


RECLAMATION NEEDS IN A CHANGING COAL SECTOR: AN APPALACHIAN PERSPECTIVE

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In the beginning:

- Pre-Clean water act 1970 (CWA) and
- Pre-Surface mining control and reclamation act 1977 (SMCRA)

- Offsite impacts:
  - CWA compelled mines to treat Acid mine drainage (AMD) to adjust pH, remove major metal ions
- Onsite impacts:
  - Surface mines were generally small surface, contour/auger operations
  - Underground mines intruded on the surface as preparation plants with attendant refuse (tailings) piles
  - Pre law surface hazards addressed through the Abandoned mine land (AML) program

The Pre law legacy

USEPA and USDI/OSMRE

- USEPA delegates CWA primacy to approved state regulatory programs
- The state develops rules that conform to the CWA
  - Stream impairment: protection of designated stream uses e.g.
    - Recreation
    - Fishery
    - Public drinking water supply
    - Includes: numeric (e.g. pollutant concentrations) and
    - narrative stream standards: biological indicators of stream impairment
      - "diversity, productivity, and stability of aquatic organisms ..."
  - Discharge standards
    - CWA permits persist until the untreated discharge meets numeric state discharge standards (e.g. pollutant concentrations)
  - Termination of jurisdiction

USEPA and USDI/OSMRE

- OSMRE is the designated Federal authority under SMCRA. Primacy is delegated to approved state regulatory programs.
- SMCRA permits included mining method, surface reclamation and water pollution controls
  - Water pollution control
    - Identification of toxic materials
    - Toxic material handling plans
    - Acid mine drainage policy compliance
    - Water treatment during and after operations
  - Land reclamation
    - Designated land use
    - Landscape: Approximate original contour
    - Soil salvage and replacement
    - Revegetation
  - Stream loss/mitigation
    - In kind or cash settlement for stream burial
    - Stream mitigation methods/validation
    - Stream mitigation valuation

Thanks to SMCRA and the AML Trust Fund
Before and After Reclamation

Jurisdictional boundary **SMCRA** and **CWA**

- **Onsite**
  - SMCRA regulates mining and reclamation within the permit boundary
- **Offsite**
  - CWA regulates offsite water pollution effects: protection of waters of the United States

Are SMCRA and CWA technologies and policies resolved?

- Yes if I don’t know of any:
  - Active legislation or rule making
  - Legal or interjurisdictional challenges to legislation or rule making
  - Contested permits

SMCRA: Current technology and policy

Largely resolved

- Water pollution control
  - Identification of toxic materials
  - Toxic material handling plans
  - Acid mine drainage policy compliance
  - Water treatment during operations
- Land reclamation
  - Designated land use
  - Landscape: Approximate original contour
  - Soil salvage and replacement
  - Revegetation
- Stream loss/mitigation
  - In kind or cash settlement for stream burial

Still under development

- Water pollution control
  - Identification of toxic materials
  - Toxic material handling plans
  - Acid mine drainage policy
  - Water treatment during operations
- Land reclamation
  - Designated land use
  - Landscape: Approximate original contour
  - Soil salvage and replacement
  - Reforestation: long term performance
- Stream loss/mitigation
  - In kind or cash settlement for stream burial
  - Stream mitigation methods/validation
  - Stream mitigation valuation

CWA: Current technology and policy

Largely resolved

- Stream impairment: protection of designated stream uses e.g..
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SMCRA: unresolved issues

– Designated land use

Landscape: Alternatives to approximate original contour

1. Landowner's land use goals
2. Disposition of roads, infrastructure, ponds
3. How to reconcile ultimate land valuation and potential liabilities: see item 2.
4. Creation of landscapes that minimize geotechnical as well as erosion hazards

SMCRA: unresolved issues

- Soil Genesis
  - Long term development
  - Nutrient cycling
  - Soil structure development

- Forestry-how best to ensure stable, productive, self sustaining forest
  - Succession
  - Nurse crops
  - Beneficial vs. harmful species

SMCRA: unresolved issues

Stream loss/mitigation

- In kind or cash settlement for stream burial
  - When is it appropriate?
- Stream mitigation methods/validation
  - What techniques yield predictable ecological uplift?
- Stream mitigation valuation
  - How to quantify the benefit of a particular mitigation strategy

CWA: unresolved issues

- Stream impairment: protection of designated stream uses e.g.
  - numeric (e.g. pollutant concentrations) and
    - Reliance on total rather than dissolved metal analysis is prone to positive bias particularly with aluminum. This puts many NPDES permit holders out of compliance since the USEPA's recommended digestion method digests alumino-silicate clay. Work arounds include translators and hardness adjustments.
  - narrative stream standards: biological indicators of stream impairment.
    - How to determine discharge standards that will ensure CWA's goal: "diversity, productivity, and stability of aquatic organisms ..."
    - Identify controlling stream pollutant concentrations.

Narrative Standards: Biological Impairment

WVSCI = West Virginia Stream Condition Index
Multimetric Index on scale of 0 – 100
Impairment threshold at 68
How to translate into discharge limits?

Hypothesis:
WVSCI=f (EC)
R^2=0.24

CWA: unresolved issues

- Discharge standards
  - CWA permits persist until the untreated discharge meets numeric state discharge standards (e.g. pollutant concentrations)
  - Unresolved issues include
    - stream flow criteria for load and concentration levels e.g. Harmonic mean vs. 7Q10
    - Analytical methods
    - Compliance point
    - Mixing zones

CWA: unresolved issues

- Termination of jurisdiction
  - The process of terminating a CWA sec 402 permit.
  - Monitoring protocol
  - Compliance point
    - On site
    - Off site??

Future directions in technology and policy development

Level 1. Active Operations

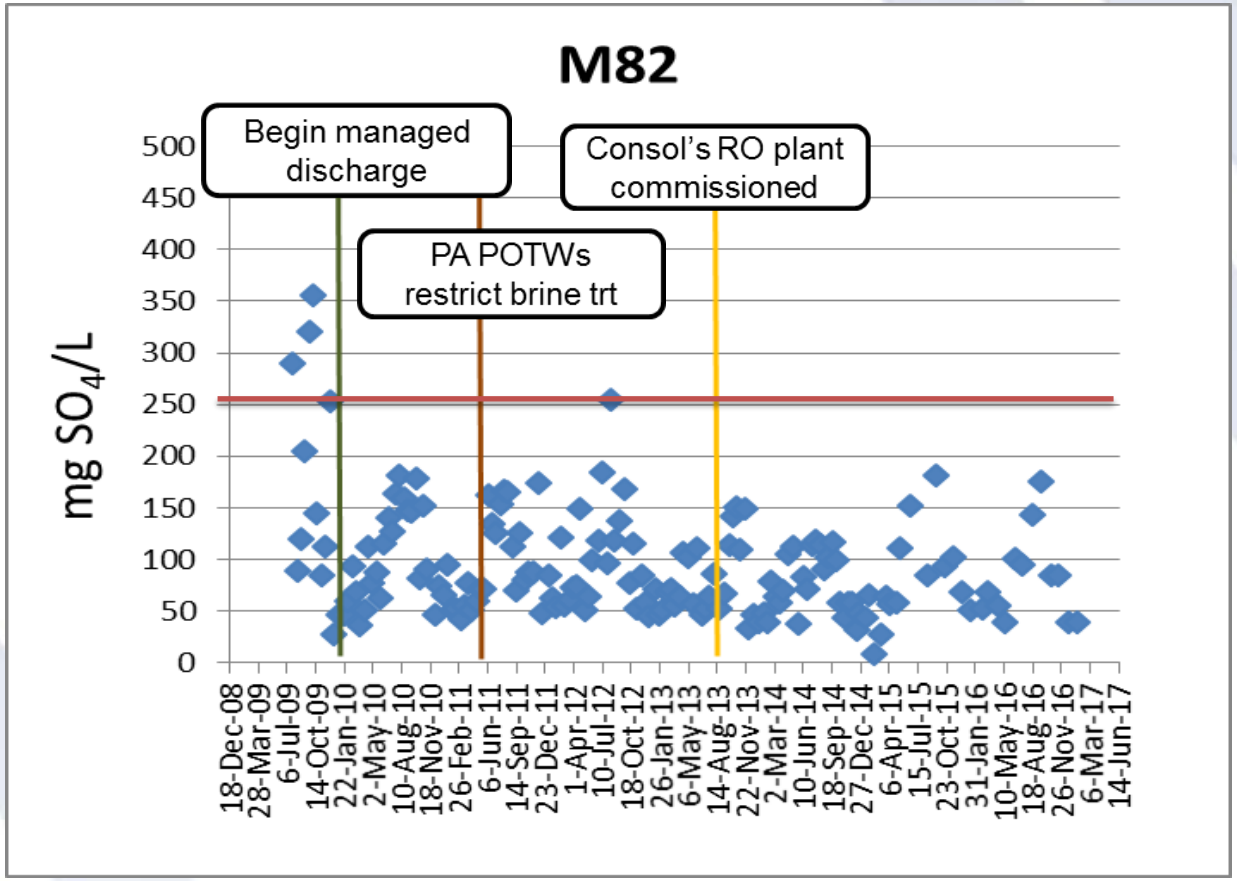
- SMCRA
  - Land use
  - Mitigation

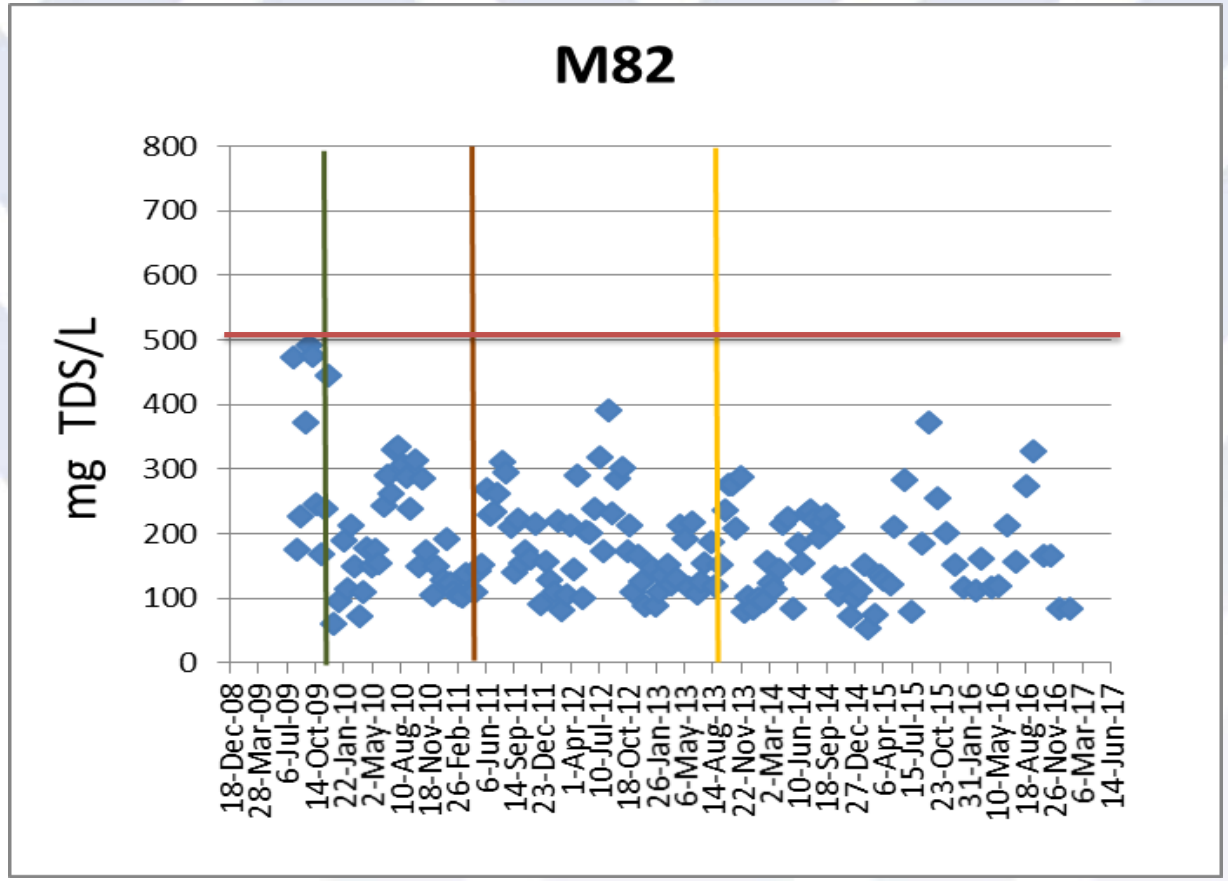
- CWA
  - Criteria for designated use attainment
  - Identify stream chemical criteria for achievement of narrative water quality standards
  - Improved analytical methods
  - Stream flow criteria
  - In stream compliance point

Future directions in technology and policy development
Level 2. Closure and Bonding

- SMCRA
  - Bonding instruments
    - How best to regulate and manage:
      - Bond pools
      - Self bonding
      - Third party surety bond
    - Estimation of water and land liability
- CWA
    - Alternate approaches to CWA permit compliance
      - Watershed scale discharge management
      - Quantifying watershed scale benefits
      - Costs
      - Private investment

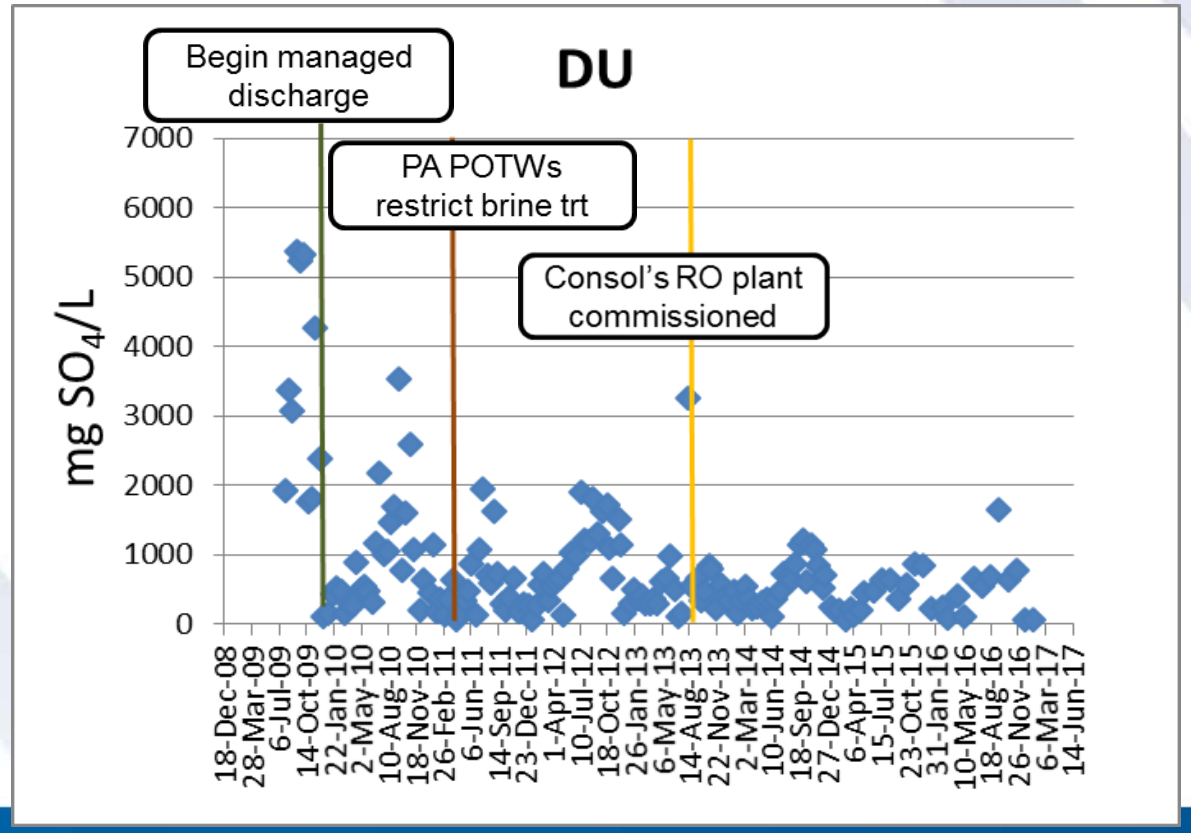
Effect of Managing Mine Discharge Rates: 2009 to 2017 Monongahela River at Masontown PA



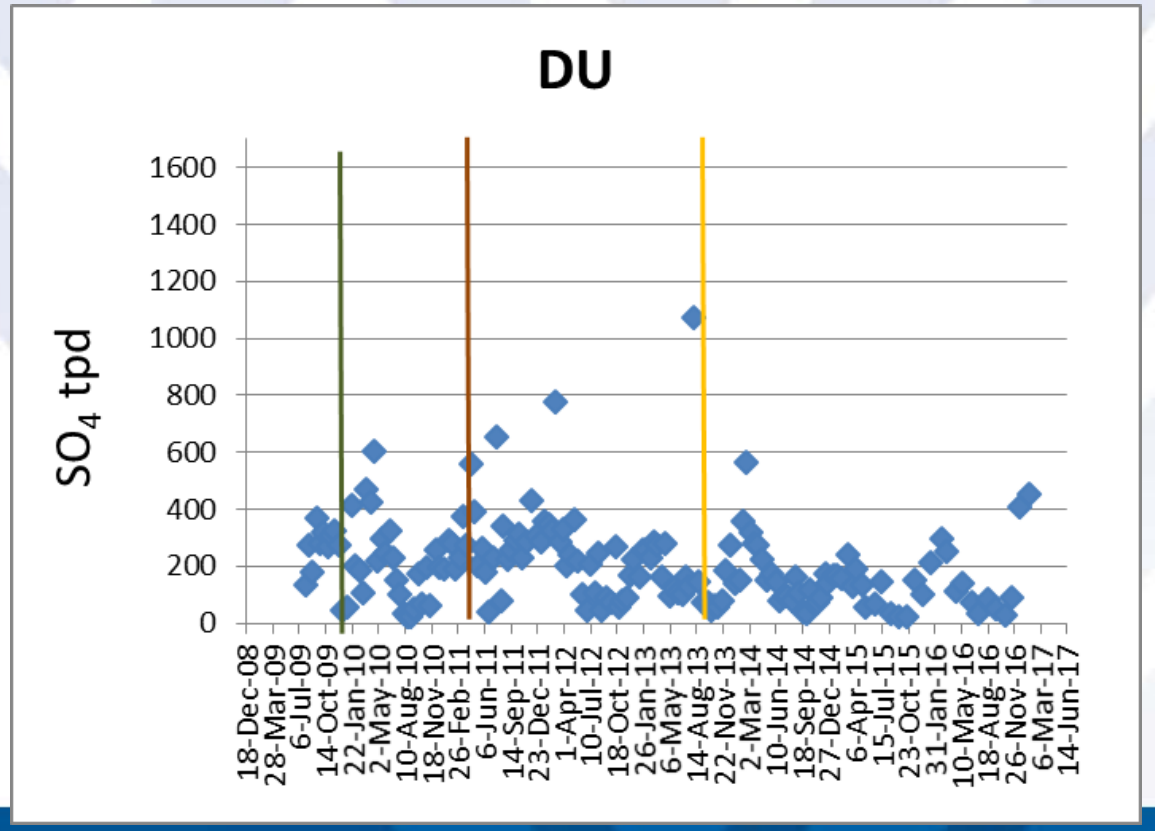


Effect of Mine discharge management: Dunkard Ck.

Sulfate concentration



Sulfate load



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Make the world safe for mining

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QUESTIONS PLEASE

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