

Section III – AMD project reports

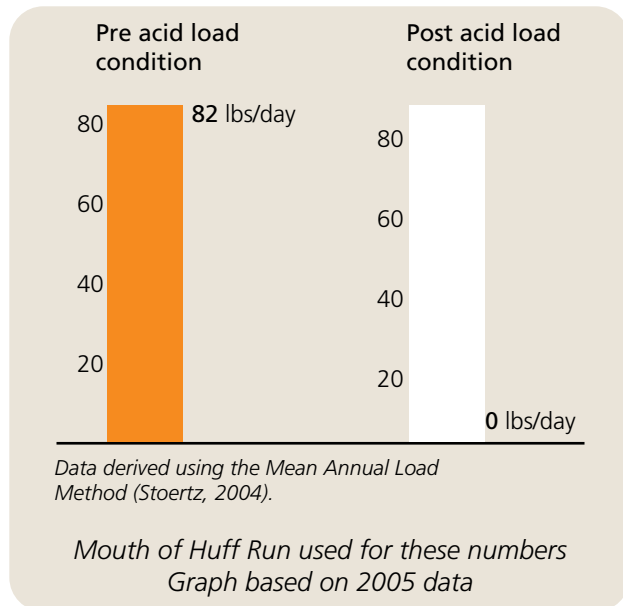
Huff Run Watershed comprehensive acid mine drainage projects progress report for 2006.

Section III for the Huff Run Watershed contains one comprehensive reports listing completed and funded AMD projects; displaying photos of the project site, a description of the project, water quality data change at the mouth of Huff Run (station HRR08/HR 32) and the impact of all the reclamation projects from the period 1976-1997 for pre-construction to 1997-2006 for post construction. Acidity and pH graphs have been generated for Farr, Acid Pit #1, and Lyons using available data.

List of acid mine drainage reclamation projects reported on in the 2006 NPS monitoring report:

1. Huff Run AML project
2. Farr project
3. Linden Bioremediation project
4. Acid Pit #1 (Phase I) project
5. Lindentree project
6. Harsha North project
7. Lyons project
8. Fern-Hill HR-42 project
9. Belden project
10. Thomas project
11. Mineral Zoar Road AMD project

Project Status: All completed projects since 1999



Huff Run is located in Sandy Township in Tuscarawas County and Rose Township in Carroll County. The watershed has a 14 square mile drainage area and flows ten miles long before discharging into Conotton Creek. The completed projects in Huff Run are evaluated collectively at the mouth of Huff Run (Station HRR08/HR 32). Since 1999 seven projects have been completed and are shown on the following pages. The designs and construction were completed by a variety of companies. The funding sources for these projects for both design and construction was ODNR-DMRM, Ohio EPA 319, and OSM Clean Streams. Figure 3 and 4, estimate approximately 82 lbs/day of acid and 0 lbs/day of metals were reduced from entering Huff Run as a result of these AMD reclamation projects.

List of construction projects completed since 1999:

1. Huff Run AML 1999
2. Farr 2003
3. Linden Bioremediation 2003
4. Acid Pit #1 2004
5. Lindentree 2005
6. Lyons 2005
7. Harsha North 2006

List of funded projects to be complete within the next two years:

1. Thomas
2. Belden
3. Fern Hill HR-42
4. Mineral Zoar

Water quality report

Water quality data was collected along the mainstem at long-term monitoring stations during pre- and post- construction conditions. The graphs below show changes in pH (Figure 1) and acidity (Figure 2) along the mainstem of Huff Run. Changes between the pre- and post- conditions are attributed to the completed AMD reclamation projects. Graphs based on 2005 data.

Figure 1. Pre and Post pH

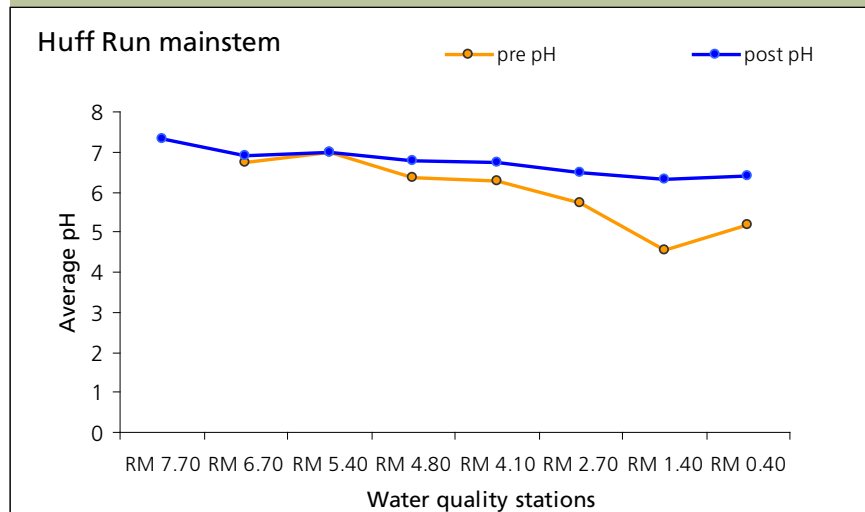
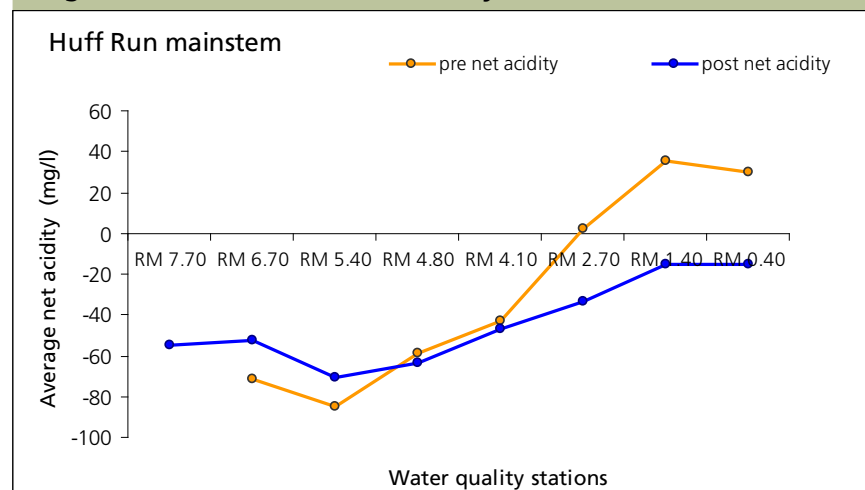


Figure 2. Pre and Post Acidity



As a result of these projects completed in Huff Run Watershed, the pH and net acidity as improved downstream of the reclamation sites for 5 miles to the mouth. Pre-construction data shows pH in the range of 4.5 – 7.0 along the mainstem. However after the completion of seven major AMD reclamation projects, post-construction data shows pH in the range of 6.3 – 7.3. The net acidity concentrations decreased resulting in net alkaline conditions the entire length of Huff Run, 10 miles.

Using the Mean Annual Load Method (Stoertz, 2004) acid and metal load reduction occurring at this project were plotted and shown in Figure 3 and 4. Acidity, iron, aluminum and discharge were measured pre- and post-construction at the project discharge from 1985 to 1998 for pre-construction and from 1999 – 2006 for post-construction. Graphs based on 2005 data.

Figure 3. Acid Load Reduction

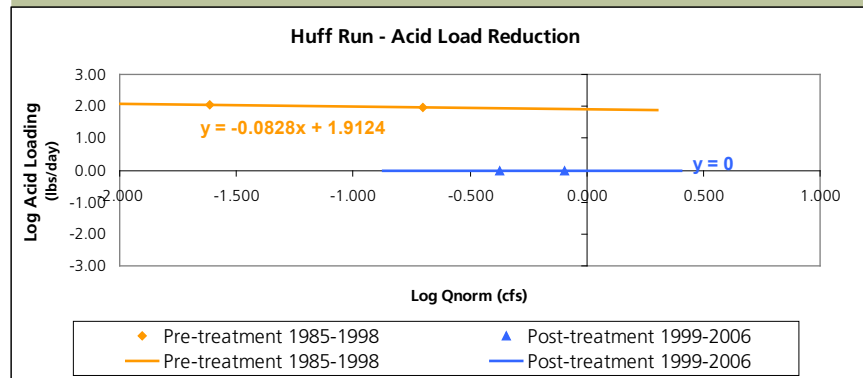
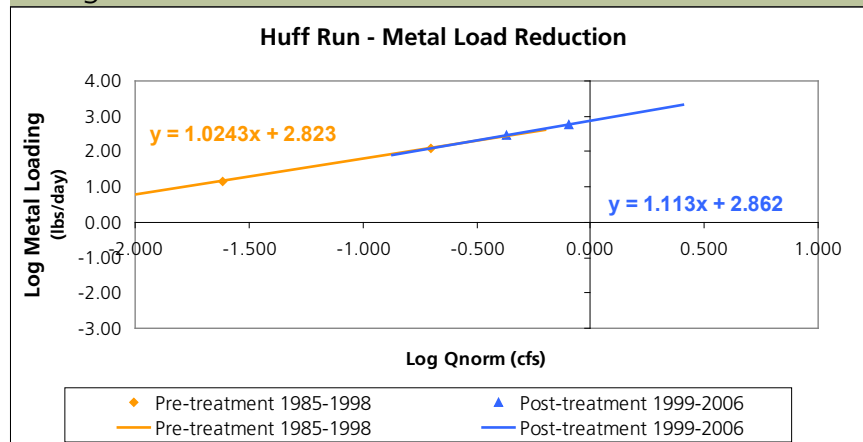


Figure 4. Metal Load Reduction



Stoertz, Mary W. and Douglas H. Green, 2004. Mean Annual Acidity Load: A Performance Measure to Evaluate Acid Mine Drainage Remediation. Ohio Department of Natural Resources Conservation and Restoration Innovations 2004 Applied Research Conference at Ohio University.

Pre-construction



The Huff Run AML Reclamation Project was the first major project in the watershed. It was completed in 1998 to reduce sedimentation and acid loading from a large, unreclaimed surface mine. The project involved the resoiling and revegetation of over 60 acres, 109,000 cubic yards of earthwork, 1600 linear feet of stream reconstruction and removal of an AMD impoundment. This project was in Mineral City, in the area of the American Legion Hall.

Pre-construction

*Farr AMD discharge pre-construction**Photo by Huff Run Watershed*

Post-construction

*View from finishing cells looking upstream**Photo by Douglas Leed*

Farr Project is located in Sandy Township in Tuscarawas County. The site is located at the open limestone channel before entering the Huff Run. The Acid Pit #1 discharges into Huff Run at river mile 1.0. The design was completed by Gannett Fleming for \$30,976. The treatment approach was to passively treat deep mine discharge with a anoxic limestone system. The treatment consisted of installing 500 linear feet of limestone channels, a 10,000 cubic foot anoxic limestone drain, a 0.5 acre wetland and complete 1.2 acres of surface reclamation. The goal of the design was to reduce

high metals from deep mine discharge to main-stem of Huff Run. Construction was complete may 2003 by Tucson Inc. for a cost of \$150,000. Problems with the construction were unexpected high flows versus design flow of system, inadequate retention in system, continue high metal output, limited space for reconstruction or improvements. The funding sources for this project were for the design was ODNR-DMRM and for construction was OSM Clean Steams, ODNR/MRM and Ohio EPA.

Water quality report

Water quality data was collected at the project discharge as well as multiple stations pre and post construction. The graphs below show changes in pH (Figure 1) and acidity (Figure 2) along the mainstem of the receiving stream upstream and downstream of the project discharge as a result of the AMD reclamation project.

Figure 1. Pre and Post pH

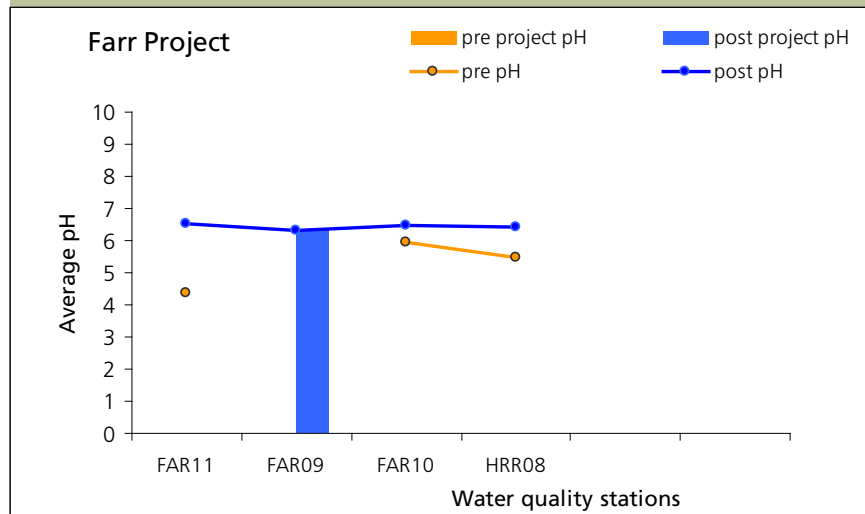
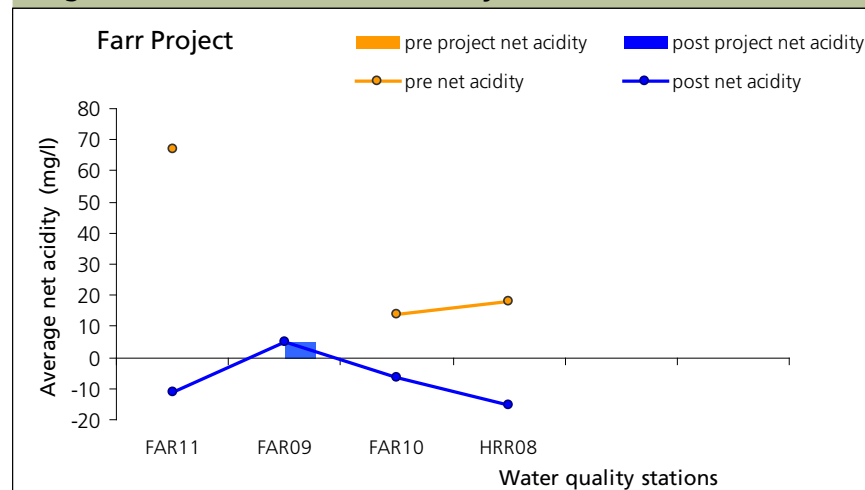


Figure 2. Pre and Post Acidity



As a result of the Farr Project, pH and net acidity have slightly improved downstream approximately 1.0 mile. Pre-construction data shows pH at 5.97 downstream the project discharge. After installation of the Farr Project, post-construction data shows pH 6.47 downstream the project discharge. The net acidity concentration decreased 100% downstream the project discharge at site FAR10 on Huff Run.

Pre-construction



*Farr AMD discharge pre-construction
Photo by Huff Run Watershed*

Post-construction



*Huff Run Awareness Day 2003
Photo by Huff Run Watershed*

Treatment Approach: Mine drainage passes sequentially through a flow control system, a wetland, to reduce metals concentrations and provide microbial nutrients, and finally through an inoculated Pyrolusite limestone treatment bed and/or attendant discharge structures and diversion ditches, before being discharged to the receiving stream.

Design: Allegheny Mineral Abatement Company

Cost:

Construction: Tucson, Inc.

Cost: \$321,619

Funding Source:

Pre-construction



Post-construction



*Acid pit completed project
Photo by Jim Gue*

Acid Pit #1 is located in Rose and Sandy Township in Tuscarawas County. The site is located at the effluent from Acid Pit #1. The Acid Pit #1 discharges into Huff Run at river mile 3.78. The design was completed by Ohio Department of Natural Resources – Division of Mineral Resources Management. The treatment approach was to eliminate the acid-filled impoundments, reclaim the mine spoil, eliminate the recharge through the spoil and provide positive drainage. The treatment consisted of installing 2000 linear feet of limestone channels and to

reclaim 15 acres of gob pile. The goal of the design was eliminate collection and recharge of extremely acid water through spoil material and to main stem Huff Run. Construction was complete March 2004 by Tucson Inc. for a cost of \$150,000. Problems with the construction were no solid base (underclay) to effectively place underdrains for subsurface collection of mine drainage flows. The funding sources for this project were for the design was ODNR-DMRM and for construction was OSM Clean Steams, ODNR/MRM.

Water quality report

Water quality data was collected at the project discharge as well as multiple stations pre and post construction. The graphs below show changes in pH (Figure 1) and acidity (Figure 2) along the mainstem of the receiving stream upstream and downstream of the project discharge as a result of the AMD reclamation project.

Figure 1. Pre and Post pH

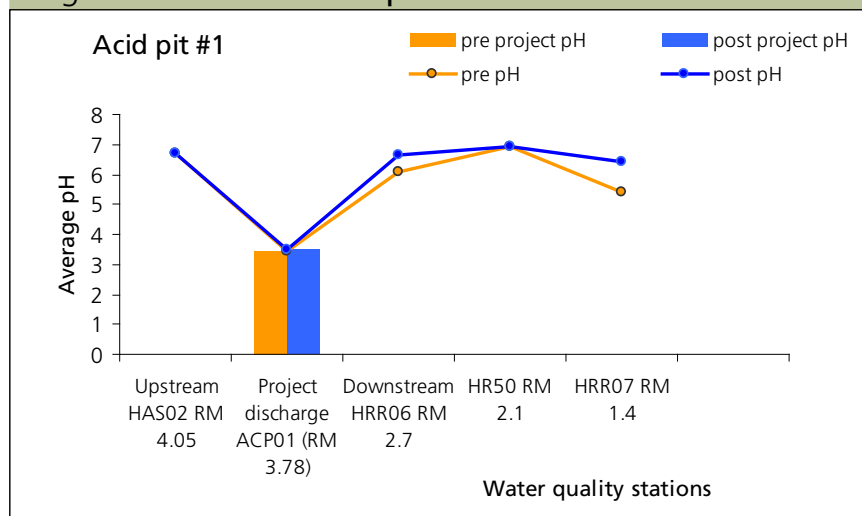
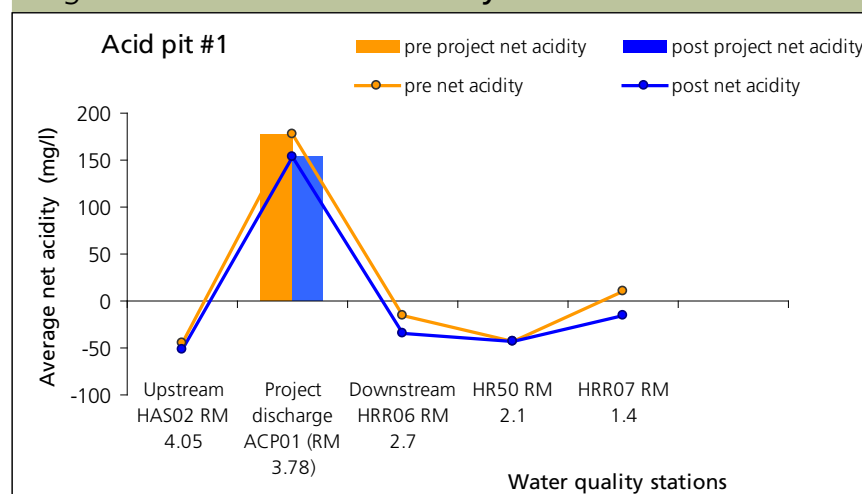


Figure 2. Pre and Post Acidity



As a result of the Acid pit #1 Project, pH and net acidity have slightly improved downstream approximately 2.4 miles. Pre-construction data shows pH in the range of 3.46 – 5.43 at the project discharge and downstream. After installation of the Acid Pit #1 Project, post-construction data shows pH in the range of 3.5 – 6.4 at the discharge and downstream. The net acidity concentration decreased 13% at the project discharge. This project needs discharge measurements to show acid and metal load reductions.

Project Status: Complete 2005

Project Number:

Pre-construction



*One of four acidic ponds on project site
Photo by Jim Gue*

Post-construction



*Lindentree reclamation area
Photo by Maureen Wise*

Treatment Approach: The restoration project regraded and revegetated the area along with filling in acid pits and using mill slag and limestone channels to raise alkalinity. A wetland originally on the project site is still used for filtration of heavy metals. (www.huffrun.org)

Design: MRM in-house & OSM design

Cost: \$60,239.50

Construction: Monarelli

Cost: \$210,000

Funding Source: ODNR-DMRM and Ohio EPA 319

Pre-construction



Access road facing west with new limestone channels
Photo by Maureen Wise

Post-construction



Harsha North spoil and gob pile
Photo by Jim Gue

Treatment Approach: Eartwork started Summer 2006 to reclaim the project site. The site is primarily toxic coal refuse piles and highwalls along with areas affected by deep mine entries, deep mine drainage and unreclaimed contour surface mines.(www.huffrun.org)

Design: ATC Associates

Cost: \$106,909.00

Construction: Tuscon

Cost: \$686,186

Funding Source: ODNR-DMRM, Ohio EPA 319, and OSM Clean Streams

Pre-construction



*Overview of gob on the project site
Photo by Brent Miller*

Post-construction



*After construction major outlet
Photo by Jim Gue*

Lyons is located in Sandy Township in Tuscarawas County. The project site is 35 acres. Lyons discharges into Huff Run at river mile 1.90. The design was completed by ATC Associates for \$53,335. The treatment approach was to reclaim eroding mine spoils, eliminate acid impoundment, install alkaline recharge with steel slag berms and open limestone channels. The treatment consisted of installing 3000 linear feet of limestone channels and 1500 linear feet of steel slag channel and reclaim a 15 acre of gob pile and 5 acres of surface reclamation. The goal of

the design was to eliminate eroding acid spoils and impoundments, generate alkalinity to deep mine pools and decrease AMD discharges and neutralize acidic discharges prior to main stem. Construction was complete December 2005. The cost of the project was \$794,030. Problems with the construction were placement of underdrain tiles to effectively collect subsurface flows to constructed OLC/steel slag channels. The funding sources for this project were Ohio EPA and ODNR/MRM.

Water quality report

Water quality data was collected at the project discharge as well as multiple stations pre and post construction. The graphs below show changes in pH (Figure 1) and acidity (Figure 2) along the mainstem of the receiving stream upstream and downstream of the project discharge as a result of the AMD reclamation project.

Figure 1. Pre and Post pH

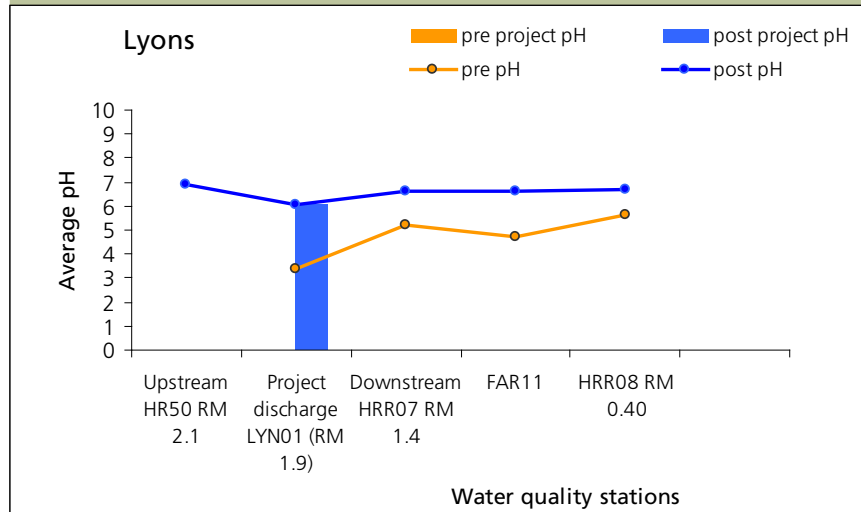
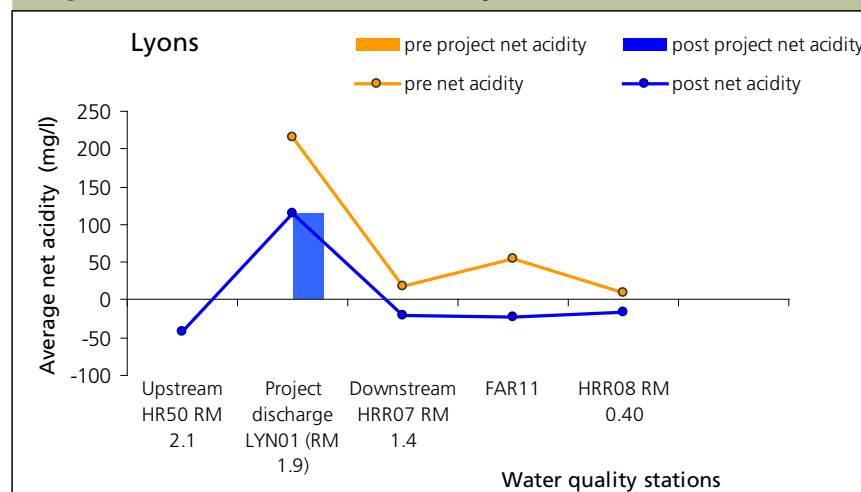


Figure 2. Pre and Post Acidity



As a result of the Lyons Project, pH and net acidity have improved downstream approximately 1.5 miles. Pre-construction data shows pH in the range of 3.39 – 5.63 at the project discharge and downstream. After installation of the Lyons Project, post-construction data shows pH in the range of 6.1 – 6.7 at the discharge and downstream. The net acidity concentration decreased 47% at the project discharge. This project needs discharge measurements to show acid and metal load reductions.

Project Status: - Funded

Pre-construction

*AMD plume**Photo by Maureen Wise*

Treatment Approach: HR-42 consists of a few acid pits and a large AMD plume that sits directly beside Huff Run itself and dumps severe amounts of AMD directly into the stream.

Design: Baker Consulting and ODNR-DMRM

Costs:\$

Funding Source: OSM Clean Stream and ODNR-DMRM

Pre-construction



Gob pile with impounded acidic water
Photo by Huff Run Watershed

Treatment Approach: The Army Corps of Engineers plan includes reclamation of mine spoil and related land as well as a passive treatment system to treat the remaining seeps with a successive alkaline producing system (verticle flow wetlands). (www.huffrun.org)

Design: ODNR-DMRM

Expected construction costs: \$700,000

Funding Source: US EPA Targeted Watershed Grant and ODNR-DMRM

Pre-construction



*Southern area with large beaver ponds
Photo by Maureen Wise*

Project number: CR-Rs-08

Treatment Approach: The site is composed of approximately twenty acres of surface mine water impoundments and toxic mine spoil. The impoundments are recharging a shallow deep mine, allowing for large contributions of metals and acidity to Huff Run. Plans for restoration include a limestone channel for drainage and erosion control plus regrading and revegetation of the spoils and pits. (www.huffrun.org)

Design: ODNR-DMRM

Costs:\$275,000

Funding Source: Ohio EPA and ODNR-DMRM



The Mineral City Park/Mineral-Zoar Road will take place in the summer of 2006. The reclamation will include a wetland and limestone system that will not only fix AMD problems but also help with flooding in the direct vicinity. This project is located in Mineral City. An Office of Surface Mining grant will fund the construction.