for FERC relicensing)

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Discussion topics

- Highlights of 2008 vs. 2011 bathymetry
- Estimates of sediment volume change – bathymetry vs. mass balance
- Sediment load to Chesapeake Bay from Tropical storm Lee

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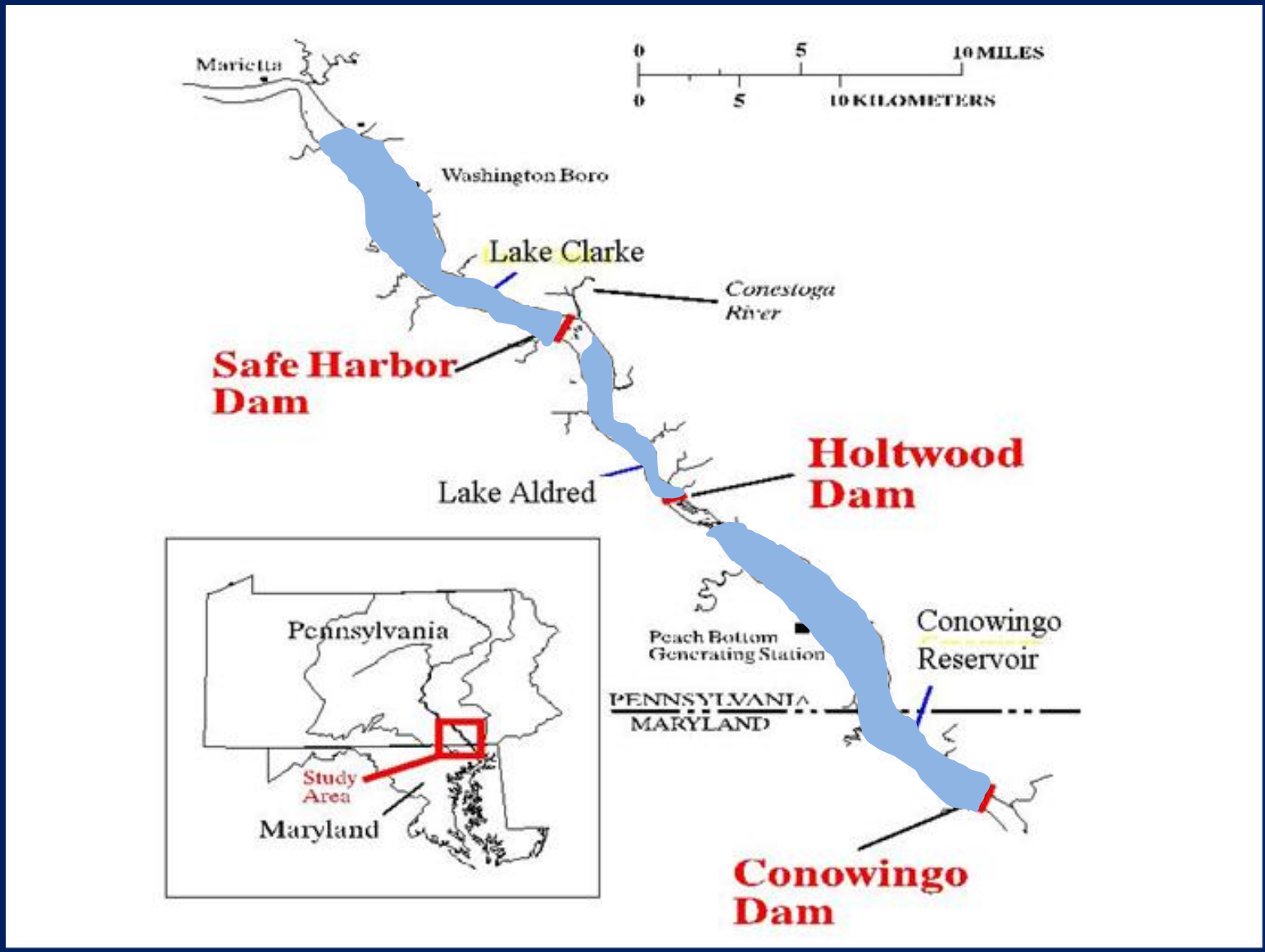
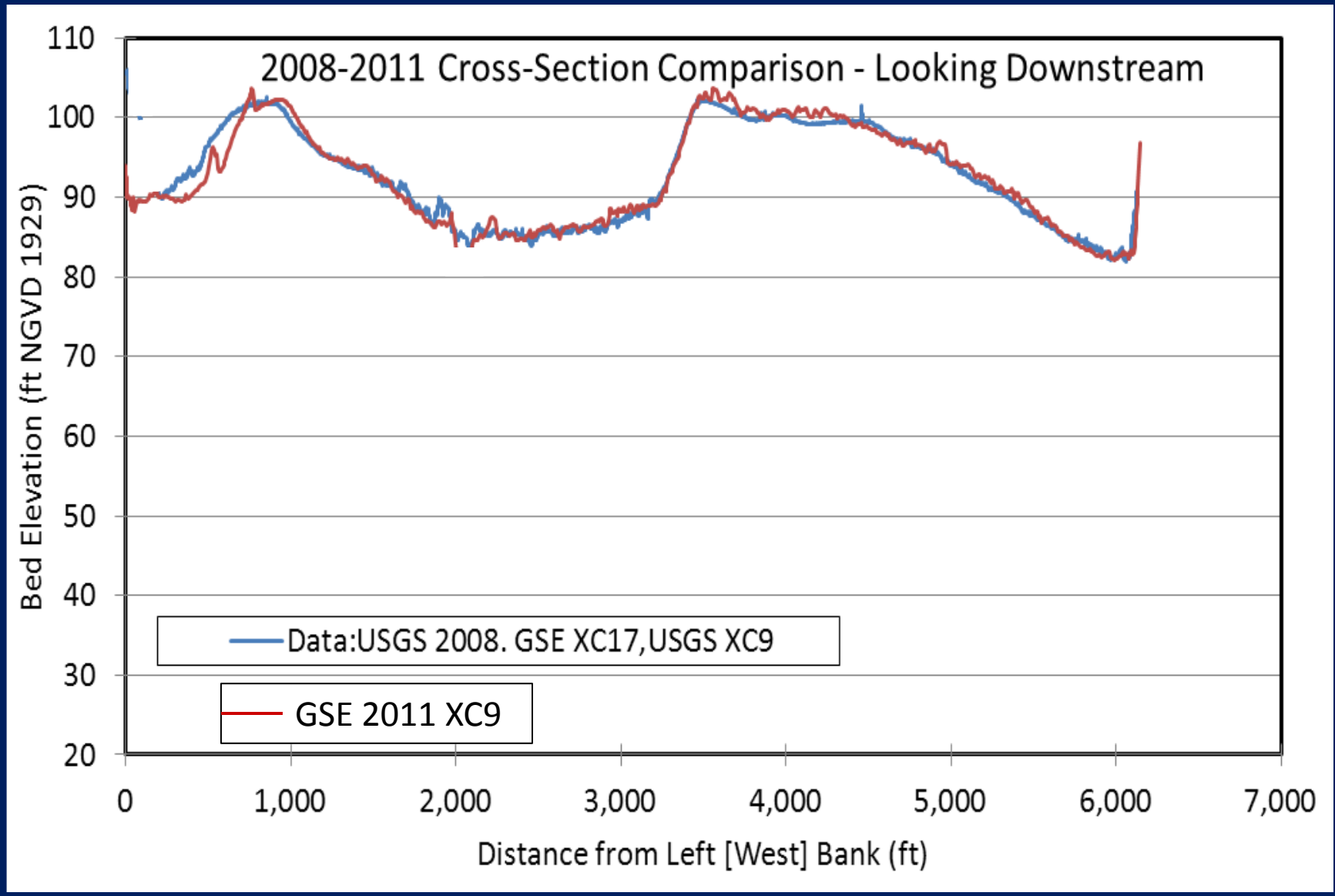
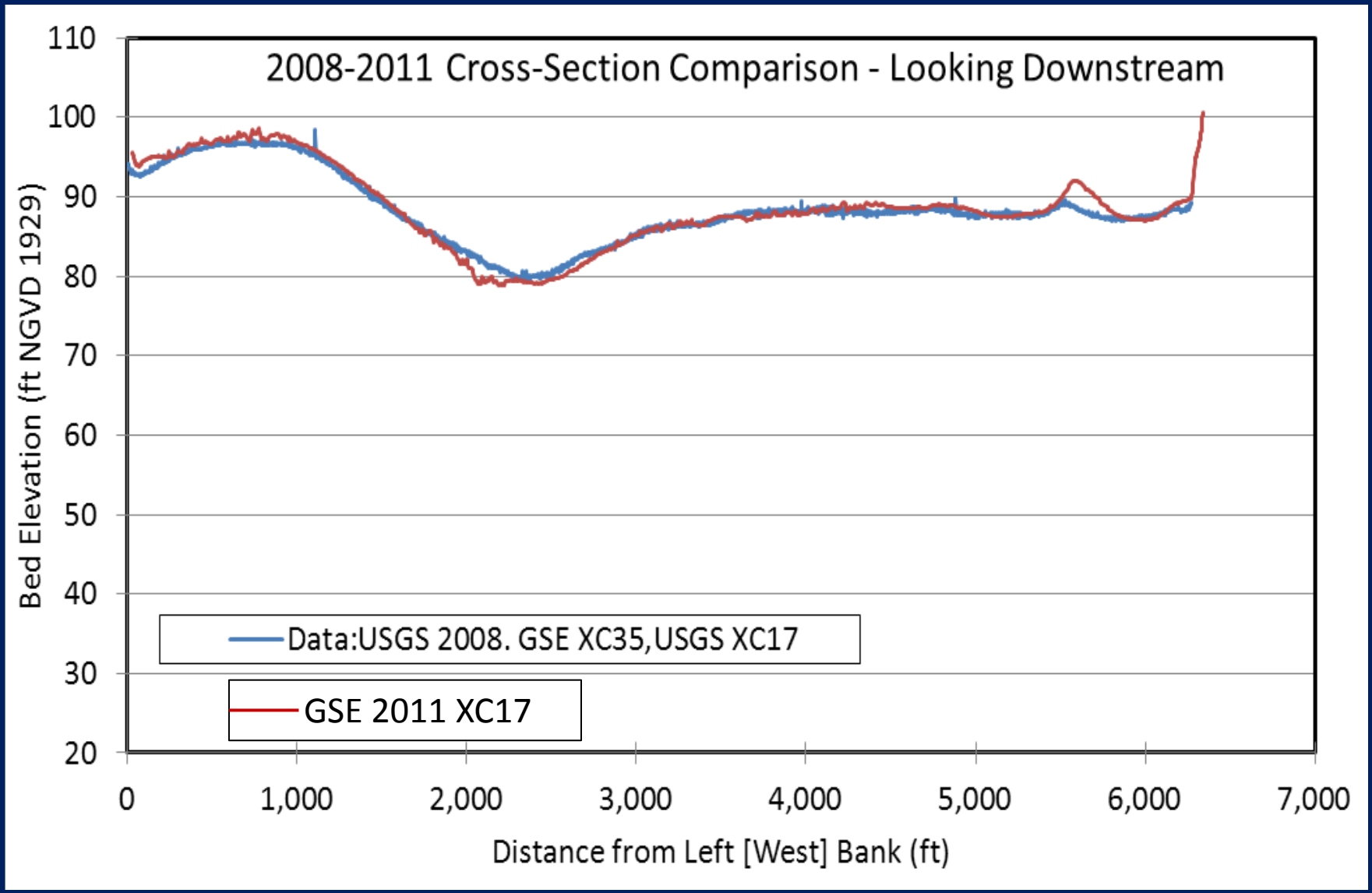
Susquehanna River Reservoirs



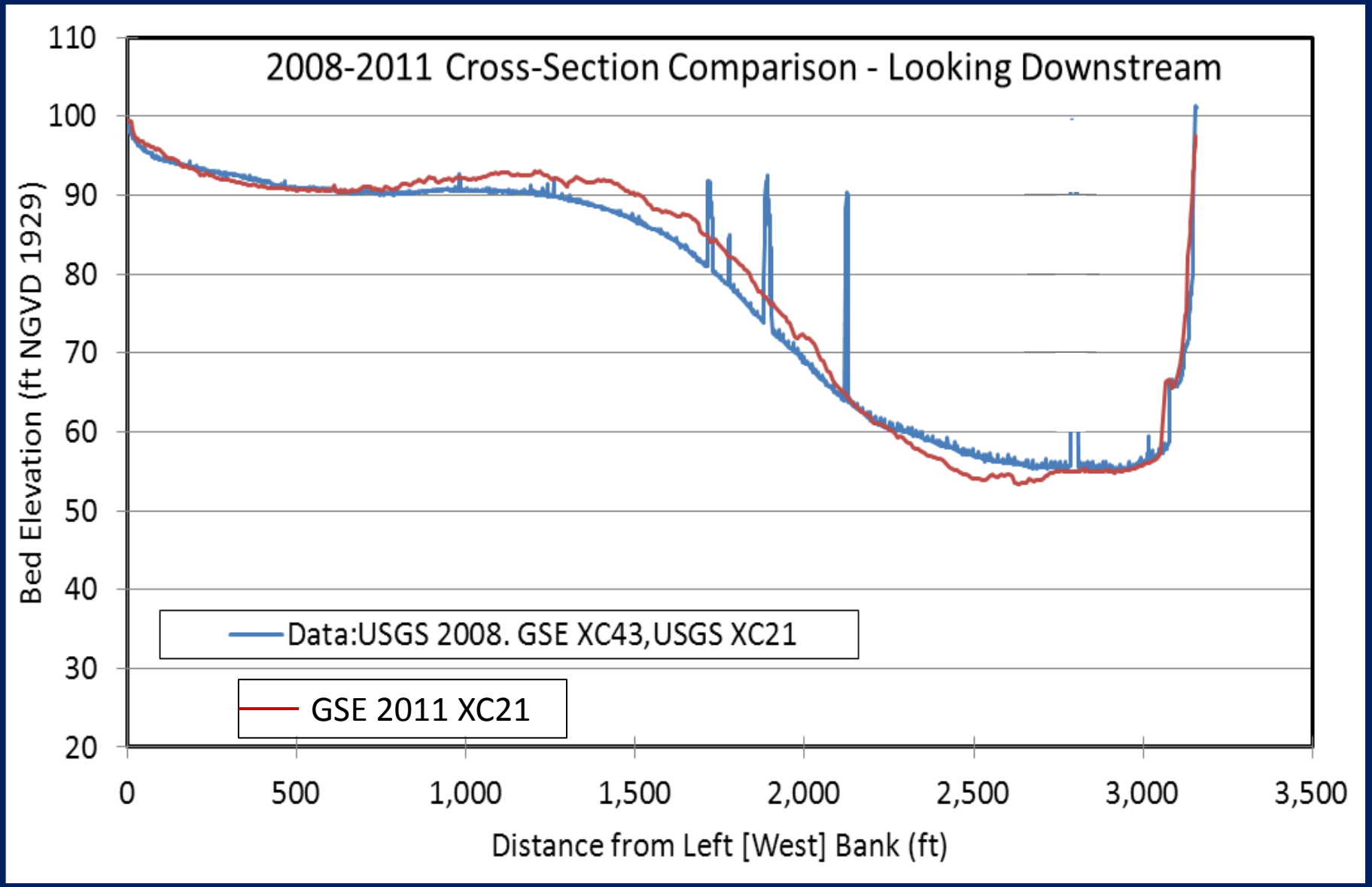
Conowingo Reservoir X-sections


2008-2011 Cross-Section Comparison - Looking Downstream
Bed Elevation (ft NGVD 1929)
110
100
90
80
70
60
50
40
30
20
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
Distance from Left [West] Bank (ft)
Data:USGS 2008. GSE XC17,USGS XC9
GSE 2011 XC9

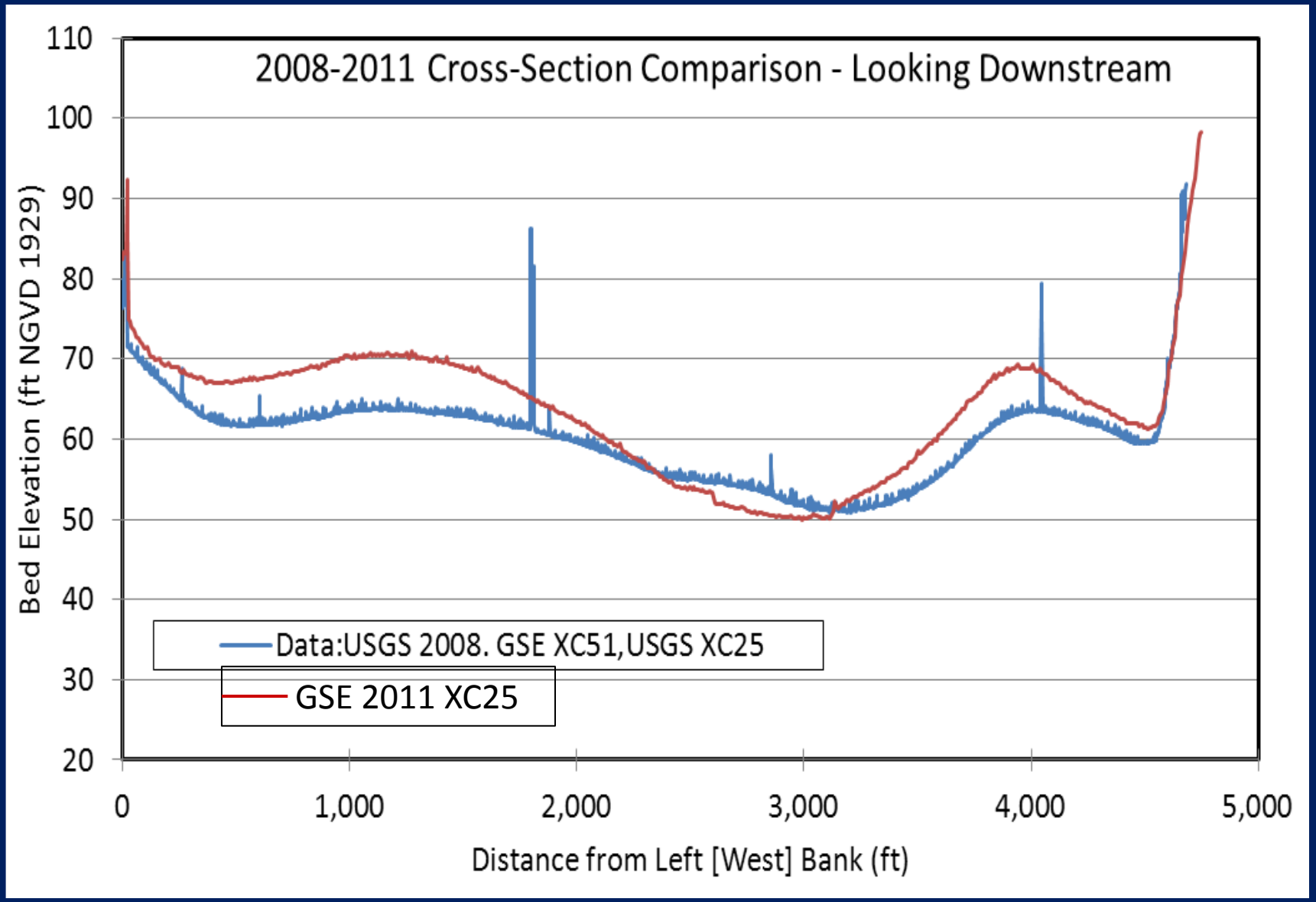
USGS


2008-2011 Cross-Section Comparison - Looking Downstream
Bed Elevation (ft NGVD 1929)
110
100
90
80
70
60
50
40
30
20
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
Distance from Left [West] Bank (ft)
Data:USGS 2008. GSE XC35,USGS XC17
GSE 2011 XC17

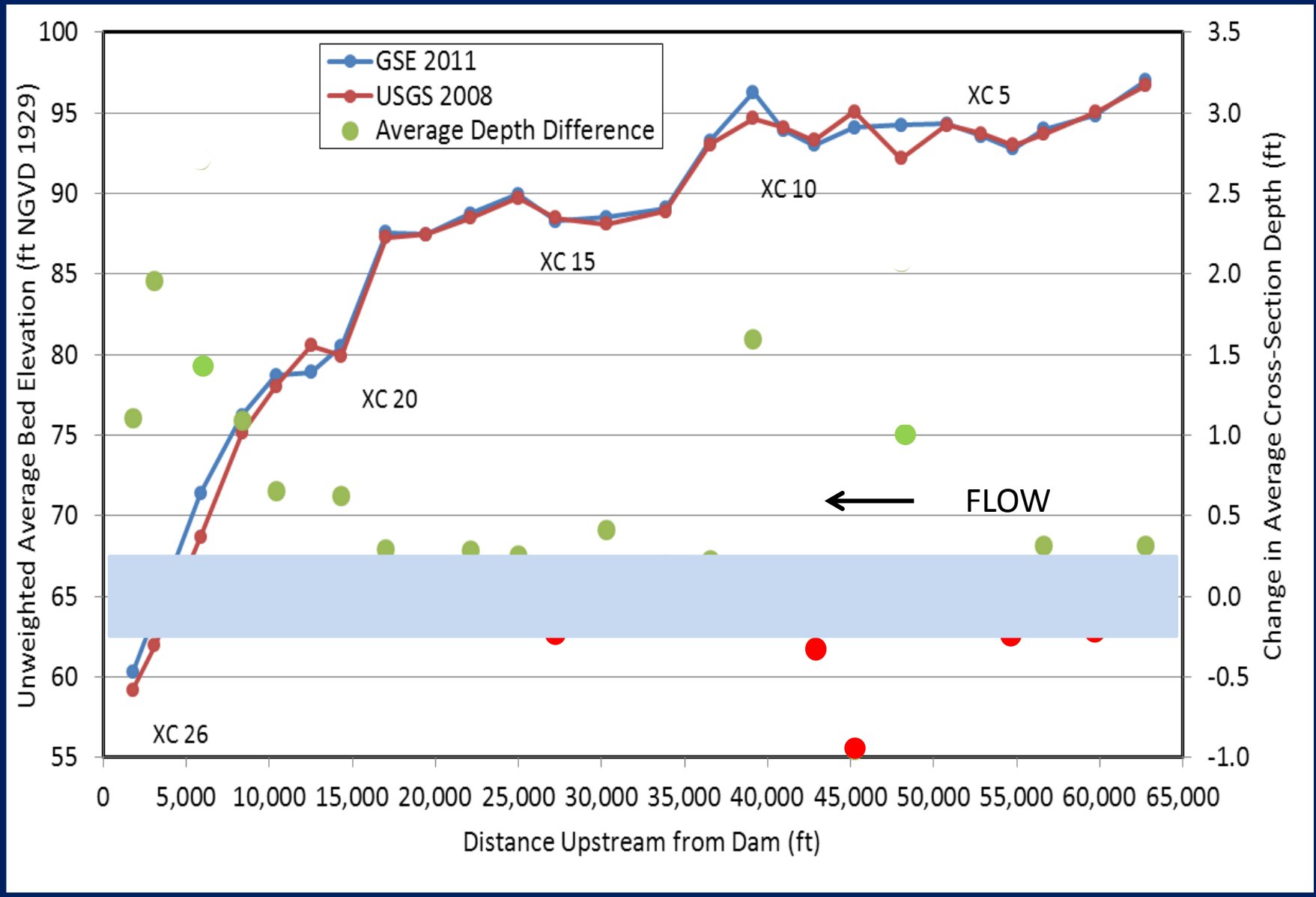
USGS


2008-2011 Cross-Section Comparison - Looking Downstream
Bed Elevation (ft NGVD 1929)
110
100
90
80
70
60
50
40
30
20
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance from Left [West] Bank (ft)
Data:USGS 2008. GSE XC43,USGS XC21
GSE 2011 XC21

USGS


2008-2011 Cross-Section Comparison - Looking Downstream
Bed Elevation (ft NGVD 1929)
110
100
90
80
70
60
50
40
30
20
0
1,000
2,000
3,000
4,000
5,000
Distance from Left [West] Bank (ft)
Data:USGS 2008. GSE XC51,USGS XC25
GSE 2011 XC25

USGS



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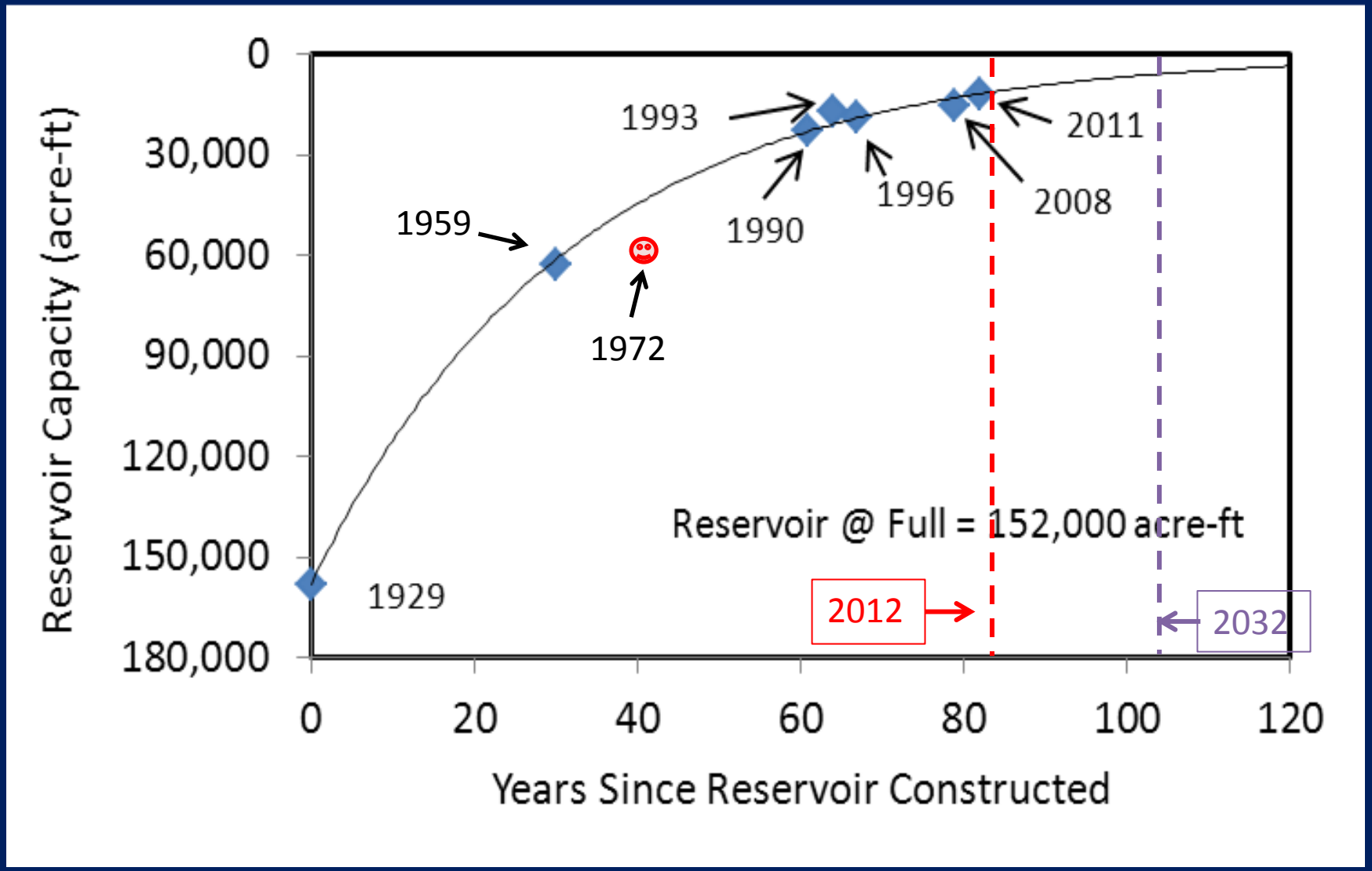
Bathymetry change +4.0 M tons

Changes in Bathymetry with Time



2008 - 20,000 acre-ft	2011 - 13,000 acre-ft	2032 - 6,000 acre-ft

Tropical Storm Lee and Lower Susquehanna Reservoirs

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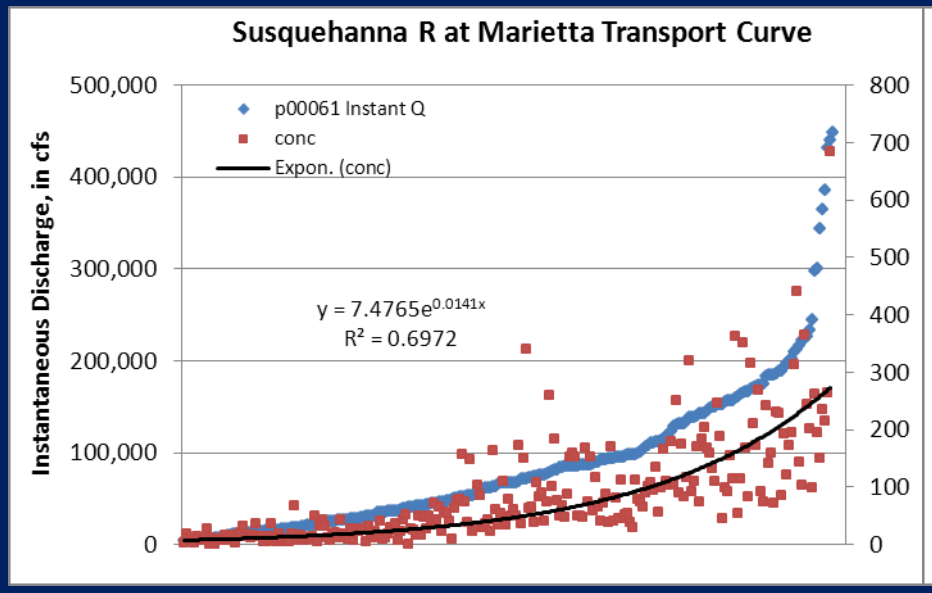
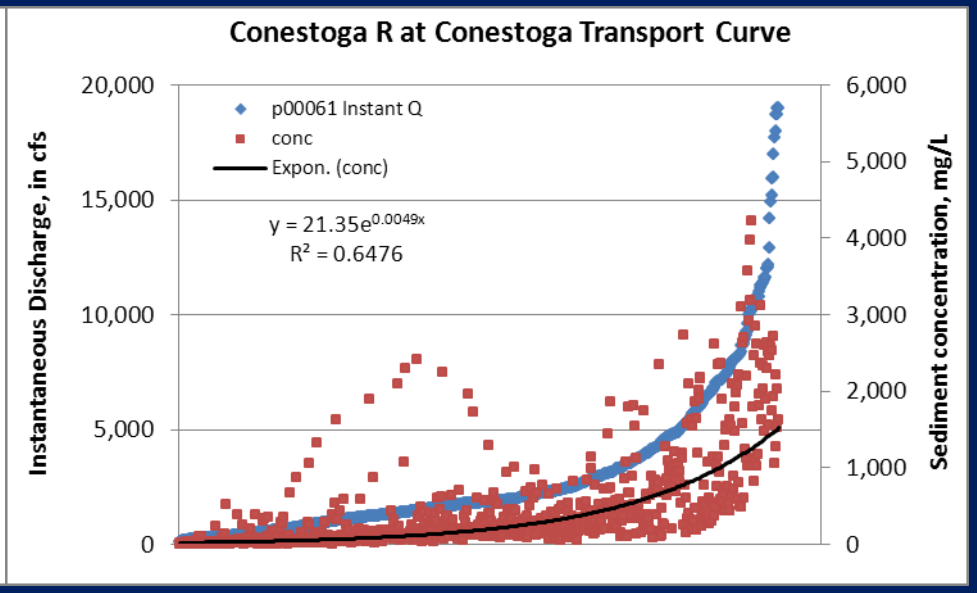
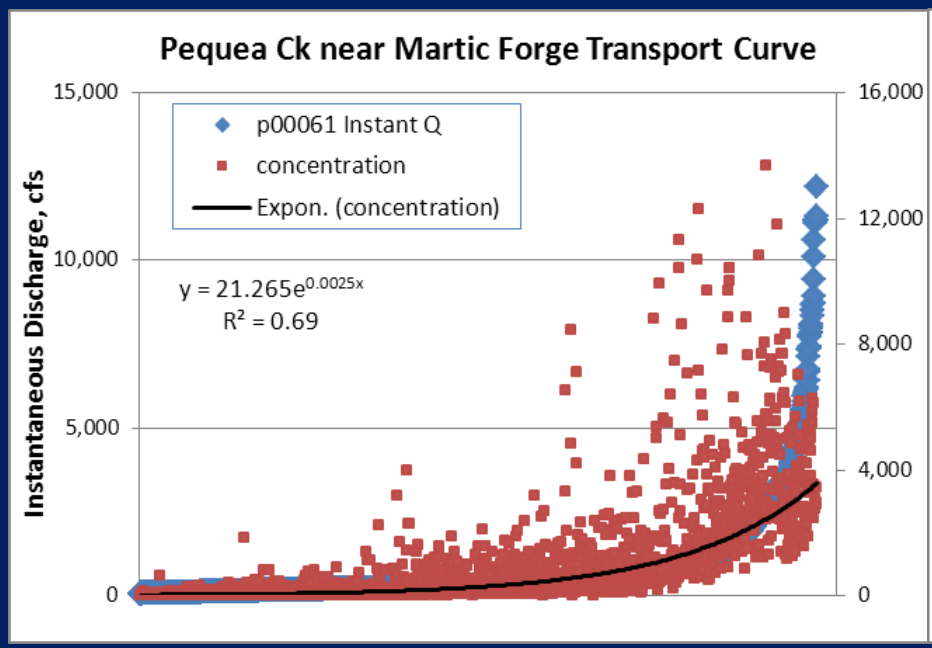
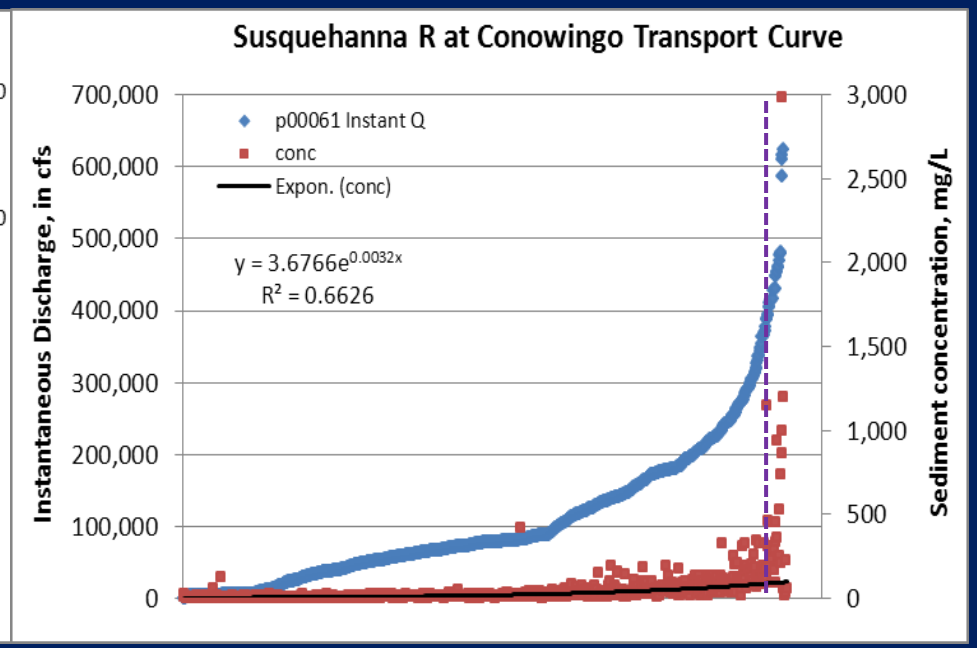
Transport Curves

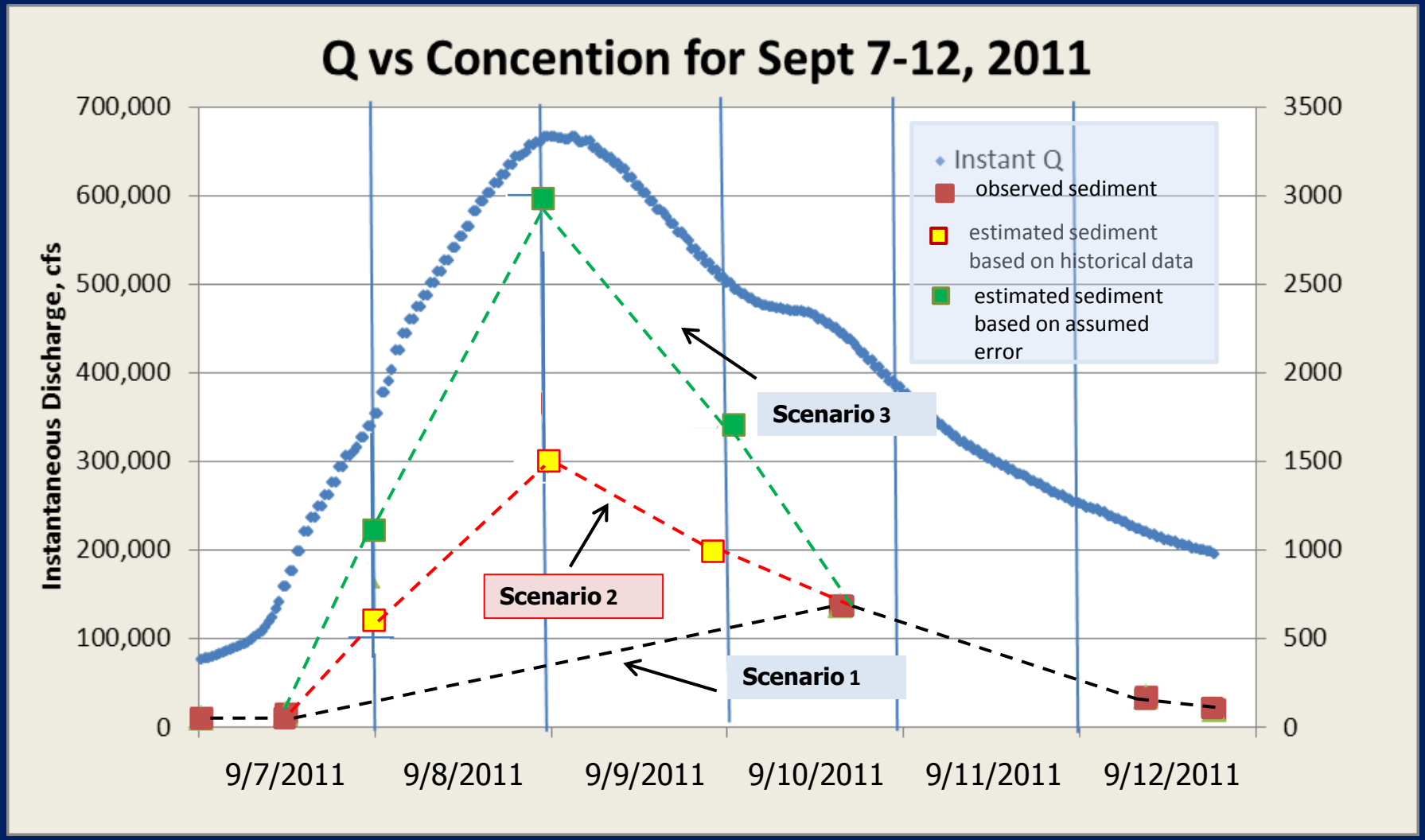








Estimated Sediment and Discharge Hydrographs for Susquehanna R. at Marietta, Tropical Storm Lee using "subdivided day method"



Marietta "subdivided day"

Site Number 01573810 **(using the estimated "medium" sediment concentrations, Scenario 2)**

Site Name Susquehanna R at Marietta, PA

						using (qtc)	using (d)	
	Time (t) (1)	**Q (2)**	**Average Sed (C) (3)**	**tc = (1*3) (4)**	**qtc = (2*4)**	**load (tns/interval) (qtc*.0027)/T**	**time interval (*d)**	**load (t/interval) (2*3/d)**
Date 9/07/2011	12	101,000	100	1200	121,200,000	**13,635**	740.7	**13,636**
	12	253,000	250	3000	759,000,000	**85,388**	740.7	**85,392**
Date 9/08/2011	12	452,000	800	9600	4,339,200,000	**488,160**	740.7	**488,187**
	12	609,000	1400	16800	10,231,200,000	**1,151,010**	740.7	**1,151,073**
Date 9/09/2011	12	653,000	1600	19200	12,537,600,000	**1,410,480**	740.7	**1,410,558**
	12	576,000	1400	16800	9,676,800,000	**1,088,640**	740.7	**1,088,700**
Date 9/10/2011	12	485,000	1100	13200	6,402,000,000	**720,225**	740.7	**720,265**
	12	445,000	750	9000	4,005,000,000	**450,563**	740.7	**450,587**
Date 9/11/2011	12	359,000	650	7800	2,800,200,000	**315,023**	740.7	**315,040**
	12	294,000	450	5400	1,587,600,000	**178,605**	740.7	**178,615**
Date 9/12/2011	12	245,000	250	3000	735,000,000	**82,688**	740.7	**82,692**
	12	209,000	125	1500	313,500,000	**35,269**	740.7	**35,271**
	12	4,681,000	8875	106500	53,508,300,000	**6,019,684**	8888.4	**6,020,015**
	mean Q	**390,083**						
	mean C	**740**						

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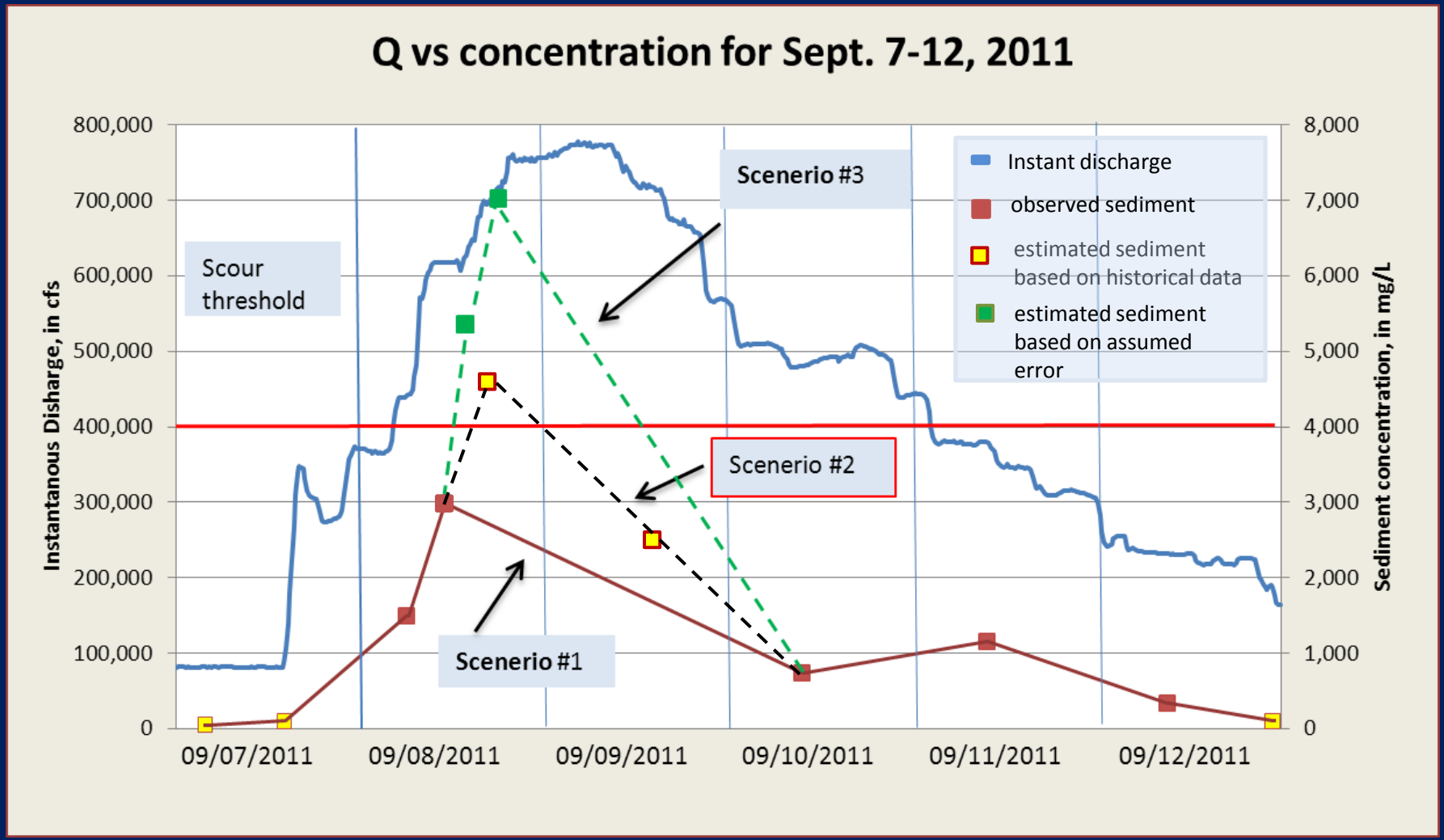
Scenario 1 - 4 M tons

Scenario 3 - 9 M tons

Sediment and Discharge Hydrographs for Susquehanna R. at Conowingo, TS Lee using SDD



Scenario 1 - 6 M tons | Scenario 2 - 12 M tons | Scenario 3 - 17 M tons

Results from TS Lee

- Input from Marietta (+6.0 M tons)
- Input w/in Reservoir (+1.5 M tons)
  (Conestoga and Pequea)
- Predicted scour removal (-4.0 M tons)
- Total (out) (+11.5 M tons)
- Meas Out Conowingo (~12 M tons)
- Difference (-0.5 M tons)

USGS

Summary

- Both deposition and scoured indicated via bathymetry (2008-11)
- Bathymetry indicates nearing SSC
- No sediment samples available at or near peak of storm at Marietta or Conowingo
- Using subdivided day, over half the annual sediment load (from ESTIMATOR) transported through Reservoirs to upper Bay during TS Lee

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