Appalachian Coal Mining Related Research

EPA Region 3 NPDES States Mining Meeting

November 2014
Current Research Projects

Potential Future Research Questions

Your Projects and Questions
Background Macroinvertebrate Drift from Headwater Tributaries

- Region 3 and Office of Research and Development
- Field sampling in Kentucky
- Quantifying monthly 24-hr macroinvertebrate drift from the mouths of forested tributaries
- Implications for mitigation/restoration success by predicting downstream dispersal potential from clean tributaries
- Manuscript in preparation
Macroinvertebrate Response to Conductivity Dosing

- Region 3 and Office of Research and Development
- Field tests in Kentucky
- Macroinvertebrate drift response to short duration conductivity dosing ($\text{MgSO}_4$) at various concentrations
- Data analysis underway
Persistence of Ecological Impacts Downstream of Valley Fills

- Partnership between Region 3 and OSMRE
- Longevity of the effect on biological communities downstream of reclaimed valley fills in WV
- Valley fills ranged in age from 11 to 33 years since reclamation
- Published in *Environmental Management* (2014)
Effect of MTM on Fish and Benthos: A Decadal Comparison

- Region 3
- Data from 2000 vs. 2011 in three WV watersheds that underwent varying changes in mining landuse
- Compare independent responses of fish and benthics
- Data analysis underway; awaiting new assessment methodology from WV
WET Study: Laboratory Comparability

- Region 3
- *Ceriodaphnia dubia* chronic WET for valley fill effluents
- Comparing results of split samples between two NELAC certified laboratories
- Data analysis underway
Field-based Method to Develop Ambient Aquatic Life Water Quality Criteria for Conductivity

- EPA Office of Science and Technology
- Working to develop a draft recommended method for states
- Once final, states and authorized tribes located in any region of the country may use the method
- Would not impose any binding water quality criteria on any state
- Allow states to develop science-based conductivity criteria that appropriately reflect ecoregional- or state-specific factors such as background conductivity and ionic and aquatic community composition.
- Independent external peer review will be completed soon
- Anticipating that the draft method will be made available in 2015 for comment before finalization
Cumulative Impacts of Mining in Eastern Kentucky (CIMEK)

- EPA Region 4 Lead
- Project Objective: To evaluate the cumulative impacts of coal mining in 3 HUC 12 watersheds in the Big Sandy River Basin (Eastern KY)
- Initial 402, 404 and NEPA regulatory interests
  - What is the condition of the watershed?
  - What is the relationship of the watershed’s health and condition to historical and current surface mining?
  - What parameters best measure cumulative impacts from mining?
- Primary Data collection in 2013 and 2014
Cumulative Impact of Mining in Eastern Kentucky (CIMEK)

Water Chemistry Sampling for:
- Manganese
- Mercury (trace level)
- Aluminum
- Alkalinity
- Ammonia
- Antimony
- Arsenic
- Barium
- Cadmium
- Calcium
- Chloride
- Chromium
- Copper
- Hardness
- Iron
- Lead
- Magnesium
- Nickel
- NO₂ + NO₃
- Potassium
- Selenium
- Silver
- Sodium
- Sulfate
- TDS
- Thallium
- TKN
- TP
- TSS
- Zinc
Continuous (every 15 minutes):
- Water level
- Specific conductivity

Macroinvertebrate Monitoring
- Headwaters and Wadeables in 2013 and 2014

Fish Tissue in Aug 2013 and 2014
- Mercury
- Selenium
- Thallium

Data analysis just beginning
Reports expected in 2016
Eastern Kentucky Hollow Fills

- Region 4 and Headquarters oversight of contractors
- Monitoring downstream from individual hollow fills with Phase III bond release
- Collecting documentation on mining practices and any monitoring information collected in the SMCRA files
- Exploring potential relationships between water quality results and mining practices, dip direction, time since completion of reclamation, etc
Water Chemistry Sampling for:

- Bicarbonate Alkalinity (as CaCO3)
- Chlorides
- Hardness (as CaCO3)
- Sulfates
- Total Suspended Solids (TSS)
- Total Dissolved Solids (TDS)
- Total Recoverable Aluminum
- Total Recoverable Cadmium
- Total Recoverable Calcium
- Total Recoverable Iron
- Total Recoverable Lead
- Total Recoverable Magnesium
- Total Recoverable Manganese
- Total Recoverable Nickel
- SRP (soluble-reactive phosphorus) or Orthophosphate
- Ammonia (NH3)
- Caffeine
Region 4 Surface Mining Data Summary

- A report that summarizes many water quality studies conducted in KY and TN in association with the CWA 402 and 404 review of various proposed coal projects
  - 94 samples from sediment ponds (some influent and effluent)
  - Over 400 in-stream stations with in-situ data, along with chemical, habitat, macroinvertebrate and fish tissue samples at a subset of locations
- Report is in the final stages of development
Research Questions

What are your most pressing questions?
What can we work together on?
Conductivity and Ionic Stress Related

**Alternative Mining Practices**
- Identification and isolation of TDS generating materials in the mining process
- Water management to prevent a discharge
- Treatment and reclamation options for controlling existing sources of TDS

**Monitoring TDS**
- Develop a more appropriate species for use in WET testing
- Refine understanding of the effects of TDS for varying durations and frequencies
  - How long does it take for the biological community to rebound?
Effectiveness of On and Offsite Projects

- Stream mitigation
  - on site work
  - off site projects
- Adaptive Management Plan
  - Individual actions
  - Cumulative results
- Offsets and fresh water dilution
Your Turn:

- Research Questions
- Current Projects
- Opportunities

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