Managing TDS in the Upper Monongahela River Basin
Project WRI 119

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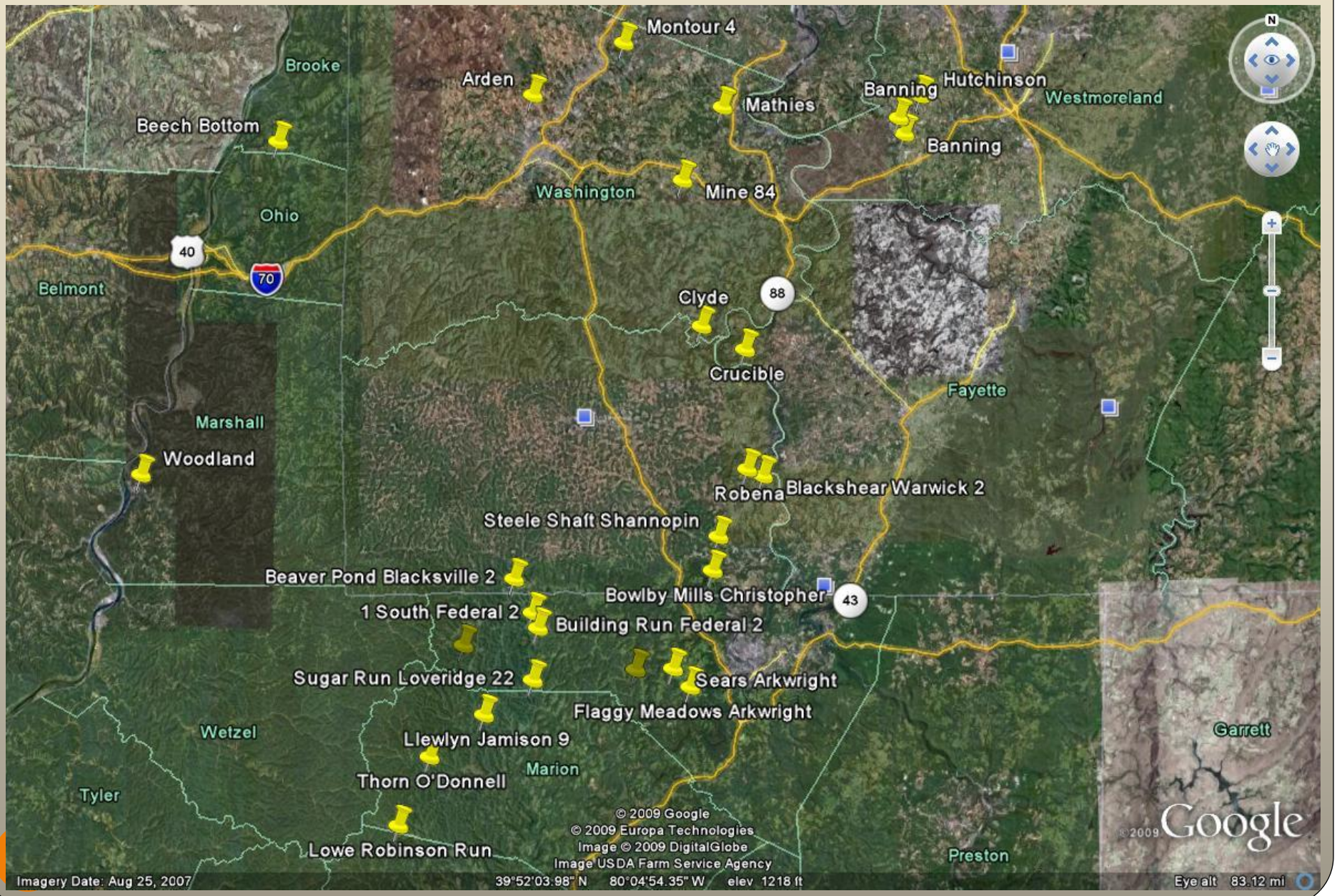
17 Aug 10

Pittsburgh Basin-Major AMD plants



Estimated TDS loads (tpy) from Upper Mon AMD treatment plants

	average observed	maximum observed	full pump capacity
Dunkard Ck	153,340	190,784	257,950
Robinson Run (Mon Co.)	11,000	22,000	17,600
Flaggy Meadows Run	12,205	34,166	47,300
Indian Ck	12,975	30,008	115,500
Paw Paw Ck	2,200	4,400	11,550
Buffalo Ck	10,043	36,938	36,300
Robinson Run (Marion Co.)	3,900	9,779	27,500
Total	205,662	328,075	513,700

Dunkard Creek

Managing TDS

- How much TDS is coming from AMD treatment plants?
- What is the assimilative capacity of Mon and tribs?
- How does that vary through the year?
- Can a coordinated pumping plan be developed?
- How to measure compliance?

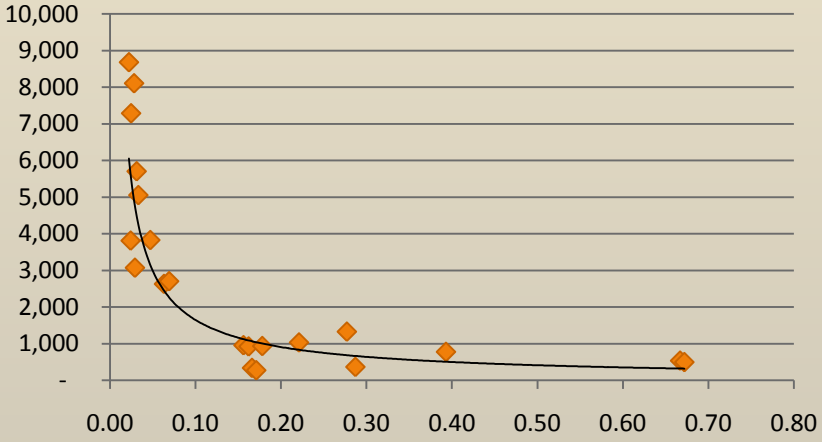
Managing TDS in the Monongahela River Basin Things that can be done in the near term

- Develop relationship between flow and TDS
- Management tools:
  - Identify Assimilative Capacity
  - Coordinate release of treated AMD With higher river flows
    - What are the critical flows in the Mon and the tributaries?
    - Manage by month? Season? Instantaneous flow?
- Will require:
  - Monitoring program: chemistry and flows
  - Organization/Coordination: Industry TDS Working Group
  - Understanding of mine water storage capacities
  - More responsive pumping systems
- Alternatively we'll probably see end of pipe discharge limits for TDS

The relationship between flow (x)and [TDS] (y)

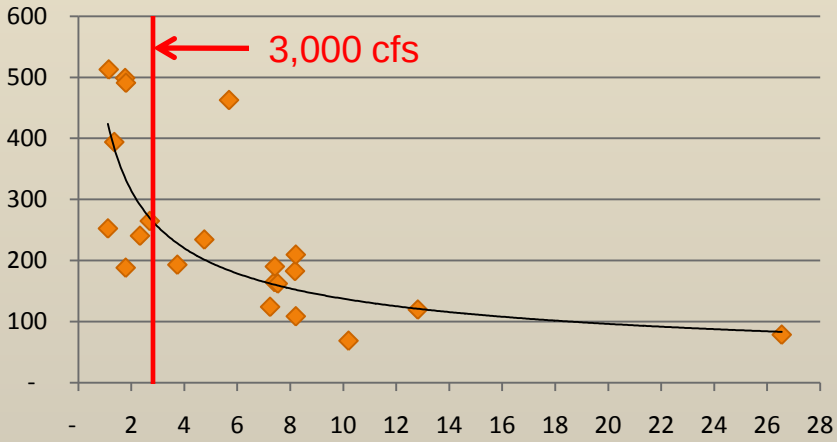
Dunkard Ck

$y = 86200x^{-0.859}$
$R^2 = 0.78$



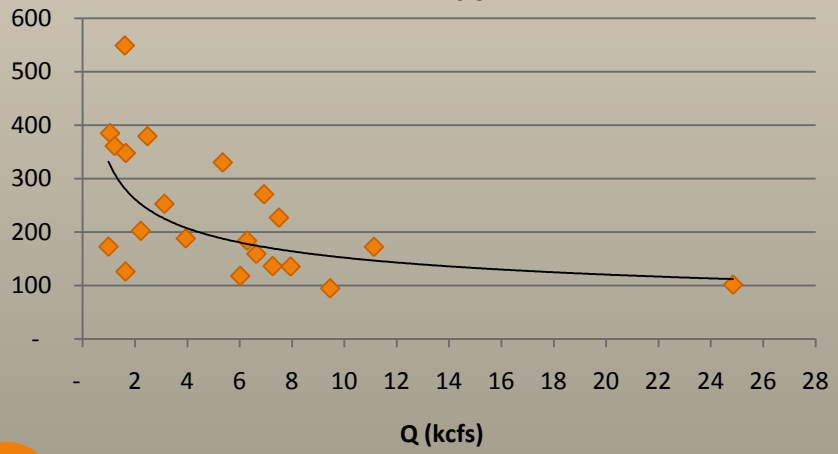
Masontown PA

$y = 15637x^{-0.514}$
$R^2 = 0.60$



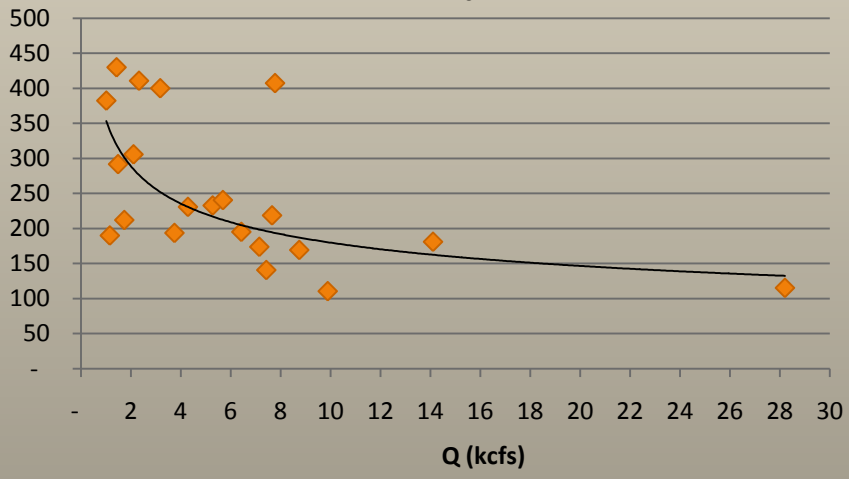
Pt. Marion PA

$y = 3384.7x^{-0.337}$
$R^2 = 0.37$



Elizabeth PA

$y = 2706.1x^{-0.294}$
$R^2 = 0.41$



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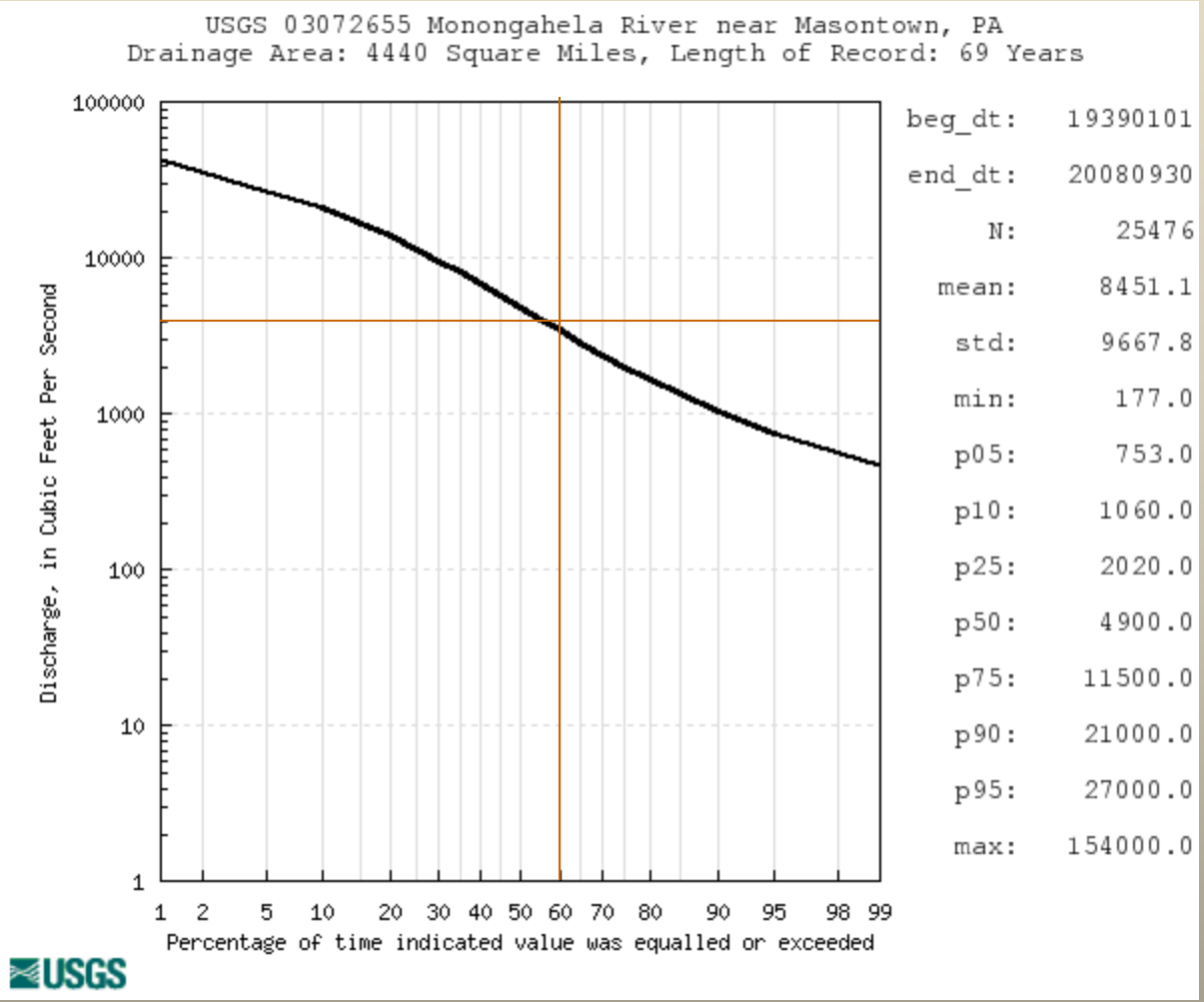
Flow in the Monongahela R. at Masontown PA is greater than 3,000 cfs 60% of the time



At near maximum mine pumping rates, the [TDS] in Dunkard Ck will respond to flow

Q > 192 cfs ~50% of the time

TDS load tpy	Q cfs	[TDS] mg/L
250,000	50	5051
250,000	150	1684
250,000	250	1010
250,000	350	722
250,000	450	561

The relationship among: flow, TDS Load and resulting [TDS] in Dunkard Ck.

Remember: the total load from AMD treatment plants on Dunkard Ck. normally ranges between 150,000 to 300,000 tpy

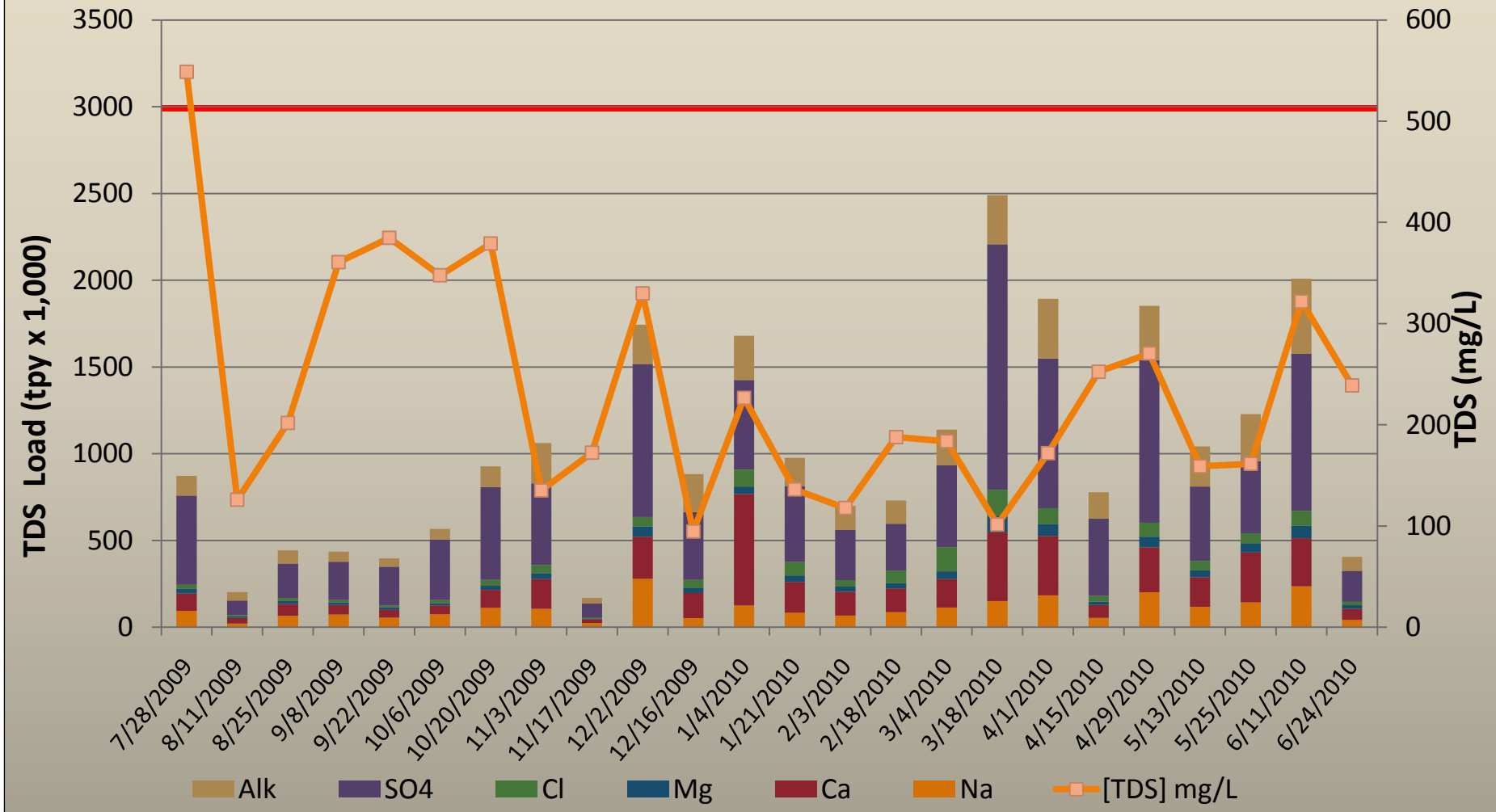
Q (Dunkard Ck)	30	120	300	cfs
TDS load	148,170	148,170	296,340	tons/yr
[TDS]	5,000	1,250	1,000	mg/L

Organization:
Coal Industry TDS Working Group

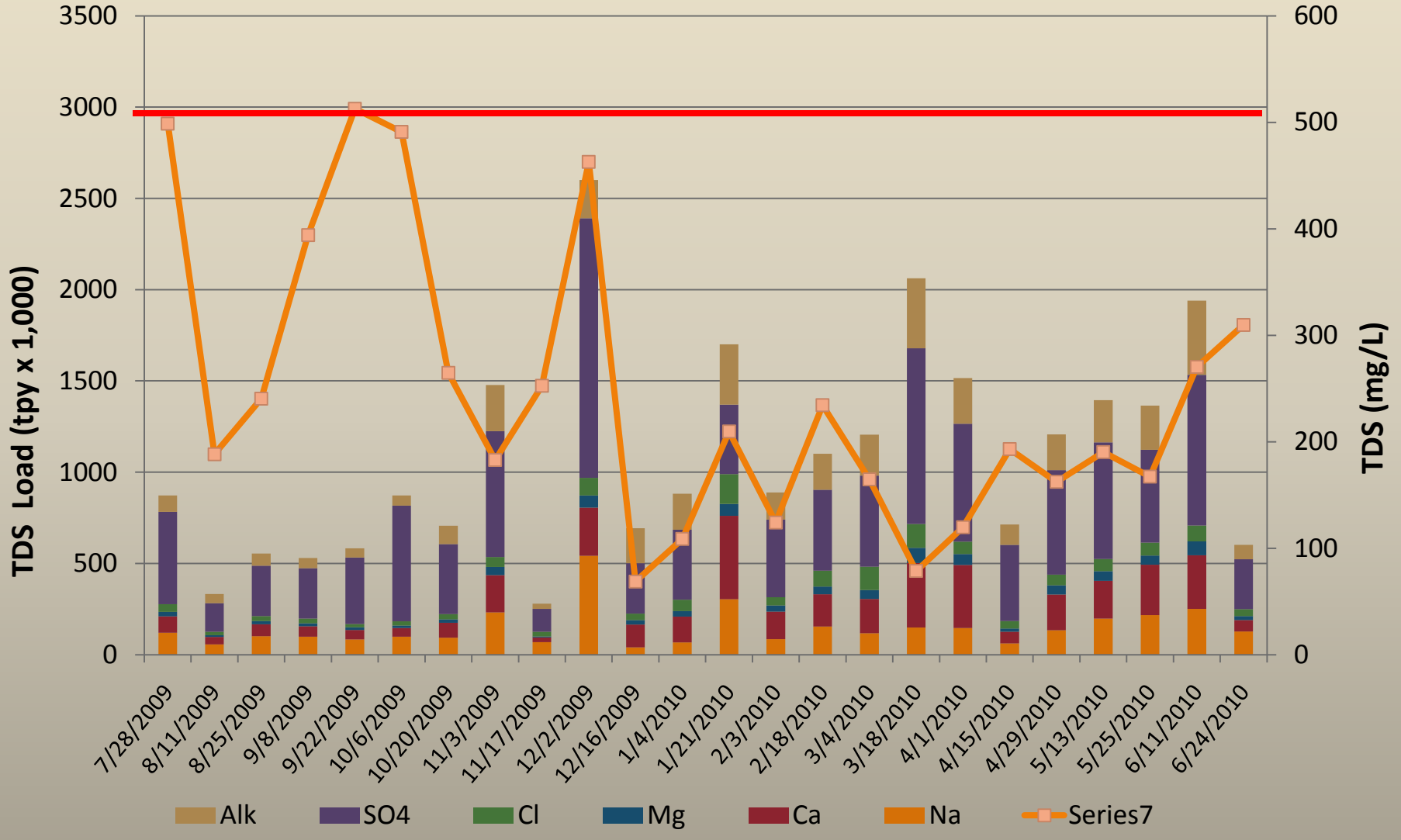
- Formed in January 2010
- Consists of the major coal producers in the upper Monongahela basin
- Supported by ongoing TDS monitoring and assessment carried out by the WV Water Research Institute

Some recent findings

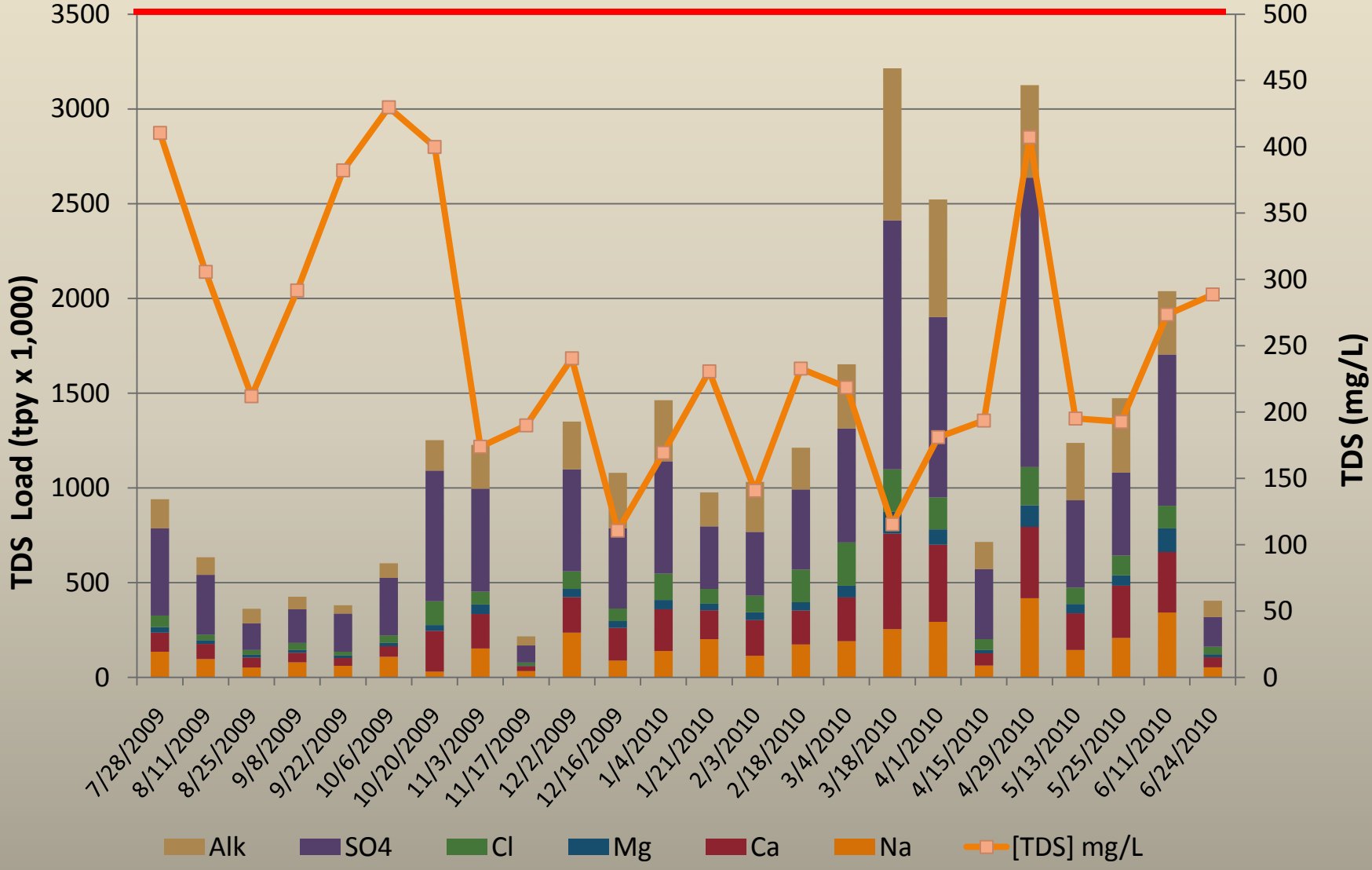
Monongahela R. @ Pt. Marion PA



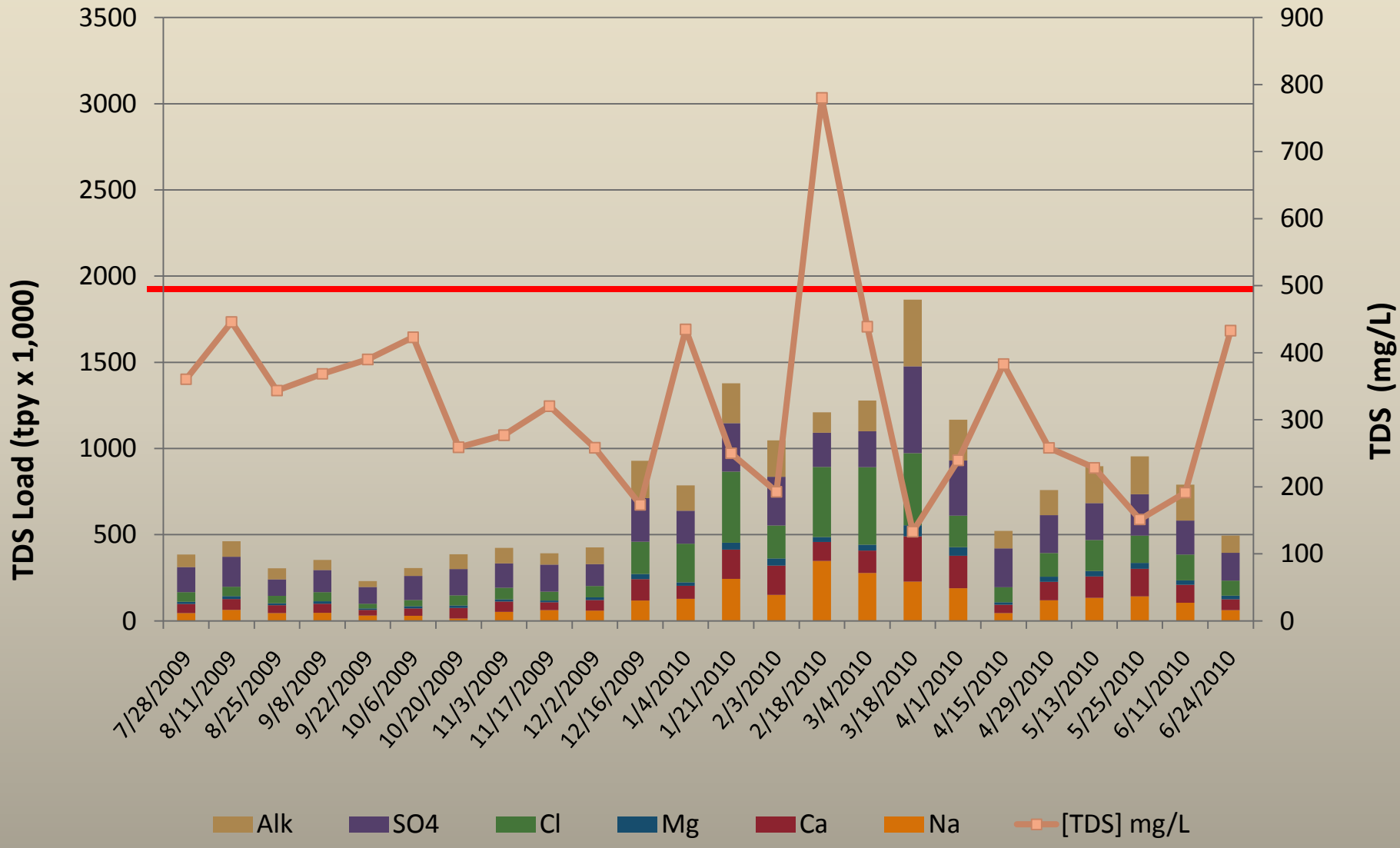
Monongahela R. @ Masontown PA



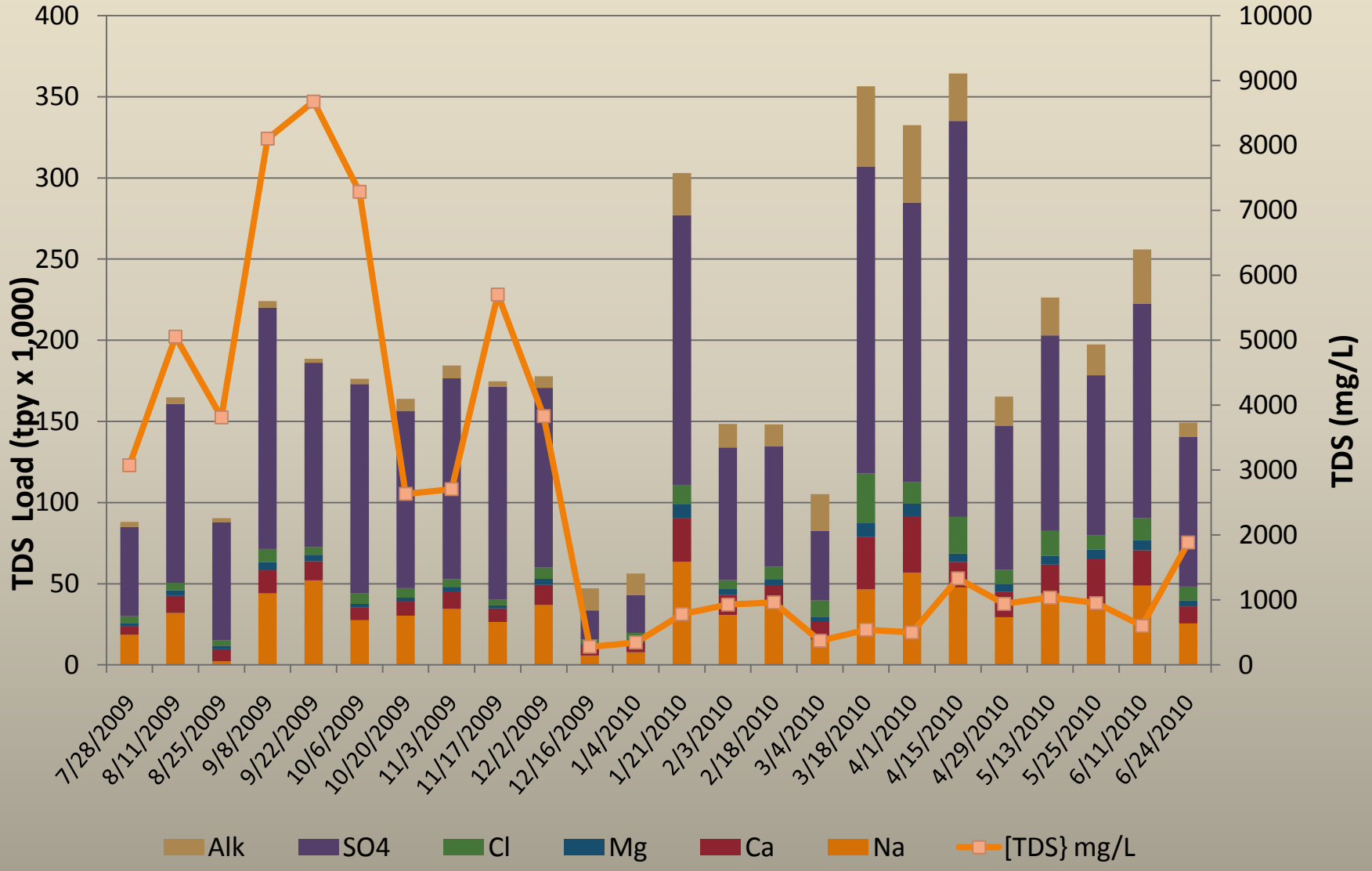
Monongahela R. @ Elizabeth PA



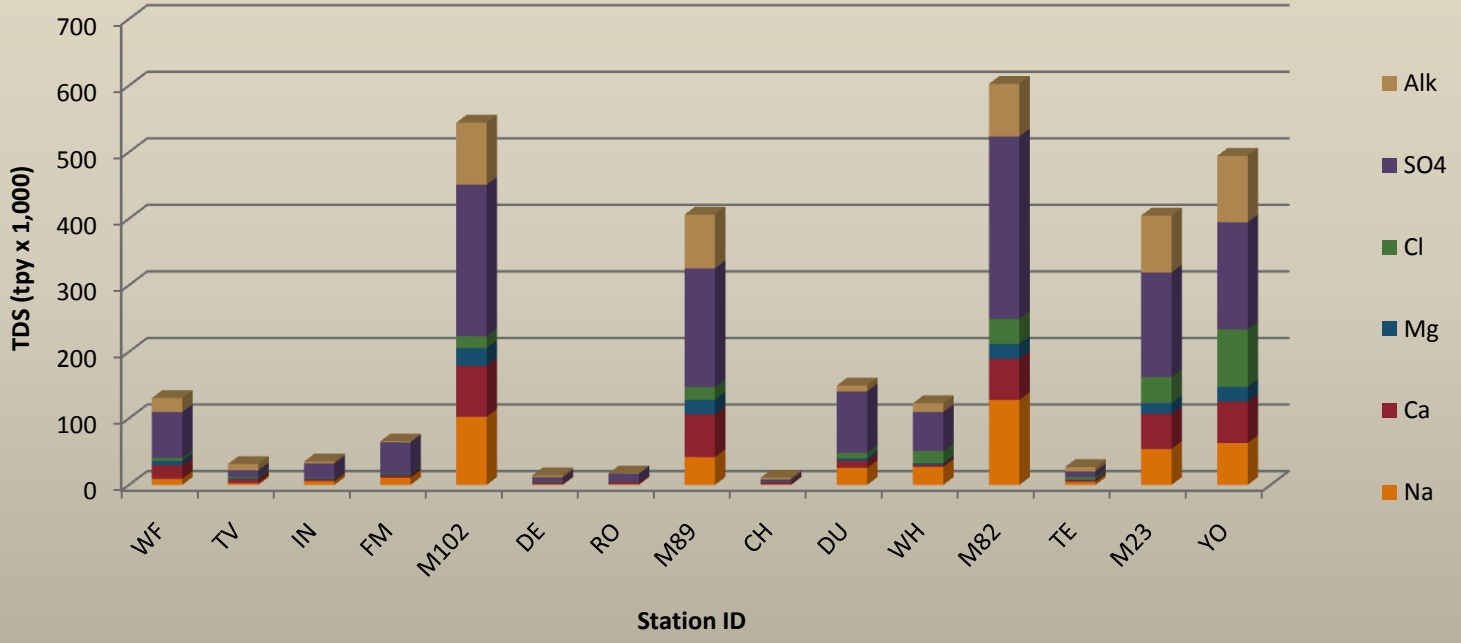
Youghiogheny R. @ Sutersville PA



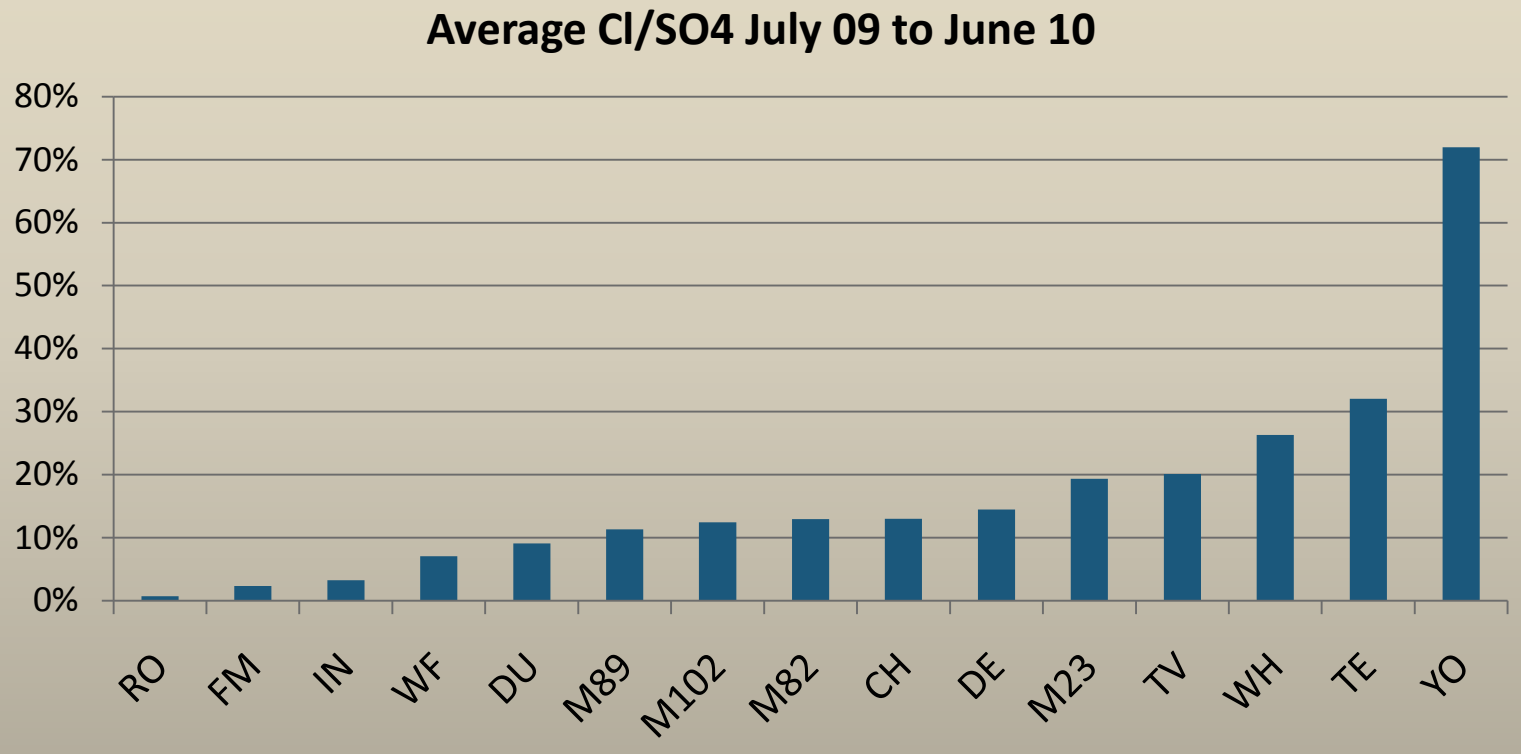
Dunkard Ck. @ Bobtown PA



Monongahela river TDS loading
24 June 2010



The Chloride to Sulfate ratio may be a good indicator of mining vs. brine water



Road salt does not explain the high [TDS]

WVDOH consumption: July 09 to June 10

(that covers an exceptionally snowy winter)

Marion	tons
Mannington	1,390
Fairmont	2,636
subtotal	**4,026**

Preston	
Albright	2,145
Aurora	1,485
Bruceton	2,572
Fellowsville	1,009
Terra Alta	1,209
subtotal	**8,420**

Monongalia	tons
Goshen	5,462
Pentress	962
subtotal	**6,424**

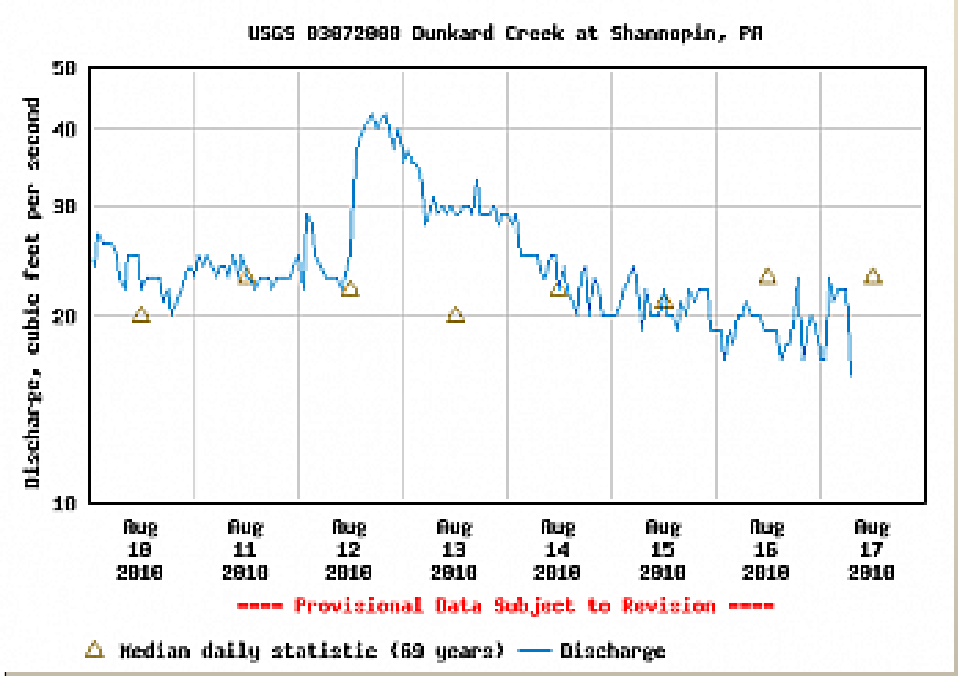
Taylor	**3,535**

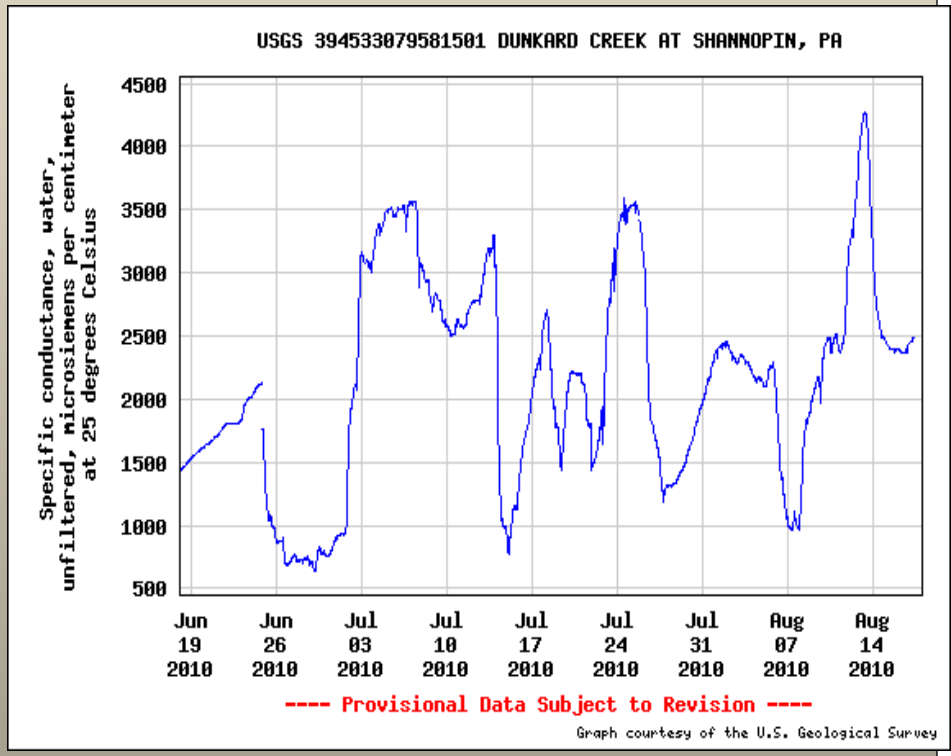
Interstates	
I 79-Goshen Rd (PA to exit 132)	4,379
I 68-Coopers Rock (MD to I-79)	4,544
subtotal	**8,923**

Total **31,328 tpy**

Current USGS Flow and EC data for Dunkard Ck:

[TDS] between 700 and 3,000 mg/L





Conclusions:

- None of the TDS constituents are cumulative or toxic at reasonable concentrations
- Upper Mon AMD plants generate between 200,000 and 500,000 tpy of TDS
- That accounts for between 20 to 100% of TDS in the Mon
- For much of the year the Mon can easily assimilate that sort of loading while maintaining a [TDS] below 500 mg/L
- It should be possible to develop a managed, load-weighted discharge program to control [TDS] at the desired levels
- That will require organization, commitment , transparency and accountability

Questions?

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