Slippery Rock Watershed Coalition
De Sale Restoration Area – Phase I

Public Private Partnership Effort
Venango Township, Northern Butler County, PA

Stream Restoration Incorporated

A PA Non-Profit Organization 501(c)(3)
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Date: July 31, 2000

To: Bureau of District Mining Operations
Department of Environmental Protection
P.O. Box 669
Knox, PA 16232-0669

Attn: Timothy VanDyke, Inspector Supervisor

Re: Final Report for Project WR10
Watershed Restoration and Partnership Act (WRPA) - ME #359476
Abatement of Mine Discharges - De Sale Restoration Area Phase I
Venango Twp., Butler Co., PA
200211/FR-trans

Enclosed is the final report for the above noted project.

This report represents only a portion of the "success stories" made possible by this grant. The public-private partnership effort and the "hands-on" educational opportunities have spurred interest in the restoration of this and other watersheds in the region. We hope that this report will meaningfully acknowledge the importance of this project and the funding received through your office.

Please review and comment. The submission of a good-quality work product is important to all of us.

Your patience and assistance has been very much appreciated. If there are any questions or comments, please do not hesitate to contact any of the participants.

From: Stream Restoration Incorporated

By: Margaret H. Dunn, PG, President

Sent: First Class Mail

Copy: DiLISSIO, Lou, Project Officer; PA DEP Bur. of Mining and Recl., Div. of Env. Analysis and Support, RCOB, Harrisburg, PA
ELICKER, Theresa, MCI, BOWMAN, Roger, Eng.; GILLEN, Tim, PG; ODENTHAL, Lorraine, Permit Chief; MIRZA, Javed, DMM, PA DEP, Knox DMO
DOLENCE, Robert, Deputy Secretary, PA DEP
HILTON, Tiff, Mining Eng., WOPEC
STILLEY, John and JOHNSON, Fred, Amerikohl Mining, Inc.
BRENNER, Fred, PhD, Biologist, Grove City College
BERAN, Robert, Wetland Ecologist; REIDENBAUGH, Jeff, Eng., Aquascape
HOLDEN, John, Watershed Coordinator, Northwest Region
BRUMAGIN, Steve, Water Pollution Biologist
WATZLAF, George, Env. Eng., US Dept. of Energy
NAIRN, Robert, PhD, Univ. of Oklahoma
DANEHY, Tim, EPI, BioMost, Inc.

SLIPPERY ROCK WATERSHED COALITION

FINAL REPORT

DE SALE RESTORATION AREA

VENANGO TOWNSHIP, BUTLER COUNTY, PA

A SEATON CREEK MINE DRAINAGE ABATEMENT PROJECT

Slippery Rock Creek Headwaters

PHASE I

submitted to

Pennsylvania Department of Environmental Protection
Bureau of Mining and Reclamation

Brief Description of Project Work Conducted through Grant

Designed passive system with an estimated treatment life of 25 years using the following parameters: 100 gpm flow having a 3 pH, no alkalinity, 420 mg/L acidity, 30 mg/L dissolved iron, 50 mg/L manganese, and 15 mg/L aluminum. Installed the following components in series: Anoxic Collection System with Flow Splitter Box, Vertical Flow Ponds(two in parallel with two-tiered underdrains), Settling Pond-Aerobic Wetlands Complex, and Horizontal Flow Limestone Bed. Planted Aerobic Wetlands using Slippery Rock Watershed Coalition volunteers and other participants in the public-private partnership effort. Grove City College continued monitoring of Seaton Creek Watershed. Conducted before, during, and after site tours for news media, community groups, etc. Kept photographic and video log. Submitted electronic updates, quarterly status reports, the final report with "As-Builts" and selected photos, and administered the contract.

Contract Amount: **$391,707**

Grant Program: **Watershed Restoration and Partnership Act "Reclaim PA" Initiative**

In-Kind Contributors:

PA Department of Environmental Protection -
Bureau of District Mining Operations, Knox Office
Slippery Rock Watershed Coalition Volunteers
Amerikohl Mining, Inc.
Aquascape
BioMost, Inc.
Stream Restoration Inc. [non-profit]

July 2000

cover photos: before (upper) where polluted drainage created "dead" area and after (lower) successfully reclaimed abandoned minesite.

PUBLIC-PRIVATE PARTNERSHIP

Water Quality Monitoring, Construction Inspection, State Grant Administration
PA Dept. of Environmental Protection, District Mining Operations, PO Box 669, Knox, PA 16232
GILLEN, Timothy, PG; BOWMAN, Roger, Engineer; PLESAKOV, James, MCI; ELICKER, Theresa, MCI; VanDYKE, Timothy, Insp. Supervisor; ODENTHAL, Lorraine, Permit Chief; MIRZA, Javed, Dist. Mining Mgr. (814) 797-1191

Landowner Support
MEYER, James and Marlene; MEYER, James, Jr. and Suzanne, 5194 Hardt Road, Gibsonia, PA 15044

Wetland Planting
AQUASCAPE, 114 Deer Road, Boyers, PA 16020
BERAN, Robert, President and REIDENBAUGH, Jeff, Env. Eng. (724) 735-2766

Conceptual and Engineering Design of Passive Treatment Systems
BioMost, Inc., 3016 Unionville Rd., Cranberry Twp., PA 16066
DANEHY, Timothy, EPI; DUNN, Margaret, PG (724) 776-0161
WOPEC, Rt. 2, Box 294B, Lewisburg, WV 24901
HILTON, Tiff, Mining Engineer (304) 645-7633

Passive Treatment System Construction
Amerikohl Mining, Inc., 202 Sunset Drive, Butler, PA 16001
STILLEY, John, President, and JOHNSON, Fred, Reclamation Mgr. (724) 282-2339

Limestone Aggregate
Quality Aggregates Inc., 200 Neville Rd., Neville Island, PA 15225
ALOE, Joseph, President, ANKROM, Jeff, Mine Manager (412) 777-6717

Trucking
Shaliston Enterprises, Inc., 126 Main St., West Sunbury, PA 16061
DEMATTEIS, Domenic, President (724) 637-3211

Aquatic Life Monitoring (Seaton Creek tributary)
Grove City College, 100 Campus Drive, Grove City, PA 16127
BRENNER, Frederick, PhD, Biologist, Biology Dept. (724) 458-2113

Grant Administration, Public Outreach, and Volunteer Effort
Stream Restoration Incorporated, 3016 Unionville Rd., Cranberry Twp., 16066
DANEHY, Timothy, EPI; DUNN, Margaret, PG; PEART, Darcy, Public Relations; BUSLER, Shaun, Biologist; TAYLOR, Will, Env. Ed. (724) 776-0161

SLIPPERY ROCK WATERSHED COALITION

DE SALE RESTORATION AREA

VENANGO TOWNSHIP, BUTLER COUNTY, PA

A SEATON CREEK MINE DRAINAGE ABATEMENT PROJECT

Slippery Rock Creek Headwaters

PHASE I FINAL REPORT

submitted to

Pennsylvania Department of Environmental Protection
Bureau of Mining and Reclamation

EXECUTIVE SUMMARY

Participants in the Slippery Rock Watershed Coalition received a grant (executed 12/16/99) from the Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation, through the Commonwealth's "Reclaim PA" initiative.

Within only 6 ½ months, one of the "worst" discharges in the Slippery Rock Creek headwaters was successfully abated, clearly illustrating how state agencies, private industry, non-profits, and volunteers can "make a big difference". This effort has benefitted not only the environment by improving water and wildlife resources but also the community by generating support and interest in watershed restoration and by improving neighboring property values.

As this site is highly visible from a well-traveled state road and as the aesthetic change has been so spectacular, the community, local government, and the news media have paid particular attention to the restoration effort. Shortly after announcement of the grant, Pittsburgh television station WPGH Channel 53 spotlighted the effort on the evening news. Articles have also been published in the Pittsburgh Tribune-Review, Grove City Allied News, the Pittsburgh Business Times, Slippery Rock Watershed Coalition monthly newsletter, "The Catalyst," and the PA DEP weekly publication, the "Update."

Prior to approval of the grant, a smaller, public-private partnership effort was reclaiming an eight-acre barren area at this site. This effort was made possible through the use of alkaline, circulating, fluidized-bed coal ash from the Scrubgrass Generating Plant, Kennerdell, PA.

The "Reclaim PA" grant enabled expansion of the restoration effort to include abatement of a diffuse, very acidic, mine discharge with a high dissolved metal content.

This drainage was the major contributor of polluted water to a tributary in the upper reaches of Seaton Creek, the most highly-impacted major stream in the Slippery Rock Creek headwaters.

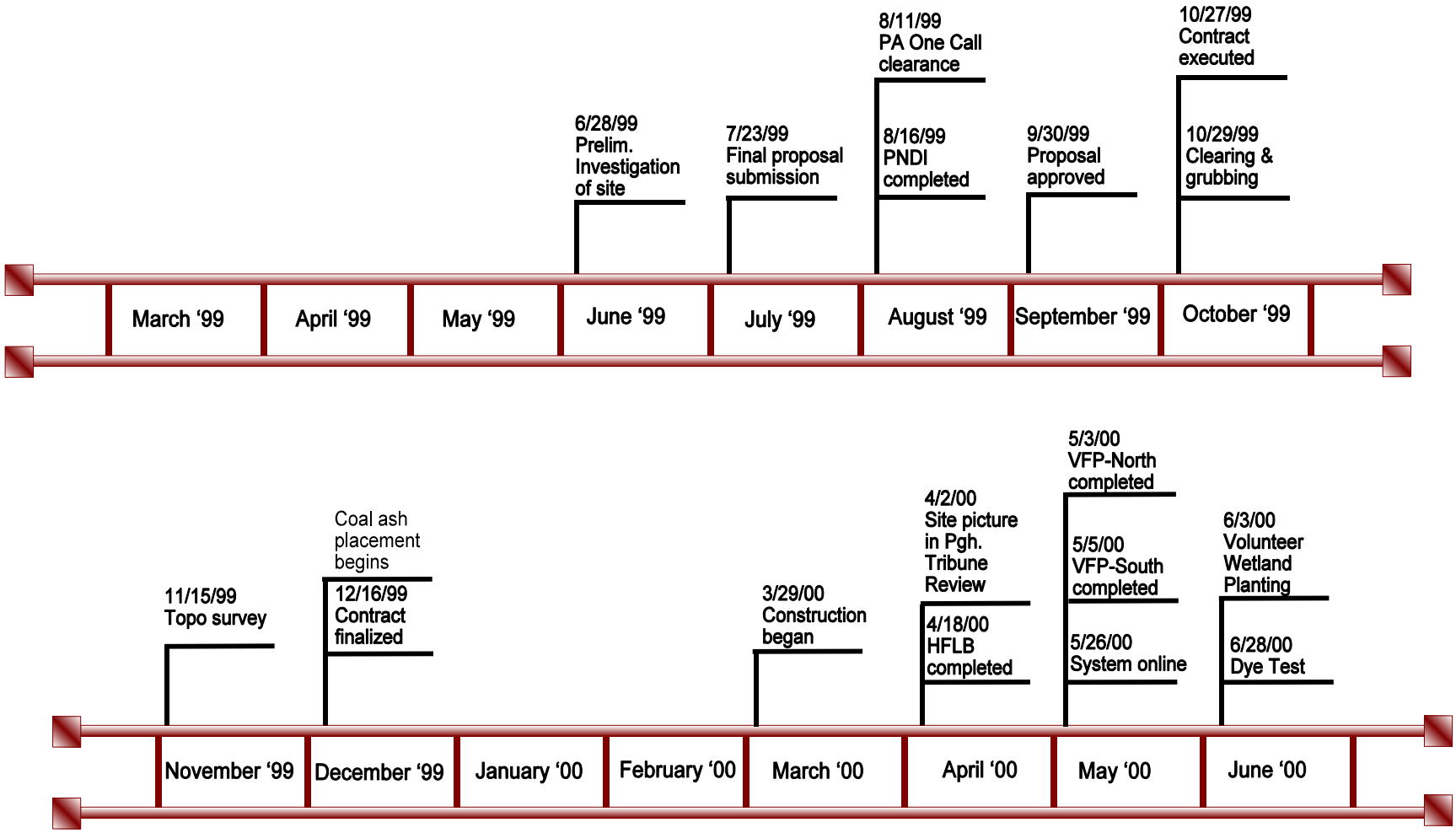
Coordinating with the land reclamation project and dependent upon the construction season, installation of the passive system began on 3/29/00. The system was operational within six weeks on 5/10/00, 1 ½ months before the contract deadline. Scheduled for warmer weather, the wetland was successfully planted by Slippery Rock Watershed Coalition volunteers on 6/3/00 using about a dozen different wetland plant species.

The passive treatment system installed included four components: Anoxic Collection System with Inlet Control Structure, Vertical Flow Ponds (two in parallel), Settling Pond/Wetland Complex, and Horizontal Flow Limestone Bed. An innovative underdrain design was implemented in the construction of the Vertical Flow Ponds. A combined total of about 1 ½ miles of piping in a two-tiered underdrain system with valved outlets were installed to enable more thorough flushing and utilization of the pond. This is the first known system of this design installed in the Commonwealth.

In order to evaluate the continued effectiveness of the system and the degree of success in improving the receiving stream on a long-term basis, Grove City College students and faculty, PA Department of Environmental Protection-Knox District Mining Office personnel, and other participants in the Slippery Rock Watershed Coalition will continue to monitor the system after the term of the grant. To supplement this monitoring, Coalition participants have begun dye testing to determine surface migration patterns in the Vertical Flow Ponds and are in the process of evaluating preferential flow through the system by use of the innovative underdrain.

Currently, the passive treatment system is neutralizing about 130 lbs/day of acidity and preventing about 40 lbs/day of metals, excluding manganese, from entering the receiving stream. In addition, the receiving stream has been substantially improved from an acidic stream with a 3.3 pH to a stream that is net alkaline with a 6.6 pH. About 70 lbs of acidity are being neutralized daily. Based on recent and historical monitoring of the stream and discharge and continued functioning of the De Sale Phase I passive treatment system, an estimated average of 74,000 lbs/yr (37 tons/yr) of acidity and 14,600 lbs/yr (7 tons/yr) of metals, excluding manganese, are expected to be eliminated from the receiving stream. With the combined stream improvement from the previously restored Chernicky Site and the De Sale Phase I, II (under construction), and III (future), a total of four stream miles are expected to be substantially restored in Seaton Creek.

Timeline for De Sale Phase I



Timeline

Date	Description
06/28/99	< Preliminary investigation of site
06/30/99	< Field meeting to discuss preliminary plans
07/23/99	< Final proposal submission
07/26/99	< Field meeting
08/02/99	< Install drainage ditch and site investigation
08/11/99	< PA One Call clearance
08/16/99	< PNDI review completed
09/09/99	< Water sample
09/30/99	< Proposal approved
10/08/99	< Contract forms received
10/22/99	< Grant listed in DEP "Update" < Grant announcement celebration
10/23/99	< Fox 53 television report on grant
10/27/99	< Contract executed
10/29/99	< Field meeting discuss future plans for site < Article in DEP “Update” < Clearing and grubbing
11/01/99	< Article in SRWC "Catalyst"
11/13/99	< Article in Pgh Tribune-Review
11/15/99	< Topo survey
11/18/99	< Water samples < Field meeting for As-Built survey
12/01/99	< Article in SRWC "Catalyst" < Coal ash placement begins
12/16/99	< Contract finalized
01/01/00	< Article in SRWC "Catalyst"
01/14/00	< Quarterly Report submitted
01/20/00	< Field meeting
03/10/00	< Field meeting
03/10/00	< Prelim. design for passive system < Coal ash delivery < Field meeting to review preliminary plan and sample water
03/17/00	< Field meeting to layout VFP and ACS < Preliminary site layout
03/22/00	< Review plans with DEP
03/29/00	< Collection system under construction < Field meeting
03/30/00	< Site tour - WPCAMR, etc.
03/31/00	< VFP-North: construction begins < Field meeting to review progress < Coal ash placement ends
04/02/00	< Site picture in Pgh Tribune-Review
04/03/00	< Final design plans & narrative to DEP
04/05/00	< Geotextile, pipe, and gravel installed for the Anoxic Collection System
04/06/00	< HFLB: excavation
04/07/00	< Site tour - SRWC symposium
04/10/00	< HFLB: geotextile placed
04/11/00	< HFLB: LS placed to rough grade
04/12/00	< VFP-North: excavation completed and geotextile placed
04/13/00	< Settling Pond/Wetland: excavation

Timeline

Date	Description
04/14/00	< VFP-North: bedding stone placed and lower tier installation < HFLB: outlet excavated
04/17/00	< Field meeting discussed outlet pipes and revised outlet structure < Stone delivery
04/18/00	< VFP-North: LS placed above lower tier < HFLB: outlet piping installed, spillway lined, facility completed
04/19/00	< Installing pipe < Field meeting project oversight
04/20/00	< Field meeting outlet structure discussions
04/21/00	< VFP-North: upper tier installation and limestone placed < VFP-South: excavation begins < Settling Pond/Wetland: excavating south end
04/25/00	< VFP-North: LS placement completed and emergency spillway lined < VFP-South: excavation and grading completed < Settling Pond/Wetland: excavation, embankments completed
04/28/00	< Anoxic Collection System: northern section completed < VFP-South: geotextile installed, bedding stone placed, lower tier installed, outlet construction
05/01/00	< VFP-South: LS placement over lower tier, upper tier installed
05/03/00	< Field meeting < VFP-North: compost placed, valves installed, facility completed < VFP-South: LS placement completed, compost placed < Settling Pond/Wetland: spillway completed, pond being excavated
05/05/00	< Field meeting with Pittsburgh Business Times < VFP-South: valves installed, facility completed < Settling Pond/Wetland: grading completed compost placed
05/10/00	< Anoxic Collection System: inlet control box installed < Wetland/Settling Pond construction completed < System online
05/25/00	< Anoxic Collection System: steel inlet lid installed
05/26/00	< Final effluent discharging
06/01/00	< Field meeting with BCCD
06/03/00	< Wetland planting
06/10/00	< Affected area revegetation completed
06/14/00	< Article published in Allied News
06/28/00	< Dye test
07/03/00	< Field meeting with Venango Twp. Supervisors
07/17/00	< Field meeting using bucket excavator to expose pipes in north VFP

Slippery Rock Watershed Coalition
Final Report

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INTRODUCTION

In northern Butler County in western Pennsylvania, coal mining has been conducted in a 27-sq. mi. area of the Slippery Rock Creek headwaters for over 100 years. Mining communities which once flourished were abandoned leaving polluted streams, coal refuse, and spoil. The residents that stayed called Slippery Rock Creek, "Sulfur Creek", due to the affects of mine drainage. In 1970 during the Commonwealth's Operation Scarlift, the quality of the headwaters was documented to be "the most severe condition of coal mine drainage... . Indeed, very little drainage from this region is produced exclusive of contact with, or issuance from mine workings." (About 4000 acres are underlain by mine workings and 8000 acres were included in surface mine permits.) Within the 300 sq. mi. of the Slippery Rock Watershed, streambed sediments in the headwaters have the highest heavy metal concentration.

Since late 1994, the Slippery Rock Watershed Coalition has been working to restore the headwaters and has successfully completed eight abandoned mine restoration projects.

Based on the 1998 Comprehensive Mine Reclamation Strategy Report by the PADEP, Knox District Mining Office, the De Sale Restoration Area, is one of the areas most heavily-impacted by pollutive drainage from abandoned coal mines in the headwaters. About 100 acres of pre-act surface coal mining (incl. coal refuse disposal) on the Middle Kittanning coalbed surround the two unnamed tributaries which form the northeastern uppermost reaches of Seaton Creek (Figure 1). Seaton Creek (stream # 34751; segment # 4571), the most impacted, major stream in the Slippery Rock Creek headwaters, is listed on the 1998 PA DEP 303(d) list as high priority for restoration due to abandoned minelands.

This final report addresses the first phase of the restoration effort which was to treat a major discharge zone on the easterly of the two tributaries (Figure 1). This effort was funded through the Commonwealth's "Reclaim PA" initiative and generous in-kind contributions from Coalition participants.

Phase II which addresses the degradation of the westerly tributary has received funding through the Commonwealth's "Growing Greener" initiative and is under construction (Figure 1).

Phase III is the target of a future proposal to treat an additional downstream discharge (Figure 1).

Completion of these projects combined with the stream improvement associated with the previously reclaimed Able/Dreshman minesite is predicted to substantially improve the water quality in about 3 miles of Seaton Creek and the headwaters tributaries (Figure 1).

Phase I Site Location

Phase I is in Venango Township along the northern right-of-way of SR 58 about 2 miles west of Eau Claire, PA. The systems are constructed on property of James and Marlene Meyer and James, Jr. and Suzanne Meyer. There is currently no residence on the property. The site is located on the 7 ½' USGS Eau Claire topographic map (PR1979) at latitude 41^0 08' 29" and longitude 79^0 49' 30". (See Figure 1 and location map on attached "As-Builts".)

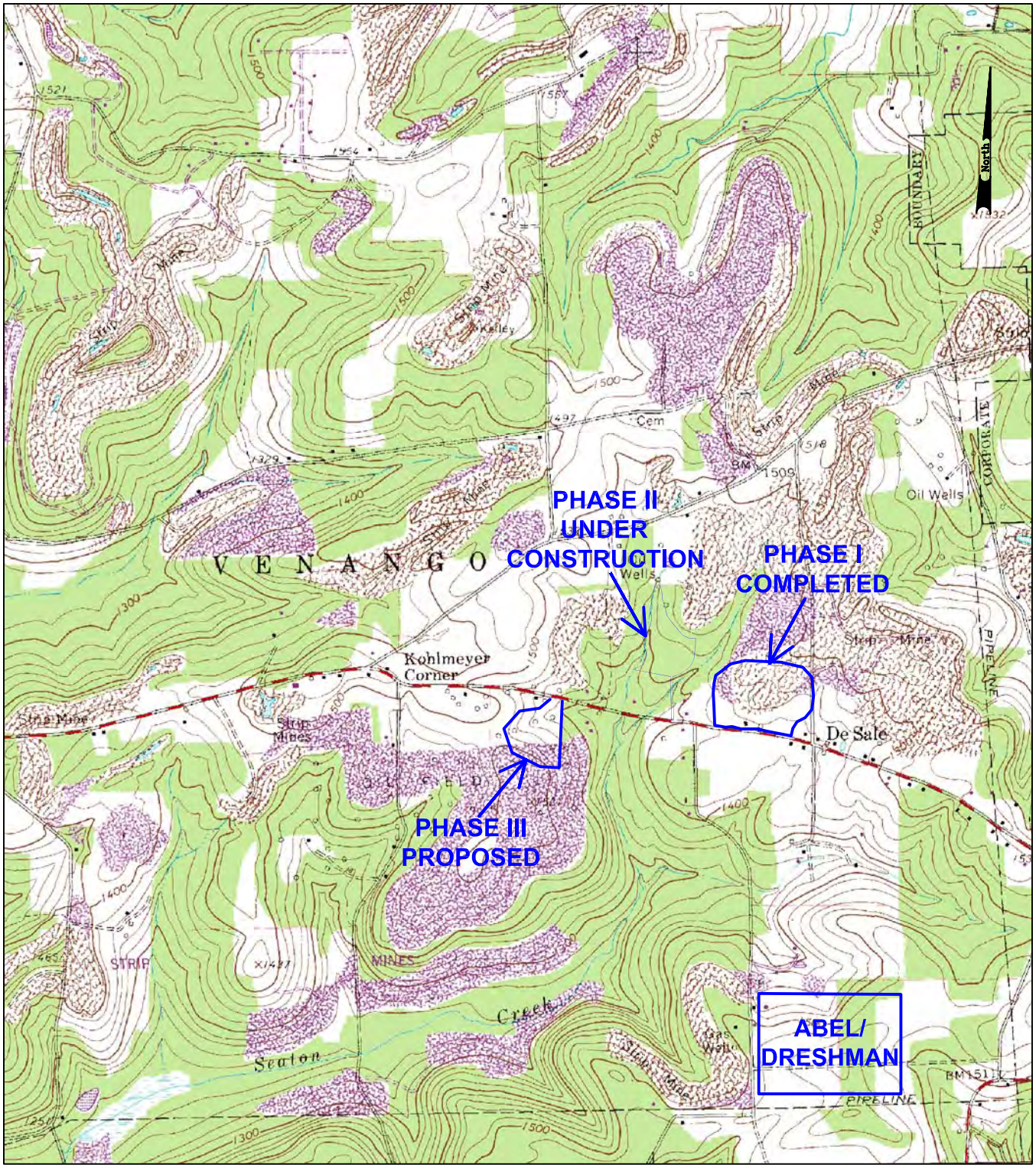


FIGURE 1: PROJECT LOCATION - USGS 7.5' EAU CLAIRE, PA (PR1979)
DE SALE RESTORATION AREA - PHASE I, PHASE II, AND PHASE III

Slippery Rock Watershed Coalition
Venango Township, Butler County, PA
Stream Restoration Incorporated
June 2000, Scale 1" = 2000'

PRE-EXISTING CONDITIONS PHASE I

The pollutive drainage in Phase I was diffuse and emanated in an area near the coal crop. Dead trees and essentially barren ground (about 10 acres) vividly illustrated the affects of this highly-acidic drainage associated with the 100-acre abandoned coal surface mine on the Middle Kittanning coalbed (Kittanning Fm.; Allegheny Gp.). (See photos p. 1-4.) Because the "dead area" fronted along the major public road (SR 58), the community recognized this as a target area for restoration. The mine drainage seeping into the road ditch along the northerly edge of SR 58 coated and at times filled the ditch with white (aluminum) and red (iron) precipitates.

Two homes, located below the minesite, were plagued by wet basements, apparently associated with drainage from the minesite.

The receiving stream below De Sale Phase I was highly acidic with significant dissolved aluminum. The flow from Phase I was the major contributor of drainage to the stream.

Benthic organisms were not found in the stream.

To assist in the restoration effort and not part of the "Reclaim PA" project work, in August 1999 Amerikohl installed a collection ditch with laterals in order to intercept the diffuse flow. A small breastwork was placed in the ditch and a pipe installed in order to monitor the quantity and quality of the drainage during monthly sampling events.

Prior and during the installation of the passive treatment system and also not part of the work conducted under the grant, a complementary land reclamation project utilizing circulating-fluidized bed coal ash (Scrubgrass Generating Plant, Kennerdell, PA) to cap a portion of the recharge area was conducted. From December 1999 to May 2000, 35,058 tons of coal ash were used to cap the approximately 8-acre barren area.

Pre-Existing Stream and Drainage Characteristics

The following table allows for a comparison of the impact of the site drainage on the stream quality and quantity prior to installation of the passive treatment system:

Pre-Existing Average/"Worst Case" Stream and Drainage Characteristics

point	flow	pH	alkalinity	acidity	Fe	Mn	Al
upstream	21/80	3.3/3.1	0	170/248	11/23	23/37	9/13
discharge	31/60	3.4/3.1	0	353/492	65/95	63/85	14/22
downstream	61/150	3.5/3.1	0	220/419	9/40	38/72	14/23

flow in gpm; alkalinity, acidity, and total metals expressed in mg/L; pH not averaged from H ion concentration; n(discharge) = 12; n(upstream) = 10; n(downstream) = 25 to 46; *(Note the maximum flows do not necessarily correspond to maximum concentrations. See attached data.)*

SITE PREPARATION

Erosion and Sediment Pollution Controls were constructed after plan approval by the Butler County Conservation District. A wetland waiver was also received with the assistance of the PA DEP, Knox District Mining Office and Bureau of Water Quality. Road bonds and permits were handled by Amerikohl Mining, Inc. Passive system design plans were reviewed by the PA DEP, Knox District Mining Office. Submission to the PA Historical and Museum Commission was not required as the proposed affected area was less than 10 acres. PA One Call relating to underground utilities was contacted and the response was no involvement.

A temporary collection ditch, conveying the degraded drainage northerly to the limit of the affected area then westerly to an existing channel previously constructed by the adjoining property owners to the receiving stream, was installed prior to commencement of the work under the grant.

After review of the monitoring data and setbacks requested by the affected landowners, the location of this ditch was determined to conflict with the final location of the passive system.

The ditch was relocated in March 2000, as part of the grant work, to divert the flow from the proposed construction area. The relocated ditch conveyed the flow southerly and then westerly to the receiving stream in order to dewater and dry the proposed construction site. Hay/straw bales were placed in selected sections of the relocated ditch to control sediment and erosion (See photo section, p. 5 and 6).

Site preparation was also coordinated with the coal ash capping project conducted on a barren portion of the upland area. For example, coal ash was used to stabilize access to the passive treatment system construction site (See photo section, p. 10) .

PASSIVE TREATMENT SYSTEM INSTALLATION

The passive treatment system installed at De Sale Phase I consists of the following four components in series **(See "As-Built" drawings and photo section.)**:

1. Anoxic Collection System with Inlet Control Structure - about 360' of 8", perforated, N12 Pipe; 210 tons of AASHTO# 2B river gravel; Type M concrete box (5'L x 3'W x 3 ½'H);

2. Two Vertical Flow Ponds in parallel with two-tier underdrain systems - 175 tons on the bottom of each pond (349 tons total) 90% $CaCO_3$, AASHTO #57 limestone aggregate, 1500 tons each pond (3000 tons total) 90% $CaCO_3$, AASHTO #1, limestone aggregate and about 1800' in each lower tier and 2200' in each upper tier of 4", perf., Sch. 40 PVC pipe; overlain by about 160 cy of spent mushroom compost.

3. Settling Pond/Wetland Complex - 33,400 SF; wetland area contains ½-foot of spent mushroom compost;

4. Horizontal Flow Limestone Bed - 1600 tons of 90% $CaCO_3$, AASHTO #1, limestone aggregate.

Selected Milestones

3/29/00	Anoxic Collection System construction begins
4/18/00	Horizontal Flow Limestone Bed completed
5/03/00	Vertical Flow Pond-North completed
5/05/00	Vertical Flow Pond-South completed
5/10/00	Anoxic Collection System with Inlet Control Structure operational
5/10/00	Wetland/Settling Pond completed (excluding wetland planting)
5/10/00	system on-line
5/19/00	upland diversion ditch completed
5/26/00	final effluent discharging
6/03/00	wetlands planted
6/10/00	affected area revegetation completed

Bulk Materials

Spent mushroom compost was used in the Wetlands and in the Vertical Flow Ponds in a layer above the limestone aggregate. The source of the compost is Creekside Mushroom Ltd., Worthington, PA.

Limestone aggregate was used in the spillways, Vertical Flow Ponds, and Horizontal Flow Limestone Bed. The source of the aggregate is the Quality Aggregates Inc. Boyers Quarry, Boyers, PA. The Vanport limestone (Clarion Fm.; Allegheny Gp.), is a high-calcium, 90% $CaCO_3$, marine limestone.

River gravel was used in the Anoxic Collection System. This glacial material is from Atlantic States Materials of PA, Inc., Mercer Plant, Mercer, PA.

Anoxic Collection System with Inlet Control Structure

The Anoxic Collection System is about 360 feet in length. A "T" was installed about 160 feet from the northern end of the collection system. The flow was allowed to drain out the southern end of the collection system during installation of the passive treatment system in order to keep the construction area dry. AASHTO #2B river gravel with an 8-inch, perforated, N12 pipe was wrapped in geotextile fabric (See photo section, p. 11). After the system was completed, 8-inch, solid, N12 pipe was extended from the "T" about 20 feet to the Inlet Control Structure. The Inlet Control Structure consists of a 6-inch walled, Type M concrete box with openings for the pipe from the Anoxic Collection System and for two inlet pipes, one to Vertical Flow Pond-North and one to Vertical Flow Pond-South (See photo section, p. 12). Inlet pipes can be adjusted by adding a 6-inch Fernco and 6-inch street elbow to control flow rate into the ponds.

Vertical Flow Ponds

The design of the passive treatment system includes two Vertical Flow Ponds of equal size that are used in parallel. These facilities are designated as Vertical Flow Pond-North and Vertical Flow Pond-South. Geotextile was used to line the bottom and sides of the pond to the approximate elevation of the top of the limestone (See photo section, p. 13). ½ -foot of #2B limestone aggregate was then placed on the geotextile and the lower underdrain piping system was installed. Each tier in each pond was divided into quadrants. 4-inch, perf., Sch. 40 PVC pipe laterals, about 18 feet in length (bottom tier) and 20 feet in length (upper tier), were placed on 4 ½-foot centers and plumbed into 4-inch, solid, Sch. 40 PVC mains.

Each main extends though the breastwork to a flush valve located in a valve box at the outside toe of the vertical flow pond. Approximately 30 feet before the flush valve, a tee was installed with a vertical riser pipe extending to an elevation 7.5 feet above the bottom of the pond (See "As-Builts"). A 4" 90 degree elbow was plumbed onto the riser to direct the flow to the discharge regulation valve. The discharge regulation valve allows for adjustment of flow through each "cell" of underdrain piping in order to maximize system utilization of limestone and treatment efficiency. Prior to the discharge regulation valve a tee was installed. This tee is part of an overflow outlet system which has an invert elevation 1 foot above the invert elevation of the discharge regulation valve (See photo section, p.16). Overflow piping allows for controlled discharge of treated water prior to the water in the vertical flow pond reaching the emergency spillway elevation.

There are a total 16 "cells" (4 quadrants per tier X 2 tiers X 2 ponds) which outlet through individual discharge pipes. Each cell has both a flush valve and discharge regulation valve for a total of 32 valves. All valves are 4" slide gate valves.

This plumbing system is designed to allow for maximum distribution of flow throughout the pond during normal operating conditions. As aluminum and iron precipitates accumulate within the vertical flow ponds, a decrease in permeability is expected due to the filling of void space within the AASHTO #1 limestone layers. As the permeability decreases, the amount of head (difference between water elevation in the vertical flow pond and the discharge pipe elevation) needed to push the water through the system will increase. This decrease in permeability will cause the water level in the vertical flow ponds to rise. Prior to the water elevation reaching the crest of the emergency spillway, the ponds should be

flushed.

System flushing is designed to be carried out by opening one flush valve per pond at a time. Based on previous experience of project team participants, the amount of time for the aluminum/iron sludge to flush out should be approximately 15 to 20 minutes. There should be a visibly significant change the effluent during flushing. Once the flushing effluent appears to begin to "run clear" the valve should be closed. Increased flushing efficiency should be realized with increased amounts of head. In order to maximize the amount of head during a single-day flushing event, valves should opened on alternating ponds in sequence. An example of this flushing sequence is as follows: 1UF, 5UF, 2UF, 6UF, 3UF, 7UF, 4UF, 8UF, 1LF, 5LF, 2LF, 6LF, 3LF, 7LF, 4LF, 8LF. As this is the first known flushing mechanism installed of this type, it is recommended that flushing events be monitored and adjustments be made to the flushing sequence as needed.

The emergency and primary outlet spillways are stabilized with 90% $CaCO_3$, R4 limestone rip rap. Between the underdrain tiers and above the upper underdrain tier is a 2-foot layer of 90% $CaCO_3$, AASHTO #1 limestone aggregate. A ½-foot layer of spent mushroom compost was spread above the limestone aggregate. With a 2 ½ -foot water cap, the design water level is 7.5 feet above the bottom of the pond.

Settling Pond/Wetland Complex

Due to space limitations based on property boundaries and landowner required setbacks, the Settling Pond and Wetland were constructed with the same design water elevation and connected by a broad inlet with a decreasing water depth from the pond to the wetland. The inter-system berm, width two feet, was installed to separate the settling pond from the wetland (See photo section, p. 17).

The wetlands were planted with various hydrophytic species by a volunteer effort of the Slippery Rock Watershed Coalition (See photo section, p. 18-19). The following wetland plants were harvested from PA Game Lands No. 95:

Wetland Species Planted 6/3/00

Common Name	Scientific Name	Indicator Status	Water Depth
Water Plantain	*Alismo plantago-aquatica*	obligate	≤12" or saturated
Water Pepper	*Polygonum hydropiperoides*	obligate	≤12" or saturated
Wool Grass	*Scirpus cyperinus*	obligate	≤12" or saturated (Plant near edges)
Soft-stem bullrush	*Scirpus validus*	obligate	≤12" or saturated
Purpleosier Willow	*Salix purpurea*	facultative-wet	permanently inundated
Spatterdock	*Nuphar luteum*	obligate	1 to 3 feet
Three-sided Sedge	*Dulichium arundinaceum*	obligate	≤12"
Blue Flag	*Iris versicolor*	obligate	≤ 6"
Broad-leaved Cattail	*Typha latifolia*	obligate	≤12"
Narrow-leaved Cattail	*Typha angustifolia*	obligate	≤12"
Eastern Burr-weed	*Sparginum americanum*	obligate	≤ 6"

Horizontal Flow Limestone Bed

Excavation for the Horizontal Flow Limestone Bed began on 4/6/00 during construction of the Anoxic Collection System and before the other components in the system. 1600 tons of AASHTO #1 were used in this component. (See photo log, p.20.) The outlet piping consisted of an 8-inch, perforated, Sch. 40 PVC pipe extended across the northern end at the base of the component. Midway a “T” was installed and 8-inch, solid, Sch. 40 PVC was extended through the breastwork of the component. The “T” was rotated and a 45^{o} elbow was used to attain the design elevation.

Major Equipment List

TS 24 TEREX Pan
966 C Caterpillar Wheel Loader
330 L Caterpillar Track Excavator
D6H LGP Caterpillar Dozer

CONSTRUCTION TIMELINE

DATE	ANOXIC COLLECTION SYSTEM W/ INLET STRUCTURE	VERTICAL FLOW POND-NORTH	VERTICAL FLOW POND-SOUTH	SETTLING POND /WETLAND	HORIZONTAL FLOW LIMESTONE BED
3/29/00	construction begins (flow temporarily diverted from constructed area)				
3/31/00		construction begins			
4/05/00	geotextile, pipe, gravel installed				
4/06/00					excavation begins
4/10/00					geotextile placed
4/11/00					LS placed to rough grade
4/12/00		excavated & geotextile placed			
4/13/00				excavating-north end	
4/14/00		bedding stone placed; lower tier installation			outlet excavated
4/18/00		LS placed above lower tier			outlet piping installed; spillway lined; facility completed

4/21/00		upper tier installation; limestone placed	excavation begins	excavating-south end	
DATE	**ANOXIC COLLECTION SYSTEM W/ INLET STRUCTURE**	**VERTICAL FLOW POND-NORTH**	**VERTICAL FLOW POND-SOUTH**	**SETTLING POND/ WETLAND**	**HORIZONTAL FLOW LIMESTONE BED**
4/25/00		LS placement completed; emergency spillway lined	excavation & grading completed	excavation, embankments completed	
4/28/00	northern section completed		geotextile installed; bedding stone placed; lower tier installed; outlets under construction		
5/01/00			LS placement over lower tier; upper tier installed		
5/03/00		compost placed; valves installed; facility completed	LS placement completed; compost placed	spillway completed; pond being excavated	
5/05/00			valves installed; facility completed	grading completed; compost placed	
5/10/00	inlet control box installed; temporary diversion reclaimed			interior berm completed	
5/25/00	steel inlet lid installed				
6/03/00				wetlands planted	

PASSIVE TREATMENT SYSTEM PERFORMANCE

The system has only been recently installed. The discussion that follows is intended only to evaluate the initial performance of the system. **(See Figures 2 thru 6 and attached analyses.)**

The following table identifies the initial discharge characteristics through the system:

COMPARISON OF WATER QUALITY
through the
DE SALE PHASE 1 PASSIVE TREATMENT SYSTEM
one month after completion (6/26/00)

Component	Flow	lab pH	alkalinity	acidity	iron	manganese	aluminum
Inlet **(raw)**	44	3.1	0	251	71	calc. 40	8
VFP-N/S	NM	7.0/7.1	148/181	0/0	8/ 6	38/33	<1/<1
SP/Wetland	NM	7.5	161	0	1	16	<1
HFLB **(final)**	39	7.4	164	0	4	14	<1

flow in gpm; alkalinity, acidity, and total metals expressed in mg/L; Note reported manganese measurement for raw water of 9 mg/L appeared spurious based on previous monitoring data. Manganese listed based on calculation.)

Anoxic Collection System with Inlet Control Structure

An Anoxic Collection System is not always used in conjunction with Vertical Flow Ponds. Due, however, to the limited space, the design elevation at the base of the collection system, the consideration relating to particulate matter in the inflow, an Anoxic Collection System was installed to collect the diffuse polluted site drainage. Any unencountered drainage present below the elevation of the collection system, depending upon elevation, would seep into the other components; thus, contributing to the total flow through the system. The Inlet Control Structure successfully allows for the control flow rate into the individual flow ponds. This structure also enables the flow to be “shut off” to an individual pond for flushing or maintenance purposes. The inlet box also provides accessibility for raw water sample collection necessary for evaluation of the long-term system performance.

Vertical Flow Ponds

The underdrain and outlet design incorporate about 1 ½ miles of pipe. This is the first known installation using this design in the Commonwealth. A total of 32 valves are utilized to allow for control of flow distribution and selective flushing. Due to this unique application, further investigations can be made regarding preferential flow in vertical flow-type passive treatment systems.

Samples collected about one month after the system was operational demonstrated that the Vertical Flow Ponds were operating successfully. The initial effluent can be characterized as being a net alkaline - manganese discharge with low aluminum and low

iron concentrations (Figure 2 and Figure 3). Over 130 lbs/day of acidity were being neutralized and over 35 lbs/day of metals are being retained in the system. This is a decrease in the total iron concentration of 90% and a decrease in total aluminum concentration approaching 100% (Figure 4 and Figure 5). The reported manganese concentration appeared spurious and an evaluation can not be made at this time (Figure 3). Note the four-fold improvement in pH from a 3 to 7 (Figure 6).

Settling Pond/Wetland Complex

Due to the limited space, the Settling Pond and the Wetland were not constructed as separate facilities. In order to decrease the possibility for short-circuiting interior berms were installed. The 6/26/00 sampling was conducted about 3 weeks after the wetland was planted. The iron remaining in the treated flow from the Vertical Flow Ponds appears to have been essentially removed by this system (Figure 4). The manganese concentration also appears to be decreased by more than 50%. This may be a short-lived phenomena associated with the organic wetlands substrate or may represent a more long-lived phenomena relating to the oxidation and removal of manganese after iron oxidation. The more long-term monitoring, as resources permit, by the PADEP, Knox District Mining Office will assist in evaluating the longevity of this phenomena. The individual system components will continue to be monitored by Slippery Rock Watershed Coalition participants as part of the system maintenance program.

Horizontal Flow Limestone Bed

This system is constructed to remove manganese by increasing the pH of the water directly in contact with the limestone aggregate. This system is of similar construction to one recently constructed at Ohiopyle State Park, PADCNR, and is based on work of Dr. William Hellier, PE, Technology Transfer, Bureau of Mining and Reclamation, PA DEP. The alkalinity does appear to have been slightly increased and the total manganese slightly decreased (Figure 3). Later monitoring will aid in determining the effectiveness of this system. The final effluent flow rate from the Horizontal Flow Limestone Bed appears to be less than the influent flow rate to the Vertical Flow Ponds. This may be due to variable flows, measurement discrepancies, and/or adsorption or leakage within the system. Influent and effluent flow measurements will be included in future monitoring for further evaluation.

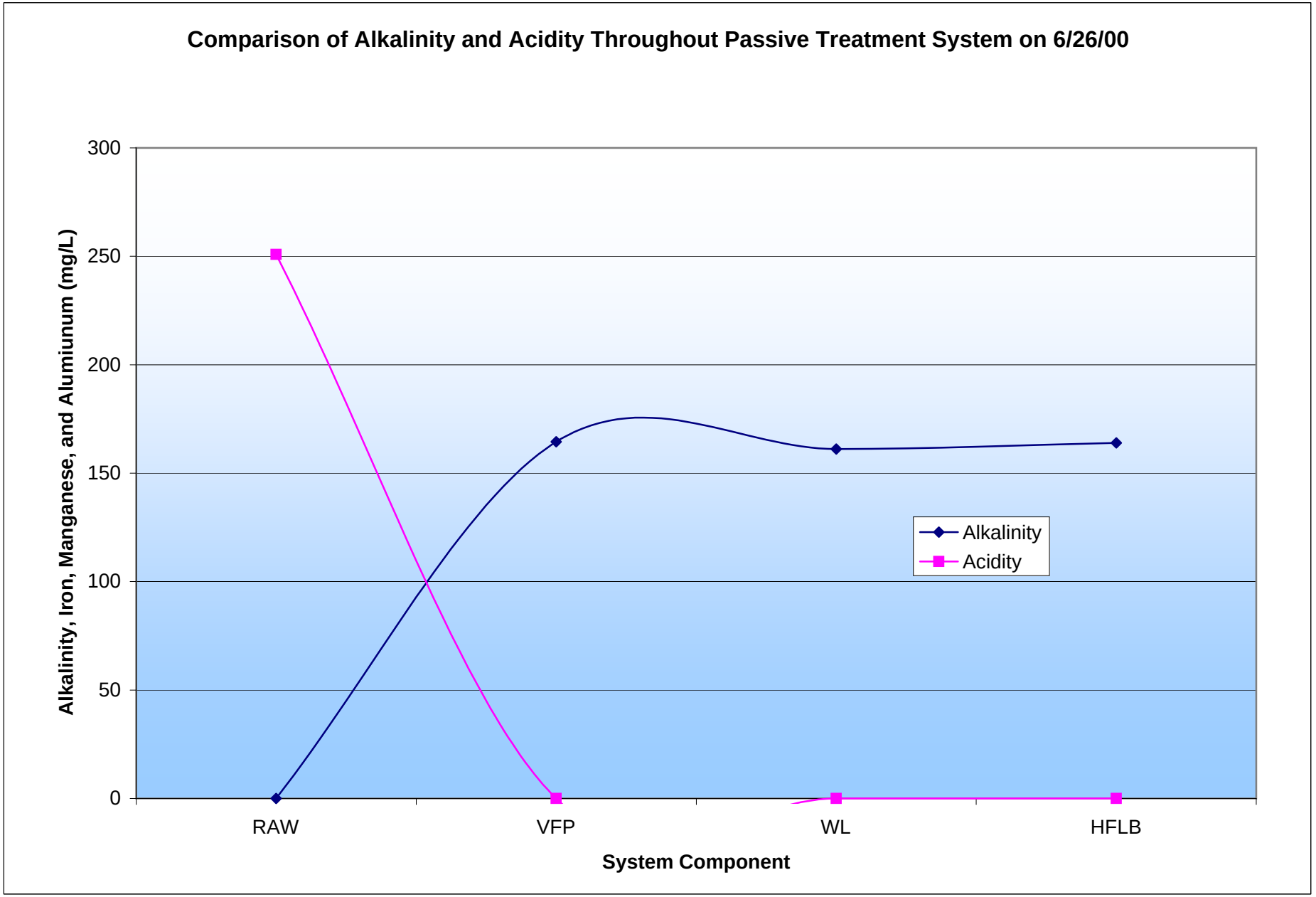

Comparison of Alkalinity and Acidity Throughout Passive Treatment System on 6/26/00
Alkalinity, Iron, Manganese, and Alumiunum (mg/L)
300
250
200
150
100
50
0
RAW
VFP
WL
HFLB
System Component
Alkalinity
Acidity

Figure 2

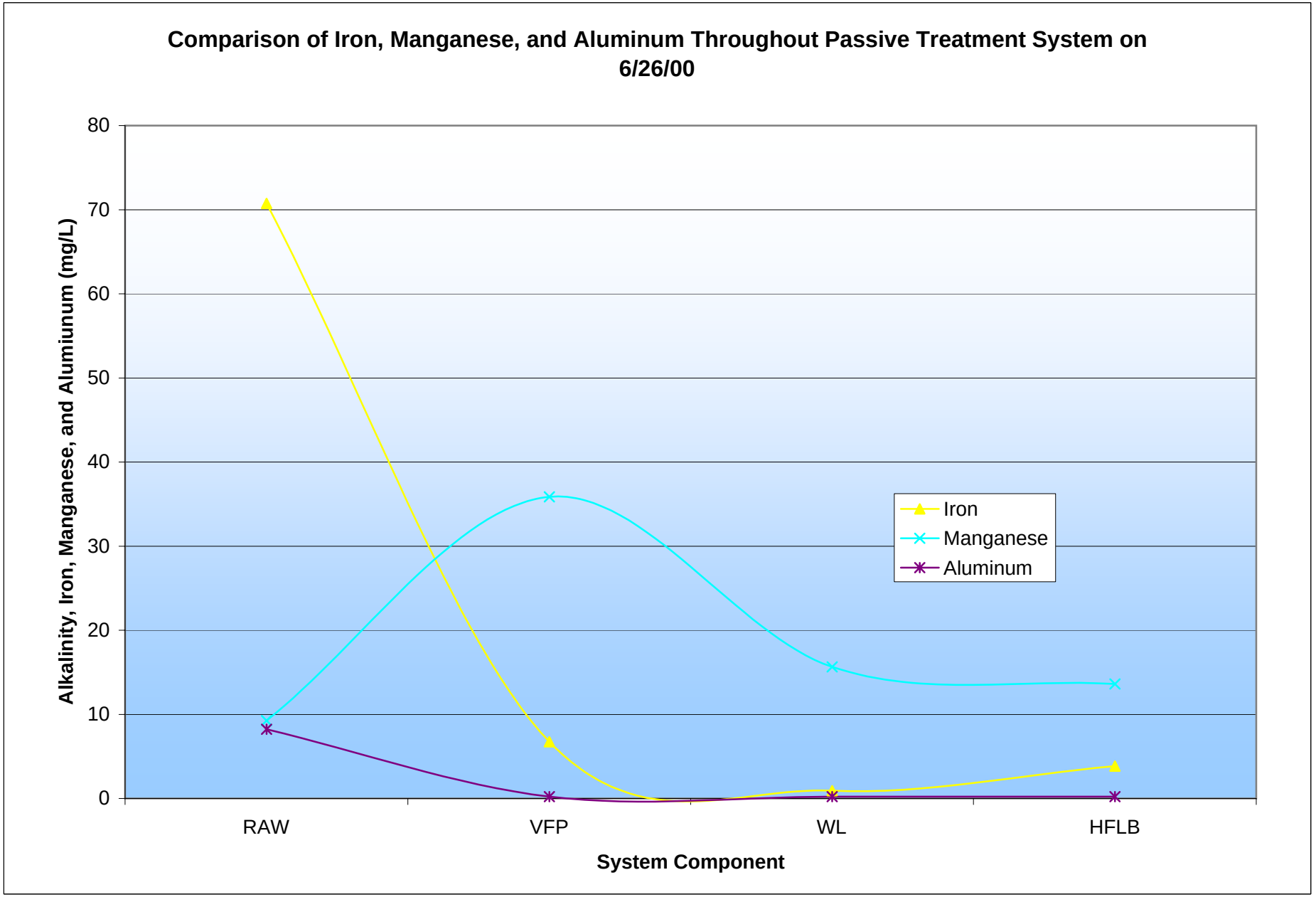

Comparison of Iron, Manganese, and Aluminum Throughout Passive Treatment System on 6/26/00
Alkalinity, Iron, Manganese, and Aluminum (mg/L)
80
70
60
50
40
30
20
10
0
RAW
VFP
WL
HFLB
System Component
Iron
Manganese
Aluminum

Figure 3

Comparison of Iron Retained Within Each Component Throughout Passive Treatment System on 6/26/00

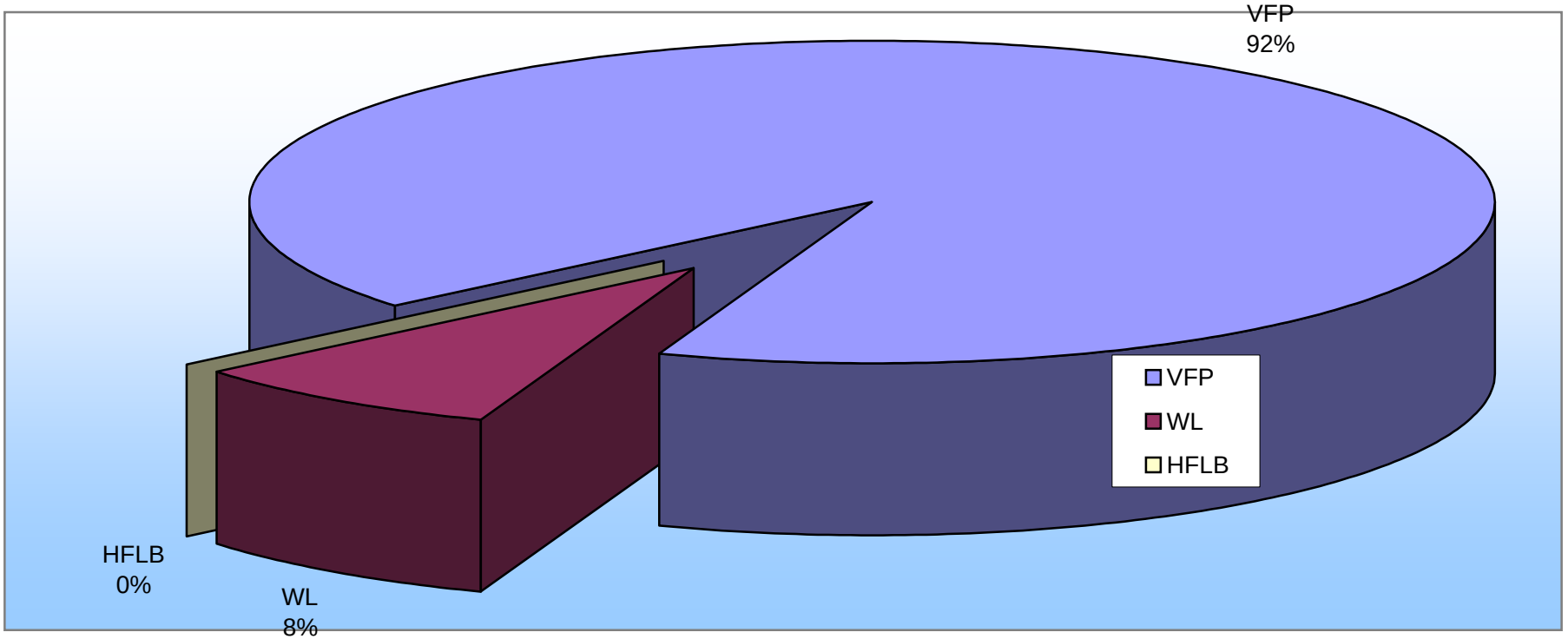


Figure 4

Comparison of Aluminum Retained Within Each Component Throughout Passive Treatment System on 6/26/00

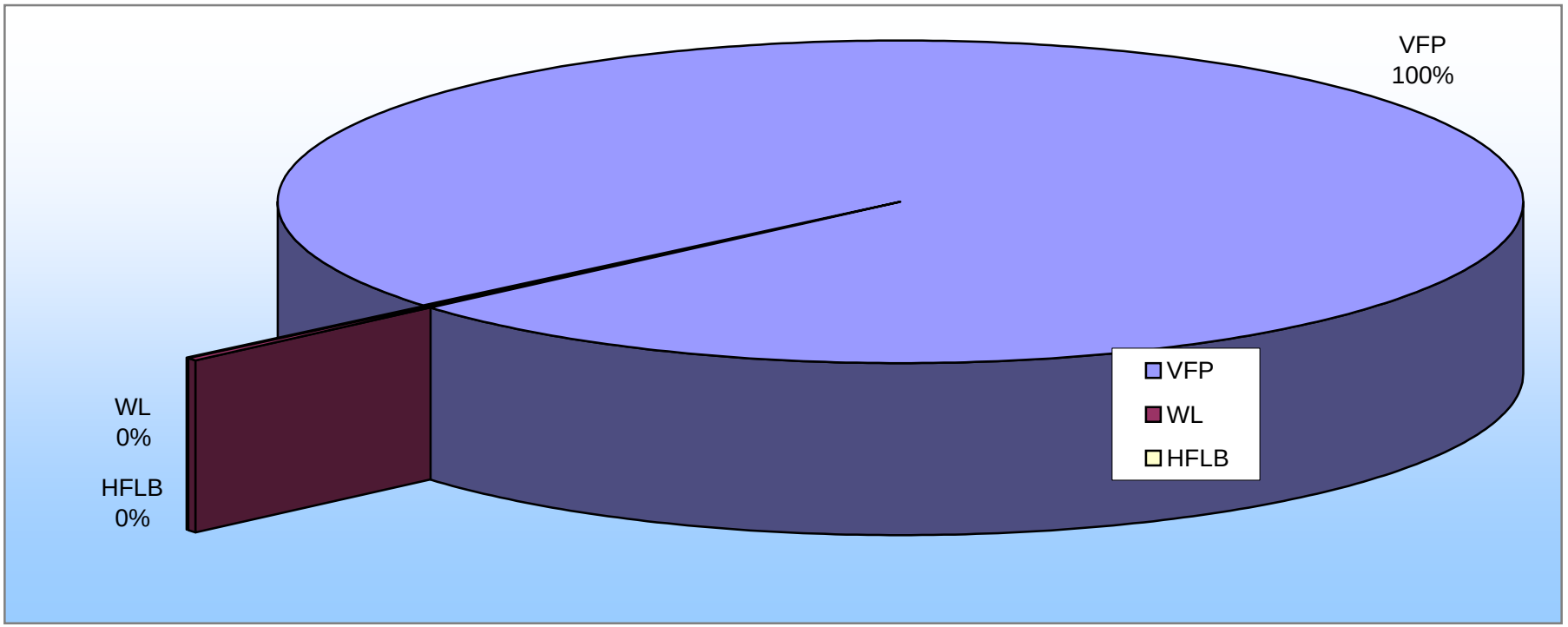


Figure 5

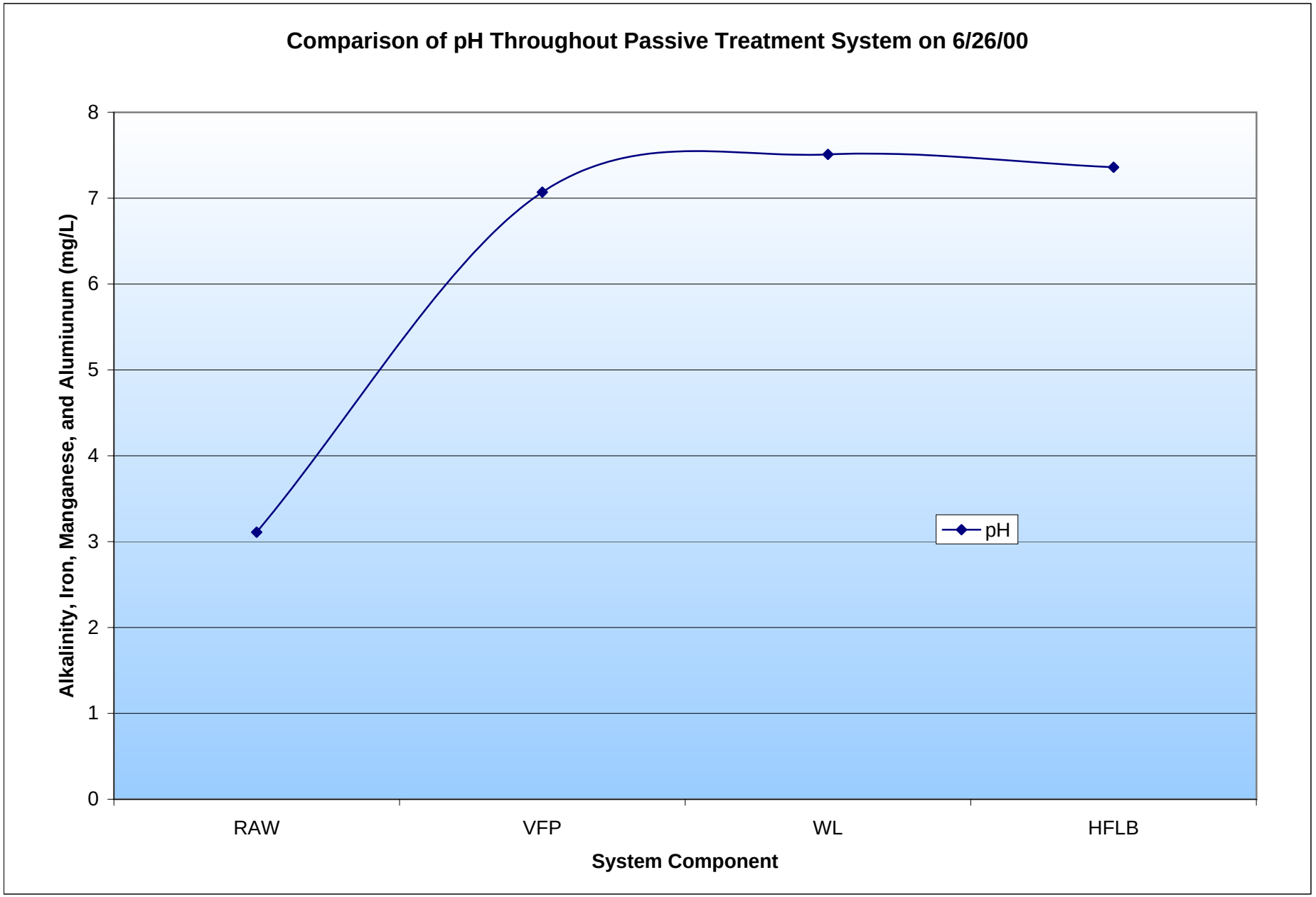

Comparison of pH Throughout Passive Treatment System on 6/26/00
Alkalinity, Iron, Manganese, and Alumiunum (mg/L)
0
1
2
3
4
5
6
7
8
RAW
VFP
WL
HFLB
System Component
pH

Figure 6

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
RAW	8/12/99		36		3.6	1842			0	381	78.5		66.5		17.3		1285	62
RAW	8/17/99		36		3.5				0	286	77.2		62.0		14.8		1612	0
RAW	8/19/99		36		3.4	1866			0	439	76.5		66.8		14.0		1478	8
RAW	8/20/99				3.4				0	298	83.4		64.8		15.4		1449	10
RAW	9/2/99		27	3.4	3.4	2221	25		0	372	84.0		72.3		15.9		1469	11
RAW	9/9/99	Estimate	20		3.1				0	310	92.5		68.9		17.6		124	12
RAW	10/5/99		29	3.2	3.2	2078	9		0	492	61.5		69.5		13.8		1665	35
RAW	10/13/99	Estimate	24		3.2				0	408							1662	
RAW	11/12/99	Estimate	26		3.1				0	556	83.5		69.0		21.0		1622	126
RAW	11/12/99		28	3.1	3.1	2197	8		0	421	86.8		84.8		16.7		1746	42
RAW	11/18/99	Bucket	24	4.8	3.1	2311	5		0	443	94.8		84.0		17.3		2358	41
RAW	12/8/99		28	3.3	3.4	2156	4		0	338	47.5		72.5		22.0		2525	50
RAW	12/28/99	Estimate	30		3.4				0	274	59.3		64.9		20.4		1288	12
RAW	1/13/00		60	3.5	3.5	1691	4		0	306	48.1		57.0		13.7		1722	26
RAW	1/20/00	Estimate	45		3.6				0	242	68.5		59.9		15.4		681	0
RAW	2/10/00	Estimate	40		3.5				0	356	66.8		56.1		14.1		869	8
RAW	2/10/00		11	3.8	3.5	1723	9		0	324	62.7		61.0		13.2		2170	31
RAW	3/1/00		50	3.7	3.4	1610	11		0	224	29.9		43.1		10.1		1096	16
RAW	3/8/00	Estimate	30		3.4				0	252								951
RAW	4/4/00		28	4.2	4.0	1360	10		0	268	45.8		39.7		8.0		1199	23
RAW	4/25/00	Estimate	50		4.0				3	238	58.4		41.0		6.9		851	0
RAW	5/4/00		20	4.1	4.1	1474	12		0	229	64.9		41.3		7.9		1278	5
RAW	5/25/00	Estimate	40		4.1				5	276	59.5		40.5		7.7		1044	0
RAW	6/15/00	Estimate	50		4.2				7	286	61.1		41.3		7.5		1055	0
RAW	6/26/00	Bucket	44	4.5	3.1	1641	11		0	251	70.8		9.3		8.2		1195	3
RAW	7/13/00	Estimate	30		4.1				5	408								
RAW	7/13/00	Estimate	30		4.1				4									

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
Min			11	3.1	3.1	1360	4		0	224	29.9		9.3		6.9		124	0
Max			60	4.8	4.2	2311	25		7	556	94.8		84.8		22.0		2525	951
Avg			34	3.8	3.5	1859	10		1	334	67.9		58.1		13.9		1393	61
Range			49	1.7	1.1	951	21		7	332	64.9		75.5		15.1		2401	951
Total Loading (lb/day)									0	134	27.3		23.4		5.6			

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
VFP-N	6/26/00			6.7	7.0	1674	20		148	0	7.9		38.3		0.2		1255	8
Min				6.7	7.0	1674	20		148	0	7.9		38.3		0.2		1255	8
Max				6.7	7.0	1674	20		148	0	7.9		38.3		0.2		1255	8
Avg				6.7	7.0	1674	20		148	0	7.9		38.3		0.2		1255	8
Range				0.0	0.0	0	0		0	0	0.0		0.0		0.0		0	0
Total Loading (lb/day)																		

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
VFP-S	6/26/00			6.7	7.1	1698	21		181	0	5.6		33.4		0.2		1331	11
Min				6.7	7.1	1698	21		181	0	5.6		33.4		0.2		1331	11
Max				6.7	7.1	1698	21		181	0	5.6		33.4		0.2		1331	11
Avg				6.7	7.1	1698	21		181	0	5.6		33.4		0.2		1331	11
Range				0.0	0.0	0	0		0	0	0.0		0.0		0.0		0	0
Total Loading (lb/day)																		

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
WL	6/26/00			7.9	7.5	1923	33		161	0	0.9		15.7		0.2		1489	10
Min				7.9	7.5	1923	33		161	0	0.9		15.7		0.2		1489	10
Max				7.9	7.5	1923	33		161	0	0.9		15.7		0.2		1489	10
Avg				7.9	7.5	1923	33		161	0	0.9		15.7		0.2		1489	10
Range				0.0	0.0	0	0		0	0	0.0		0.0		0.0		0	0
Total Loading (lb/day)																		

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
HFLB	5/25/00	Estimate	25		7.2				146	0	4.6		11.3		0.0		1413	0
HFLB	6/15/00	Estimate	50		7.0				180	0	3.6		10.7		0.0		927	4
HFLB	6/26/00	Bucket	39	7.6	7.3	1907	24		157	0	3.9		13.5		0.2		1557	15
HFLB	6/26/00			7.6	7.4	1896			171	0	3.9		13.8		0.2		1609	15
HFLB	7/13/00	Estimate	30		7.2				186	0	4.9		26.1		0.0		1038	12
Min			25	7.6	7.0	1896	24		146	0	3.6		10.7		0.0		927	0
Max			50	7.6	7.4	1907	24		186	0	4.9		26.1		0.2		1609	15
Avg			36	7.6	7.2	1902	24		168	0	4.2		15.1		0.1		1309	9
Range			25	0.0	0.4	11	0		40	0	1.3		15.4		0.2		682	15
Total Loading (lb/day)									72	0	1.8		6.5		0.0			

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
UP STREAM	9/2/99		20	3.0	3.1	1735	24		0	206	10.9		31.2		12.5		873	6
UP STREAM	10/5/99		21	3.0	3.2	1531	10		0	248	18.9		12.7		9.9		894	5
UP STREAM	10/13/99				3.1				0	242							1118	
UP STREAM	11/12/99	MEASURED	7		3.2				0	300	13.5		29.6		12.1		953	0
UP STREAM	11/12/99		8	3.0	3.1	1557	10		0	226	14.4		34.0		13.3		1044	3
UP STREAM	11/18/99	Weir	7	4.5	3.2	1656	2		0	235	15.5		36.6		13.4		933	3
UP STREAM	12/8/99		9	3.3	3.4	1371	3		0	180	22.8		26.7		9.9		1369	26
UP STREAM	12/28/99	MEASURED	14		3.3				0	186	14.8		27.4		12.3		939	0
UP STREAM	1/13/00		22	3.4	3.3	1106	5		0	132	7.5		20.5		8.3		608	5
UP STREAM	2/10/00	Estimate	20		3.3				0	202	12.7		24.5		10.7		868	0
UP STREAM	2/10/00		5	3.6	3.4	1192	4		0	192	9.8		23.8		9.0		1262	8
UP STREAM	3/1/00		16	3.6	3.4	894	9		0	93	4.9		14.2		6.7		495	5
UP STREAM	3/8/00	MEASURED	8		3.3				0	134	6.5		18.7		13.2		541	0
UP STREAM	4/3/00		80	3.8	3.7	430	11		0	60	1.8		5.8		3.2		253	7
UP STREAM	4/25/00	Estimate	75		3.5				0	136	2.9		14.1		8.2		501	0
UP STREAM	5/4/00		20	3.5	3.5	1105	12		0	130	2.4		17.3		1.9		885	2
UP STREAM	5/25/00				3.4				0	130	2.7		12.0		5.8		268	0
UP STREAM	6/6/00		41	3.8	3.6	840	13		0	73	2.3		13.3		6.4		567	1
UP STREAM	6/15/00				3.4				0	108	2.7		12.0		5.8		268	0
UP STREAM	6/26/00	Cross-section	36	4.2	3.3	1336	20		0	159	8.4		21.3		8.9		1037	6
UP STREAM	7/13/00				3.2				0	198	7.0		28.7		12.7		690	4
Min			5	3.0	3.1	430	2		0	60	1.8		5.8		1.9		253	0
Max			80	4.5	3.7	1735	24		0	300	22.8		36.6		13.4		1369	26
Avg			24	3.6	3.3	1229	10		0	170	9.1		21.2		9.2		779	4
Range			75	1.5	0.7	1305	22		0	240	21.0		30.8		11.5		1117	26
Total Loading (lb/day)									0	49	2.6		6.1		2.7			

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
DN STREAM	1/6/69		50		3.6				0	220	1.6						778	
DN STREAM	2/5/69		94		4.0				0	170	1.6						672	
DN STREAM	3/10/69		42		3.9				0	320	3.1						77	
DN STREAM	4/7/69		94		4.1				0	112	1.7						528	
DN STREAM	5/5/69		34		3.7				0	196	1.7						643	
DN STREAM	6/2/69		22		3.5				0	190	2.6						854	
DN STREAM	7/8/69		42		3.6				0	238	2.3						778	
DN STREAM	7/31/69				3.2				0	264	6.3		39.5		15.4		792	0
DN STREAM	8/4/69		42		3.4				0	198	2.3						979	
DN STREAM	9/8/69		123		3.6				0	1122	3.0						557	
DN STREAM	10/6/69		34		3.7				0	142	2.4						643	
DN STREAM	11/3/69		123		4.0				0	98	1.4						490	
DN STREAM	12/8/69		123		4.2				0	90	1.1						403	
DN STREAM	1/26/81		25		3.6				0	108	1.5		24.4				580	4
DN STREAM	5/16/95				3.3				0	220	6.5		36.0		13.7		666	4
DN STREAM	6/29/95				3.3				0	202	6.5		36.9		15.1		915	10
DN STREAM	7/27/95				3.2				0	238	6.4		39.4		14.9		894	3
DN STREAM	9/12/95		8		3.2				0	320	7.3		52.2		23.2		879	3
DN STREAM	11/20/95				3.4				0	166	8.1		31.6		13.6		648	3
DN STREAM	2/22/96				3.5				0	108	4.3		20.2		9.1		485	3
DN STREAM	3/27/96				3.2				0	220	7.2		33.3		15.1		921	3
DN STREAM	4/18/96				3.4				0	184	5.3		29.0		13.0		749	3
DN STREAM	5/30/96				3.3				0	224	7.0		35.1		15.3		966	3
DN STREAM	6/27/96				3.2				0	236	8.4		40.0		16.0		891	3
DN STREAM	7/31/96				3.2				0	264	6.3		39.5		15.4		792	0
DN STREAM	8/29/96				3.2				0	304	7.8		45.9		19.2		1188	0
DN STREAM	9/18/96				3.2				0	222	7.2		30.7		11.5		737	0
DN STREAM	10/24/96				3.4				0	190	10.1		34.7		13.0		767	0
DN STREAM	11/26/96				5.2				11	30	1.9		6.2		2.8		148	18

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
DN STREAM	1/6/97				3.4				0	184	7.9		27.1		11.2		867	0
DN STREAM	6/10/97				3.1				0	276	9.2		36.8		13.8		880	6
DN STREAM	6/10/97				3.4				0	184	7.9		27.1		11.2		867	0
DN STREAM	7/10/97				3.1				0	302	9.9		45.1		17.1		782	0
DN STREAM	8/12/97				3.1				0	322	8.2		46.4		18.7		947	4
DN STREAM	10/9/97				3.1				0	328	12.2		49.0		19.0		1043	8
DN STREAM	11/18/97				3.4				0	298	13.8		41.1		17.4		1008	0
DN STREAM	12/23/97	Estimate	150		3.6				0	142	6.7		23.1		10.2		501	0
DN STREAM	1/7/98				3.3				0	226	10.7		34.2		12.9		1236	0
DN STREAM	2/10/98	Estimate	80		3.4				0	226	11.9		32.9		13.8		721	4
DN STREAM	3/5/98		190		3.3				0	210	10.8		31.9		12.5		770	6
DN STREAM	3/19/98				3.3				0	160	8.6		27.7		11.0		724	0
DN STREAM	4/9/98				3.5				0	178	19.7		30.1		13.4		712	138
DN STREAM	5/19/98				3.3				0	186	9.1		37.5		7.0		817	0
DN STREAM	7/7/98				3.2				0	246	9.3		44.1		17.1		989	0
DN STREAM	9/24/98				3.2				0	266	8.3		48.3		21.4		1122	6
DN STREAM	10/14/98				3.3				0	252	9.6		52.9		24.1		1025	0
DN STREAM	1/26/99	Estimate	50		3.5				0	142	11.4		31.6		12.7		717	0
DN STREAM	3/23/99				3.4				0	162	8.0		32.0		13.5		555	0
DN STREAM	5/18/99				3.3				0	184	5.3		33.2		13.7		708	0
DN STREAM	6/24/99				3.3				0	198	5.6		34.1		13.2		883	0
DN STREAM	7/8/99	Estimate	50		3.2				0	274	8.1		42.2		16.3		882	0
DN STREAM	8/20/99				3.1				0	232	25.6		56.8		16.9		1354	0
DN STREAM	9/2/99		47	3.0	3.1	2125	24		0	303	24.3		57.9		15.7		1152	9
DN STREAM	9/9/99				3.2				0	286	30.1		59.0		16.0		1416	0
DN STREAM	10/5/99		52	3.1	3.1	1928	10		0	419	27.9		63.5		15.7		1419	7
DN STREAM	10/13/99				3.1				0	362							1244	
DN STREAM	11/12/99		37	3.1	3.1	1877	10		0	394	31.4		70.3		16.2		1491	9
DN STREAM	11/12/99				3.2				0	442	29.6		55.5		16.4		1651	6

De Sale Phase I Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
DN STREAM	11/18/99	Bucket	29	4.7	3.1	2118	2		0	417	39.8		71.8		17.6		1595	26
DN STREAM	12/8/99		37	3.5	3.3	1767	4		0	274	23.6		54.5		17.3		2095	9
DN STREAM	12/28/99				3.4				0	240	28.0		52.8		18.1		922	0
DN STREAM	1/13/00		82	3.5	3.4	1413	5		0	204	16.8		36.9		9.9		927	20
DN STREAM	1/20/00				3.4				0	216	30.7		46.4		14.1		1052	0
DN STREAM	2/10/00		16	3.6	3.4	1648	5		0	251	20.1		49.0		12.6		1691	24
DN STREAM	2/10/00				3.4				0	296	27.2		42.9		13.2		1250	6
DN STREAM	3/1/00		67	4.0	3.9	1369	9		0	141	15.0		27.6		9.0		829	13
DN STREAM	3/8/00				3.3				0	212							839	
DN STREAM	4/3/00		83	4.1	4.0	477	10		0	39	4.4		7.6		2.9		255	11
DN STREAM	4/25/00				3.5				0	170	16.3		28.4		9.8		695	0
DN STREAM	5/4/00		58	3.5	3.5	1291	14		0	157	15.2		27.0		7.6		936	5
DN STREAM	5/25/00				4.4				8	84	3.6		14.5		5.1		661	0
DN STREAM	6/6/00		103	6.0	6.0	1177	14		11	24	4.2		14.3		4.1		717	4
DN STREAM	6/15/00				6.0				28	48	5.7		13.3		3.5		697	32
DN STREAM	6/26/00	Cross-section	79	6.4	6.6	1610	24		55	0	6.1		16.5		4.4		939	15
DN STREAM	7/13/00				6.4				48									
DN STREAM	7/13/00				6.5				48	0								
Min			8	3.0	3.1	477	2		0	0	1.1		6.2		2.8		77	0
Max			190	6.4	6.6	2125	24		55	1122	39.8		71.8		24.1		2095	138
Avg			67	4.0	3.6	1567	11		3	223	10.7		37.5		13.5		878	7
Range			182	3.4	3.6	1648	22		55	1122	38.7		65.6		21.3		2018	138
Total Loading (lb/day)									2	179	8.6		30.0		10.8			

MEASURABLE ENVIRONMENTAL IMPROVEMENT

Based on early results, the De Sale Phase I passive treatment system is successfully treating the abandoned mine drainage at the site. Final effluent from the system was first reported on 5/26/00, 16 days after the system was placed on-line. One month later on 6/26/00, water samples were collected and analyzed for the raw water, the effluents of each component in the passive treatment system (two Vertical Flow Ponds, Settling Pond/Wetland Complex, Horizontal Flow Limestone Bed), and for the receiving stream at the upstream weir and at the downstream SR 58 road culvert.

Comparison of the Raw and Final Effluent and Impact on Receiving Stream on 6/26/00

Point	Flow	pH	alkalinity	acidity	iron	manganese	aluminum
raw	44	3.1	0	251	71	calc. 40	8
final effluent	39	7.3	164	0	4	14	<1
upstream	36	3.3	0	159	8	21	9
downstream	79	6.6	55	0	6	17	4

flow in gpm; alkalinity, acidity, and total metals in mg/L; Note reported manganese measurement for raw water of 9 mg/L spurious based on previous monitoring data. Listed manganese calculated.

Passive Treatment System

These analyses demonstrate that the De Sale Phase I Passive Treatment System is successfully treating the abandoned mine drainage from the site (Figure 1 and Figure 2). The final effluent can be characterized as a net alkaline-manganese discharge. The total iron concentration meets standard surface mine permit effluent limits. There is essentially no aluminum. Based on these analyses, on 6/26/00, over 130 lbs. of acidity was neutralized and about 40 lbs of metals, excluding manganese, were retained on that day.

Impact on Receiving Stream

These analyses demonstrate that the effluent from the De Sale Phase I effectively improves the downstream water quality of the receiving stream (Figure 2 and Figure 3). The acidity is neutralized and the pH is increased three-fold. The tributary is net alkaline due to the excess alkalinity in the effluent with higher flow rate in comparison to the upstream flow. On that date, about 70 lbs of acidity were being neutralized in the stream. At this pH, aluminum would be as particulates and not dissolved.

Long-Term Impact on Receiving Stream

Based on a comparison of the average and maximum flows of the discharge with the upstream and downstream monitoring points on the receiving stream, the discharge is responsible for 40 to 50% of the total flow at the downstream monitoring point. On 6/26/00, the discharge contributed about 49% to the total downstream flow at the monitoring point. Considering this relationship and the continuous effective treatment of

the discharge, the receiving stream is expected to be improved throughout the year from a net acidic stream, with significant iron, manganese, and aluminum concentrations to a net alkaline-manganese stream with a relatively low total iron and aluminum. The continued stream monitoring by the PA DEP, Knox District Mining Office and Grove City College students will determine the degree of success in improving the stream on a long-term basis.

Installation of the De Sale Phase II passive treatment system to treat the remaining northeastern headwaters tributary is under construction and is to be completed this year. The impact of both the De Sale Phase I and II abatement projects combined with the impact from the land restoration at the Able/Dreshman (Chernicky) Site, and the future De Sale Phase III abatement project is expected to substantially improve about 4 stream miles of Seaton Creek.

Wetlands Created and Land Reclaimed

About ½-acre of a naturally-functioning wetland has been created, using more than 10 hydrophytic species. In addition, in conjunction with the land reclamation project with the beneficial use of coal ash, about 8 acres, which were formerly barren, have been reclaimed and successfully revegetated (See photo section, p. 21).

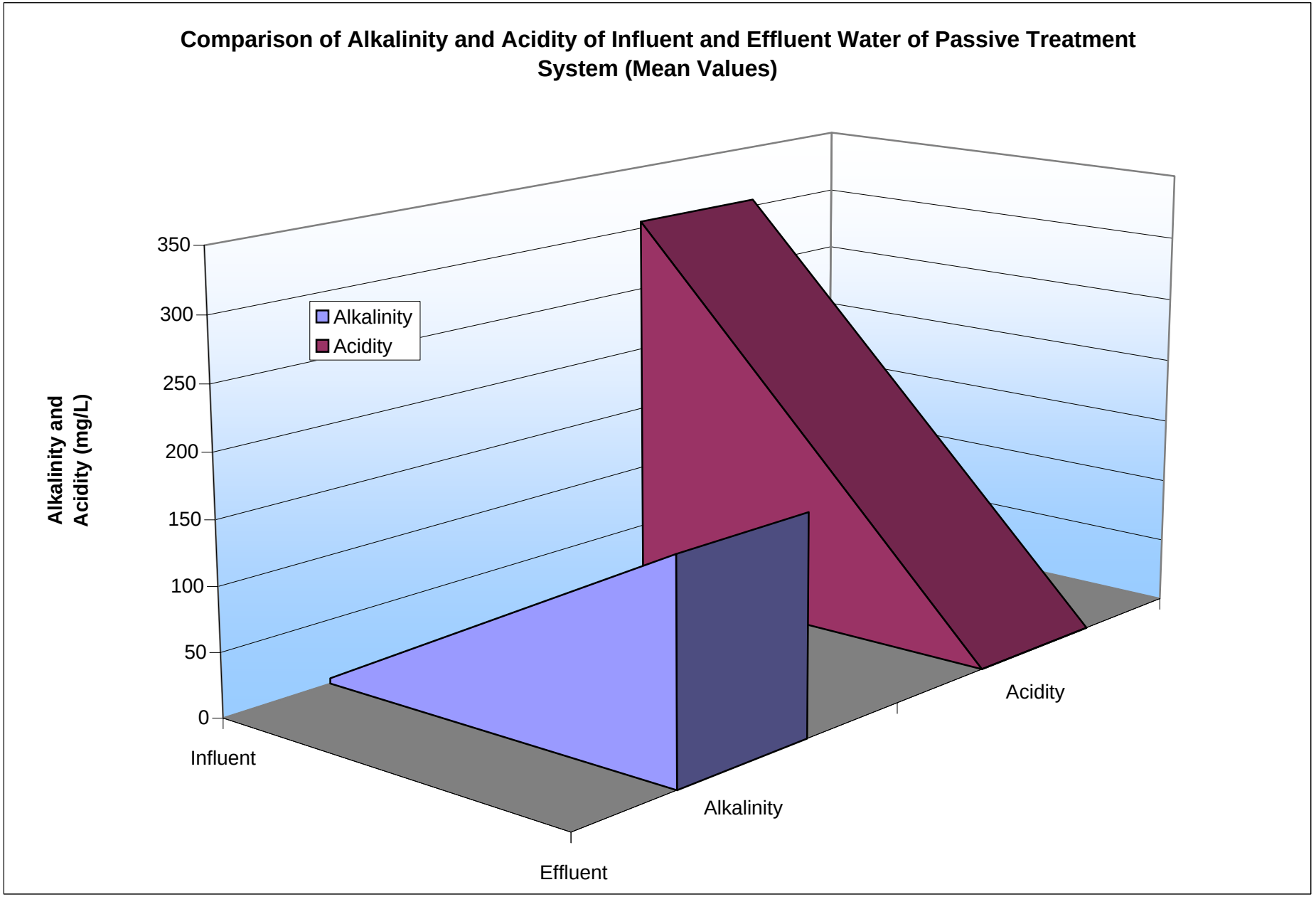

Comparison of Alkalinity and Acidity of Influent and Effluent Water of Passive Treatment System (Mean Values)
Alkalinity and Acidity (mg/L)
350
300
250
200
150
100
50
0
Alkalinity
Acidity
Influent
Effluent
Alkalinity
Acidity

Figure 1

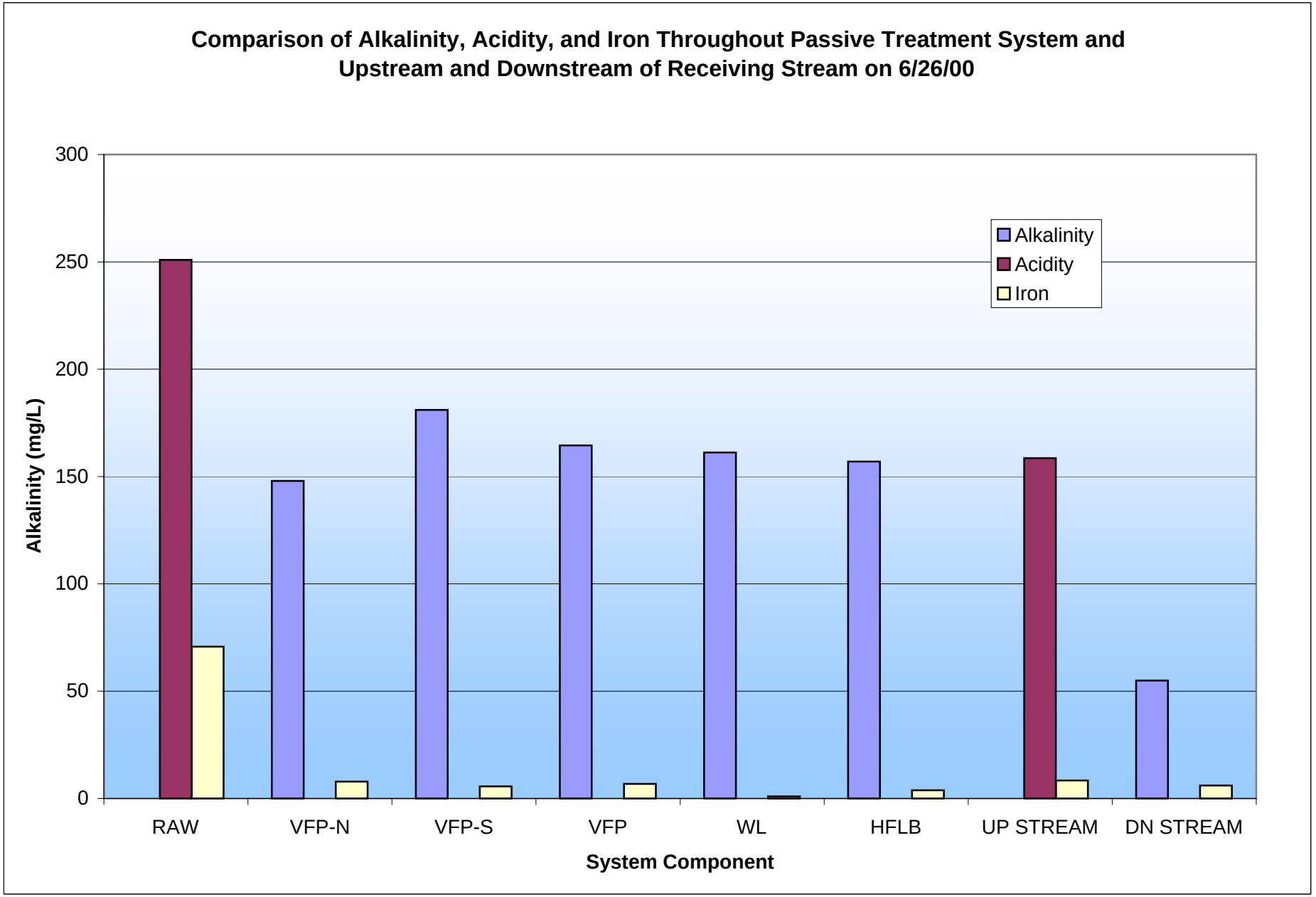

Comparison of Alkalinity, Acidity, and Iron Throughout Passive Treatment System and Upstream and Downstream of Receiving Stream on 6/26/00
Alkalinity (mg/L)
300
250
200
150
100
50
0
Alkalinity
Acidity
Iron
RAW
VFP-N
VFP-S
VFP
WL
HFLB
UP STREAM
DN STREAM
System Component

Figure 2

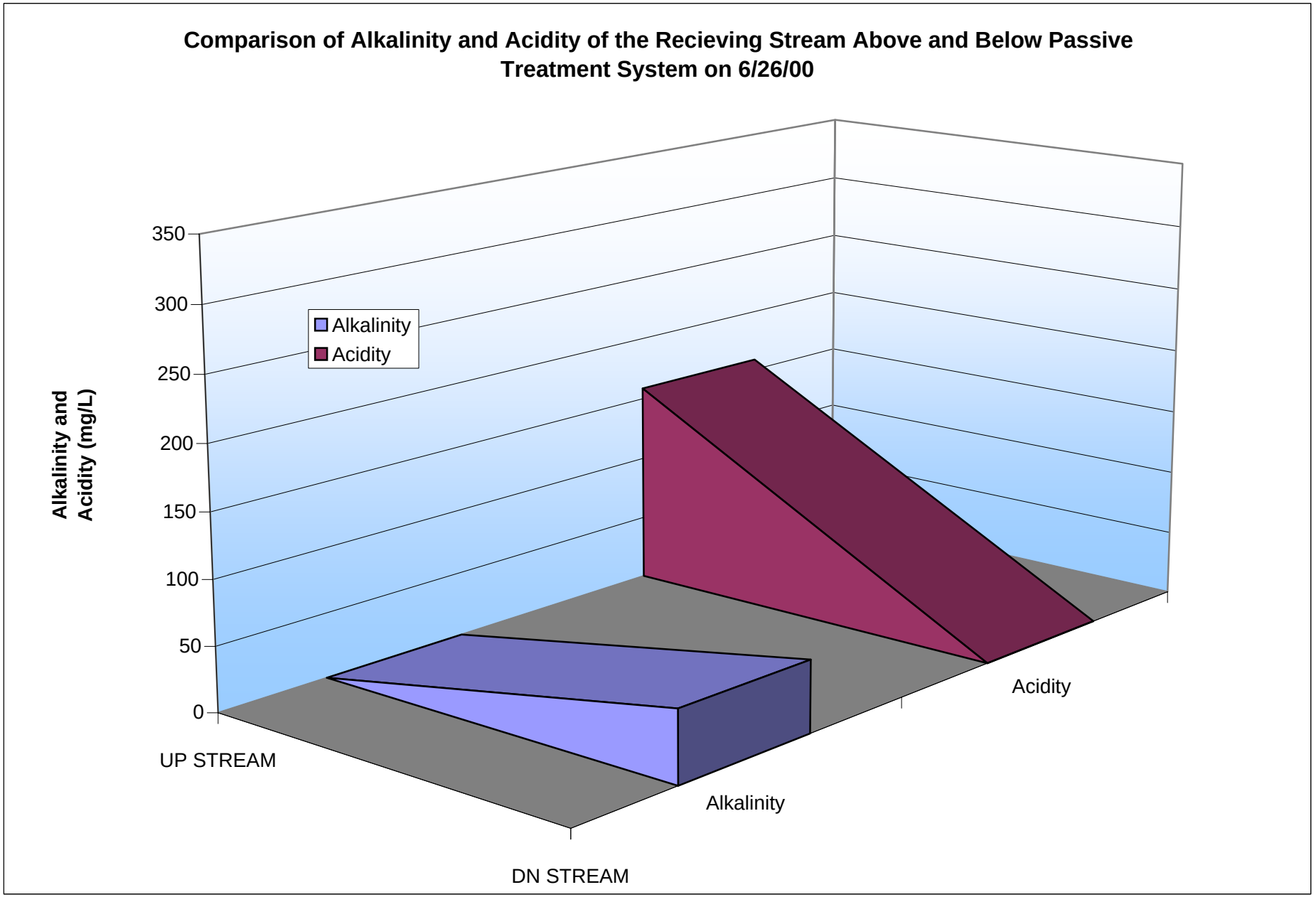

Comparison of Alkalinity and Acidity of the Recieving Stream Above and Below Passive Treatment System on 6/26/00
Alkalinity and Acidity (mg/L)
350
300
250
200
150
100
50
0
Alkalinity
Acidity
UP STREAM
DN STREAM
Alkalinity
Acidity

Figure 3

De Sale Restoration Project

Public Private Partnership Effort
Venango Township, Northern Butler County, PA

BEFORE CONSTRUCTION

Severely degraded acid mine drainage discharged from the approximate toe of spoil on an abandoned surface mine site on the Middle Kittanning coal seam in Butler Co., PA

Upper: (10/22/99) Barren spoil located upgradient of discharge area.
Lower: (6/28/99) Diffuse seep zone below the approximate toe of spoil.

A portion of the area devastated by abandoned mine drainage. (6/28/99)

Diffuse flow of abandoned mine drainage below mine spoil. (6/28/99)

Formerly wooded area devastated by abandoned mine drainage. (8/2/99)

The devastated area is highly visible from heavily traveled PA State Route 58. (6/28/99)

A portion of the barren spoil above the abandoned mine drainage. (6/28/99)

Barren area with a small seep near toe of spoil. (8/2/99)

Interceptor trench for abandoned mine drainage. Water ponded behind clay barrier in coaly spoil material. (8/2/99)

Installation of straw bales during temporary diversion of collected mine drainage from construction area. (8/2/99)

Pipe installed in temporary interceptor trench to monitor discharge. (10/22/99)

Tim Gillen, PG, Knox DMO, measuring discharge flow prior to passive system installation. (10/22/99)

Robert Dolence, Deputy Secertary, PA Department of Environmental Protection at grant announcement, at Jennings Environmental Education Center, PA DCNR, note Coalition Posters. (10/22/99)

Robert Dolence, Deputy Secertary, PA Department of Environmental Protection presenting checks for “Reclaim PA” project. (10/22/99)

Tim Gillen, PG, PA Department of Environmental Protection, Knox District Mining Office, describing abandoned mine site after announcement of “Reclaim PA” grant. (10/22/99)

John Stilley, President, Amerikohl Mining, Inc. describing Amerikohl’s role in the installation of the passive treatment system. (10/22/99)

Darcy Peart, Slippery Rock Watershed Coalition participant, expressing excitement at the beginning of the restoration effort. (11/18/99)

Overlooking area during site preparation. (11/18/99)

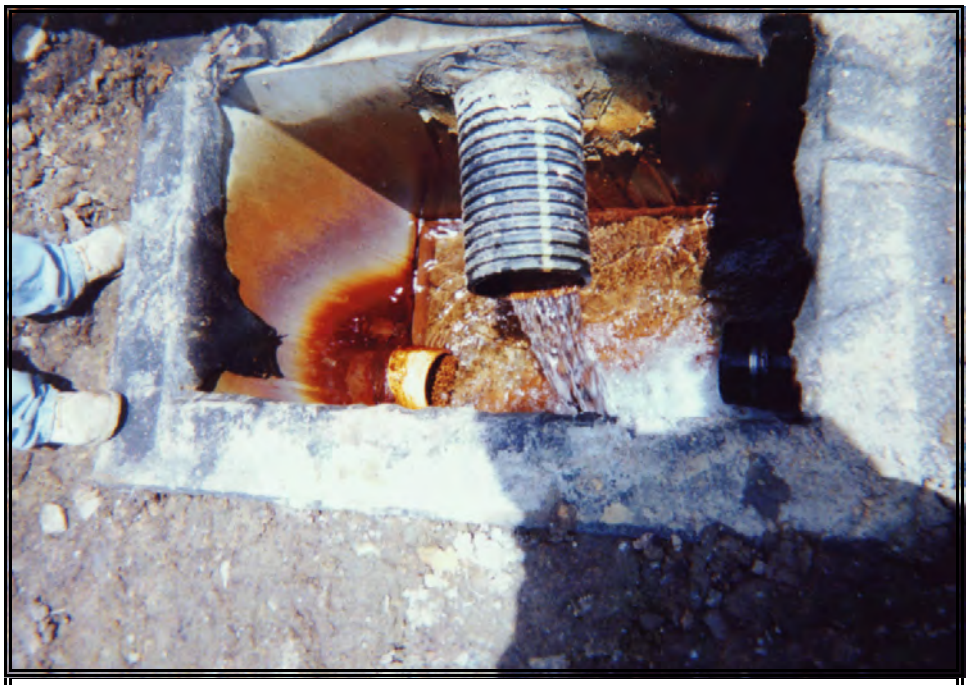
Steam rising during delivery of alkaline, circulating, fluidized-bed coal ash from the Scrubgrass Generation Plant, Kennerdell, PA. 35,000 tons were used to reclaim a barren portion of the upland spoil area.

A watering truck was used to inhibit fugitive dust associated with coal ash.

Fred Johnson, Reclamation Manager, Amerikohl Mining, Inc., directing construction of the Anoxic Collection System.

Anoxic Collection System: 8", perferated, N12 piping bedded in gravel and wrapped in woven drainage geotextile. (4/5/00)

Inlet Control Structure: opening for piping from collection system (center) and one of two openings for piping to the Vertical Flow Ponds (right).



Inlet Control Structure after installation. 8", solid, N12 piping conveying flow from Anoxic Collection System. Two, 6", solid, Sch. 40 PVC pipes: pipe to Vertical Flow Pond-North (left) and -South (right). (5/26/00)

Vertical Flow Pond-North: installation of geotextile.

Vertical Flow Pond-North: lower underdrain tier of 4", perforated Sch. 40 PVC pipes on 4 ½ -foot centers. Laterals plumbed into 4, 4", solid, Sch. 40 PVC mains, dividing pond into quadrants. Bedding stone ½ -foot of AASHTO #57 limestone.

Vertical Flow Pond-North: AASHTO #1 limestone placed above lower underdrain tier. Note rodman surveying for "As-Builts."

Vertical Flow Pond-North: AASHTO #1 limestone placed above lower underdrain tier. Note grade stakes and geotextile extending onto embankments. (4/17/00)

Vertical Flow Pond-North: AASHTO #1 limestone placed above upper underdrain tier. Note coordinated effort with tri-axle delivering stone, rubber-tired, front-end loader spreading stone, and excavator constructing trenches for outlet pipes. (4/17/00)

Vertical Flow Pond-North: trench for outlet pipes. (4/19/00)

Vertical Flow Pond-South: valved outlets. (5/3/99)

Vertical Flow Pond-North: valve boxes used for outlet pipes.

Vertical Flow Ponds: ½ -foot of spent mushroom compost overlying limestone.

Wetlands: spent mushroom compost placement for planting substrate.

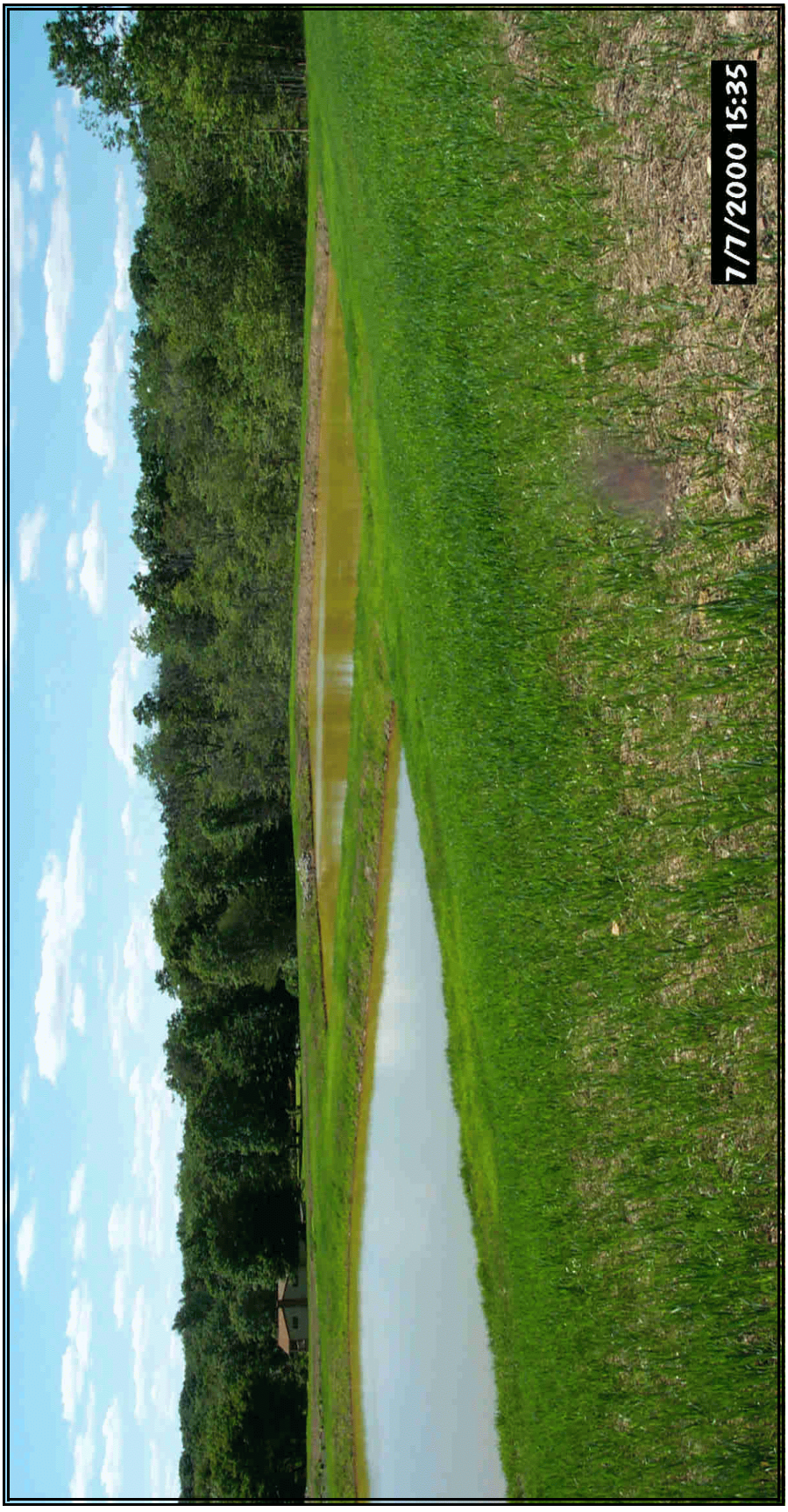
Wetlands planting by Slippery Rock Watershed Coalition volunteers. Robert Beran, Wetland Ecologist and watershed resident, discusses various planting procedures for each of the dozen different species.

Volunteers planting wetland.

One month after planting of wetland by volunteers.

Horizontal Flow Limestone Bed: spillway from wetland stabilized with R4 limestone rip rap. (5/26/00)

Horizontal Flow Limestone Bed: spillway to upgraded, pre-existing channel to Seaton Creek tributary. Outlet pipe from manifold not visible. (5/26/00)



Panorama of site: successful revegetation one month after seeding. Vertical Flow Ponds-North (right) and South (left).

$394,207 Awarded for Acid Mine Drainage Abatement in Butler Co.

On behalf of Gov. Tom Ridge, DEP Deputy Secretary for Mineral Resources Management Robert C. Dolence on Oct. 22 awarded $394,207 to Stream Restoration Inc. to improve watersheds in Butler County impacted by acid mine drainage.

"Pennsylvania has long been the leader in identifying and addressing abandoned mine problems affecting public health and safety," Dolence said. "Reclaim PA has set a framework to further expand and enhance mine reclamation and watershed restoration throughout the Commonwealth.

Dolence made the award at the Jennings Environmental Education Center in commemoration of the one-year anniversary of Reclaim PA.

On Oct. 23, 1998, Gov. Ridge announced the Reclaim PA program, consisting of legislative, policy and management initiatives designed to enhance operator, volunteer and DEP reclamation efforts.

Reclaim PA has four objectives:

- to encourage private and public participation in abandoned mineral extraction reclamation efforts;
- to improve reclamation efficiency through better communication between reclamation partners;
- to increase reclamation by reducing remining risks; and
- to maximize reclamation funding by expanding existing sources and exploring new sources.

"Today's award presentation to Stream Restoration represents another new source of funding to abate acid mine drainage – one of the major water pollutants in the Commonwealth today," Dolence said.

Funding for the grants was appropriated by the General Assembly for the 1999-2000 fiscal year to support activities to abate acid mine drainage abatement in Pennsylvania.

The DeSale Restoration Area in Venango Township, Butler County, is one of the most heavily impacted areas of acid mine drainage from abandoned mines in the 27-square mile Slippery Rock Creek headwaters.

Stream Restoration Inc. received a check for $391,707 to construct a vertical flow passive treatment system with a retention pond and constructed wetland at the DeSale site. The system will use 3,000 tons of limestone aggregate mixed with 1,500 tons of spent mushroom compost and has a design life of 25 years.

The passive system is expected to eliminate 92 tons of acidity, seven tons of iron and three tons of aluminum per year from the Seaton Creek tributary to Slippery Rock Creek.

"A similar passive treatment system was installed three years ago here at the Jennings Environmental Education Center, which is part of the same watershed, and the results have been very successful," Dolence said. "The design for the DeSale system is based on the system at Jennings."

While Stream Restoration Inc. is sponsoring the project, numerous organizations are participating, including Slippery Rock University, Grove City College, Amerikohl Mining, Bio Most Inc. and DEP's Knox District Mining Office.

"The restoration of this area was made possible because of the cooperation and dedication of a number of organizations," Dolence said. "DEP continues to encourage partnerships at all levels – industry, government and grassroots organizations – to address the problems of abandoned mines and acid mine drainage."

The DeSale Restoration Project is scheduled to be complete by June 30, 2000.

In addition, Stream Restoration Inc. was presented with a $2,500 check to document the migration patterns of mine drainage as it travels through passive treatment systems. The Jennings Environmental Education Center and the Slippery Rock Watershed Coalition also will participate in the project. The project will use dye tests to visually depict areas of passive treatment systems that are underutilized.

"This type of study is important to help further the development of technology to abate acid mine drainage," Dolence said. "The lessons learned from this project will lead to improvements in the design and implementation of passive treatment systems in impacted watershed throughout the Commonwealth."

The results of this project will be presented at local and regional events and reported in *The Catalyst*, the Slippery Rock Watershed Coalition's monthly newsletter. Results also will be presented at the annual symposium held at the Jennings Center. The final report on the drainage migration project is scheduled for March 2000.

<> For more information on Reclaim PA, visit DEP's website (directLINK "Reclaim PA").

The Pittsburgh Tribune Review
Saturday, November 13, 1999
Page 2

Slippery Rock Creek shows signs of rebirth

Costly efforts paying off in cleanup of area's mine drainage

By Lawrence Sanata
Staff writer

Patricia McFadden never thought she would live to see the day that the stream behind her home in Butler County would carry clear water, instead of the blood-red muck to which she has become accustomed.

But earlier this year, work began upstream of McFadden's home in DeSale as scientists and contractors tried to reclaim another section of Slippery Rock Creek. Once a thriving fishing steam, it "died" when its waters mixed with abandoned coal mines and piles of coal refuse and carried polluted water downstream.

Today, there's improvement.

"It looks like (the creek) is really cleaning up. The redness is clearing off," McFadden said.

But the improvement comes with a multimillion-dollar price tag. "That's a lot of money — taxpayer money," she said.

Butler County

Since the early 1970s, it has cost $11.9 million to reclaim this small meandering waterway in Butler County and the hundreds of square miles of land left tainted by toxic runoff created by abandoned coal mines.

Of that amount, $4 million came in the form of coal taxes, and $450,000 came from coal operator bond forfeitures. The remainder came from state and federal funds, said Ted Kopas, a spokesman for the state Department of Environmental Protection.

Department officials earlier this year said it could cost as much as $3.3 billion to repair all of the streams across Pennsylvania polluted by acid mine drainage.

Acid mine discharges result when the mineral pyrite, exposed by past mining operations, mixes with water moving through a mine and is exposed to air. This causes discharges of iron, aluminum, manganese and sulfates into the water.

"It is a whopping sum," said Margaret Dunn, a geologist who is involved with the nonprofit Slippery Rock Watershed Coalition, about the cost of the cleanup. To her, the effort is worth every cent and then some, she said.

"Where you have abandoned mine lands, where you have scarred ground that is not productive and where you have polluted streams with no fish, you have depressed areas," she said.

Reclaiming this polluted creek and surrounding lands "helps everyone down the road," Dunn said.

Process is long, expensive

There also is the issue of the safety of the water carried by the meandering creek, which flows into the Connoquenessing Creek and mixes with the waters of the Beaver, Ohio and Mississippi rivers, said Will Taylor, an environmental education specialist at the Jennings Environmental Education Center in Slippery Rock.

The water collected from the polluted Slippery Rock Creek "is the worst kind of water you can have," he said. "There's such a brew of bad stuff in this water."

Water from the creek mixes with other waterways, which provide a source of drinking water for communities downstream, Dunn said.

But reclaiming the stream to the way it was 50 to 100 years ago, when it was pristine and a viable fishery, is an involved and costly process, according to Dunn and Taylor.

But Kopas said reclaiming the Slippery Rock Creek and its headwaters is an environmental issue that needs to be resolved once and for all. It also represents one of the areas most heavily affected by acid mine drainage in the state.

Land stripped of beauty

Patricia McFadden and her family blame nearby strip mines for destroying the beautiful homestead where they moved in 1971.

"This used to be farmland," she said. But within a few years, the red muck seeping from the abandoned mines began killing the healthy trees on their property. Eventually, it killed all of them, she said.

"It ruined their water," said Wanda Eakin, McFadden's daughter.

Years ago, she remembers clear water, crab apple trees and deer. "But it got worse and worse and worse," she said, as the water deteriorated.

The water turned red, the trees died, and the animals stay clear of the creek. Her parents also had to have a well drilled for water.

> "It looks like (the creek) is really cleaning up. The redness is clearing off."
>
> **Patricia McFadden, resident near Slippery Rock Creek**

State helping out

The Slippery Rock Creek watershed is one of nine watersheds in Pennsylvania being addressed by the Pennsylvania Department of Environmental Protection's Comprehensive Mine Reclamation Strategy. Those watersheds are in Butler, Cambria, Clearfield, Clinton, Elk, Lebanon, Luzerne, Schuylkill, Tioga and Westmoreland counties.

Since the mining companies that damaged the environment are defunct or are not legally responsible because their actions occurred before environmental laws were in place, other funding sources have been needed to address the problems.

State and federal governments teamed up in the early 1970s and reclaimed hundreds of acres of land in Butler County. Since then, state and federal agencies have joined forces with sportsmen's associations, watershed groups and industry to clean the state's affected streams.

A century ago, coal mines in western Pennsylvania were an essential ingredient in the success of the nation by feeding the steel mills and power plants that helped build our world.

Today, mushroom compost and limestone are the essential ingredients in ridding western Pennsylvania of the acid mine runoff that continues to seep from those long abandoned mines.

Last month, Stream Restoration Inc., a nonprofit group, was chosen to oversee the newest phase of reclamation along Slippery Rock Creek, in hopes of cleaning another three to four acres of waterway.

With the help of a nearly $400,000 grant from the Department of Environmental Protection, the group will oversee construction of a treatment system to clean acid drainage from abandoned mines in the 27-square-mile Slippery Rock Creek headwaters.

"With this new grant, we hope to improve three miles of stream in just one year," Dunn said. It took four years to improve four miles of stream in an earlier phase of work, she said.

Using 1,500 tons of spent mushroom compost and 3,000 tons of limestone aggregate, the company hopes to build a treatment system to clean the acid mine drainage.

The DeSale Restoration Area project, as it is known, also calls for construction of a retention pond and wetlands at the site.

Christopher Horner/Tribune-Review

Will Taylor, an environmental education specialist at the Jennings Environmental Education Center in Slippery Rock, tests pH levels in the water at the center's prototype restoration area. The site is a prototype of the DeSale Restoration Area being built in Venango Township, Butler County.

THE CATALYST

SLIPPERY ROCK WATERSHED COALITION MONTHLY ACTIVITIES UPDATE

NEXT MEETING: Wednesday, November 10th @ 7:00 pm, Macoskey Center - Harmony House, Pizza & Pop will be provided!! 10/13/99 meeting attendance: C. Cooper, R. Bowman, W. Taylor, T. Reynolds, V. Kefeli, M. Dunn, T. Danehy.

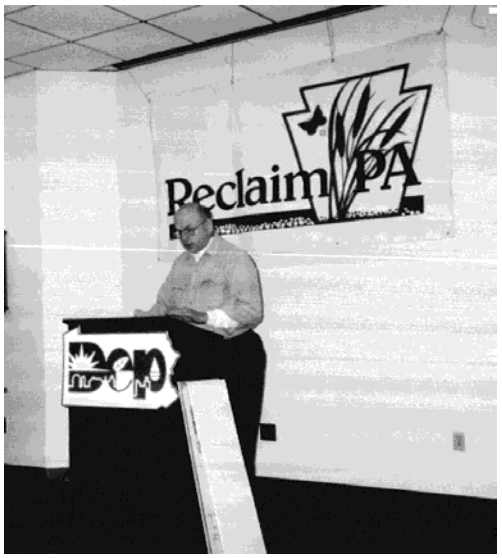
Shaliston Trucking and Quality Aggregates Help Students

Students of Valentin Kefeli PhD at the Macoskey Center have started constructing a shed and an interpretive trail. To complete the projects they needed aggregate. Quality Aggregates donated the aggregate and Shaliston Trucking provided shipping. Thank you Joe Aloe, Jeff Ankrom, and Domenic DeMatteis.

Fred Brenner Recognized Yet Again!

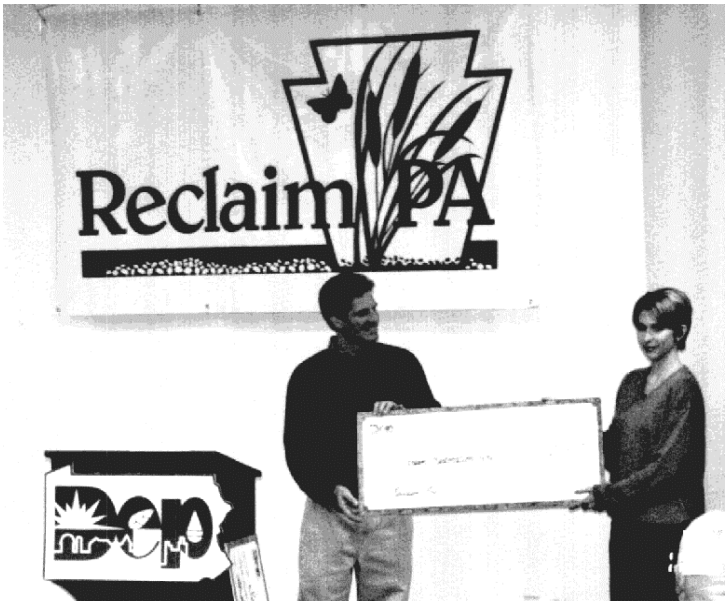
Dr. Brenner, Professor of Biology at Grove City College, was recently elected a Fellow of the American Association for the Advancement of Science. This association is the largest professional scientific society in the world. (Dr. Brenner is seen here at the 10/22/99 "Reclaim PA" grant presentation commenting on the efforts of his students and their contributions to the advancement of biological and environmental sciences after graduation.)

Congratulations to Dr. Brenner!!



"RECLAIM PA" GRANT PRESENTATION

On 10/22/99, over 40 participants in the Slippery Rock Watershed Coalition gathered at the Jennings Environmental Education Center to celebrate their successful efforts to date (including the installation of four Anoxic Limestone Drains and five Vertical Flow Systems) that have improved four miles of the main branch of Slippery Rock Creek in the headwaters. Fish have been observed in this area during monitoring by Slippery Rock University and the Knox District Mining Office, probably for the first time in about a century.



Darcy Peart accepts funding for an expansion of dye testing of passive systems as part of the "Reclaim PA" initiative from PA DEP Deputy Secretary, **Robert Dolence**

On the first anniversary of the "Reclaim PA" initiative, Robert Dolence, Deputy Secretary of the PA Department of Environmental Protection announced the funding of additional projects within the watershed. At the De Sale Restoration Area, where a volunteer-effort has already begun, funding from the initiative will enable the construction of a Vertical Flow System, about 10x the size of the system at the Jennings Center, with settling ponds, and wetlands. Land restoration efforts will also be conducted to revegetate the site. Special thanks to the landowners, J. C. and Marlene Meyer, James, Jr., and Suzanne Meyer, Elton and Patricia McFadden, and Jack Edwards, of the three properties upon which the systems are to be constructed. Completion of the restoration effort is projected to improve, in just one (!!!) year, about three stream miles in the Seaton Creek subwatershed. Seaton Creek is the most heavily-impacted major tributary in the Slippery Rock Creek headwaters. Grove City College and Slippery Rock University students/professors will be assisting with the comprehensive effort.

Attendees included:

Jeff Ankrom, Operations Manager, Quality Aggregates; *Fred Brenner, PhD, Grove City College -speaker,* Bob Beran, Aquascape; *Ted Kopas, PADEP- speaker;* Lucy Blanchfield; Charles Cooper, PE, PLS, CDS Assoc.; Domenic DeMatteis, President, Shaliston Trucking; *Robert Dolence, Deputy Secretary, DEP - speaker;* Don Barnes and Dave Hogeman, PA BMR; Marilyn Tregembo for Representative Howard Fargo; *Josh First, Director of Environmental Education, DCNR -speaker;* Valentin Kefeli, PhD, Sustainable Systems, and Gerald Chmielewski, PhD, Associate Dean of Arts and Sciences, Slippery Rock University; Richard Dolence; Jeff Allio, Local Government Liaison, PA DEP Todd Lawton, Fuels Manager, Scrubgrass Generation Plant; Darrel Lewis and Mark Snyder, Allegheny Mineral Corporation; Tim Gillen, Lori Odenthal, and Javed Mirza, Knox District Mining Office; *Darcy Peart, Stream Restoration Inc.-speaker;* John Stilley, John Saugrich, and Denise and Dustin Davis, Amerikohl Mining Inc.; Freda Tarbell, PA DEP, *State Senator Mary Jo White -speaker* and Deborah and Matt Scheckengost, James Kennedy, Butler County Commissioner; Glenn Anderson, Butler County Commissioner, *Margaret Dunn, Stream Restoration Inc.-speaker*, Timothy Danehy, BioMost, Inc., JEEC staff-David Johnson Center Manager, Jo Ann Albert, Will Taylor, Candy Vild, Ray Markle, and Gary Jenkins.

In the next issue:

Citizens' Volunteer Monitoring Program Held at Jennings Environmental Education Center!!

Thanks to The William & Frances Aloe Charitable Foundation, Amerikohl Mining, Inc., Quality Aggregates Inc., and Allegheny Mineral Corporation for their support. For more information contact: Slippery Rock Watershed Coalition, c/o Stream Restoration Incorporated (PA non-profit), 338 Glen Eden Road, Rochester PA 15074, (724)776-0161, fax (724)776-0166, sri@ccia.com. November Distribution: 403 copies

THE CATALYST

SLIPPERY ROCK WATERSHED COALITION MONTHLY ACTIVITIES UPDATE

NEXT MEETING: Thursday, January 13 @ 7:00 pm, Macoskey Center - Harmony House, Pizza & Pop will be provided!! 12/09/99 meeting attendance: C. Cooper, W. Taylor, E.Taylor, J. Taylor, V. Kefeli, M. Dunn, T. Danehy, D. Peart, S. Smith, J. Belgredan, T. Rucosky, T. Consbruck, P. Kramer, F. Brenner

SRWC Get-Together and Symposium

The dates have been decided upon for the Symposium and the Get-Together. The Symposium will be held on April 7 at the Jennings Environmental Education Center. The tentative date for the Get-Together is April 12 (Gloria, we hope this date is acceptable) at the Epiphany Church in Boyers, PA.

Pittsburgh TV Station Highlights "Reclaim PA"

Fox 53 TV ran a segment relating to the De Sale Restoration Project in Venago Twp on October 23. Peter Livingston conducted the interview and made the film which included Robert Dolence Deputy, Secretary for Mineral Resources Management; Jeff Jarret, Director of District Mining Operations; Javed Mirza, Knox District Mining Manager; Tim Danehy; Darcy Peart; and Margaret Dunn, Stream Restoration, Inc. Jennings Environmental Education Center was also included in the film as the Vertical Flow System at Jennings was the model used for the De Sale effort. Thank you Fox for the **excellent** coverage.

Expanded Catalyst Distribution

Recently, the Barnes and Noble bookstore in Cranberry Twp. permitted the Slippery Rock Watershed Coalition to display copies of the Catalyst in the entryway of their store. Over twenty copies have been distributed just in December!! Thank you Barnes and Noble!

SRWC Year Book

Through the efforts of Dr. Valentin Kefeli (SRU) and Janice Belgredan, documentation of the first five years of the Slippery Rock Watershed Coalition is well underway. Following Janice Belgredan's suggestion, it was unanimously decided to dedicate the year book to the memory of **Kitty Peart**. The Peart Family wishes to extend their appreciation to the members of the Coalition for the considerate gesture.

Guide Book Final Draft

Work on the final draft of the guide book, authored by Will Taylor, is nearing completion. Various Coalition participants are currently busy contributing comments and collecting photos that can be used in the book. Every historical organization contacted has been extremely helpful and friendly while taking time out of their hectic schedules to locate photos. The Coalition wishes to thank the private supporters who have funded this project.

Slippery Rock High School Contributing to the Watershed Restoration Effort

Slippery Rock High School students are contributing to the effort under the guidance of Tony Consbruck, a biology teacher at Slippery Rock High School, by monitoring a stream impacted by mine drainage. It is truly thrilling to see young people in the field gathering valuable experience and data. More later...

Photo of the Month
De Sale Restoration Area

Construction progresses at the De Sale Restoration Area. Approximately 8 acres of sparsely vegetated and barren ground will be amended with alkaline material and revegetated. A passive treatment system designed to treat a 100 gpm discharge will also be constructed!!!!

Thanks to The William & Frances Aloe Charitable Foundation, Amerikohl Mining, Inc., Quality Aggregates Inc., and Allegheny Mineral Corporation for their support. For more information contact: Slippery Rock Watershed Coalition, c/o Stream Restoration Incorporated (PA non-profit), 3016 Unionville Road, Cranberry Twp., PA 16066, (724)776-0161, fax (724)776-0166, sri@ccia.com. January Distribution: 414 copies

THE CATALYST

SLIPPERY ROCK WATERSHED COALITION MONTHLY ACTIVITIES UPDATE

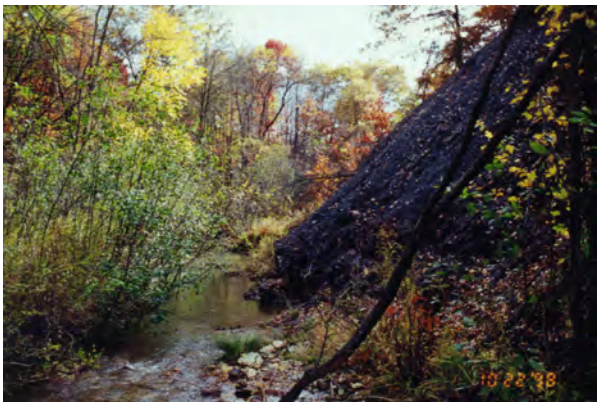
NO MEETING IN APRIL:
SYMPOSIUM APRIL 6th AND 7th AT JENNINGS ENVIRONMENTAL EDUCATION CENTER
GET-TOGETHER APRIL 12th AT BOYERS EPIPHANY CHURCH 03/08/00 meeting attendance: W. Taylor, V. Kefeli, J. Hicks, M. Dunn, T. Danehy, D. Peart, S. Smith, J. Belgredan, S. Busler, J. Coulter

Symposium Field Tour Preview

De Sale

Passive treatment system with vertical flow pond under construction.

Goff Station Gob Pile



Removal of coal refuse pile and placement with coal ash in reclamation of abandoned cut.

See the attached page for more information about times and speakers at the symposium.

GIS DATA FOR SLIPPERY ROCK WATERSHED NEARING COMPLETION

Erin Grabigel is nearly done compiling water quality data in a GIS system. Erin is a Geography student at Slippery Rock University and will be graduating in May. This system integrates the location of abandoned mine sites, streams, roads, and geological information with data. For example, if you click on a stream the water quality data will appear. The maps should be available on the Slippery Rock Watershed Coalition's website very soon. Thank you Erin for all your hard work.

PHOTO OF THE MONTH

Photo of the month

Photo of the month

Mike Leon of Harding Lawson and **Margaret Dunn** at the Society for Mining, Metallurgy and Exploration Dinner in Salt Lake City, Utah. The conference, with an attendance of about 4,900, provided a great opportunity to “compare notes” with others. Margaret Dunn was recognized for receiving the Environmental Conservation Distinguished Service Award from The American Institute of Mining, Metallurgical, Petroleum Engineers.

Thanks to The William & Frances Aloe Charitable Foundation, Amerikohl Mining, Inc., Quality Aggregates Inc., and Allegheny Mineral Corporation for their support. For more information contact: Slippery Rock Watershed Coalition, c/o Stream Restoration Incorporated (PA non-profit), 3016 Unionville Road, Cranberry Twp., PA 16066, (724)776-0161, fax (724)776-0166, sri@ccia.com. April Distribution: 423 copies

The Pittsburgh Business Times
Page 1
May 12-18, 2000

Photo by D. M. Scott

OUTDOOR LAB: Tim Danehy of Stream Restoration Inc., left; Fred Johnson, project manager of Amerikohl Mining Inc.; SRI president Margaret Dunn; and SRI's Shaun Busler perform pH water testing in Butler County.

STREAM SAVIORS

Cranberry nonprofit Stream Restoration battles acid mine drainage

BY ETHAN LOTT

Talk about an acid trip.

The water flowing into the high point of the abandoned mine reclamation project in Venango Township, Butler County, is as acidic as vinegar. A few hundred feet away and 22 feet lower, after flowing through four different components of the treatment system, the water leaves the project and flows into Seaton Creek with a neutral and fish-friendly pH of 7.0.

When Stream Restoration Inc., a Cranberry Township nonprofit, got a $391,000 grant in October to reclaim the site, it was in the midst of designing the multilevel system. The eight-acre site along Route 58 was an acidic marsh, with 3-foot deep bogs of iron-laden mud. It flooded neighbors' basements and discharged 100 gallons a minute into the creek in the Slippery Rock Watershed.

Acid mine drainage from these types of old mines is the single biggest cause of water pollution in the state, with more than 240,000 acres of abandoned surface mines polluting about 2,400 miles of streams.

SRI partners with numerous for-profit firms to design and build the remediation projects, with Amerikohl Mining Inc. of

See STREAM, page 60

The Pittsburgh Business Times
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STREAM: *State plans to spend $650 million on Growing Greener environmental, water projects*

From page 1

Butler County doing the final construction. After Margaret Dunn, SRI president, finished work engineering the job, Amerikohl moved in with its bulldozers to move earth, lay pipe, layer in limestone and spent mushroom compost and build wetlands.

Lapsed construction time from start to finish: just six weeks.

"We're fast. We get in. We get out. We cure the problem much faster," said John Stilley, Amerikohl president, who had two to five men on the site during the project's duration.

The efficient effort is necessary to make the jobs hit the tight budgets required to win the grants.

This kind of successful quick turnaround of state grants to fix longtime problem mine sites helped SRI land two more state Growing Greener grants last month, a $449,000 grant for property near the first Seaton Creek project and a $1.2 million grant to do a job about four times as large in Ohiopyle State Park, Fayette County.

SRI landed $1.69 million of the $26 million awarded to more than 200 organizations and municipalities from around the state.

Only one other seven-figure grant was awarded in this region, one for $1.96 million to the city of Pittsburgh to clean up the Nine Mile Run Watershed.

It is clear that SRI's formula and partnerships have won support.

Growing Greener grants were started this fiscal year by the Ridge administration. The state plans to spend $650 million on environmental projects, targeting polluted waterways over five years. Before this initiative was started, SRI received grants through another program, Reclaim PA.

KEEPING OVERHEAD LOW

The first step in the Ohiopyle project, a former clay and coal mine site, will be dredging chemical-filled sludge from the current treatment effort, which involved daily injections of sodium hydroxide, a harsh chemical. This active treatment system never worked well and will be replaced by the passive system designed to last 25 to 50 years and require virtually no maintenance.

The Ohiopyle system, which costs the park more than $50,000 annually to maintain, is much more complex than the one near Slippery Rock and will take about six months to build.

Aside from the fact that the passive systems work better than the chemical-reliant active systems, there is another major advantage to the passive systems, in which natural products such as the spent mushroom compost and limestone ponds deacidify the water.

"Anyone can touch anything in this pond," said Ms. Dunn, 51, who holds a master's degree in geology and owns a for-profit company, BioMost Inc., Cranberry Township.

She founded SRI in 1996 to cheaply administer state grants to clean up old mines and donates her design time to the nonprofit. She has more than 20 years experience working with the mining industry.

"We're trying to put as much money into the ground as possible," Ms. Dunn said. "We try to put everything we can into the ground and work with everybody."

Growing Greener grant recipients must have projects with less than 2 percent going to administrative costs. That means the four-employee SRI will be able to design and manage the Ohiopyle project for less than $24,000 in administrative costs, leaving $1.18 million for cleanup.

Photo by D. M. Scott

Margaret Dunn, president of Stream Restoration Inc., by a Butler County stream polluted by acid mine drainage. She founded SRI in 1996 to cheaply administer state grants to clean up old mines and donates her design time to the nonprofit. She has more than 20 years experience working with the mining industry. "We're trying to put as much money into the ground as possible," Ms. Dunn said.

NEIGHBOR HUGS MINER

Ms. Dunn combines her experience with designing and engineering reclamation jobs with Amerikohl's ability to build them. Amerikohl cleaned up several messes left by bankrupt mining companies in recent years in partnerships with the Department of Environmental Protection and insurance agencies that had bonded the failed companies. These jobs required no state funds.

But jobs such as the ones in northern Butler County and in Ohiopyle need government funds because they are "pre-act mines," meaning they were built before there were reclamation laws on the books. So no one is legally responsible for the discharges.

Roger Bowman, mining engineer with the DEP Knox District Mining Office, did an examination of the 27-square-mile Slippery Rock Watershed and found 75 discharges, 59 of which where acidic. So far, about a dozen of those have been cleaned up, five through SRI projects. SRI is slated to fix another six discharges under current Growing Greener grants.

While strip miners are generally not thought of as a welcome sight to neighbors, the three owners of the property along Route 58 welcomed Amerikohl onto the land. The first thing Amerikohl did was divert the water away to dry out the land while it was working, drying out their basements in the process. This led to a surrealistic event, Ms. Dunn said.

"A woman came out and hugged a strip miner," she said.

"It was scary," Mr. Stilley said.

■ AT A GLANCE

Stream Restoration Inc.

Nonprofit administering federal grants to clean up abandoned strip mine discharges

- **Headquarters:** Cranberry Township
- **President:** Margaret Dunn
- **Mission:** Establishes partnerships with for-profit companies to efficiently clean up sites
- **History:** Applied for 21 grants since 1996, winning 14 totaling $3.37 million
- **Recent grants:** Received more than $1.69 million in two separate state Growing Greener grants; the larger, a $1.2 million grant to clean up a major discharge site in Ohiopyle State Park

As Mr. Stilley and Ms. Dunn looked at the finishing touches being put on the wetlands May 5, each tried to divert credit for the job to the other. Ms. Dunn stressed the importance of private partners, such as Amerikohl and Quality Aggregates Inc. in Boyers, Butler County. Mr. Stilley pointed to the dogged efforts of Ms. Dunn. Both praised the state.

"It has happened without a lot of the bureaucracy that you'd expect in working with the state," Mr. Stilley said. "That's a big plus for industry and the environment, getting these jobs done."

On May 5, the harsh water with a pH of 2.8 was still flowing untreated around the property. On May 9, a valve was opened and water began filling the vertical flow ponds at the top of the system, working its way toward its clean and neutral exit.

TEACHING OTHERS THE WAY

Completing the job at Ohiopyle will clean up a major problem for the park, which has more than 2 million visitors a year. Currently, there are five discharges with a variety of pollutants at the site, combining for about 200 gallons per minute. One spews iron-filled water with a pH of 3.2. Another is filled with dissolved aluminum with a pH of 3.5.

"This is not real easy water to treat, but the technology has developed enough that we think we can treat it," Ms. Dunn said.

James Brahosky, manager of the DEP's Greensburg District Mining Office, which covers a seven-county area including Ohiopyle, hopes to see SRI's work restore life to Laurel Run.

"Discharges without treatment pretty much whack out Laurel Run there," Mr. Brahosky said. "Laurel Run's pretty well shot with the acidity and iron and aluminum. We hope Laurel Run will eventually recover to the point that we'll see some aquatic life come back in it." He guessed that will probably take several years.

Aside from cleaning up the creek, the passive treatment system will also save the park money due to minimal maintenance and will improve the ugly former mine site.

When it's finished, SRI will put together an educational program so the park can show off the finished project. It will be a showcase of the very latest in passive treatments, unique in the state.

"At this site," Ms. Dunn said, "we will have an example of every type of passive treatment system."

MR. LOTT may be contacted at elott@amcity.com.

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SRI group reclaiming watershed

► Wetland planting just part of the work done at the DeSale mine site

By Shelby Clark
Allied News Staff Writer

Restore it and they will return. That was the mantra of the Slippery Rock Watershed Coalition as they planted a wetland at the DeSale mine reclamation site earlier this month.

Though the abandoned mine dump has been dead for decades, oozing a reddish sludge of iron sulfides, aluminum and magnesium, within a week of a pond being built there, it showed signs of life. Tadpoles were swimming along its edge and waterbugs skated on the surface.

The DeSale restoration project is one in a series undertaken by the nonprofit Stream Restoration Incorporated. SRI was founded by geologist Margaret Dunn in 1992 to address the severe problem of acid mine drainage in the area, in particular in the Slippery Rock watershed.

"(The idea) came after a (design demonstration) at Jennings Environmental Center," Dunn said.

Though the Jennings design was interesting, it was the cooperation among the participants that inspired Dunn.

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Allied News, *Grove City, Pennsylvania*

Reclamation

from page A-1

"(I thought to myself), Gee, I've never seen this before. (People) could get along and get things done."

And she did just that. Dunn, who has worked with the mining industry as a consulting geologist her entire career, has cobbled together a small, but highly qualified and dedicated group of staff and volunteers.

Together, this eclectic group of professional wetlands specialists, geologists, college students and others form the Slippery Rock Watershed Coalition. Their main goal is to restore as many of the abandoned mines in the Slippery Rock watershed as possible.

They work cooperatively with the university, Pennsylvania Department of Environmental Protection and other public agencies and private companies, and landowners.

This coalition has helped SRI control costs, with an average of only two percent going to administrative costs.

"If you keep the administration costs to the bare bones, there's more money for restoration," Dunn said.

According to SRI staff member Tim Danehy, the Slippery Rock watershed is the most highly impacted watershed in the state.

"Fifty percent of (the 14-square mile watershed) is permitted for surface mining," Danehy said. "Another 25 percent is deep mined."

The problem of acid mine drainage is a decades-old problem. Prior to 1977, however, no one was held accountable for its clean up.

That's when the Surface Mining Reclamation and Control Act was passed, mandating that mine owners remediate mine sites.

The act, along with improvements in mining technology have helped make the mining industry if not environmentally friendly, then at least non-destructive.

"Of the surface mines in Pennsylvania, less than one percent have post mine discharge," Dunn said.

Early in the '70s, money from Operation Scarlift, a state-funded project, was used to clean up many abandoned sites.

"Still, there are a lot of problems left," Danehy said.

The coalition works on many different restoration projects throughout the watershed.

The DeSale, since it's at the head of Slippery Rock creek is an important one. It's also a disaster.

According to Danehy, "(DeSale) has some of the worst water quality in the watershed."

Allied/S. Clark

Life-giving swamp

Just one week after this pond was filled at DeSale mine restoration site, it had life. Tadpoles and waterbugs were thriving, even though the site had been dead for years.

According to Danehy, pyrite, or fool's gold is commonly found in coal. When coal is extracted, the pyrite is washed out, leaving the tailings with high concentrations of pyrite. Those tailings were trucked to dump sites such as DeSale.

When pyrite is exposed to oxygen, it breaks down, or oxidizes, and goes into solution. This solution has a low enough pH that it in turn dissolves naturally occurring aluminum in the clay soil and reacts with other chemicals to create sulfuric acid.

This heavy metal contamination leaves the soil at DeSale with a pH similar to vinegar.

The cost of reclaiming the site is about $400,000, with another 25 percent of contributions in kind, meaning that the bulk of the physical restoration is being provided for free by members of the coalition.

For example, Amerikohl cleared the land last year, even though the Harrisville mining company didn't have any part in the contamination.

The heart of the restoration project is a passive filtration system that's constructed of a maze of pipes lining a filtration bed and ending in a wetland.

The eight-plus-acre site is hilly, with the top of the toe spoil sloping down to a wet area.

Amerikohl cleared the site, then dug until they found a clearly defined stream of water.

The system is constructed so that that stream is funneled through a pipe into two settling ponds.

The ponds are lined with limestone and mushroom compost to remove the majority of iron and sulfides in the water. Heavy aluminum sinks to the bottom of the ponds and is removed manually when enough accumulates.

From the ponds, the water flows through a maze of pipes into a diked wetland.

The wetland was filled for the first time at the end of May and volunteers turned out the next weekend to plant wetlands species donated from a similar Pennsylvania Game Commission site.

The plants take up the remainder of any heavy metals, and the cleaned drainage flows through yet another limestone bed to remove residual magnesium.

Since it's passive, there's no need to constantly monitor the site, making it an affective as well as inexpensive solution.

Dunn expects the system to last at least 25 years, at which point the wetland is likely to fill itself in and, hopefully, the soil will have returned to a more neutral pH level.

Though the coalition was happy to have the planting done, Dunn and her crew were already looking to the next phase of the project.

"Phase two includes that stream," Dunn said, pointing several hundred yards away. "It's a similar project, but it's the whole stream. We'll have to divert the stream," she said.

"What else can we do?" she asked herself. "We can just leave (the sites) or do something."

Dunn and the coalition have chosen to do something.

Allied/S. Clark

The pond is here

Tim Danehy, staff member of Stream Restoration, Inc. points out details on the site plan while SRI founder Margaret Dunn and a volunteer absorb the details.

The Pittsburgh Tribune Review
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4/2/00

Heidi Murrin/Tribune-Review

Geologist Margaret Dunn stands Wednesday in front of a trench dug at a reclamation site in Eau Claire. Dunn recently received the Environmental Conservation Distinguished Service Award for her work.

Mining society honors geologist for service

Lawrence Sanata
TRIBUNE-REVIEW

Margaret Dunn calls it her "life-changing experience."

Standing knee-high in mud, snow and rain, she watched in amazement as environmentalists and mining company officials rubbed shoulders and worked together to move soil and rock.

The project at the Jennings Environmental Education Center in Brady Township was the first time in Dunn's memory that the two sides got together without pointing fingers and making accusations.

"This sounds corny," Dunn said with a West Virginia accent, but that day in 1992 changed the course of her life. "And I saw how we could pool our talents together."

That experience has since spurred environmentalists, mining industry officials and others to help reclaim waterways contaminated by abandoned coal mines, she said. And in the process, she said, they are making western Pennsylvania a healthier and more beautiful place to live.

On March 13 in Nashville, Dunn received the Environmental Conservation Distinguished Service Award from the American Institute of Mining, Metallurgical, Petroleum Engineers for her efforts.

"Without her involvement, nothing that has been accomplished by (the Slippery Rock Watershed Coalition and the Jennings Water Quality Improvement Coalition) would have ever been accomplished," said Will Taylor, an environmental educator at Jennings Environmental Education Center.

Along with Dunn's involvement in those environmental coalitions, "she works very closely with the mining industry, and she also

PLEASE SEE **GEOLOGIST/N4**

North Hills Notables

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Geologist honored for efforts to reclaim streams

GEOLOGIST FROM/**N1**

works very closely with state agencies and local communities," Taylor said. And she is effective at what she does, he added.

Mike Leon, a mining engineer with Harding Lawson in Pittsburgh, said he nominated Dunn for the award because of her commitment to people and environment. "She goes well beyond what is required," he said.

"Margaret is really a grassroots kind of person. A lot of times these awards go to high-profile people who maybe work for the bigger companies."

Leon said Dunn got involved with students from Slippery Rock University, Grove City College in Mercer County and Allegheny College in Crawford County who assisted in environmental remediation projects in Butler County.

Dunn is the co-founder of CDC Associates in Cranberry, an engineering and geologic consulting firm.

Her interest in geology grew from visits with her grandfather to the coal mines where he worked. She pursued a bachelor's degree in geology from Florida State University and a master's degree in geology from Virginia Tech, at a time when women geologists were a rarity.

> 'I've tried to find common ground so that we can all work together on a project.'
>
> — Margaret Dunn
> CO-FOUNDER OF CDC ASSOCIATES, AN ENGINEERING AND GEOLOGIC CONSULTING FIRM

After working for a handful of surface mining companies, she became a consultant to the mining industry about 20 years ago and specializes in mine drainage issues.

Many describe her as a peacemaker, managing to bring the public and private sector together to reclaim creeks and streams damaged by unsound mining practices of generations ago. Dunn prefers to call it "public-private partnering."

But it has not been easy, said Dunn, adding that some environmentalists remain critical of the mining industry for its past practices.

"I've tried to find common ground so that we can all work together on a project," she said. "The mining industry has a lot to offer. They have trained personnel. They have equipment."

Dunn said she never imagined the gathering eight years ago in the Jennings Environmental Education Center would have such an impact, especially because of the adversarial relationship that existed between environmentalists and the mining industry.

But as both sides learned about a new way of reclaiming streams, creeks and rivers contaminated by the acid runoff from abandoned coal mines, something incredible happened, she said. Both sides quit arguing and started working with one another.

"And here were all these people who usually can't get along, and we're able to do this together," she said.

The project at the center was the construction of a passive treatment system. Such a system treats acid mine runoff by increasing its alkalinity with limestone aggregate and bacteria, thereby reducing the acidity of the water.

Since the system was built at Jennings, Taylor said, as many as six other similar treatment systems have been built elsewhere in northern Butler County. In addition, state and federal agencies have adopted the project and are quick to recommend it to groups elsewhere, he said.

The Dunn file

- **Name:** Margaret Dunn
- **Age:** 50.
- **Residence:** Rochester.
- **Family:** Husband, Mike Dunn.
- **Profession:** Co-founder of CDC Associates in Cranberry, an engineering and geologic consulting firm.
- **Notable:** She received the Environmental Conservation Distinguished Service Award from the American Institute of Mining, Metallurgical, Petroleum Engineers.
- **Hobbies:** Horses.

The cooperation of various entities in western Pennsylvania has resulted in millions of dollars being earmarked by the state for reclamation efforts in Butler County, according to the Department of Environmental Protection.

Working together, environmental groups, such as the Slippery Rock Watershed Coalition, and mining companies, such as Amerikohl Mining, have been involved in a growing list of projects aimed at cleaning tainted waterways, Dunn said.

"And it keeps growing," she said.

THE CATALYST

SLIPPERY ROCK WATERSHED COALITION MONTHLY ACTIVITIES UPDATE

THIS MONTH'S MEETING: Wednesday, July 12 @ 7:00 PM, Jennings Environmental Education Center, Pizza and Pop will be provided!! 07/07/00 meeting attendance: W. Taylor, F. Cetera, S. Smith, T. Gillen, C. Cooper, V. Kefeli, D. Peart, T. Danehy, M. Dunn, S. Busler, T. Reynolds.

THE JULY MEETING WILL BE HELD AT 7PM AT THE JENNINGS ENVIRONMENTAL EDUCATION CENTER. JENNINGS IS LOCATED SOUTHWEST OF THE SR 8 AND SR 528 INTERSECTION.

Berm Raised at Biosolids Wetland at Jennings

With the help of the generosity of **Quality Aggregates** and some hard work, **Jason Hicks** raised the berm of the Channel Wetland at the Jennings Environmental Education Center. Exceptional plant growth within the wetland has forced the water to overtop. In order to disturb the wetland as little as possible, Jason raised the berm by hand. He used fill material donated by Quality Aggregates from their limestone quarry at Boyers.

Thank you Jason for all of your hard work!

Margaret Dunn Goes to Washington

On May 17th Margaret Dunn went to Washington D. C. to testify in front of the House Subcommittee on Energy and Mineral Resources. A copy of her executive summary is posted on the internet at http://www.house.gov/resources/106cong/energy/00may17/dunn.htm. Margaret spoke of the accomplishments within the Slippery Rock Watershed made possible through public-private partnerships. Allocations of existing and future Abandoned Mine Land Funds are necessary to restore the watersheds impacted by old mine lands in Pennsylvania. Tim Danehy, Darcy Peart, and Shaun Busler all helped Margaret prepare for her big day.

Wetland planting at De Sale Phase I

Attendance: **Tim Danehy, Shaun Busler, Jeff Reidenbaugh, Chuck Jr. and Chucky Malinski, Darcy Peart, Margaret Dunn, Bob Beran, Steve Smith, Janice Belgredan, Will Taylor, Charlie Cooper, and Shelby Clark.**

Volunteers from **Stream Restoration**, **DCNR**, and other supporters of the **Slippery Rock Watershed Coalition** successfully planted the 3/4 acre wetland located at De Sale Phase I. With the help of **Ned Weston**, **Bob Beran, Chuck Jr. and Chucky Malinski, Jason Hicks, and Jeff Reidenbaugh,** over 20 species of wetland plants, from spatterdock to cranberries, were gathered throughout State Game Lands 95. **Shelby Clark**, a reporter from the Allied News, took some pictures and talked to everyone there. **Tim Danehy** of Stream Restoration, Inc. gave a brief tour and explained how the system works to Shelby and all of the volunteers. **A good time was had by all!**

The two Vertical Flow Ponds at De Sale Phase I recently came online on 5/10/00.

Photo of the month

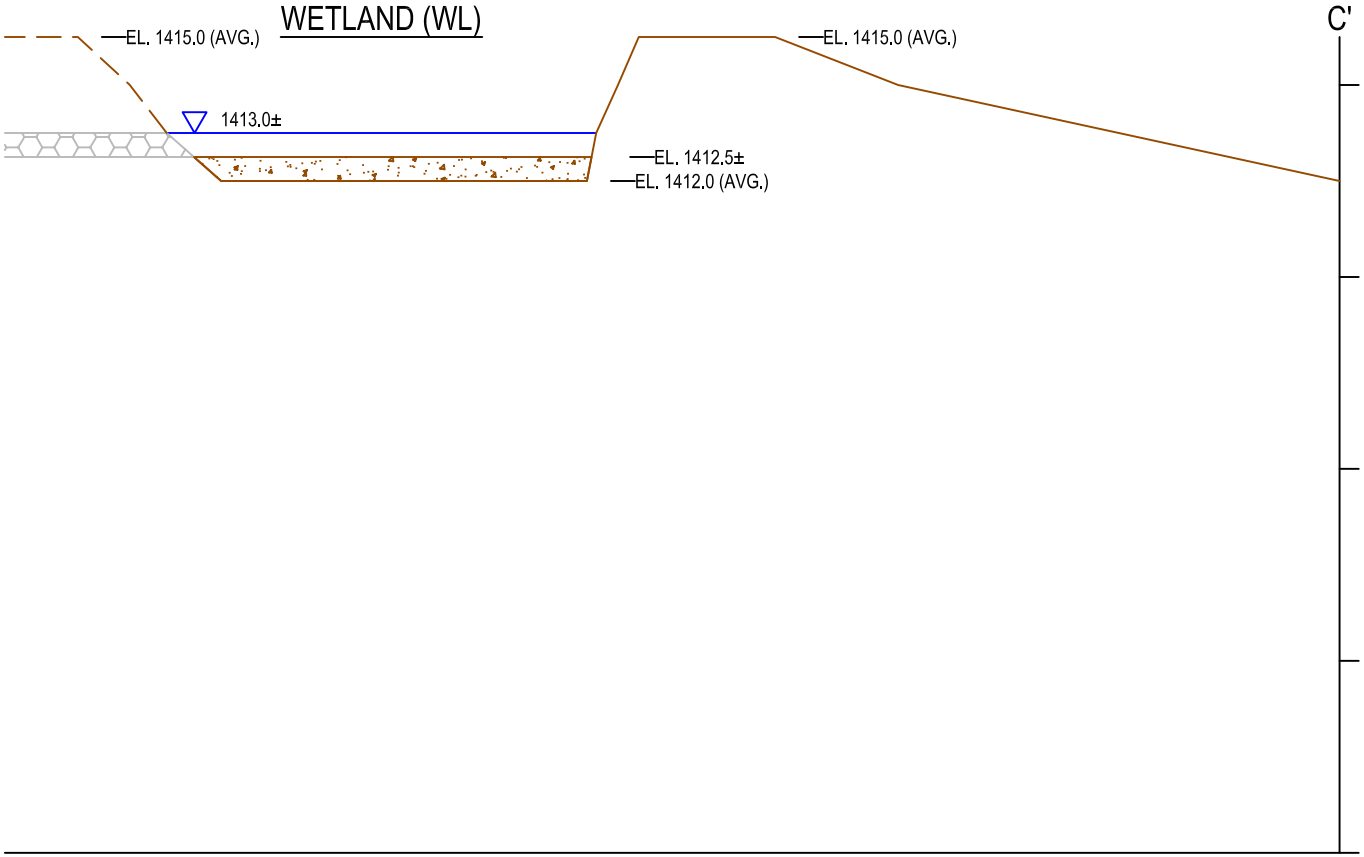
Photo of the month

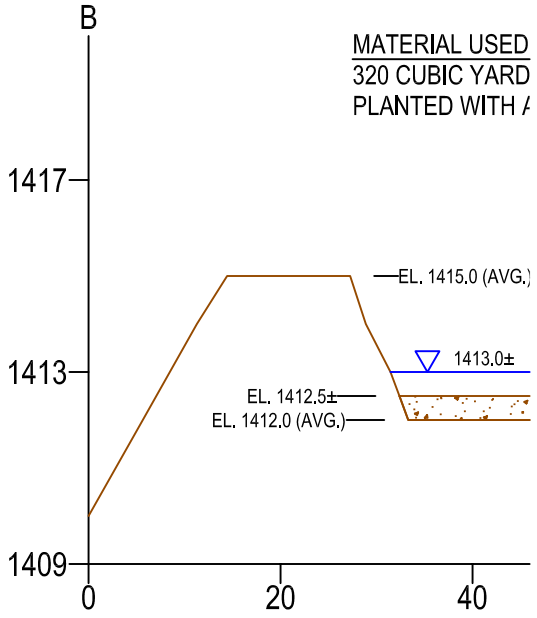
Jeff Raidenbaum, Shaun Busler, Margaret Dunn, Will Taylor, Darcy Peart, and Chuck Malinski listen intently to Bob Beran as he explains the different wetland plants to be established within the 3/4 acre wetland at De Sale Restoration Area Phase I.

Thanks to The William & Frances Aloe Charitable Foundation, Amerikohl Mining, Inc., Quality Aggregates Inc., and Allegheny Mineral Corporation for their support. For more information contact: Slippery Rock Watershed Coalition, c/o Stream Restoration Incorporated (PA non-profit), 3016 Unionville Road, Cranberry Twp., PA 16066, (724)776-0161, fax (724)776-0166, sri@salsgiver.com. July Distribution: 500 copies

SECTION A - A'

SCALE: 1" = 10' HORIZONTAL
SCALE: 1" = 4' VERTICAL





MATERIAL USED
320 CUBIC YARD
PLANTED WITH A