In-Stream Lime Dosing for Treatment of Acid Mine Drainage

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Office of Abandoned Mine Lands
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Milky Way Galaxy
Earth

70% Water

<1% Available
- 30,630 Stream Miles
- 12,626 Impaired Miles
- 41%
- 2,000 miles impaired by AMD
Three Fork Creek Watershed

- Formed by the confluence of:
  - Squires Creek
  - Birds Creek
  - Fields Creek

- ~20 miles from confluence to mouth

- Drains 103 square miles
Main AMD Contributors

- Squires Creek
- North Fork Birds Creek
- South Fork Birds Creek
- Raccoon Creek
Historical Mining

- Headwaters extensively mined since the mid 1800’s
- Approximately 9,100 acres of mine pools drain into Three Fork Creek
- Mined seams include:
  - Upper Freeport
  - Middle Kittanning
  - Bakerstown
Mine Drainage Chemistry

- Median pH - 2.9
  - Max pH - 5.2
  - Min pH - 2.4
- Av. Total AL mg/L - 15.2
  - Max AL mg/L - 64
  - Min AL mg/L - 0.12
- Av. Total Fe mg/L - 21.5
  - Max Fe mg/L - 145
  - Min Fe mg/L - 0
Impaired Tributaries

Acid and Iron Laden Tributary

Aluminum Laden Tributary
Importance of Project

- High Visibility
- Impact on Aquatic Life
- Impact on Recreation
- Impact on Local Economy
Restoration Goal

To return Three Fork Creek Mainstem to its designated usage by decreasing the water quality impairment of multiple pre-SMRCA (Surface Mining Control and Reclamation Act of 1977) coal mine discharges in the watershed
Objectives

• Improve water chemistry and aesthetics to support recreational water activities in Three Fork Creek Mainstem

• Restore benthic macro-invertebrates and fish in Three Fork Creek Mainstem
At-Source Treatment

- Various types constructed
- Multiple locations
- No measurable watershed-wide improvement
In-Stream Treatment

1994-Blackwater River
- Lime doser
- Limestone drum station
- 12 stream miles restored

1995-Middle Fork River
- Limestone Sand Fines
- 38 miles of mainstem restored
- 89 miles of tributaries restored
Lime Doser Locations

- Squires Creek
- North Fork Birds Creek
- South Fork Birds Creek
- Raccoon Creek
Basics of a Doser System

Intake

Conveyance pipe

Outlet

Doser & Housing

S I L O

Intake

Outlet

Doser & Housing

Conveyance pipe
Intake

Raccoon Creek intake

Inside of Raccoon Creek Intake

Conveyance Pipe
Doser Units

Auger System on North Fork Birds Creek

Tipping Bucket on South Fork Birds Creek
Outlets

South Fork Outlet  Raccoon Creek Outlet
Silos and Lime Delivery

North Fork Doser
- 30 ton silo
- Large truck landing developed adjacent to doser

Squires Creek Doser
- 100 ton silo
- Calcium Oxide is blown in from landing above doser
Three Fork Creek Cost and Funding

- $750,491 to construct ~ $200,000/doser
- Funded through the AMD Set-Aside Account
- $17,811/month average operational cost first year (started in May)
- $14,838/month average operational cost second year
- $19,291/month average operational cost third year
Operation and Maintenance Issues

- Stream Flow and Chemistry
- Storm Events
- Climate
- Debris
Results
Water Chemistry of Mainstem

• Prior to dosing alkalinity failed to exceed acidity within Three Fork Creek
• Since dosing alkalinity consistently exceeds acidity
• Prior to dosing pH ranged between 4.4 and 5.1
• After dosing ranged between 6.9 and 7.08
Three Fork Creek pH at Mile 17.4
Apr-Aug 2013

7.0 pH
Benthic Surveys
Compared 2012 to 2009

- 0.4 Miles
- 5.7 Miles
- 9.62 Miles
- 17.4 Miles
Benthic Survey Results

- # Total Taxa Increased at Every Site
- # EPT Increased at Every Site
Fish Surveys

Partnering:
• Office of Water Resources
• Office of Abandoned Mine Lands
• Save The Tygart Watershed Group
<table>
<thead>
<tr>
<th>DEP Pre Dosing Survey</th>
<th>DEP Post Dosing Survey</th>
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<tbody>
<tr>
<td>September 2010</td>
<td>August 2012</td>
</tr>
<tr>
<td>• 1 Green Sunfish</td>
<td>• 1,605 Fish</td>
</tr>
<tr>
<td></td>
<td>• 21 Species</td>
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Aesthetics and Embeddedness

• Iron staining gradually dissipated from downstream to upstream
• No change in embeddedness at the two lower sample sites
• Embeddedness increased at the two upper sample points nearest the dosers.
Squires Creek near mouth

Prior to Dosing

Since Dosing
Raccoon Creek near mouth

Prior to Dosing

Since Dosing
Birds Creek Near Mouth

Prior to Dosing

Since Dosing
Three Fork Creek near Thornton

Prior to Dosing

Since Dosing
Three Fork Creek Near Mouth

Prior to Dosing

Since Dosing
Were Objectives Met For Three Fork Creek Mainstem?
Objectives

• **Improve** water chemistry and aesthetics **to support recreational water activities in** Three Fork Creek Mainstem

• **Restore** benthic macro-invertebrates and fish **in Three Fork Creek Mainstem**
• 30,630 Stream Miles
• 12,626 Impaired Miles
Earth

The Beginning

70% Water

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