West Virginia:
A Comprehensive Approach to Watershed TMDLs

Efficiency + Detail = Better Implementation

How we got started…

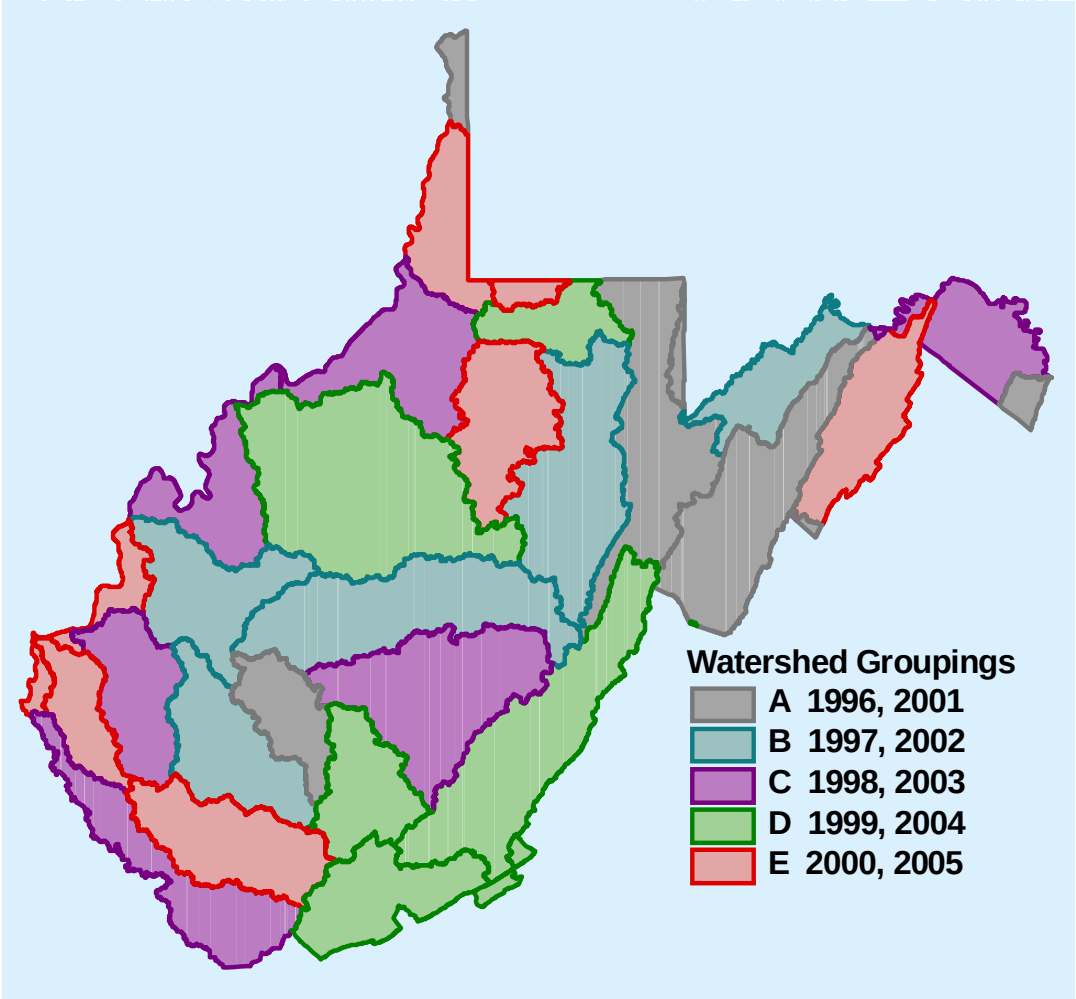
- Consent Decree:
  AMD Required for 500^{+} streams in 10 years

  - While in the watershed, do other potential impairments
    - Streams not previously listed as impaired
    - Additional parameters

Watershed Approach

- Multiple Impaired Streams in one basin
- Multiple Impairments within one basin
  - Fecal Coliform
  - Iron (Dissolved and Sediment)
  - Aluminum
  - pH (AMD and Acid precipitation)
  - Biological
- New River Example
  - 2004 303(d) listing: 47 streams/60 impairments
  - TMDLs developed for 127 streams/164 impairments
    - Removed 14 previously listed impairments because of new data

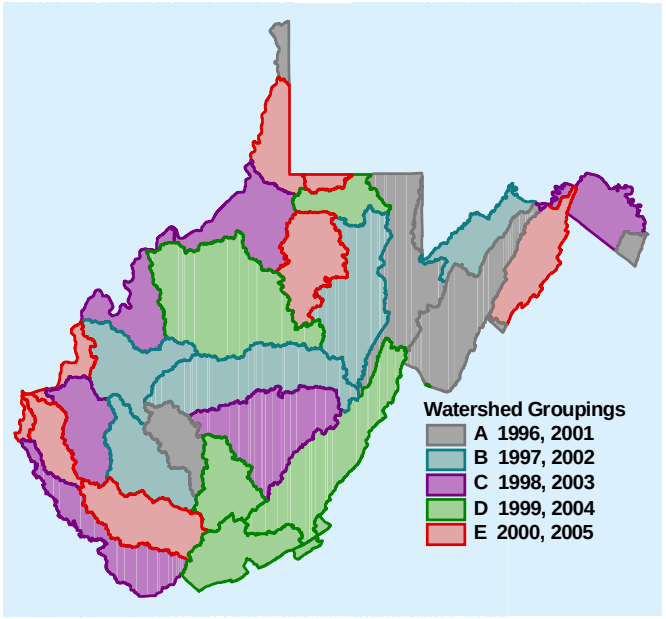
Watershed Framework
(8 digit HUCs)



Watershed Framework Integration

- 5 watershed groups on rotation
- TMDL revisited in 15 years
- All NPDES permits within watershed group are issued the same year

Example: Greenbrier River TMDL finalized in spring
All permits in the Greenbrier basin issued July-June



Efficiency

- Modeling: ~$3,500/TMDL
- Analytical: ~$300/TMDL
- +staff (field, public info, technical, administrative)

- <$10,000/TMDL

Efficiency

(While we're there…)

- Geographically close
  - Sampling
  - Public input
- Add parameters for other potential impairments

  Single source-multiple impairments

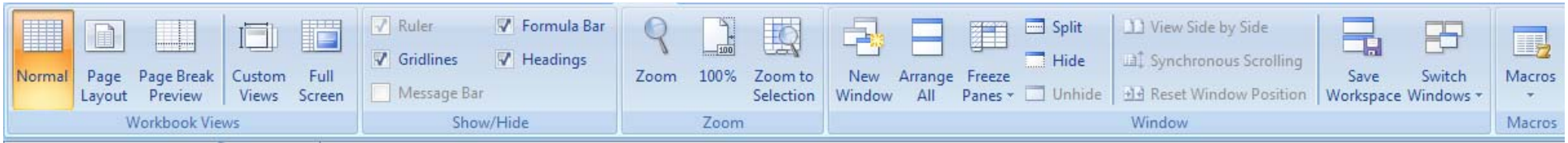
  (agriculture source: bacteria & biological impairment)
- Hydrologic calibration & Subwatershed Delineation
- Interaction: sediment-Fe correlation for Bio impairments

Detail

- Finer scale subwatershed delineation
  - 9 vs. 160
- Robust water quality data
  - 12 monthly samples @ ~300 stations
- Detailed source tracking
  - Source samples
  - BMP evaluation

Results

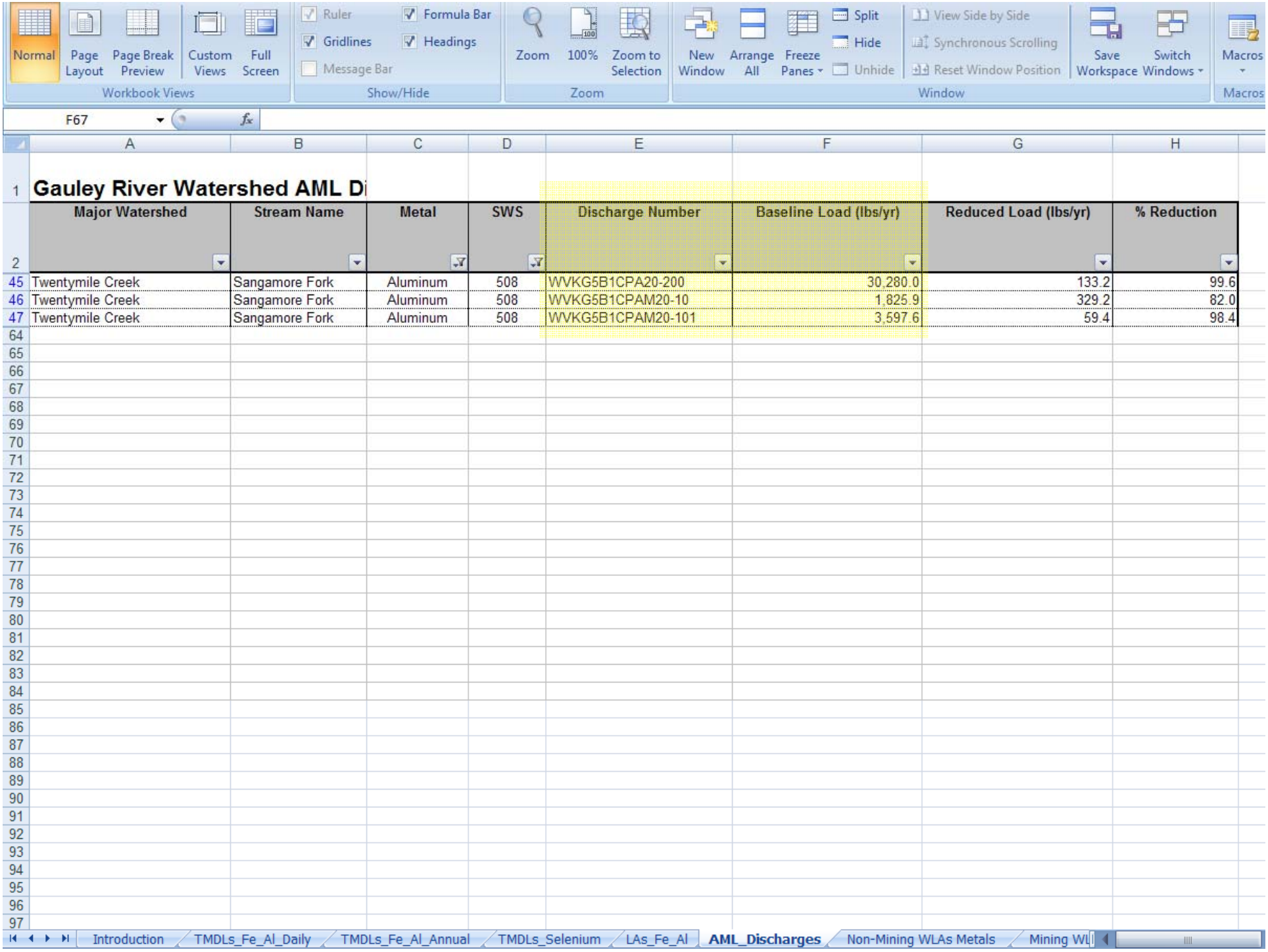
- More implementable TMDL
  - Fuller picture of problems=> better solutions
  - Reduction @ “subwatershed/individual source” level
- “TMDL on CD”
  - Arc Explorer GIS Project
  - “pre-tooled” Excel Tables
  - Water Quality Sample results
  - Narrative



A14 | Twentymile Creek

Gauley River Watershed Iron and Aluminum Load Allocations

Major Watershed	Stream Code	Stream Name	Metal	SWS	ABANDONED MINES			Bond Forfeiture Sites			FOREST HARVEST	
					Baseline Load (lbs/yr)	Allocated Load (lbs/yr)	% Reduction	Baseline Load (lbs/yr)	Allocated Load (lbs/yr)	% Reduction	Baseline Load (lbs/yr)	Allocated Load (lbs/yr)
Twentymile Creek	WVKG-5	Twentymile Creek	Iron	501	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-A	Buckles Branch	Iron	502	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5	Twentymile Creek	Iron	503	50.4	50.4	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B	Bells Creek	Iron	504	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1	Open Fork	Aluminum	505	1,075.8	1,075.8	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1	Open Fork	Iron	505	274.5	274.5	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1-B	Williams Hollow	Aluminum	506	567.3	567.3	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1-B	Williams Hollow	Iron	506	159.1	159.1	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1	Open Fork	Iron	507	14.3	1.4	90.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1	Open Fork	Aluminum	507	56.1	5.6	90.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1-C	Sangamore Fork	Aluminum	508	35,930.3	748.6	97.9	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1-C	Sangamore Fork	Iron	508	4,732.1	990.1	79.1	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1	Open Fork	Aluminum	509	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-1	Open Fork	Iron	509	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B	Bells Creek	Iron	510	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-2	Smith Branch	Iron	511	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B	Bells Creek	Iron	512	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-4	Hughes Fork	Iron	513	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-5	Rockcamp Fork	Iron	514	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B	Bells Creek	Iron	515	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-6	Laurel Fork	Iron	516	24.2	24.2	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B	Bells Creek	Iron	517	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B-7	Campbell Fork	Iron	518	171.4	171.4	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-B	Bells Creek	Iron	519	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5	Twentymile Creek	Iron	520	38.0	38.0	0.0	0.0	0.0	0.0	964.3	964.3
Twentymile Creek	WVKG-5-D	Backus Branch	Iron	521	53.7	53.7	0.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5	Twentymile Creek	Iron	522	2,745.1	2,745.1	0.0	0.0	0.0	0.0	830.7	830.7
Twentymile Creek	WVKG-5-F	Rockcamp Fork	Iron	523	3.1	0.3	89.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-F	Rockcamp Fork	Aluminum	523	11.0	1.2	89.0	0.0	0.0	0.0	0.0	0.0
Twentymile Creek	WVKG-5-F-1	Spring Branch	Iron	524	2,151.8	199.3	90.7	0.0	0.0	0.0	0.0	0.0



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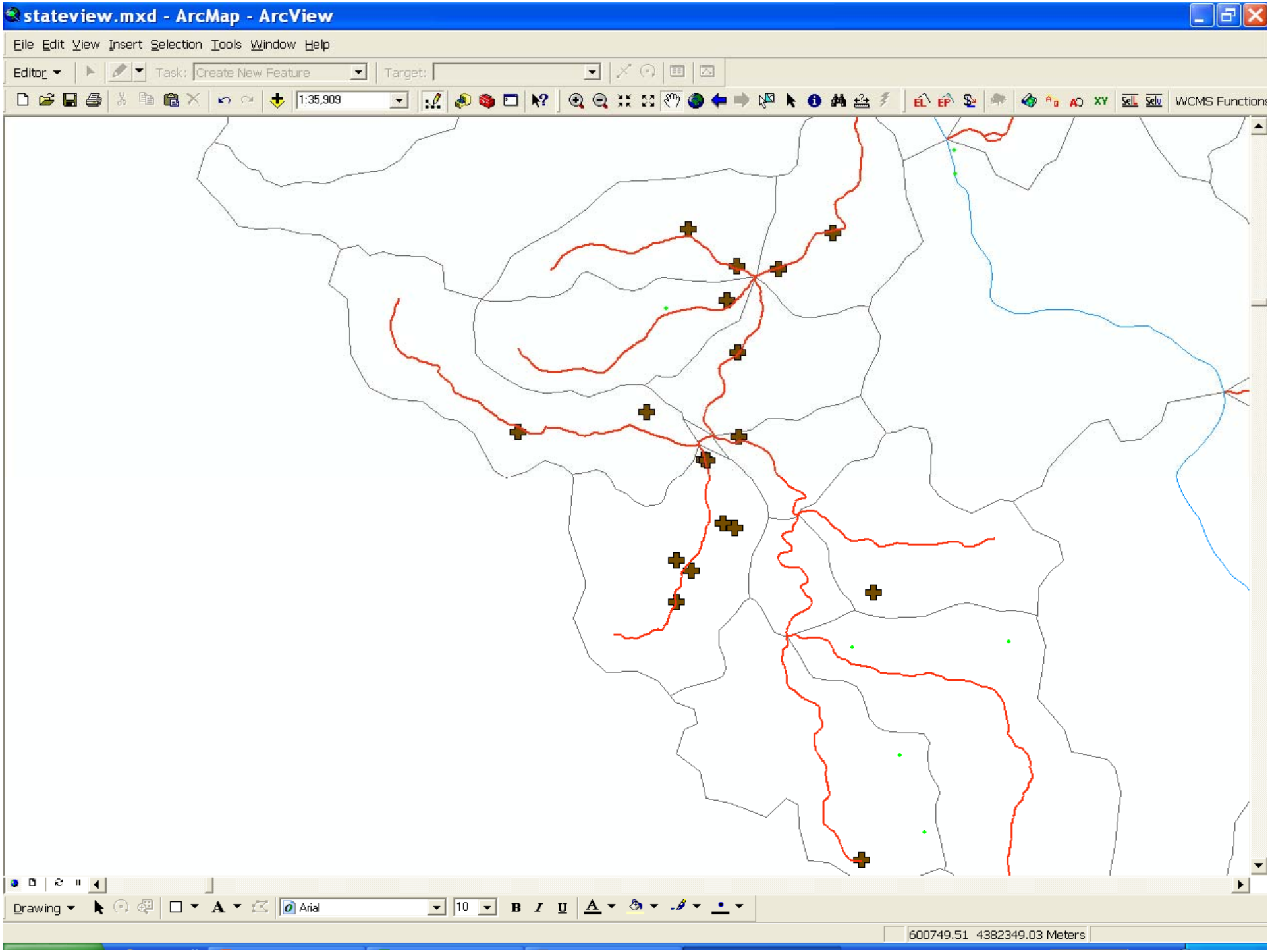
Gauley River Watershed AML Di

Major Watershed	Stream Name	Metal	SWS	Discharge Number	Baseline Load (lbs/yr)	Reduced Load (lbs/yr)	% Reduction
Twentymile Creek	Sangamore Fork	Aluminum	508	WVKG5B1CPA20-200	30,280.0	133.2	99.6
Twentymile Creek	Sangamore Fork	Aluminum	508	WVKG5B1CPAM20-10	1,825.9	329.2	82.0
Twentymile Creek	Sangamore Fork	Aluminum	508	WVKG5B1CPAM20-101	3,597.6	59.4	98.4

Introduction | TMDLs_Fe_Al_Daily | TMDLs_Fe_Al_Annual | TMDLs_Selenium | LAs_Fe_Al | AML_Discharges | Non-Mining WLAs Metals | Mining WL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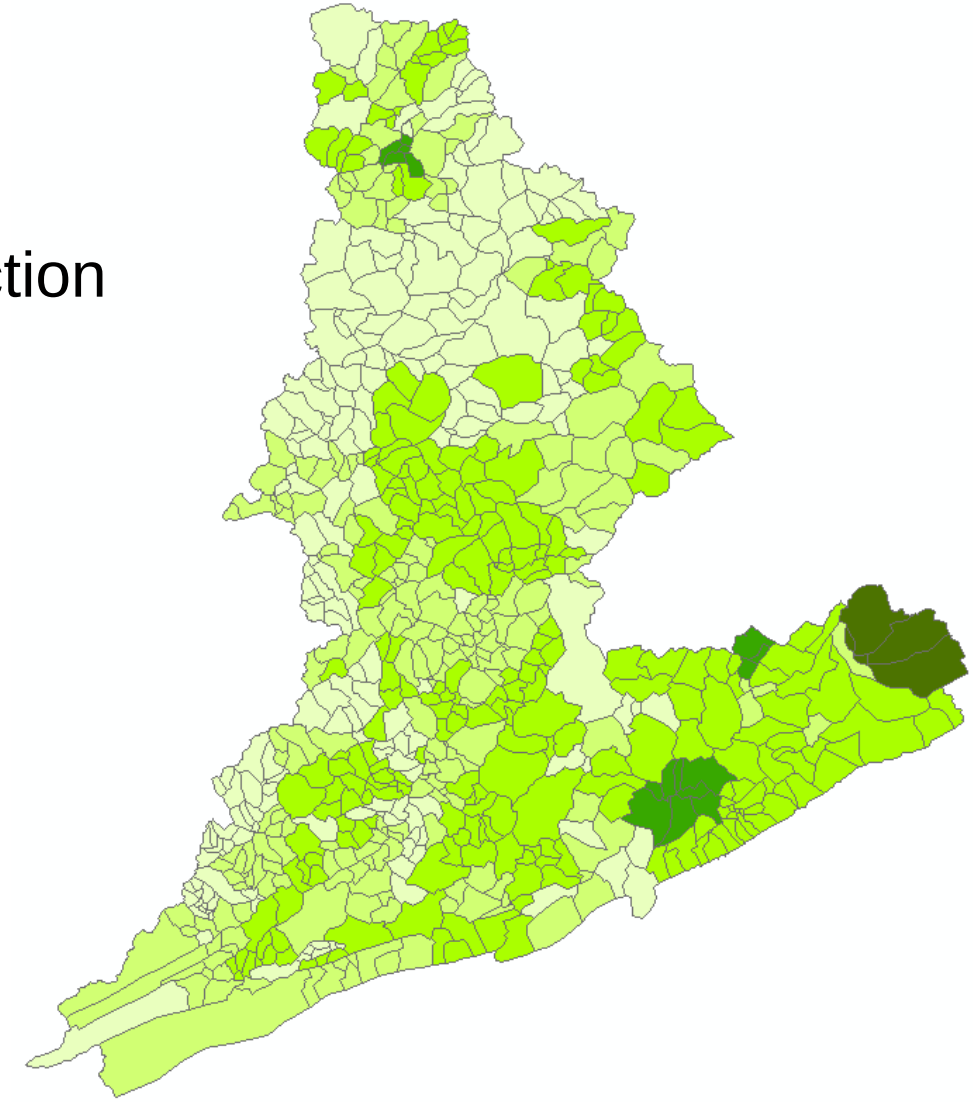
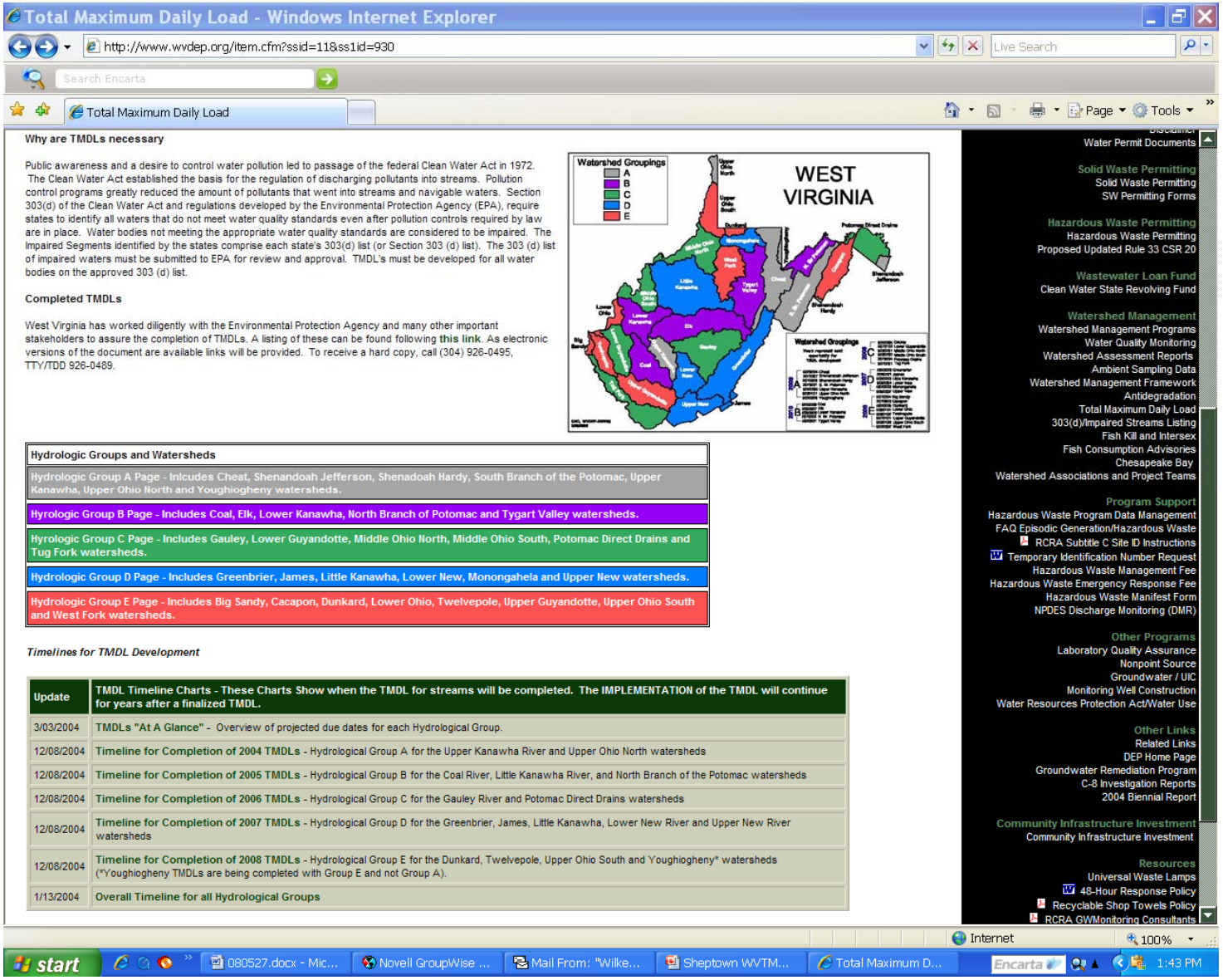
Pasturing Runoff Potential

- Pasture-Grassland Distinction
- Number of animals
- Management Practices
  - Stream access
  - Buffer zones



http://www.wvdep.org/item.cfm?ssid=11&ss1id=930



Navigation to TMDL webpage

- wvdep.org
- Click “offices” and select “Division of Water and Waste Management”
- From the list of programs on the right side of the page, select “Total Maximum Daily Load” under the “Watershed Management” heading
- Select one of the watershed groups and then select a TMDL to view. (Select a newer TMDL for the best example of what we’re doing now; we try to make improvements with each watershed group.)

Contacts

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