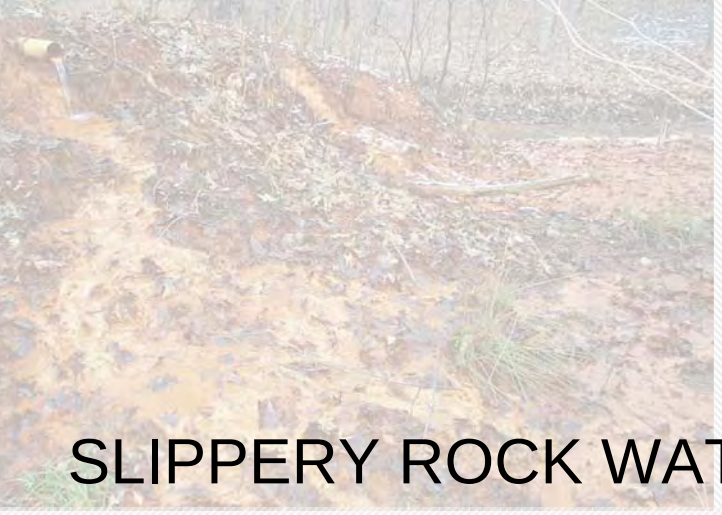

SLIPPERY ROCK WATERSHED COALITION

BC19 & BC19B REMEDIATION PROJECT

FINAL REPORT

Public Private Partnership Effort

Marion Township, Butler County, PA

Stream Restoration Incorporated
A PA Non-Profit Organization 501(c)(3)
3016 Unionville Rd., Cranberry Twp., PA 16066
PH: 724-776-0161 FX: 724-776-0266 sri@streamrestorationinc.org
www.streamrestorationinc.org

Date: August 16, 2005

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

Attn: Elias Heferle, Project Manager

Re: Final Report for Project # NW20377
Growing Greener – Environmental Stewardship and Watershed Protection Grant
ME#3521010
BC19 & BC19B Remediation Project, Blacks Creek in Slippery Rock Creek Watershed
Marion Township, Butler County, PA

Enclosed is the final report for the BC19 & BC19B Remediation Project. We are proud of the project and everyone involved.

We believe that this project serves as another positive example of the ability of public-private partnerships to successfully complete the work outlined in a grant, as well additional work outside the scope of the grant without the bid process or change orders. Estimates of in-kind contributions from project partners exceed $20,000.

This report represents a summary of the overall effort associated with this project. The BC19 &BC19B Remediation Project is an important first step in addressing the abandoned mine drainage within the McIntire Restoration Area that has severely impacted Blacks Creek. It is also serves as a reference for the continuing development of passive treatment technology and the inclusion of wildlife habitat in abandoned mine drainage remediation projects.

Please review and comment on the enclosed report, and please do not hesitate to contact any of the participants with questions. The submission of a high quality work product is important to all of us.

We cannot express our appreciation adequately to the PA Department of Environmental Protection and the Growing Greener program for making this project possible.

From: Stream Restoration Incorporated

Margaret Dunn; Timothy Danehy; Shaun Busler; Cliff Denholm; Sylvia Danehy

Copy: Joe Aloe, Pres., Quality Aggregates Inc.; Glenn Anderson, Scott Lowe, and James Kennedy, Butler County Commissioners; John Dawes, W. PA. Watershed Prog.; Jeff Jarrett, Director, OSM, USDOI; Dave Jessloski, Mgr. Aquascape; Dave Johnson, Mgr., and Will Taylor, Prog. Dir., Jennings Env. Ed. Ctr.; Ron Stanley, Dir., DEP Grants Center; Richard R. Stevenson, PA House of Representatives; George Watzlaf, FETC, DOE; Mary Jo White, PA Senator

SLIPPERY ROCK WATERSHED COALITION

BC19 & BC19B Remediation Project
Final Report

Blacks Creek Watershed, Slippery Rock Creek Headwaters
Marion Township, Butler County, PA

A Growing Greener Watershed Restoration Project

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SLIPPERY ROCK WATERSHED COALITION

BC19 & BC19B Remediation Project
Final Report

Blacks Creek Watershed, Slippery Rock Creek Headwaters
Marion Township, Butler County, PA

A Growing Greener Watershed Restoration Project

Brief Description of Project Work

SUMMARY: The BC19&BC19B Remediation Project involved construction of a treatment wetland for two discharges of mine drainage that flow into Blacks Creek within the Slippery Rock Creek Watershed in northern Butler County. The treatment wetland is preventing approximately 4,300 lbs/year of iron and 300 lbs/year of manganese from entering Blacks Creek.

The project involved the following tasks:

- Removed trash dump from project area as part of Pennsylvania River Sweep with Marion Township Environmental Advisory Council, PA Cleanways of Butler County, Americorps volunteers and SRWC volunteers.
- Completed applications and received permits and approvals. In addition to the Restoration Waiver from the Pennsylvania Department of Environmental Protection, a permit was obtained from the US Army Corps of Engineers (Corps Permit No. 200301093).
- Designed Passive Treatment System (PTS) to abate mine drainage from upwellings from two abandoned oil wells consisting of a treatment wetland with drop structures, flow directional berms, a bioswale, and level spreader.
- Installed Erosion and Sediment Controls including a plunge pool, culvert and outlet stabilization structure for the diversion of surface waters around the PTS.
- Created a naturally functioning treatment wetland with varying water levels for plant establishment and accumulation of metal precipitates. Twenty-eight species of vegetation have been documented within the treatment wetland. Wildlife observed within the treatment wetland includes frogs, tadpoles, damselflies, water striders, water boatmen, aquatic beetles, and spiders. Amphibian egg masses have also been observed.
- Improved mine drainage discharged from the site by removing 68% of iron. Estimated annual elimination from the receiving stream of 4,300 lbs/year metals. An estimated 300 lbs/year of manganese is also being removed.
- Construction and placement of habitat structures (2 bluebird boxes and 1 wood duck box) within the project area.

- Maintained photographic log and submitted quarterly status reports, prepared final report with "As-Builts" and selected photos, and administered the contract.
- Submitted to the US Army Corps of Engineers a Permit Compliance, Self-Certification Form along with a project summary, an as-built plan, a wetland planting schematic, and photographs.
- Completed all work without change orders using a partnership approach.

Grant Information: PADEP Growing Greener; NW-20377; ME#3521010; $60,000

Project Partners

Americorps
Aquascape Wetland & Environmental Services
Beran Environmental Services, Inc.
BioMost, Inc.
Butcherine's Distributor, Boyers, PA
Butler County Commissioners
Butler County Environmental Quality Board
Butler County Planning Commission
Chamberlin Surveying & Consulting
Dennis Tiche (landowner)
Jennings Environmental Education Center
Marion Township Supervisors
Marion Township Environmental Advisory Committee
PA Department of Environmental Protection
(including Bureau of District Mining Operations, Knox Office, Bureau of Abandoned Mine Reclamation, and the Water Management Program)
PA Cleanways – Butler County Affiliation
Quality Aggregates Inc.
Quality Wetland Products
Robert Kortyna (landowner)
Slippery Rock Watershed Coalition Volunteers
Stream Restoration Inc. (non-profit)
US Army Corps of Engineers
Western Pennsylvania Watershed Protection Program
WOPEC

Public-Private Partnership – Participants and Roles

Americorps volunteers assisted in the PA River Sweep cleanup of a trash dump within project area.

Aquascape Wetland & Environmental Services participated in the following: worked with Stream Restoration Incorporated to prepare the Growing Greener grant application; wetland delineation and environmental assessment of the project area; request for restoration waiver to PA DEP; water sample collection; permit application submitted to US Army Corps of Engineers; design of the passive treatment system; wetland planting events; photographic documentation of the project; assisted Chamberlin Surveying and Consulting with As-Built survey and As-Built Plans; PASPGP-2 Permit Compliance, Self-Certification Form, summary report, and wetland planting schematic submitted to the US Army Corps of Engineers; assistance with the Final Report.

Beran Environmental Services, Inc. is supporting the BC19 & BC19B Remediation project through water quality monitoring of Blacks Creek, before, during, and following construction completion.

BioMost, Inc. participated in the following: water quality monitoring before Growing Greener grant application was submitted; assisted with preparation of the Growing Greener grant application; design of the passive treatment system; Erosion and Sediment Control Plan; construction supervision/assistance; water quality monitoring following construction completion; PASPGP-2 Permit Compliance, Self-Certification Form and water quality monitoring report submitted to the US Army Corps of Engineers; assistance with the Final Report.

Boyers Sportsmen's Association provided local support for this and other restoration projects within the Slippery Rock Watershed.

Butcherine's Distributor located in Boyers, PA assisted in gaining local support for this and other restoration projects within the Slippery Rock Watershed.

Butler County Commissioners supported the BC19 & BC19B Remediation Project with a generous contribution of $40,000 in matching funds.

Butler County Environmental Quality Board supported the project and recommended financial support by the Butler County Commissioners.

Butler County Planning Commission has provided support in the county government for this and other restoration projects within the Slippery Rock Watershed.

Chamberlin Surveying & Consulting conducted the survey of the project area that was utilized in the design of the passive treatment system, and also conducted the As-Built Survey and worked with Aquascape to prepare the As-Built Plans.

Dennis Tiche (landowner) has supported efforts of participants in the Slippery Rock Watershed Coalition and granted access to the project area to the project participants and the PA DEP for the construction and

maintenance of the passive treatment system and for occasional use as a demonstration site for environmental education purposes.

Jennings Environmental Education Center is an integral participant in the Slippery Rock Watershed Coalition and will contribute to the BC19 & BC19B Remediation Project through educational project advice and assistance in the preparation of public education and outreach events.

Marion Township Supervisors have provided local government support of this and other restoration projects within the Slippery Rock Watershed.

Marion Township Environmental Advisory Committee organized and assisted in the PA River Sweep cleanup of a trash dump within the project area.

PA Department of Environmental Protection (including Bureau of District Mining Operations, Knox Office, Bureau of Abandoned Mine Reclamation, and Water Management Program) participated in the following: assessment of Blacks Creek; guidance and support of Growing Greener grant application; review of the project and issuance of a restoration waiver; and project management of the Growing Greener grant.

PA Cleanways – Butler County Affiliation organized and assisted in the PA River Sweep cleanup of a trash dump within the project area.

Quality Aggregates Inc. implemented the erosion and sediment control plan, constructed the passive treatment system, stabilized soils in upland locations of the project area, and constructed a plunge pool, culvert and outlet stabilization structure for the diversion of surface waters from the passive treatment system. Quality Aggregates will also provide earthmoving equipment and manpower that are required for any minor repairs that are required for the passive treatment system for 5 years post-construction.

Quality Wetland Products has provided tree and shrub species and supplied herbaceous wetland plants for the wetland and upland plantings at the BC19 & BC19B Remediation Project.

Robert Kortyna (landowner) has granted access to the project area to the project participants and the PA DEP for the construction and maintenance of the passive treatment system.

Slippery Rock Watershed Coalition Volunteers assisted in the following: PA River Sweep cleanup of a trash dump within the project area; construction and installation of blue bird and duck boxes; supplemental wetland planting; and monitoring event of the treatment wetland.

Stream Restoration Inc. (non-profit) worked with Aquascape in preparing the Growing Greener Grant application, administered the grant, and provided coordination of the project partners for the completion of the BC19 & BC19B Remediation Project.

US Army Corps of Engineers reviewed the project and issued a Corps Permit for construction of the passive treatment system.

Western Pennsylvania Watershed Protection Program supported the BC19 & BC19B Remediation Project with a generous contribution of $10,000 in matching funds.

Comprehensive Timeline

DEP Inspection
Site Visit
News Item

Date	Description
Prior to 2/8/02	Water sampling, site investigation, planning
2/8/02	Growing Greener grant application submitted for construction of passive treatment system for mine drainage abatement
6/15/02	PA River Sweep cleanup of trash dump within project area with volunteers from Americorps, PA Cleanways of Butler County, and the Slippery Rock Watershed Coalition. The Marion Township Environmental Advisory Council assisted in coordinating the event. (reported in the July 2002 Catalyst)
8/7/02	Growing Greener grant awarded
10/9/02	Pennsylvania Natural Diversity Inventory (PNDI) search request submitted to PA DEP NWRO
10/18/02	County and township notifications submitted
10/31/02	PNDI search conducted PA DEP NWRO, one potential conflict identified and referred to PA Fish & Boat Commission
11/7/02	PNDI potential conflict and project information submitted to PA Fish & Boat Commission
12/17/02	PNDI potential conflict cleared by PA Fish & Boat Commission
3/11/03	Wetland delineation and Environmental Assessment field work
3/24/03	Wetland delineation and Environmental Assessment field work
6/6/03	Completion of wetland delineation and Environmental Assessment field work
6/27/03	Request for restoration waiver submitted to PA DEP NWRO
9/3/03	Site visit with representatives of PA DEP NWRO, PA DEP Knox DMO, and US Army Corps of Engineers, Pittsburgh District
9/8/03	Follow-up correspondence to PA DEP NWRO with completed page 5 of Environmental Assessment Form
9/10/03	Water samples collected from pits dug in northern portion of wetland on site, at the request of US Army Corps of Engineers
9/12/03	Waiver of permit requirements from PA DEP
9/15/03	Follow-up correspondence to US Army Corps of Engineers with water sample results, completed page 5 of Environmental Assessment Form, and permit applicant information
10/6/03	Permit application submitted to US Army Corps of Engineers
10/20/03	Permit issued by US Army Corps of Engineers
1/17/04	DEP inspection (E. Heferle)
1/22/04	Site survey complete and final design of passive treatment begun

1/24/04	Design/layout of passive treatment system provided to Stream Restoration Incorporated by Aquascape
2/23/04	DEP inspection (E. Heferle)
5/21/04	DEP inspection (E. Heferle)
6/5/05	Construction of Passive Treatment System begun by Quality Aggregates Reclamation Division
7/15/04	DEP inspection (E. Heferle)
7/28/04	DEP inspection (E. Heferle)
8/11/04	DEP inspection (E. Heferle)
8/24/04	Site visit by Elias Heferle (PA DEP, project manager of the BC19 & BC19B Remediation Project) and Ryan Harr (Watershed Specialist, Butler County)
8/24/04	Wetland planting by Aquascape
8/26/04	DEP inspection (E. Heferle)
9/2/04	Completion of passive treatment system with final portion of wetland planting
9/9/04	DEP inspection (E. Heferle)
10/18/04	DEP inspection (E. Heferle)
11/3/04	Field work completed for As-Built Survey
11/20/04	As-built survey completed by Chamberlin Surveying & Consulting
11/23/04	PASPGP-2 Permit Compliance, Self-Certification Form submitted to the US Army Corps of Engineers along with Project Summary, As-Built Drawing, Water Quality Monitoring Report, Wetland Planting Schematic, and color photographs.
2/1/05	DEP inspection (E. Heferle)
3/23/05	Bluebird boxes constructed by Slippery Rock Watershed Coalition volunteers
3/29/05	DEP inspection (E. Heferle)
3/29/05	Duck box constructed by Slippery Rock Watershed Coalition volunteers
6/4/05	Supplemental wetland planting, installation of habitat structures, and field work for wetland monitoring event conducted by Slippery Rock Watershed Coalition volunteers

PROJECT SUMMARY

The BC19 & BC19B Remediation Project was constructed to address upwellings from two abandoned oil wells (BC19 & BC19B) which have historically discharged mine drainage into Blacks Creek within the Slippery Rock Creek Watershed in Marion Township, Butler County. Average annual loadings to Blacks Creek from these discharges are approximately 6,300 lbs/year of iron and 1,800 lbs/year of manganese.

Construction began on the BC19 & BC19B Remediation Project on June 5, 2004. The passive treatment system (PTS) consists of a treatment wetland with drop structures, flow directional berms, a bioswale, and a level spreader. A plunge pool, culvert, and outlet stabilization structure were also constructed for the diversion of surface flows from the treatment wetland.

Flows from the BC19 discharge are conveyed within the main basin of the treatment wetland toward a large drop structure by a flow directional berm. A bioswale collection system conveys flows downslope from the BC19B discharge toward a second drop structure within the main basin of the treatment wetland, where flows from the two discharges meet. Flows then continue through a shallow water area of the treatment wetland before reaching a level spreader, which maintains consistent water levels within the main basin of the treatment wetland and aerates the mine drainage as it drops to a lower basin of the treatment wetland. Following the level spreader, the mine drainage sheet flows into another drop structure before passing through another shallow water area and entering Blacks Creek.

Following construction of the passive treatment system, wetland plantings were conducted on August 24, 2004 and September 2, 2004. A volunteer wetland planting was also conducted on June 4, 2005 to supplement vegetation establishment within the wetland.

Original Proposal	Current Accomplishments
Treatment Wetland Area: 0.5 to 0.75 Plant Species: 22	**Treatment Wetland** **(including Drop Structures, Bioswale and Level Spreader)** Area: Estimated 0.39 acres Plant Species: 28 (documented by monitoring) **Drop Structures** Area: Estimated 0.06acres (settling and accumulation of solids) **Bioswale** Area: Estimated 0.07 acres
	Plunge Pool and Culvert Constructed for diversion of surface flows away from Passive Treatment System
	Upland Plantings Trees and Shrubs: 9 species Herbaceous Seed Mix: 25 species
	Habitat Structures Blue Bird Boxes: 2 Wood Duck Box: 1

A monitoring program was initiated in order to evaluate the success of the naturally functioning wetland. The treatment wetland was observed to support 28 plant species and various aquatic life including frogs, tadpoles, damselflies, water striders, water boatmen, and aquatic beetles. Amphibian egg masses have also been observed.

To evaluate the degree of success in improving water quality on a long term basis, BioMost Inc., the PA Department of Environmental Protection, and other participants in the Slippery Rock Watershed Coalition are continuing to monitor the treatment system and Blacks Creek after the term of the grant for the BC19 & BC19B Remediation Project.

The analysis of currently available water quality data indicates that the passive treatment system is successfully treating iron present in the abandoned mine drainage.

Raw vs. Treated Water Quality

Drainage	pH	Acidity		Fe		Mn		Al	
		mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day
RAW post-construction (BC19&BC19B	6.5	-44.8	-30.3	25.6	17.3	7.3	4.9	<0.1	<0.1
TREATED post-construction (BC19/BC19B	7.2	-124.2	-89.6	8.2	5.6	6.1	4.1	<0.1	<0.1

Based on historical monitoring of the discharges and continued functioning of the passive treatment system, an estimated average of 4,300 lbs/year of iron is being prevented from entering Blacks Creek. Approximately 300 lbs/year of manganese are also being prevented from entering Blacks Creek. A full growing season has not yet passed since the initial wetland plantings, and water quality is expected to continue to improve as wetland vegetation becomes better established.

INTRODUCTION

The McIntire Restoration Area, which is located near the headwaters of Blacks Creek and includes the BC19 & BC19B discharges, contains the first, major non-point sources of pollution to the headwaters of Blacks Creek. Within this area, abandoned oil wells and mine discharges severely degrade the stream with high levels of iron, aluminum, and acidity. The quality upstream of the McIntire Restoration Area has historically been good, although discharges do exist. Occasionally some of these discharges, which include BC6 and BC6A, have been observed to result in acidity exceeding alkalinity.

Stream Restoration Incorporated has collaborated with the Bureau of Mining and Reclamation (PA DEP), the Knox District Mining Office (PA DEP), and the US Department of Energy (US DOE) to perform a preliminary assessment of the Blacks Creek Watershed for future planning and remediation work. The BC19 & BC19B Remediation Project involves the first passive treatment system constructed in the comprehensive effort to treat all of the discharges within the McIntire Restoration Area. Water Quality Data of these discharges is provided below.

Sample Point	Flow (gpm)	pH	Alkalinity (mg/L)	Acidity (mg/L)	Fe (mg/L)	Mn (mg/L)	Al (mg/L)
TB1	21	3.2	0	804	278.8	83.7	25.7
BC14[1]	21	6.3	89	26	20.9	17.8	0.0
BC15[1]	80	6.4	115	4	35.9	10.7	0.1
BC16	88	5.9	184	21	49.0	16.4	0.3
BC19	30	6.5	202	0	23.5	7.4	0.0
BC19B	26	6.5	264	-44.8	28.3	7.1	<0.1

Attempts have been made to obtain landowner support for the construction of passive treatment systems for the BC 14 and BC 15 discharges and grant funding has been received for remediation of the BC 16 discharge. A critical phase of the McIntire Restoration Area will include the abatement of the TB1 discharge and the restoration of the Upper McIntire Site, which contains poorly reclaimed uplands and contaminated dewatering ponds remaining from past mining activities. TB1, which is possibly the largest source of acidic drainage to Blacks Creek, flows from abandoned treatment ponds. This discharge has the highest known dissolved iron concentration of any known discharge in the headwaters of the Slippery Rock Creek Watershed. A pubic-private partnership effort between the US DOE, the PADEP, and Slippery Rock Watershed Coalition has been studying the McIntire Restoration Area to determine the specific subsurface source of this discharge and appropriate treatment options. The DOE, DEP, and Slippery Rock Watershed Coalition will continue to evaluate the available options for treatment and pursue appropriate remediation for the site.

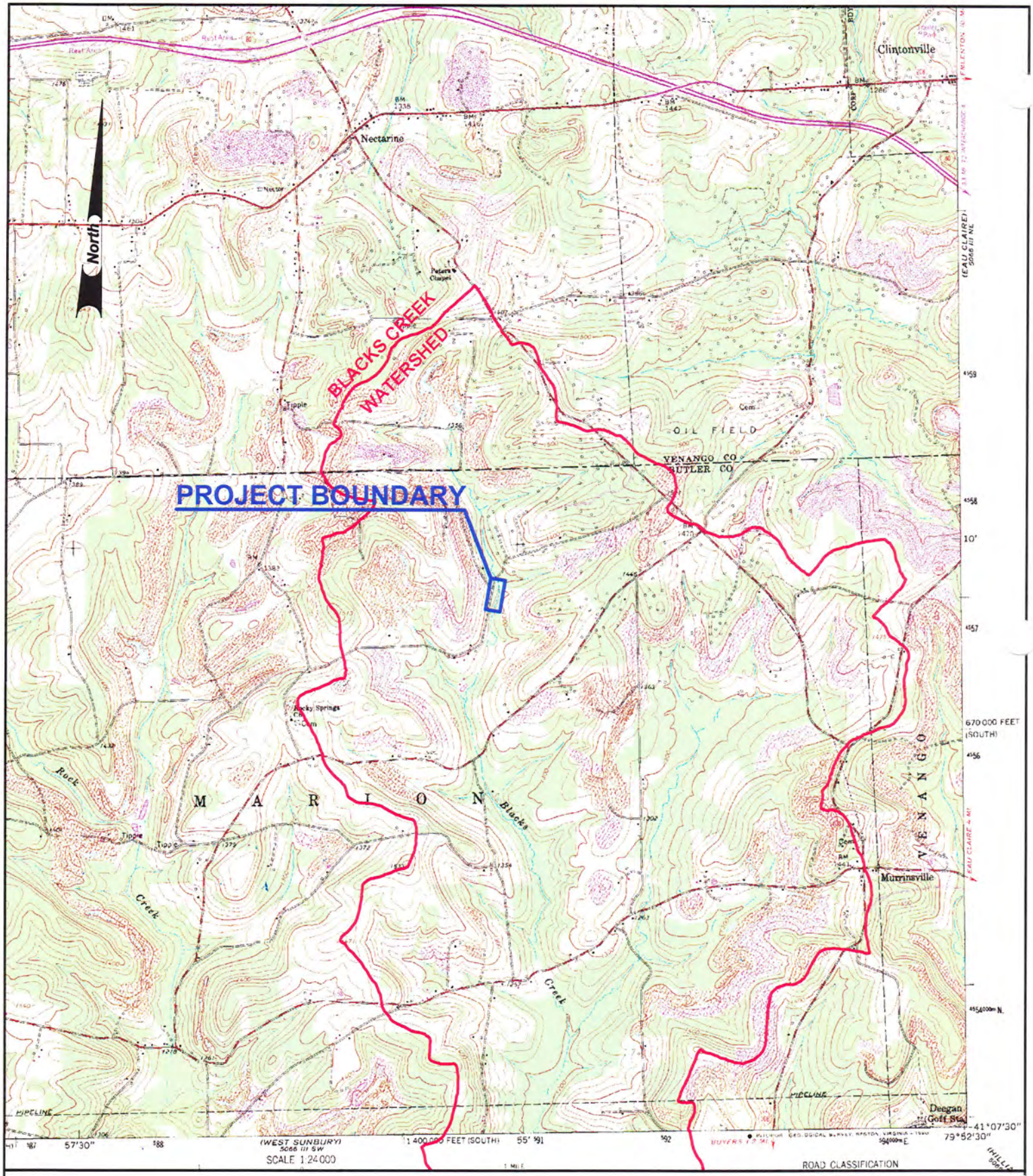
Partnerships have been built with the experience and resources needed to successfully restore Blacks Creek to a productive fishery. Completion of all phases of the McIntire Restoration Area would be expected to remove in excess of **85,000 lbs/year acidity and 89,000 lbs/year metals** from Blacks Creek, improving a 3 ½-mile segment to the confluence with Slippery Rock Creek.

BC19 & BC19B Remediation Project

Construction began on the BC19 & BC19B Remediation Project in June 2004, to address upwellings of mine drainage from the abandoned oil wells known as the BC19 and BC19B discharges. The combined average annual loadings to Blacks Creek from these discharges is approximately 6,300 lbs/year of iron and 1,800 lbs/year of manganese.

The passive treatment system constructed for the remediation of these mine drainage discharges consists of a treatment wetland with drop structures, flow directional berms, a bioswale, and a level spreader. Following construction of the treatment wetland basin, plantings were conducted on August 24, 2004 and September 2, 2004 for vegetative establishment within the wetland and in the adjacent areas disturbed during construction. Following the wetland planting, the banks and fringes of the treatment wetland were seeded to further encourage vegetation establishment. A supplemental wetland planting was also conducted on June 4, 2005.

The treatment of the BC19 & BC19B discharges is significantly reducing a known source of surface pollution as well as providing wetland habitat. Preventing large amounts of metals produced by these discharges from entering Blacks Creek also provides needed relief to the problem of excessive accumulation of sediments and metal precipitates on the streambed of Blacks Creek. This project serves as a first step toward the improvement of water quality and instream habitat for the eventual return of a productive fishery to Blacks Creek.



PROJECT LOCATION - USGS 7.5' BARKEYVILLE, PA (PR1980)

BLACKS CREEK: BC19 & 19B REMEDIATION PROJECT

Approximate Center of Project (deg-min-sec)
41-10-00 latitude 79-54-39 longitude

Marion Township, Butler County, PA
Stream Restoration Incorporated
June 2005, Scale 1" = 2000'

1000 0 1000 2000

BC19 & 19B/905 FR/loc

SITE DESCRIPTION AND LOCATION

The project area is located in Marion Township, Butler County, within the USGS Barkeyville Quadrangle. The project area is bordered by Blacks Creek to the east and Porter Road (Township Road 434) to the west. The highest elevations (approximately 1295 feet) are located along Porter Road, with the lowest elevation of the project area (approximately 1273 feet) located at the outlet of the treatment wetland.

Blacks Creek is a perennial stream with its headwaters just north of the Venango County line. Blacks Creek receives hydrology from a number of unnamed tributaries and seeps, including the BC19 and BC19B seeps and other discharges of abandoned mine drainage. The portion of Blacks Creek adjacent to the project area is approximately 8 feet wide and has an average depth of 1.5 feet. The gravel and cobble of the stream substrate are stained orange from the accumulation of iron precipitates from the abandoned mine drainage that flows into Blacks Creek from the McIntire Restoration Area. Bottoms of rocks from riffle areas in Blacks Creek were examined for macroinvertebrates during the environmental assessment conducted for the BC19 & BC19B Remediation Project, but no macroinvertebrates were discovered. The accumulated iron precipitate was observed coating the rocks and filling the interstices that macroinvertebrates typically inhabit.

The area surrounding the BC19 & BC19B Remediation Project is rural and contains farmland, forested plots, and residential dwellings. The riparian habitat in the area of the BC19 and BC19B discharges had been degraded by the continuing accumulation of iron precipitates. In addition, upland portions of the project area had historically been used as a trash dump. Cleanup efforts were coordinated and took place prior to the construction of the passive treatment system.

(See location on attached map.)

PRE-EXISTING CONDITIONS

The BC19 & BC19B Remediation Project addresses the abandoned mine discharge from two abandoned oil wells. These discharges have contributed a significant loading of iron and manganese to Blacks Creek, which was included on the 303(d) list of impaired waters in 1996, with acid mine drainage given as the source of impairment, and metals indicated as the cause of impairment.

The upwelling from abandoned oil well BC19 has produced average flows of 30 gpm, with average iron concentrations of 23.5 mg/L and average manganese concentrations of 7.4 mg/L. The BC19B discharge has produced average flows of 25 gpm, with average iron concentrations of 28.3 mg/L and average manganese concentrations of 7.1 mg/L. These discharges have substantially contributed to the total iron and manganese loading of Blacks Creek by discharging approximately **6,300 lbs/year of iron and 1,800 lbs/year** of manganese.

The wetland area that had existed within the BC19 & BC19B Remediation Project received hydrologic contributions from the BC19 discharge. A significant accumulation of iron precipitate from AMD was common in the wetland area. The area surrounding the BC19B discharge had also accumulated a great deal of iron precipitates.

Water samples were collected from the impacted wetland during the environmental assessment conducted for the BC19 & BC19B Remediation Project. Analysis of the water samples determined that water within the wetland met the criteria for elevated total metal levels published in the Pennsylvania Bulletin (Volume 26, No. 50, Saturday, December 14, 1996). Also, at the request of the US Army Corps of Engineers, an additional water sample was collected from a soil pit dug in the northern portion of the impacted wetland. This water sample was analyzed and was also found to meet the criteria for elevated total metal levels published in the Pennsylvania Bulletin.

PROJECT DEVELOPMENT

Timing of Pre-Construction Applications

Permits, Approvals, Contracts, notifications	Date Submitted	Date Approved	Approval Agency	Project Partner
Growing Greener Grant	2/8/02	8/7/02	PA DEP Grants Center	All
PA Natural Diversity Inventory Search	10/9/02	10/31/02	PA DEP (NWRO)	Aquascape
Species Impact Review	11/7/02	12/17/02	PA Fish & Boat Commission	Aquascape
Request for Restoration Waiver	6/7/03	9/12/03	PA DEP	Aquascape
US Army Corps Permit	10/6/03	10/20/03	US Army Corps of Engineers	Aquascape

The executed contract with the Commonwealth of Pennsylvania was received on June 4, 2003 and was effective beginning with the approval of the Growing Greener grant application on August 7, 2002.

The agreement with Butler county, regarding the contribution of matching funds in the amount of $40,000 for the BC19 & BC19B Remediation Project, was entered into on January 8, 2004.

Site Preparation

Erosion and Sedimentation pollution controls primarily consisted of filter fabric fence installed below the construction area and a plunge pool, culvert, and outlet stabilization structure that were installed to divert surface flows away from the construction area and passive treatment system.

The area of disturbance was cleared and grubbed, while leaving mature trees and existing vegetation where possible in sections along Porter Road, along Blacks Creek, and near the outlet of the treatment wetland.

PASSIVE TREATMENT SYSTEM INSTALLATION

Prior to clearing and earthmoving activities, the limits of disturbance necessary for construction of the passive treatment system were marked in the field and reviewed with construction personnel so that unnecessary disturbance to the surrounding area could be avoided. The work area was cleared and surface runoff was directed away from the footprint of the passive treatment system by construction of a plunge pool, culvert, and rock apron outlet stabilization structure that directs surface runoff to Blacks Creek. Flows from the BC19 discharge were also directed away from the project area prior to excavation and construction of the treatment wetland.

A laser level was utilized to ensure a level basin and appropriate water depths during construction of the treatment wetland. Breastwork was constructed to provide freeboard of 3-feet within the treatment system, also serving to prevent floodwaters of Blacks Creek from entering the passive treatment system.

A flow directional berm was constructed to the west of the BC19 discharge to convey flows from the BC 19 discharge to the north, where they enter a large drop structure to ensure low velocity flows for increased retention time. The deeper water of the drop structure also allows for greater accumulation of metal precipitates. From the drop structure, flows proceed through a shallow stretch of wetland that will allow for dense and diverse vegetative establishment.

The treatment wetland was configured to provide the deeper water areas of the drop structures and shallower water areas, which are less than 12 inches deep to provide areas of dense vegetation. The shallow water areas of the wetland were monitored with a laser level during construction to avoid excessive depths that would limit vegetative establishment, as well as to avoid areas of exposed ground above the water surface that would reduce the area providing water quality improvement within the wetland. Following the configuration of the wetland basin, topsoil salvaged from the site and mushroom compost were used to provide desirable medium for the establishment of planted vegetation. A limited amount of woody debris resulting from the construction of the passive treatment system was left in place in some areas of the treatment wetland to provide a diversity of structure and habitat.

A broad level spreader of concrete block with a sheet metal lip was constructed at the end of the main basin of the treatment wetland to ensure consistent water levels and to disperse and aerate flows, thereby encouraging further deposition of iron precipitate. Therefore, an additional drop structure was excavated beyond the level spreader. Following this drop structure, only limited disturbance was necessary to convey flows to the outlet.

Following construction of the treatment wetland, wetland plantings were conducted on August 24, 2004 and September 2, 2004 utilizing container grown

herbaceous vegetation and a limited number of container grown shrubs, which were located in shallow water areas and along the fringe of the treatment wetland. The banks of the treatment system and fringes of the wetland were also seeded for vegetation establishment. During a wetland planting on June 4, 2005, the treatment wetland of the DeSale Phase I passive treatment system was utilized as a source of appropriate transplants to supplement the establishment of vegetation in the BC19 & BC19B treatment wetland.

PASSIVE TREATMENT SYSTEM – TREATMENT WETLAND

Construction began on the BC19 and 19B Remediation Project on June 5, 2004 for the treatment of two abandoned mine drainage discharges, which are estimated to produce 6,300 lbs/year of iron and 1,800 lbs/year of manganese. Available analytical data of these discharges is summarized in the following table.

BC&BC19B DISCHARGE WATER QUALITY

Discharge	Flow (gpm)	pH	Alkalinity (mg/L)	Acidity (mg/L)	Fe (mg/L)	Mn (mg/L)	Al (mg/L)
BC 19	30	6.5	202	0	23.5	7.4	0.0
BC 19B	26	6.5	264	-44.8	28.3	7.1	<0.1

The passive treatment system consists of a treatment wetland with drop structures, flow directional berms, a bioswale, and a level spreader.

Flows from the BC19 discharge are conveyed to the north, guided by a flow directional berm toward a large drop structure, which is an area of deeper water that provides storage volume for the accumulation of metal precipitates. The deeper water also slows flow velocities, which increases retention times within the treatment wetland. The BC19B discharge flows directly down a short cascade into a drop structure. From this drop structure, the flows from the BC19B discharge enter a bioswale that conveys flows downslope to the north to a second drop structure within the main basin of the treatment wetland, where flows from the two discharges meet. Flows then continue through a shallow water area of the treatment wetland before reaching another drop structure, followed by a level spreader that maintains consistent water levels within the main basin of the treatment wetland. Following the level spreader, the mine drainage sheet flows into another drop structure, then through a final shallow water portion of the treatment wetland before entering Blacks Creeks.

Following construction of the collection system and treatment wetland basin, wetland plantings were conducted on August 24, 2004 and September 2, 2004. Seventy 1-gallon containers and 30 flats of herbaceous wetland vegetation were planted in the treatment system. Following the wetland planting, the banks and fringes of the treatment wetland were seeded to further encourage vegetation establishment. A supplemental wetland planting was also conducted on June 4, 2005. Following the initial plantings, the treatment wetland has not yet had a complete growing season for vegetation to become established and spread by vegetative reproduction or by seed. Water quality is expected to continue to improve as wetland vegetation becomes better established. A plant list for the treatment wetland of the BC19 & BC19B Remediation Project is provided in the following table.

PLANTING LIST FOR THE BC19 & BC19B TREATMENT WETLAND

Scientific Name	Common Name	Zone
HERBACEOUS PLANTS		
Alisma plantago-aquatica	Water Plantain	A
Bidens sp.	Bur Marigold	A
Carex lurida	Lurid Sedge	A
Cyperus sp.	Flatsedge	A
Eleocharis sp.	Spikerush	A
Juncus effusus	Soft Rush	A
Leersia oryzoides	Rice cut-grass	A
Nuphar luteum	Spatterdock	B
Pontederia cordata	Pickerelweed	A/B
Scirpus acutus	Hard-stem Bulrush	A/B
Scirpus atrovirens	Green Bulrush	A/B
Scirpus cyperinus	Woolgrass	A
Scirpus pungens	Three Square	A
Scirpus validus	Soft-stem Bulrush	A/B
Sparganium americanum	Eastern bur-reed	A/B
Sparganium eurycarpum	Giant bur-reed	B
Typha latifolia	Broad-leaf Cattail	A/B
TREES & SHRUBS		
Cephalanthus occidentalis	Button bush	A
Cornus sericea	Red-osier Dogwood	F
SEED		
Carex vulpinoidea	Fox sedge	F/A
Echinochloa muricata	Barnyard grass	F/A

A = water surface to 6” below water
B = 6” to 18” below water
F = wetland fringe, edge of water

Upland Plantings and Habitat Structures

During the wetland planting conducted on August 24, 2004, fifty container-grown shrubs and trees were also planted along the slopes and in the upland areas adjacent to the passive treatment system. A plant list for the upland plantings for the BC19 & BC19B Remediation Project is provided in the following table.

Scientific Name	Common Name	Zone
Amorpha fruticosa	False Indigo Bush	U
Cornus amomum	Silky Dogwood	U
Cornus sericea	Red-osier Dogwood	F/U
Fraxinus pennsylvanica	Green Ash	U
Robinia pseudoacacia	Black Locust	U
Sambucus canadensis	Elderberry	U
Viburnum lentago	Nannyberry	U

F = wetland fringe, edge of water
U = upland

Following the wetland and upland plantings, the banks and fringes of the treatment wetland were also seeded to further encourage vegetation establishment. Species that were seeded along excavated banks and berms of the passive treatment system are indicated in the following table.

Scientific Name	Common Name	Zone
Elymus virginicus	Virginia Wild Rye	Banks/berm
Eupatorium rugosum	White Snakeroot	Banks/berm
Geum aleppicum	Yellow Avens	Banks/berm
Rudbeckia fulgida	Orange Coneflower	Banks/berm
Rudbeckia hirta	Black Eyed Susan	Banks/berm
	NE perennial & annual wildflower mix	Banks/berm

The northeast perennial and annual wildflower mix from Ernst Conservation Seeds contains the following species, with species listed in order of greatest percent composition to least percent composition:

Scientific Name	Common Name
Centaurea cyanus, Tall Blue	Tall Blue Cornflower/Bachelor's Button
Gypsophila elegans	Annual Baby's Breath
Lupinus perennis	Wild Blue Lupine
Hesperis matronalis	Dame's Rocket
Linum perenne lewisii	Lewis Perennial Blue Flax
Cheiranthus alliaonii	Wallflower
Chrysanthemum maximum	Shasta Daisy
Coreopsis lanceolata	Lance Leaved Coreopsis
Cosmos bipinnatus	Cosmos
Cosmos sulphureus	Sulphur Cosmos
Delphinium ajacis	Rocket Larkspur
Rudbeckia hirta	Black Eyed Susan
Linum grandiflorum rubrum	Scarlet Flax
Papaver rhoeas, Shirley Mix	Shirley Mix/Corn Poppy
Gaillardia aristata	Blanket Flower

Echinacea pallida	Pale Purple Coneflower
Phacelia campanularia	California Bluebells
Silene armeria	Catchfly
Liatris spicata	Marsh (Dense) Blazing Star (Spiked Gayfeather)
Daucus carota	Queen Anne's Lace
Linaria maroccana	Spurred Snapdragon-Northern lights
Gaillardia pulchella	Annual Gaillardia/Indian Blanket

During the supplemental wetland planting conducted on June 4, 2005, several shrubs and trees were also planted in upland positions. These included

Scientific Name	Common Name	Zone
Acer saccharum	Sugar Maple	U
Cornus sericea	Red-osier Dogwood	F/U
Populus grandidentata	Bigtooth Aspen	U

F = wetland fringe, edge of water
U = upland

Two blue bird boxes and one wood duck box were also installed within the project area of the BC19 & BC19B Remediation Project.

The Wetland Monitoring Report (included in Section V) provides detailed information regarding the vegetative establishment to date within the treatment wetland and observed wildlife utilization.

Outreach / Education

The project participants strongly support community involvement and public outreach activities for all of our projects. Through community involvement and outreach/education programs, those interested not only learn about passive treatment technology, habitat restoration, environmental issues, and the concept of public-private partnerships, but are also given the opportunity to take an active role in watershed restoration.

On June 15, 2002, approximately 30 volunteers joined in the removal of a trash dump from the BC19/19B Remediation Project as part of the statewide Pennsylvania River Sweep. Project Partners involved in the cleanup included Americorps, the Marion Township Environmental Advisory Council, PA Cleanways of Butler County, and Slippery Rock Watershed Coalition participants.

Slippery Rock Watershed Coalition participants have also constructed and installed blue bird boxes and a wood duck box in the project area, and participated in supplemental wetland planting and monitoring event of the treatment wetland at the BC19 & BC19B Remediation Project.

SUMMARY OF PASSIVE TREATMENT EFFECTIVENESS

Raw vs. Treated Water Quality

Drainage	Sampling Events (n)	Flow (gpm)	pH	Acidity		Fe		Mn		Al	
				mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day
RAW (BC19&BC19B	6	56	6.5	-44.8	-30.3	25.6	17.3	7.3	4.9	<0.1	<0.1
TREATED post-construction (BC19/BC19B	5	60	7.2	-124.2	-89.6	8.2	5.6	6.1	4.1	<0.1	<0.1

Based on historical monitoring of the discharges and continued functioning of the passive treatment system, an estimated average of 4,300 lbs/year of iron are being prevented from entering Blacks Creek. An estimated 300 lbs/year of manganese are also being prevented from entering Blacks Creek. A full growing season has not yet passed since the initial wetland plantings, and water quality is expected to continue to improve as wetland vegetation becomes better established.

MEASUREABLE ENVIRONMENTAL IMPACT

The naturally functioning treatment wetland of the BC19 & BC19B Remediation Project has demonstrated water quality improvements. As of the wetland monitoring event conducted on June 4, 2005, the establishment of dense vegetation throughout the wetland has not yet occurred because a full growing season has not yet passed since the wetland plantings took place.

Water quality data of flows entering and leaving the treatment wetland indicates a significant reduction in total iron. An estimated average of 4,300 lbs/year of iron and 300 lbs/year of manganese are being prevented from entering Blacks Creek.

Water quality improvements from the treatment wetland provide mitigation for the wetland area that was degraded by the BC19 discharge and that was impacted during the construction of the passive treatment system. Water quality is expected to continue to improve as wetland vegetation continues to establish.

During monitoring of the treatment wetland in June 2005, 28 species of vegetation were documented within the wetland.

Species of wildlife observed within the treatment wetland include frogs, tadpoles, damselflies, water striders, water boatmen, aquatic beetles, and spiders. Amphibian egg masses have also been observed. The following table presents vegetation planted and observed within the BC19 & BC19B Remediation Project. Vegetation observed or planted in both wetland and upland positions are included.

Vegetation: BC19 & BC19B Remediation Project

Scientific Name	Common Name	Wetland Indicator Status	Zone
HERBACEOUS PLANTS			
Agrostis alba	Redtop	FACW	A
Alisma plantago-aquatica	Water Plantain	OBL	A
Bidens sp.	Bur Marigold	--	A
Brassica rapa	Field Mustard	UPL	A/F/U
Cardamine pennsylvanica	Pennsylvania Bittercress	OBL	A
Carex lurida	Lurid Sedge	OBL	A
Carex vulpinoidea	Fox Sedge	OBL	A/F
Cyperus sp.	Flatsedge	--	A
Echinochloa muricata	Barnyard grass	FACW+	F/A
Eleocharis sp.	Spikerush	--	A
Elymus virginicus	Virginia Wild Rye	FACW-	Banks/berm
Eupatorium rugosum	White Snakeroot	FACU-	Banks/berm
Geum aleppicum	Yellow Avens	FAC	Banks/berm
Glyceria grandis (maxima)	Reed Meadowgrass	OBL	A
Gratiola neglecta	Clammy Hedgehyssop	OBL	A
Juncus effusus	Soft Rush	FACW+	A
Leersia oryzoides	Rice cut-grass	OBL	A
Lemna minor	Lesser Duckweed	OBL	A
Nuphar luteum	Spatterdock	OBL	B

Polygonum hydropiper	Water Pepper	OBL	A
Polygonum persicaria	Lady's Thumb	FACW	A
Pontederia cordata	Pickerelweed	OBL	A/B
Rudbeckia hirta	Black Eyed Susan	FACU-	Banks/berm
Rumex sp.	Dock	--	A
Scirpus acutus	Hard-stem Bulrush	OBL	A/B
Scirpus atrovirens	Green Bulrush	OBL	A/B
Scirpus cyperinus	Woolgrass	FACW+	A
Scirpus pungens	Three Square	FACW+	A
Scirpus validus	Soft-stem Bulrush	OBL	A/B
Sparganium americanum	Eastern bur-reed	OBL	A/B
Sparganium eurycarpum	Giant bur-reed	OBL	B
Symplocarpus foetidus	Skunk cabbage	OBL	A
Typha latifolia	Broad-leaf Cattail	OBL	A/B
Veronica sp.	Speedwell	--	A

TREES & SHRUBS

Acer saccharum	Sugar Maple	FACU-	U
Amorpha fruticosa	False Indigo Bush	FAC	U
Cephalanthus occidentalis	Button bush	OBL	A
Cornus amomum	Silky Dogwood	FACW	U
Cornus sericea	Red-osier Dogwood	FACW+	F
Fraxinus pennsylvanica	Green Ash	FACW	U
Populus grandidentata	Bigtooth Aspen	FACU-	U
Robinia pseudoacacia	Black Locust	FACU-	U
Sambucus canadensis	Elderberry	FACW-	U
Viburnum lentago	Nannyberry	FAC	U

A = wetland surface to 6" below water
B = 6" to 18" below water
F = wetland fringe, edge of water
U = upland

A northeast perennial and annual wildflower mix from Ernst Conservation seeds, which was broadcast along the banks and berms of the passive treatment system, contains the following species (with species listed in order of greatest percent composition to least percent composition):

Scientific Name	Common Name
Centaurea cyanus, Tall Blue	Tall Blue Cornflower/Bachelor's Button
Gypsophila elegans	Annual Baby's Breath
Lupinus perennis	Wild Blue Lupine
Hesperis matronalis	Dame's Rocket
Linum perenne lewisii	Lewis Perennial Blue Flax
Cheiranthus alliaonii	Wallflower
Chrysanthemum maximum	Shasta Daisy
Coreopsis lanceolata	Lance Leaved Coreopsis
Cosmos bipinnatus	Cosmos
Cosmos sulphureus	Sulphur Cosmos
Delphinium ajacis	Rocket Larkspur
Rudbeckia hirta	Black Eyed Susan
Linum grandiflorum rubrum	Scarlet Flax
Papaver rhoeas, Shirley Mix	Shirley Mix/Corn Poppy
Gaillardia aristata	Blanket Flower
Echinacea pallida	Pale Purple Coneflower
Phacelia campanularia	California Bluebells
Silene armeria	Catchfly

Liatris spicata	Marsh (Dense) Blazing Star (Spiked Gayfeather)
Daucus carota	Queen Anne's Lace
Linaria maroccana	Spurred Snapdragon-Northern lights
Gaillardia pulchella	Annual Gaillardia/Indian Blanket

A wetland planting schematic based on the 2004 wetland planting events is provided with the As-Built Plans in Section VII.

WETLAND MONITORING REPORT

BC19 & BC19B REMEDIATION PROJECT
Marion Township, Butler County

Prepared for
Stream Restoration Incorporated
3016 Unionville Road
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June 2005

WETLAND MONITORING REPORT

BC19 & BC19B REMEDIATION PROJECT
Marion Township, Butler County

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Appendix A: Monitoring Site Plan

Appendix B: Photographs

Appendix C: Data Forms

1.0 INTRODUCTION

A Growing Greener grant was applied for and obtained for the BC19 & BC19B Remediation Project to address upwellings from two abandoned oil wells (BC19 & BC19B) which have historically discharged mine drainage into Blacks Creek within the Slippery Rock Creek Watershed in Marion Township, Butler County. Average annual loadings to Blacks Creek from these discharges are approximately **6,400 lbs/yr of iron and 1,900 lbs/yr of manganese**.

Construction began on the BC19 & BC19B Remediation Project on June 5, 2004. The passive treatment system constructed for the remediation of the mine drainage discharges consists of a collection system and treatment wetland with drop structures, or deep water areas, for the retention of metal precipitates and a level spreader to maintain desired water levels.

Flows from the BC19 discharge are conveyed to the north, guided by a flow directional berm toward a large drop structure. The bioswale collection system for the BC19B discharge conveys flows downslope to the north to a second drop structure within the main basin of the treatment wetland, where flows from the two discharges meet. Flows then continue through a shallow water area of the treatment wetland before reaching another drop structure, followed by a level spreader, which maintains water levels within the main basin of the treatment wetland at an elevation of 1276.9 feet. Following the level spreader, the mine drainage sheet flows into another drop structure before passing through another shallow water portion of the treatment wetland and entering Blacks Creek. Details of the passive treatment system are provided in the Monitoring Site Plan (Appendix A).

Following construction of the collection system and treatment wetland basin, wetland plantings were conducted on August 24, 2004 and September 2, 2004. Fifty container-grown shrubs and trees were planted along the slopes and in the upland areas adjacent to the passive treatment system. Seventy 1-gallon containers and 30 flats of herbaceous wetland vegetation were planted. Following the wetland planting, the banks and fringes of the treatment wetland were seeded to further encourage vegetation establishment. A supplemental wetland planting was also conducted on June 4, 2005. The treatment wetland has not yet had a complete growing season for vegetation to become fully established and spread through vegetative reproduction or by seed. Water quality is expected to continue to improve as wetland vegetation becomes better established. A plant list for the treatment wetland of the BC19 & BC19B Remediation Project is provided in the following table.

PLANT LIST

Scientific Name	Common Name	Zone
HERBACEOUS PLANTS		
Alisma plantago-aquatica	Water Plantain	A
Bidens sp.	Bur Marigold	A
Carex lurida	Lurid Sedge	A
Cyperus sp.	Flatsedge	A
Eleocharis sp.	Spikerush	A
Juncus effusus	Soft Rush	A
Leersia oryzoides	Rice cut-grass	A
Nuphar luteum	Spatterdock	B
Pontederia cordata	Pickerelweed	A/B
Scirpus acutus	Hard-stem Bulrush	A/B
Scirpus atrovirens	Green Bulrush	A/B
Scirpus cyperinus	Woolgrass	A
Scirpus pungens	Three Square	A
Scirpus validus	Soft-stem Bulrush	A/B
Sparganium americanum	Eastern bur-reed	A/B
Sparganium eurycarpum	Giant bur-reed	B
Typha latifolia	Broad-leaf Cattail	A/B
TREES & SHRUBS		
Cephalanthus occidentalis	Button bush	A
Cornus sericea	Red-osier Dogwood	F
SEED		
Carex vulpinoidea	Fox sedge	Fringe, shallow
Echinochloa muricata	Barnyard grass	Fringe, shallow

A = water surface to 6" below water
B = 6" to 18" below water
F = wetland fringe, edge of water
U = upland

Monitoring of the BC19 & BC19B treatment wetland will provide valuable information for the development of improved design and establishment of future wetlands constructed for the treatment of mine drainage.

2.0 METHODOLOGY

Observation points and photopoints have been established in the treatment wetland at the BC19 & BC19B Remediation Project. Please refer to the Monitoring Site Plan (Appendix A).

The targeted functions for the treatment wetland of the BC19 & BC19B Remediation Project are:

To perform water quality functions
To contribute to the abundance and diversity of wetland vegetation
To contribute to the abundance and diversity of wetland fauna

Although the abundance and diversity of wetland vegetation and fauna may be limited within passive treatment wetlands due to water quality, it is believed that these treatment wetlands can provide substantial habitat opportunities in addition to treatment functions.

Monitoring efforts consisted of documenting density and diversity of vegetation, visual observation of successful establishment or stress of vegetation, hydrology, photographic documentation, and evidence of wildlife use. Density and diversity of vegetation were recorded by the establishment of fixed observation points and transects between observation points. Observation points were marked with a PVC pipe, and locations were recorded with a Trimble GeoExplorer CE GPS unit. Modified Routine Wetland Determination Data Forms from the 1987 Corps of Engineers Wetland Delineation Manual were used to record hydrology data at the observation points and the percent cover of vegetation within 1m x 1m quadrats centered at the observation points. Modified Point Intercept Data Forms from the operational draft of Wetland Monitoring Guidelines (Tiner, 1999) were used to document the frequency of occurrence of plant species along the transects between observation points. These data forms are provided in Appendix B.

The data recorded on these forms will provide quantitative and qualitative data to identify trends in the vegetative communities within the constructed wetlands. Photographic documentation from established reference locations allows for visual comparison of present wetland conditions to past and future conditions. Photographs of the constructed wetland areas are provided in Appendix C.

3.0 RESULTS

Monitoring of the treatment wetland of the BC19 & BC19B Remediation Project occurred on June 4, 2004. Three observation points were established in the treatment wetland. Observation Points A and B were located within the main basin of the treatment wetland, with Observation Point C located between the level spreader and the final drop structure before the outlet to Blacks Creek. As indicated in Section 2.0 Methodology, transects were established between the observation points. Because a flow directional berm is located between Observation Points A and B, the A-B transect follows the line from Observation Point A to Photopoint 1 to Observation Point B. Please refer to the Monitoring Site Plan (Appendix A) for the locations of the observation points and the WL1 transect.

Observation Point A

The depth of water at Observation Point A was 5 inches. Vegetation present within the 1m x 1m quadrat at Observation Point A included

Scientific Name	Common Name	% cover	Wetland Indicator Status
Polygonum persicaria	Lady's Thumb	10	FACW
Cardamine pensylvanica	Bitter-Cress, Pennsylvania	2	OBL
Scirpus sp.	Bulrush	2	--
Glyceria grandis (maxima)	Meadowgrass, Reed	2	OBL
Eleocharis sp.	Spikerush	1	--
Lemna minor	Duckweed, Lesser	1	OBL

Other vegetation present in the vicinity of Observation Point A, but not located within the 1m x 1m quadrat included

Scientific Name	Common Name	Wetland Indicator Status
Agrostis alba	Redtop	FACW
Brassica rapa	Field Mustard	UPL
Carex sp.	Sedge (unidentified)	--
Juncus effusus	Rush, Soft	FACW+
Leersia oryzoides	Cutgrass, Rice	OBL
Sparganium americanum	Burreed, Eastern	OBL

Observation Point B

The depth of water at Observation Point B was 5 inches. Vegetation present within the 1m x 1m quadrat included

Scientific Name	Common Name	% cover	Wetland Indicator Status
Sparganium americanum	Burreed, Eastern	5	OBL
Leersia oryzoides	Cutgrass, Rice	2	OBL

Other vegetation present in the vicinity of Observation Point B, but not located within the 1m x 1m quadrat included

Scientific Name	Common Name	Wetland Indicator Status
Agrostis alba	Redtop	FACW
Carex sp.	Sedge (unidentified)	--
Juncus effusus	Rush, Soft	FACW+
	Grass (unidentified)	--

Observation Point C

The depth of water at Observation Point C was approximately ½ inch. Vegetation present within the 1m x 1m quadrat at Observation Point C included

Scientific Name	Common Name	% cover	Wetland Indicator Status
Juncus effusus	Rush, Soft	10	FACW+
Rumex sp.	Dock	5	--
Glyceria grandis (maxima)	Meadowgrass, Reed	2	OBL
Polygonum hydropiperoides	Smartweed, Swamp	2	OBL
Brassica rapa	Field Mustard	1	UPL
Alisma plantago-aquatica	Water-Plantain	1	OBL

Other vegetation present in the vicinity of Observation Point C, but not located within the 1m x 1m quadrat included

Scientific Name	Common Name	Wetland Indicator Status
Agrostis alba	Redtop	FACW
Carex sp.	Sedge (unidentified)	--
Eleocharis sp.	Spikerush	--
Leersia oryzoides	Cutgrass, Rice	OBL
Lemna minor	Duckweed, Lesser	OBL
Sparganium americanum	Burreed, Eastern	OBL
Veronica sp.	Speedwell	--

Transect A-B

Vegetation observed in the A-B Transect (which passes from Observation Point A to Photopoint 1 to Observation Point B) included the following species, provided in order from highest number of occurrences to fewest number of occurrences:

Scientific Name	Common Name	Wetland Indicator Status
Juncus effusus	Rush, Soft	FACW+
Glyceria grandis (maxima)	Meadowgrass, Reed	OBL
Leersia oryzoides	Cutgrass, Rice	OBL

Scirpus sp.	Bulrush	--
Sparganium americanum	Burreed, Eastern	OBL
Carex vulpinoidea	Sedge, Fox	OBL
Gratiola neglecta	Hedgehyssop, Clammy	OBL
Cardamine pensylvanica	Bitter-Cress, Pennsylvania	OBL
Lemna minor	Duckweed, Lesser	OBL
Carex sp.	Sedge (unidentified)	--
Rumex sp.	Dock	--

Transect B-C

Vegetation observed in the B-C Transect included the following species, provided in order from highest number of occurrences to fewest number of occurrences:

Scientific Name	**Common Name**	**Wetland Indicator Status**
Juncus effusus	Rush, Soft	FACW+
	Grass (unidentified)	--
Carex sp.	Sedge (unidentified)	--
Glyceria grandis (maxima)	Meadowgrass, Reed	OBL
Leersia oryzoides	Cutgrass, Rice	OBL
Scirpus validus	Bulrush, Soft-stem	OBL
Veronica sp.	Speedwell	--
Agrostis alba	Redtop	FACW
Carex vulpinoidea	Sedge, Fox	OBL
Alisma plantago-aquatica	Water-Plantain	OBL
Brassica rapa	Field Mustard	UPL
Cephalanthus occidentalis	Buttonbush	OBL
Eleocharis sp.	Spikerush	--
Pontederia cordata	Pickerelweed	OBL
Scirpus sp.	Bulrush	--

More than 20 plant species were observed within treatment wetland of the BC19 & BC19B Remediation Project.

Wildlife observed in WL1 included frogs, tadpoles, damselflies, water striders, water boatmen, aquatic beetles, and spiders. Evidence of additional wildlife use was observed by the presence of amphibian egg masses, as well as browsing of the buttonbush (*Cephalanthus occidentalis*).

4.0 CONCLUSIONS

The June 4, 2005 wetland monitoring revealed the expected vegetative community based on the wetland plantings conducted in August and September 2004, along with the supplemental planting in June 2005. Significant spread of plants by seeding or vegetative reproduction has not yet occurred, because only a limited portion of a growing season has passed since the wetland planting events took place. Hydrology within the treatment wetland is appropriate for treatment of the mine drainage discharges as well as for vegetative establishment. Water is overflowing across the entire length of the level spreader and is providing a wide sheet flow in the shallow water areas of the wetland below the level spreader. As a result, the level spreader is improving the water quality improvement functions of the treatment wetland by providing broad slow flows (as opposed to short-circuiting preferential flow paths that reduce retention times and treatment potential of the wetland).

The area following the final drop structure and preceding the outlet to Blacks Creek was observed to have the greatest vegetative density and diversity. This may be the result of multiple contributing factors including shallower water levels observed in this location and the remnants of hydric soils from the wetlands disturbed during construction of the passive treatment system.

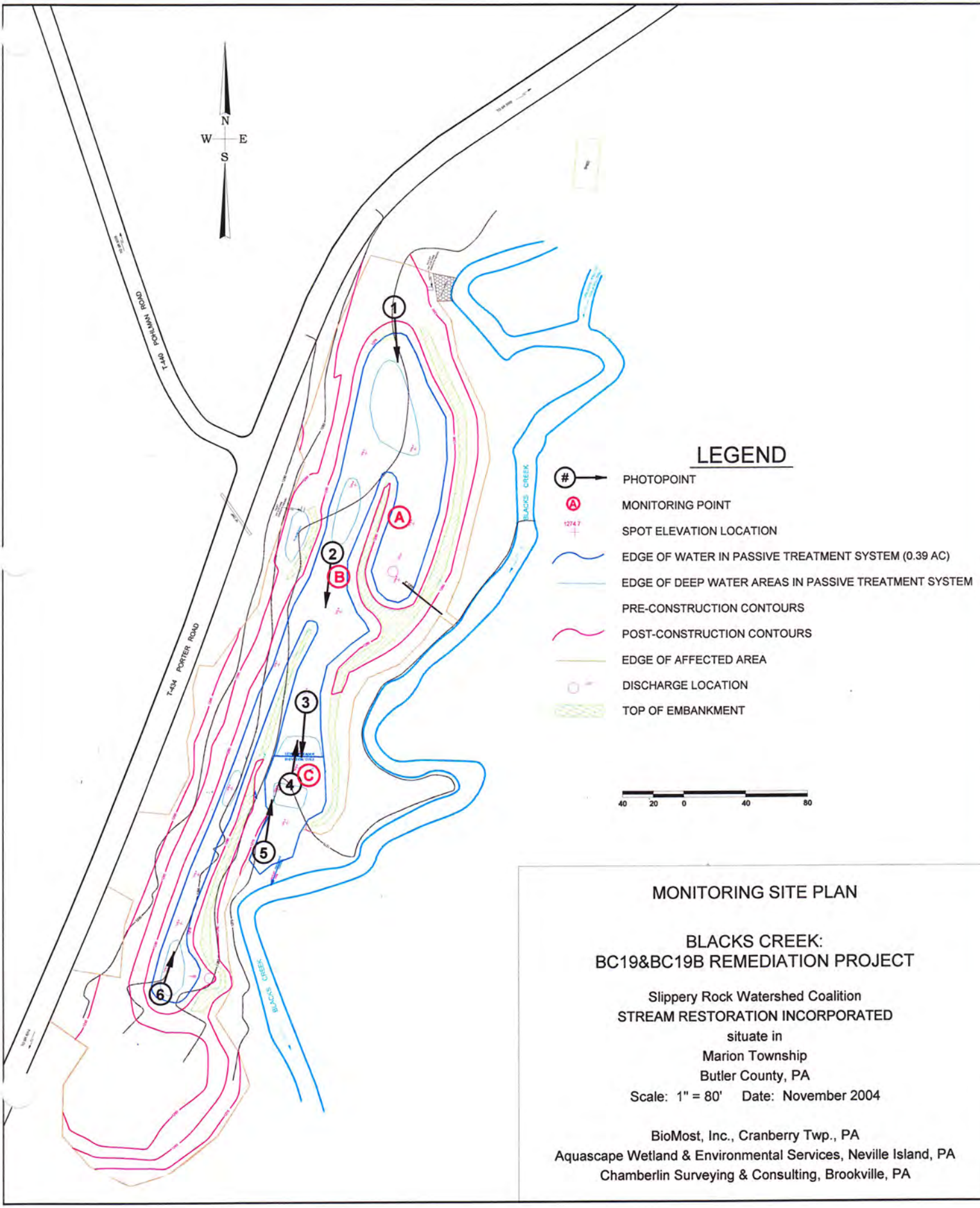
The composition of the vegetation in this area indicates that hydric soils remained from the wetland impacted during the construction of the passive treatment system. As noted in other treatment wetlands within the Slippery Rock Watershed, the use of hydric soils can greatly accelerate vegetative establishment. This area provides additional evidence that when wetlands are to be impacted for abandoned mine drainage remediation projects (and appropriate restoration waivers and/or permits have been obtained from the Pennsylvania Department of Environmental Protection and/or US Army Corps of Engineers), hydric substrates should be salvaged and utilized as the substrate for treatment wetlands and vegetated drainageways within the passive treatment system.

A greater diversity of plant species are able to tolerate the shallow water levels observed in the area following the final drop structure and preceding the outlet to Blacks Creek compared to the several inches of water observed throughout much of the area of the treatment wetland. Limited areas of shallow water are beneficial to increase vegetative density and diversity; however, shallower water decreases the total volume of the treatment wetland, which results in shorter retention times for the mine drainage flowing through a treatment wetland.

As constructed, the treatment wetland of the BC19 & BC19B Remediation Project provides appropriate water depths for vegetative establishment, deposition of precipitates, and for broad, slow flows that avoid short-circuiting through the wetland. Vegetation establishment will continue to be monitored to

observe and document changing conditions over time, which may be used in planning for future treatment wetlands.

Appendix A:
Monitoring Site Plan



MONITORING SITE PLAN

BLACKS CREEK:
BC19&BC19B REMEDIATION PROJECT

Slippery Rock Watershed Coalition
STREAM RESTORATION INCORPORATED
situate in
Marion Township
Butler County, PA
Scale: 1" = 80' Date: November 2004

BioMost, Inc., Cranberry Twp., PA
Aquascape Wetland & Environmental Services, Neville Island, PA
Chamberlin Surveying & Consulting, Brookville, PA

Appendix B:
Photographs

Photo 1: Treatment Wetland of the BC19/19B Remediation Project, Photopoint 1 (6-4-05)

Photo 2: Plunge pool below BC19B discharge, Photopoint 6 (6-4-05)

Photo 3: Observation point A, facing south (6-4-05)

Photo 4: Observation point A, facing north (6-4-05)

Photo 5: Observation point B, Photopoint 2 (6-4-05)

Photo 6: Observation point B, facing north (6-4-05)

Photo 7: Observation point C, facing south (6-4-05)

Photo 8: Observation point C, Photopoint 4 (6-4-05)

Photo 9: Photopoint 3 (6-4-05)

Photo 10: Photopoint 5 (6-4-05)

Appendix C:
Data Forms

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	BC19 & BC19B Remediation Project	Date:	6-4-05
Applicant/Owner:	Stream Restoration Incorporated	County:	Butler
Investigator:	Jeff Reidenbaugh	State:	PA
Do Normal Circumstances exist on the site?	**Yes** No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	Yes **No**	Transect ID:	
Is the area a potential Problem Area?	Yes **No**	Plot ID:	A
(If needed, explain on reverse)			

VEGETATION

	Plant Species	Stratum	Indicator	% Cover		Dominant Plant Species	Stratum	Indicator	% Cover
1.	*Polygonum persicaria*	H	FACW	10	9.				
2.	*Cardamine pennsylvanica*	H	OBL	2	10.				
3.	*Scirpus sp.*	H	--	2	11.				
4.	*Glyceria grandis (maxima)*	H	OBL	2	12.				
5.	*Eleocharis sp.*	H	--	1	13.				
6.	*Lemna minor*	H	OBL	1	14.				
7.					15.				
8.					16.				

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100%

Remarks: Flowering species within the monitoring station included *Cardamine pennsylvanica* and *Glyceria grandis.*

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

X No Recorded Data Available

Field Observations:
- Depth of Surface Water: 5 (in.)
- Depth to Free Water in Pit: -- (in.)
- Depth to Saturated Soil: -- (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- **X** Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- **X** Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- **X** Water-Stained Leaves
- ___ Local Soil Survey Data
- **X** FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS Monitoring Point A

Map Unit Name
(Series and Phase): Drainage Class:

Taxonomy (Subgroup): Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks: No soil pit was excavated, due to innundation

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**Yes**	No
Wetland Hydrology Present?	**Yes**	No
Hydric Soils Present?	Yes	No

Is this Sampling Point Within a Wetland?
Yes No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	BC19 & BC19B Remediation Project	Date:	6-4-05
Applicant/Owner:	Stream Restoration Incorporated	County:	Butler
Investigator:	Jeff Reidenbaugh	State:	PA
Do Normal Circumstances exist on the site?	**Yes** No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	Yes **No**	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse)	Yes **No**	Plot ID:	B

VEGETATION

	Plant Species	Stratum	Indicator	% Cover		Dominant Plant Species	Stratum	Indicator	% Cover
1.	*Sparganium americanum*	H	OBL	5	9.				
2.	*Leersia oryzoides*	H	OBL	2	10.				
3.					11.				
4.					12.				
5.					13.				
6.					14.				
7.					15.				
8.					16.				

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100%

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other
- **X** No Recorded Data Available

Field Observations:
- Depth of Surface Water: 5 (in.)
- Depth to Free Water in Pit: -- (in.)
- Depth to Saturated Soil: -- (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- **X** Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- **X** Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- **X** Water-Stained Leaves
- ___ Local Soil Survey Data
- **X** FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS Monitoring Point B

Map Unit Name
(Series and Phase): Drainage Class:

Taxonomy (Subgroup): Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks: No soil pit was excavated, due to innundation

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**Yes**	No	Is this Sampling Point Within a Wetland?
Wetland Hydrology Present?	**Yes**	No	
Hydric Soils Present?	Yes	No	**Yes** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	BC19 & BC19B Remediation Project	Date:	6-4-05
Applicant/Owner:	Stream Restoration Incorporated	County:	Butler
Investigator:	Jeff Reidenbaugh	State:	PA
Do Normal Circumstances exist on the site?	**Yes** No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	Yes **No**	Transect ID:	
Is the area a potential Problem Area?	Yes **No**	Plot ID:	C
(If needed, explain on reverse)			

VEGETATION

	Plant Species	Stratum	Indicator	% Cover		Dominant Plant Species	Stratum	Indicator	% Cover
1.	*Juncus effusus*	H	FACW+	10	9.				
2.	*Rumex sp.*	H	--	5	10.				
3.	*Glyceria grandis (maxima)*	H	OBL	2	11.				
4.	*Polygonum hydropiper*	H	OBL	2	12.				
5.	*Brassica rapa*	H	UPL	1	13.				
6.	*Alisma plantago aquatica*	H	OBL	1	14.				
7.					15.				
8.					16.				

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100%

Remarks: Flowering species within the monitoring station included *Juncus effusus, Rumex sp., Glyceria grandis, and Brassica rapa.*

HYDROLOGY

Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

X No Recorded Data Available

Field Observations:
- Depth of Surface Water: 0.5 (in.)
- Depth to Free Water in Pit: -- (in.)
- Depth to Saturated Soil: -- (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- **X** Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- **X** Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- **X** Water-Stained Leaves
- ___ Local Soil Survey Data
- **X** FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS Monitoring Point C

Map Unit Name
(Series and Phase): Drainage Class:

Taxonomy (Subgroup): Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks: No soil pit was excavated, due to innundation

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**Yes**	No	Is this Sampling Point Within a Wetland?
Wetland Hydrology Present?	**Yes**	No	
Hydric Soils Present?	Yes	No	**Yes** No

Remarks:

Transect Data Form

Site Name: BC19 & BC19B Remediation Project Date: 6/4/2005
Site Location: Marion Township Butler Co. PA
Investigator(s): Jeff Reidenbaugh

Monitoring Year: 2005 (Year 1, 1st full growing season)

Transect Number: A to PP1 to B

Plant Species		Indicator Status	Total Occurrences	Notes
Juncus effusus	Soft Rush	FACW+	30	F
Glyceria grandis (maxima)	Reed Meadowgrass	OBL	25	F
Leersia oryzoides	Rice Cutgrass	OBL	16	
Scirpus sp.	Bulrush	OBL	12	
Sparganium americanum	Eastern Burreed	OBL	5	
Gratiola neglecta	Clammy Hedgehyssop	OBL	4	F
Carex vulpinoidea	Fox Sedge	OBL	4	F
Cardamine pennsylvanica	Pennsylvania Bittercress	OBL	2	F
Lemna minor	Lesser Duckweed	OBL	2	
Rumex sp.	Dock	--	1	F
Carex sp.	Sedge	--	1	

"F" indicates that flowers, fruiting bodies, or seeds were observed.

Transect Data Form

Site Name: BC19 & BC19B Remediation Project Date: 6/4/2005
Site Location: Marion Township Butler Co. PA
Investigator(s): Jeff Reidenbaugh

Monitoring Year: 2005 (Year 1, 1st full growing season)

Transect Number: B to C

Plant Species		Indicator Status	Total Occurrences	Notes
Juncus effusus	Soft Rush	FACW+	11	F
--	Unidentified grasses	--	11	F
Carex sp.	Sedge	--	9	
Glyceria grandis (maxima)	Reed Meadowgrass	OBL	9	F
Leersia oryzoides	Rice Cutgrass	OBL	7	
Scirpus validus	Softstem Bulrush	OBL	5	
Veronica sp.	Speedwell	--	4	
Agrostis alba	Redtop	FACW	3	F
Carex vulpinoidea	Fox Sedge	OBL	2	F
Alisma plantago-aquatica	Water Plantain	OBL	1	
Brassica rapa	Field Mustard	UPL	1	F
Cephalanthus occidentalis	Buttonbush	OBL	1	
Eleocharis sp.	Spikerush	--	1	
Pontederia cordata	Pickerelweed	OBL	1	

"F" indicates that flowers, fruiting bodies, or seeds were observed.

NEWS ITEMS

SRWC CATALYST Newsletter Items

Date	Article
January 2002	Stream Assessments with the PA DEP
July 2002	Pennsylvania River Sweep
December 2002	TMDL Meeting To Be Held Prior To December SRWC Meeting
January 2003	TMDL Meeting Last Month, a Recap

PHOTO OF THE MONTH

PHOTO OF THE MONTH

Pictured above are members of the PA DEP participating in a stream assessment of Blacks Creek, a tributary to Slippery Rock Creek. **Sherry Carlin** (back left), watershed manager, assists **Tim Gillen** (back right) Hydrogeologist with flow measurements while **Scott Alexander** (front left), Water Pollution Biologist measures pH. Thanks to Sherry, Tim and Scott!!!

Stream Assessments with the PA DEP

Thorough stream assessments are extremely valuable to watershed groups. They help to characterize the ecological health of streams within a watershed which allows you to identify and prioritize problem areas for restoration projects as well as identify those streams which are of good quality.

Scott Alexander, PA DEP Bureau of Mining and Reclamation has been an extremely valuable resource and excellent partner of the Slippery Rock Watershed Coalition. Although not from this area, Scott none the less, has an interest in watershed restoration, AMD issues, and the work of the Coalition. So much so that he is willing, wanting, and able to come all the way out from the Ebensburg office about two hours away to assist us whenever he can.

This past summer and fall Scott assisted **Shaun Busler, Stream Restoration Inc.**, in the assessment of Big Run and Blacks Creek, both tributaries to Slippery Rock Creek. Blacks Creek is affected by abandoned mine drainage and the data collected from the stream assessment will be submitted as part of a Growing Greener grant to reclaim the McIntire site, the prime source of degradation to Blacks Creek.

In addition, **Sherry Carlin** and **Tim Gillen** of the **PA DEP Knox District Mining Office**, came out to assist with the assessment. Just another example of the value of public-private partnerships and what they can accomplish.

Watch For In Next Months Catalyst:
News on the SRWC Symposium in April of 2002

PHOTO OF THE MONTH

The Butler County Juvenile Court System helps out with a wetland planting! Thanks!!!

PHOTO OF THE MONTH

The Butler County Juvenile Court System Plans to Help All Summer

This summer, the Butler County Juvenile Court System, will continue to provide extra help for wetland planting. Each Tuesday, from June 11 to August 27 they will work with Stream Restoration Inc., AquaScape, and Quality Aggregates, planting wetlands and helping with local Growing Greener projects. The Keystone Interventional Program (KIP), Community Intensive Supervised Probation (CISP) Program, and two local judges also plan to help with the planting activities. This is a unique opportunity for the participants to learn and enhance their own lives while assisting with environmental restoration.

Karns City Earth Day

On April 29th, **Bob Beran** and **Laura Spencer** of **Aquascape** participated in the **Karns City Elementary School Earth Day Activities**. Bob and Laura spent the day speaking to Kindergarten through 6th graders on insect biodiversity. The program, put together by staff at Jennings Environmental Education Center, provided the students with many laughs, interesting facts and information to fulfill educational curriculum needs. **Many thanks to: Jennings Environmental Education Center** for providing the power point program, as well as other learning tools, **PA DEP**, especially **Ms. Sherry Carlin**, for providing posters, bookmarks, and magnets for the students, and to **Mrs. Marion Hall** of **Karns City Elementary School** for inviting us to participate in their earth day activities!!

4th Annual AMD/AMR Conference

On June 14th and 15th, the 4th Annual AMD/ AMR Statewide Conference took place at the Penn-Stater Convention Center in State College, PA. **Deanna Treter**, **Steve Short**, and **Chris Treter** represented the SRWC, introducing conference attendees to the reclamation work in our watershed and our recent publication, “Accepting the Challenge.” Seminars introduced conference goers to a variety of new treatment technologies and different forms of Operation and Maintenance for existing treatment systems. The highlight of the conference was a speech by PA DEP Secretary David Hess on Growing Greener and AMR Partnerships. Thanks to all those who attended and came over to learn more about the SRWC!!!!

Pennsylvania River Sweep

On Saturday June 15th, about 30 participants joined the statewide effort to clean our rivers. The participants, including **Shaun Busler, Melissa Busler,** and **Tim Danehy** of the SRWC, removed trash from the Blacks Creek Restoration Area located along Porters Rd., in Marion Twp. Those who were involved in this project include: **Marion Twp. Environmental Advisory Council, SRWC, PA Cleanways of Butler County, and Americorps.** A great time was had by all even though they got a little wet. Thanks to **Sheryl Kelly** and **Deb Bailey** for planning this extremely worthwhile project!!!

THE CATALYST

SLIPPERY ROCK WATERSHED COALITION MONTHLY ACTIVITIES UPDATE

<u>THIS MONTH'S MEETING:</u> Thursday December 12th at 7pm Jennings Environmental Education Center, pizza and pop will be provided. (The TMDL Public Meeting will be held prior to our regular meeting. The TMDL Meeting will begin at 6pm) 11/14/02 Meeting Attendance: T. Danehy, M. Dunn, D. Johnson, C. Cooper, V. Kefeli, C. Denholm, D. Treter, C. Treter, W. Taylor, S. Busler, J. Belgredan, K. Kramer, and F. Brenner

TMDL Meeting To Be Held Prior To December SRWC Meeting!!!

The Department of Environmental Protection is holding a public meeting at 6:00 PM on December 12th at Jennings Environmental Education Center prior to the SRWC monthly meeting to discuss the proposed Total Maximum Daily Load (TMDL) for Seaton Creek and Blacks Creek. The purpose of the meeting is to discuss and accept comments on proposed TMDLs, established in accordance with the requirements of the 1996 Section 303(d) of the Clean Water Act. This is a wonderful opportunity to come out and learn about this process. The regular SRWC meeting will take place following this public meeting.

To request a copy of the proposed TMDL and an information sheet, contact Timothy Gillen, Knox District Mining Office, P.O. Box 669, Knox, PA 16232, (814) 797-1191. E-mail will be received at jmital@state.pa.us

PENNSYLVANIA MAGAZINE Highlights Goff Station Bat Hibernaculum

In the November/December 2002 edition of the **Pennsylvania Magazine** there is an article titled, "**Bats Benefit from Reclaimed Mine Site**." This informative article, with text and photograph by **Michael Dittman**, recognized the Slippery Rock Watershed Coalition for it's efforts in restoring wildlife habitats. The efforts of the public-private partnership were recognized as well as the following other Goff Station project partners: **Quality Aggregates Inc**., **Aquascape Inc**., **DCNR**, **Will Taylor**, and **Jennings Environmental Education Center**. It was wonderful to see the article in a magazine dedicated to current achievements of Pennsylvanians and our rich heritage. It means a lot to us that the work we are doing is being recognized state-wide and that the public can learn about the great things being done in their back yard. Thank you **Pennsylvania Magazine** (PaMag@aol.com, 800-537-2624) for recognizing our efforts and those of our partners!!!

Butler Outdoor Club Annual Dinner!!

On Saturday, November 2nd, SRWC participants **Christopher** and **Deanna Treter** attended the Butler Outdoor Club Annual Dinner. Both Stream Restoration Inc. and the Slippery Rock Watershed Coalition had posters. (See the photo to the right of Deanna Treter manning the SRWC poster.) The evening included a great buffet dinner and silent auction. The speaker was **Kris Wagner** and his topic was "Biking in Snowy Siberia." It was a very interesting presentation about his adventures on Lake Baikal in Siberia. **The SRWC was honored as a finalist in the Butler Outdoor Club Annual Award.** The other finalists honored included: **Joe Burton**, **Daniel Dziubek**, and **Sharon Vogel**. Their year's winner of the Annual Award was **Ronald Rice**. He is president of the Butler chapter of the North Country Trail Association. Congratulations to Ronald and all the finalists!!! Thank you Butler Outdoor Club for inviting us to be a part of this wonderful event!!!

PHOTO OF THE MONTH

Alayna (left) and **Sierra** (right) **Denholm** pose in t-shirts saying "I'm An SRWC Baby!"

PHOTO OF THE MONTH

SRWC Participant to Speak to Grove City College Class about Life Experiences

Valentine Kefeli a soil scientist by training moved to the US from Russia. Valentine speaks 7 languages and has presented in front of international audiences. Valentine will be speaking on January 16th at 9:30 am to a Grove City College intersession class in Room 218 in Rockwell. **Dr. Paul Kengor,** an associate professor of political science at Grove City College, invited Valentine to speak about his native Russia. His topic will be "The Stalin Doctrine of the Totalitarian Soviet State." We wish Valentine the best of luck and we hope that the students take advantage of this opportunity.

TMDL Meeting Last Month, a Recap

At the December 12th SRWC meeting representatives of the PA DEP were present to help explain the TMDL process. Those representatives were: **Tim Gillen, Chuck Yeungling, Lori Odenthal,** and **Elias Heferle**. They presented draft TMDL plans for Seaton Creek and Blacks Creek, which are tributaries to the Slippery Rock Creek, and Fowler Run which is a tributary to Redbank Creek. Participants of the SRWC discussed with them the TMDL process and reviewed copies of the plans.

The PA DEP representatives were very successful in simplifying a complex process, in a "nutshell," TMDL stands for Total Maximum Daily Load and it helps determine the amount of pollutants that can enter the water and still stay within safe water quality standards. The Clean Water Act requires that TMDLs be completed and submitted to the EPA for approval. The nation wide goal for water quality, set by the Clean Water Act, is that all waters are to be "fishable" and "swimable."

If you would like more information about TMDLs or to request a copy of the full report contact Elias J. Heferle at (814) 797-1191 during business hours of 8 am to 4:30 pm or by writing him at the Knox District Mining Office, White Memorial Building P.O. Box 669, Knox, PA 16232-0669 or e-mail at eheferle@dep.state.pa.us. The deadline for written comments is February 4, 2003. They must be postmarked by that date and they can be sent to the address above.

WATER MONITORING

McIntyre 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)	Fe (mg/L)	D. Fe (mg/L)	Mn (mg/L)	D. Mn (mg/L)	Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
905 DN	3/25/2004			7.0	6.7	674	16		48	-35	8.3	4.6	3.4	3.3	1.6	0.0	283	17
905 DN	5/6/2004			7.0	6.9	794	16	74	62	-47	7.6	5.1	3.9	3.7	1.3	0.0	414	8
905 DN	10/18/2004				6.9				78	-29	10.8		7.4		2.0		277	28
905 DN	10/21/2004			6.9	6.9	844	11	79	62	-36	9.3	6.6	5.9	5.6	1.6	0.1	421	17
905 DN	1/12/2005			6.2	6.2	366	6	15	11	3	3.1	1.4	2.8	2.6	1.8	0.2	190	14
905 DN	2/1/2005	Measured	1026		7.1				83	-42	7.4		4.4		1.6		262	16
905 DN	4/6/2005			7.1	7.1	583	13		51	-41	3.9	2.6	2.8	2.7	0.6	0.0	309	5
905 DN	5/9/2005	Measured	1021		7.0				79	-34	5.4		3.7		0.6		250	18
Min			1021	6.2	6.2	366	6	15	11	-47	3.1	1.4	2.8	2.6	0.6	0.0	190	5
Max			1026	7.1	7.1	844	16	79	83	3	10.8	6.6	7.4	5.6	2.0	0.2	421	28
Avg			1024	6.8	6.8	652	12	56	59	-33	7.0	4.1	4.3	3.6	1.4	0.1	301	15
Range			5	0.9	0.9	478	10	64	71	50	7.7	5.2	4.5	3.0	1.4	0.2	232	23

Description:

McIntyre 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)	Fe (mg/L)	D. Fe (mg/L)	Mn (mg/L)	D. Mn (mg/L)	Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
905 UP	5/6/2004			7.0	6.9	778	15	69	55	-42	6.9	5.1	3.8	3.6	1.4	0.1	381	7
905 UP	10/18/2004				6.7				69	-19	11.6		7.7		2.5		294	24
905 UP	10/21/2004			6.6	6.8	823	11	62	55	-35	9.7	7.4	5.5	5.3	1.5	0.2	397	14
905 UP	1/12/2005			6.1	6.0	383	6	15	9	4	2.5	1.5	2.7	2.7	1.8	0.2	185	8
905 UP	2/1/2005	Measured	927		7.0				76	-26	7.9		4.9		2.0		253	24
905 UP	4/6/2005			7.1	7.0	558	13		50	-40	4.1	3.1	2.8	2.8	0.7	0.0	275	4
905 UP	5/9/2005	Measured	931		6.9				75	-31	5.8		3.5		0.7		247	16
Min			927	6.1	6.0	383	6	15	9	-42	2.5	1.5	2.7	2.7	0.7	0.0	185	4
Max			931	7.1	7.0	823	15	69	76	4	11.6	7.4	7.7	5.3	2.5	0.2	397	24
Avg			929	6.7	6.7	636	11	49	56	-27	6.9	4.3	4.4	3.6	1.5	0.1	290	14
Range			4	1.0	1.1	440	9	54	67	46	9.1	6.0	5.0	2.6	1.8	0.2	212	20

Description:

McIntyre 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)	Fe (mg/L)	D. Fe (mg/L)	Mn (mg/L)	D. Mn (mg/L)	Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
BC19	1/28/1997	Estimated	30		6.7				168	0	14.5		7.1		0.0		425	24
BC19	3/11/1997				6.6				190	0	25.7		7.3		0.2		364	36
BC19	3/30/2000	Estimated	40		6.4				170	0	26.2		6.9		0.0		659	36
BC19	6/28/2000				6.4				198	0	27.0		7.6		0.0		467	14
BC19	9/28/2001	Measured	30		6.5				256	0	25.4		7.6					
BC19	11/7/2001	Measured	20		6.5				230	0	28.8		8.5				660	12
BC19	5/6/2004			6.3	6.5	1200	11	180	146	-93	32.2	31.7	7.1	6.7	0.0	0.0	402	16
Min			20	6.3	6.4	1200	11	180	146	-93	14.5	31.7	6.9	6.7	0.0	0.0	364	12
Max			40	6.3	6.7	1200	11	180	256	0	32.2	31.7	8.5	6.7	0.2	0.0	660	36
Avg			30	6.3	6.5	1200	11	180	194	-13	25.7	31.7	7.4	6.7	0.0	0.0	496	23
Range			20	0.0	0.3	0	0	0	110	93	17.7	0.0	1.6	0.0	0.2	0.0	296	24

Description:

McIntyre 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)	Fe (mg/L)	D. Fe (mg/L)	Mn (mg/L)	D. Mn (mg/L)	Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
BC19B	3/30/2000	Estimated	20		6.5				248	0	26.2		7.8		0.0		545	20
BC19B	6/28/2000	Estimated	24		6.4				280	0	30.7		9.3		0.0		574	8
BC19B	3/25/2004	Bucket	25	6.3	6.4	1412			217	-169	32.7	31.3	7.0	6.9	0.0	0.0	496	19
BC19B	5/6/2004	Bucket	35	6.3	6.6	1350	10	258	221	-182	27.4	26.8	6.0	6.0	0.0	0.0	578	21
BC19B	10/18/2004				6.7				242	-84	28.6		7.7		0.0		426	12
BC19B	10/21/2004			6.0	6.6	1350	10	252	220	-148	28.8	28.2	6.1	6.1	0.1	0.1	585	13
BC19B	1/12/2005			6.1	6.5	1365	10	255	247	-130	28.3	9.0	6.8	6.5	0.0	0.0	653	7
BC19B	2/1/2005	Measured	27		6.5				260	-83	25.6		6.7		0.0		448	8
BC19B	4/6/2005			6.0	6.7	1246	10		216	-167	27.4	26.3	7.1	6.8	0.0	0.0	554	3
BC19B	5/9/2005	Measured	27		6.5				260	-83	25.6		6.7		0.0		452	10
Min			20	6.0	6.4	1246	10	252	216	-182	25.6	9.0	6.0	6.0	0.0	0.0	426	3
Max			35	6.3	6.7	1412	10	258	280	0	32.7	31.3	9.3	6.9	0.1	0.1	653	21
Avg			26	6.1	6.5	1345	10	255	241	-104	28.1	24.3	7.1	6.4	0.0	0.0	531	12
Range			15	0.3	0.3	166	0	6	64	182	7.1	22.3	3.3	0.9	0.1	0.1	228	18

Description:

McIntyre 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)	Fe (mg/L)	D. Fe (mg/L)	Mn (mg/L)	D. Mn (mg/L)	Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
WL	10/18/2004				7.2				174	-108	13.0		7.6		0.0		443	18
WL	10/21/2004	Bucket	66	6.9	7.2	1214	12	160	160	-114	8.3	6.0	5.8	5.8	0.2	0.0	476	8
WL	1/12/2005	Bucket	56	7.2	6.9	1060	9	143	140	-111	12.6	9.9	5.5	5.5	0.2	0.0	473	4
WL	2/1/2005	Measured	48		7.2				173	-114	15.1		7.0		0.0		364	36
WL	4/6/2005	Bucket	65	7.3	7.6	12	20		164	-148	4.0	1.3	6.5	6.4	0.0	0.0	751	4
WL	5/9/2005	Measured	66		7.4				173	-131	1.4		4.4		0.0		423	12
Min			48	6.9	6.9	12	9	143	140	-148	1.4	1.3	4.4	5.5	0.0	0.0	364	4
Max			66	7.3	7.6	1214	20	160	174	-108	15.1	9.9	7.6	6.4	0.2	0.0	751	36
Avg			60	7.1	7.2	762	14	152	164	-121	9.1	5.7	6.1	5.9	0.1	0.0	488	14
Range			18	0.4	0.7	1202	11	17	34	40	13.7	8.6	3.2	1.0	0.2	0.0	388	32

Description:

PHOTOGRAPHS

BC 19 discharge entering Blacks Creek. This discharge produces approximately 3,200 lbs/yr of iron and 1,000 lbs/yr of manganese.

BC 19B discharge. This discharge produces approximately 3,100 lbs/yr of iron and 900 lbs/yr of manganese. Blacks Creek is visible in the background.

The flows from the BC 19 discharge pass through a portion of this degraded wetland before entering Blacks Creek.

Tim Gillen, PA DEP Knox DMO, installing a pipe to measure flow from the upwelling of abandoned oil well BC19B.

Plunge pool and culvert for diversion of surface flows from passive treatment system.

Early earth moving with excavator in the area of the BC19B discharge.

Early earth moving with bulldozer in area of the bioswale and berm.

Plunge pool for surface water diversion in foreground. In background, earth moving with bulldozer and excavator in the area near the wetland outlet and berm of the bioswale.

Wetland basin and berm construction near outlet and end of bioswale. Laser level and stadia rod utilized to maintain grades throughout construction.

Excavator constructing berm in the area of the BC19 discharge to direct flows to the drop structure visible in the foreground.

Continued construction of wetland basin and berms in the area of the BC19B discharge.

Excavator grading slope south near the drop structure for the BC19B discharge.

Plunge pool near the BC19B discharge and the bioswale conveying flows to the main basin of the treatment wetland.

Main basin of treatment wetland.

Plunge pool in the main basin of the treatment wetland near the end of the bioswale that conveys flows from the BC19B discharge.

Silt fence located between the outside berm of the treatment wetland and the riparian buffer left adjacent to Blacks Creek.

Main basin of treatment wetland. Facing south from the northern end..

Area of the BC19 discharge within the treatment wetland.

Main basin of treatment wetland. Facing south toward outlet and bioswale..

Drop structure and level spreader. The level spreader maintains consistent water levels within the main basin of the treatment wetland and creates and aerating sheet flow to the lower portion of the treatment wetland. This and other drop structures slow water velocities and allow for accumulation of metal precipitates.

BC19B discharge entering drop structure of the treatment wetland.

Bioswale conveying flows from the BC19B discharge to the main basin of the treatment wetland.

Photo 1a: Photopoint 1, facing south (8-19-04)

Photo 1b: Photopoint 1, facing south (10-13-04)

Photo 1c: Photopoint 1, facing south (6-4-05)

Photo 2a: Photopoint 2, facing south (8-19-04)

Photo 2b: Photopoint 2, facing south (10-13-04)

Photo 2c: Photopoint 2, facing south (6-4-05)

Photo 3a: Photopoint 3, facing south (8-24-04)

Photo 3b: Photopoint 3, facing south (10-13-04)

Photo 3c: Photopoint 3, facing north (6-4-05)

Photo 4a: Photopoint 4, facing north (8-24-04)

Photo 4b: Photopoint 4, facing north (10-13-04)

Photo 4c: Photopoint 4, facing north (6-4-05)

Photo 5a: Photopoint 5, facing north (8-19-04)

Photo 5b: Photopoint 5, facing north (10-13-04)

Photo 5c: Photopoint 5, facing north (6-4-05)

Photo 6a: Photopoint 6, facing north (8-19-04)

Photo 6b: Photopoint 6, facing north (10-13-04)

Photo 6c: Photopoint 6, facing north (6-5-05)

BC19 and BC19B Remediation Project

"A Pennsylvania Growing Greener Initiative"

OPERATION AND MAINTENANCE PLAN

June 2005

Marion Township, Butler County, PA

"A Public-Private Partnership Effort"

Aquascape Wetland & Environmental Services
Beran Environmental Services, Inc.
BioMost, Inc.
Butler County Government
Jennings Environmental Education Center
Kortyna Family
PA Cleanways
PA DEP Knox DMO
Quality Aggregates, Inc.
Stream Restoration Incorporated
Tiche Family

OPERATION AND MAINTENANCE PLAN

This is the Operation and Maintenance Plan for the BC19 & 19B passive treatment system located in Marion Township, Butler County, PA. This project is located along Blacks Creek, which is a tributary of Slippery Rock Creek. The hydrologic order is Blacks Creek → Slippery Rock Creek→ Beaver River. The passive treatment system consists of one aerobic wetland.

The Slippery Rock Watershed Coalition will be responsible for monitoring and minor maintenance of all structures in order for the passive treatment system to continue to function properly. This Abandoned Mine Drainage (AMD) treatment system was designed, based on the best available knowledge and technology at the time and implemented through a public-private partnership effort coordinated by Stream Restoration Incorporated. Design of all structures focused on minimal operation and maintenance compared to conventional chemical treatment systems. In order, however, for these facilities to effectively treat the mine drainage, periodic inspections and maintenance are required. This Operation and Maintenance Plan has been specifically designed and written for this site to be user friendly and easily implemented in order to ensure the long-term sustainable treatment of the abandoned mine drainage at the BC19 & 19B Remediation Project.

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APPENDIX:
PASSIVE TREATMENT SYSTEM O&M INSPECTION REPORT

PASSIVE TREATMENT COMPONENT OVERVIEW

Passive treatment systems use no electricity, require limited maintenance, and use environmentally-friendly materials to such as limestone aggregate and spent mushroom compost to provide cost-effective treatment without the need for harsh chemicals typically used for conventional treatment of mine drainage. These passive treatment systems neutralize the acidity and add alkalinity while providing an environment suitable for beneficial chemical reactions and biological activity to take place. Adding alkalinity raises the pH and subsequently encourages the metals dissolved in the mine drainage to form particulates, which are then retained in the channels, settling ponds and naturally-functioning wetlands. In some cases such as the BC19 & 19B site, there is sufficient alkalinity present within the discharge such that only settling ponds and wetlands are required.

There are several principal types of passive treatment components that can be used, often in series, to treat degraded mine drainage. These components are chosen based upon the drainage characteristics (quality and flow rate), desired chemical or biological reaction, and available construction area. The following is a brief description of the passive treatment technology utilized at the BC & BC19B Remediation Project site.

Wetlands are typically used in passive treatment systems to allow for the oxidation, precipitation, and accumulation of metal solids that occur when alkaline drainage issues from a minesite or after acidic drainage has passed through an alkalinity-generating treatment component. Although many treatment wetlands are angular-shaped, shallow ponds supporting predominantly cattails, they can be designed, built, and planted to look and function as a natural wetland with high species diversity that provides not only treatment but also exceptional wildlife habitat. There is one aerobic wetland at the BC19 &19B passive treatment system.

SITE SPECIFIC INSTRUCTIONS

All who will be involved in the operation of the site should have an understanding of, and the ability to perform, basic routine duties, such as site inspections that include evaluating channels, spillways and passive treatment components as well as water sampling and measuring flows.

PASSIVE TREATMENT SYSTEM O&M INSPECTION REPORT

To maintain the integrity of the passive treatment facility, the site should be inspected at regular intervals and after major precipitation events or other natural/manmade occurrences that may affect the performance or integrity of the structure. Regular site inspections should be conducted on a quarterly basis for the first two years after construction and twice a year thereafter. A qualified person should perform the inspection and complete the appropriate report. (See attached inspection report form.) The inspectors should keep the paper copy of the report in permanent files in chronological order at a specified location. The report data may be posted on-line via the website, www.datashed.org. This can be accomplished by coordinating with Stream Restoration Incorporated, a PA Non-Profit. "Datashed" is a GIS-enabled, user-friendly, on-line database that can easily serve as a valuable tool in the Operation and Maintenance of passive treatment systems.

The report should include the inspection date, the inspector's name, the organization with which the inspector is affiliated, and the start and end time of the actual inspection. The report was designed to be completed in order as the inspector would move about the site; however, any order may be taken as long as all aspects are completed. The following sections contain descriptions that apply to the attached Passive Treatment System O&M Inspection Report.

A. Site Vegetation

Vegetation (i.e. groundcover) is extremely important to provide wildlife habitat and to prevent erosion. Erosion can carry sediment into streams resulting in turbidity and siltation. Sediment entering the passive treatment components can cause plugging or loss of capacity. During the inspection, overall condition of the site vegetation **(section A)** should be observed and numerically rated from 0 to 5. If significant areas are barren, describe the action needed as well as the location. Normal husbandry practices (such as fertilizing, removing unwanted species, etc.) should be implemented, as necessary, to maintain a stable non-erosive ground cover and viable wildlife habitat on the site.

Rating	Description	Recommended Action
0	Site barren	Revegetate as soon as practicable; temporary seeding, install staked straw/hay bales, filter fabric, etc. until stabilization with permanent seed mix
1	Site mostly barren. Only small isolated areas of vegetation	(Same as for "0" rating)
2	Large area(s) barren	Outline approximate area(s) on Site Schematic; revegetate as described for "0" rating
3	Revegetation spotty; erosion gullies present	Outline approximate area(s) on Site Schematic; on poorly vegetated areas, seed, mulch, apply soil amendments, as necessary; install staked straw/hay bales, rip-rap, etc. in gullies to control erosion
4	Successful vegetation >70% groundcover; few, isolated, minor erosion features or areas with <70% groundcover	Identify potential problem areas; note changes on future Inspection Reports
5	Successful vegetation >70% groundcover	No remedial action required

B. Pull Off Area - Site Access

The stabilized pull-off area helps to facilitate maintenance, monitoring, and any educational/outreach programs by providing a safe area to park vehicles off of the public road. (Maintenance associated with the public road is the responsibility of the township.)

On the inspection sheet **(section B)**:

- Does the pull off area need to be maintained (Yes or No)?: Site maintenance is needed if there are fallen trees or debris blocking access, if there is significant erosion, etc.

C. Culverts

The culverts should be maintained and kept free of any obstructions. The culverts should be inspected to make sure that the pipe is undamaged and unplugged. If plugged or if the capacity is substantially decreased, the debris and sediment should be removed and any damage repaired.

On the inspection sheet **(section C)**:

- Do the culverts need to be cleaned, repaired or otherwise maintained (Yes or No)?: Maintenance is needed if: There evidence of flows over or around the culverts; The culverts have been crushed or damaged; The culverts are significantly blocked with debris; Machinery is needed for cleaning. Indicate Culvert 1 (18" CMP) or Culvert 2 (24" N-12).

D. Wildlife Utilization

Wildlife habitat and utilization should be considered. If, however, during inspections, signs of damage are noted, as a result of wildlife, appropriate steps should be taken to continue the function of the passive system and general site restoration. Significant damage needs to be corrected by repairing berms, removing invasive species, replanting, as well as hunting and trapping if necessary (contact PA Game Commission).

On the inspection sheet **(section D)**:

- Animals observed: Although not an inventory, please record whether there were tracks or visual observations of wildlife utilizing the site. Describe any damage observed.
- Invasive plants observed: If invasive or undesirable plants are observed, please note and remove as soon as practicable.

E. Passive Treatment System Inspection

The passive treatment system needs to be inspected for erosion, berm (slope) stability, vegetation, siltation, leaks, etc. Any problem should be noted and corrected as soon as practicable. Water inlet areas for all structures should be observed during each site inspection and kept free from sediment, leaves, and any other foreign objects. This is very important for the efficient operation of the system. Any debris present in the water inlet areas should be removed. All water conveyance structures including pipes should be maintained to assure that they are free flowing and not restricted.

During inspections, the condition of the vegetation and the presence of any disturbed or eroded areas should be noted. Disturbed or eroded areas will need to be stabilized as soon as possible with staked straw/hay bales, riprap, plantings with native species, etc., whichever is appropriate.

On the inspection sheet note the following for the passive system (as applicable):

- Features relating to berm condition (Yes or No): Are the berms stable? Is any slumping noted? Are there erosion gullies on the inside and outside berms? Are there tension cracks on top of the berms? Are there significant areas on the inside and outside berms that need to be revegetated?
- Is there evidence of water overtopping the berm (Yes or No): Is the water level at a point where it may flow over the berm? Is there a high water mark at or near the top of berm elevation?
- Is the wetland short-circuiting (Yes or No): Are there significant channels forming or existing in the wetland? Does it appear that there are significant "dead areas" in the wetland where the water does not seem to be flowing? (Hay bales may be used to eliminate channelization and increase retention time)
- Does the outlet spillway appear to be in good condition (Yes or No): Is the spillway stable (i.e. no slumping)? Are there erosion rills or deeply incised channels present in the spillway? Is there debris present? (Any debris should be removed as soon as possible.) Is there significant sediment from erosion of berms or upland areas accumulating in the spillway?
- Water level control structure (Yes or No): Does the structure appear to be stable? Are there any cracks visible? Is there debris present? (Any debris should be removed as soon as possible.)
- Effluent flow pipe condition (Yes or No): Is the pipe still in place? Does the pipe appear to be in good condition? Has the pipe been crushed or plugged? Is all the water flowing through the pipe? (If the pipe is plugged or the water is otherwise not flowing, the pipe should be cleaned, reset or otherwise repaired to facilitate flow measurements.)
- Sludge removal needed (Yes or No): Has the sludge accumulated to a point where the water may start flowing over the berm? Is there enough sludge that it is creating severe short circuiting that sludge need to be removed to eliminate short-circuiting?
- Maintenance required: Do portions of the berms need to be stabilized with riprap and/or reconstructed? Does supplemental reseeding and mulching need to be completed? Does any sediment or debris need to be removed? Is there any vandalism?

F. Field Water Monitoring and Sample Collection

In order to assess the efficiency and performance of this system, water monitoring of the system should be completed according to the schedule below. If possible, water samples should be taken and analyzed by the PA State Lab or other approved laboratory using standard chemical testing procedures for the following water quality parameters.

Laboratory Water Quality Parameters

pH	**Total Iron**	**Total Aluminum**
Alkalinity	**Dissolved Iron**	**Dissolved Aluminum**
Acidity	**Total Manganese**	**Sulfates**
Specific Conductance	**Dissolved Manganese**	**Total Suspended Solids**

In addition to the laboratory analyses, field tests should be completed including flow (as feasible), pH, temperature, alkalinity, dissolve oxygen, and iron. If water samples cannot be taken for laboratory analysis then, at a minimum, the following field tests should be completed: pH, temperature, alkalinity, and iron.

Water sampling and/or field testing of the identified components on the inspection report **(section J)** will enable evaluation of the degree of success of the passive system in treating the mine drainage.

The monitoring program should include points other than the final effluent in order to provide a complete description of the water quality through the passive treatment system at the time of sampling. For instance, the untreated raw mine water discharges (as close to the source as possible), each component (at the effluent), and the stream (above and below the system) should be monitored. These monitoring point locations are identified on the O&M Inspection Sheet site schematic.

In order to conduct laboratory analysis for pH, alkalinity, acidity, sulfates, conductivity, and total suspended solids, a 500-ml (or other specified volume), unfiltered, sample should be collected, stored in a cooler, and transported to the laboratory. In order to differentiate between dissolved and total iron, manganese, and aluminum concentrations, the laboratory requires two, 125-ml (or other specified volume) samples that are preserved with trace metal-grade nitric acid to ensure that the pH is <2. The sample for total metals is not filtered. The sample for dissolved metals is filtered using a 0.45-μm filter in the field prior to placing the sample in the bottle. Each bottle should be labeled with its own unique number.

A record of every sample taken should be made directly on the inspection sheet. Information such as sampler's name, sample location, sample date, flow rate, field tests, and sample bottle identification will be written on the inspection sheet. Pertinent information is then transferred from the inspection sheets to the laboratory's Record of Sample form or Chain of Custody form.

On the inspection sheet **(section J)** for each Sampling Point:

Monitoring point field measurements recorded:

Parameter	**Method**
Flow	Bucket & Stopwatch (where pipe discharge)
pH	HACH pH kit, pH meter, etc.
Temperature	Field thermometer, pH meter, etc.
Alkalinity	HACH Digital Titrator, etc.
Iron	HACH iron, etc
Dissolved oxygen (optional)	HACH DO kit, DO meter, etc.

Record readings to nearest whole number, except pH (record to nearest tenth). If the discharge is not piped at the monitoring point, no flow is measured. If flow measurement is desired, a weir or flume may be installed.

- Sample bottle data: If water samples are collected, assign and record bottle numbers on the inspection sheet. You will need to transfer this information to the laboratory's Record of Sample or Chain of Custody form.
- Comments: Observations such as color of the sample or other information may be recorded in the "Comments" column.

G. Flow Measurements at Pipes

When collecting samples and/or conducting site inspections, the effluent flow rate from each discharging pipe should be measured using the bucket and stopwatch method or other acceptable method. The bucket and stopwatch method consists of timing (in seconds) the filling of a bucket of known volume (preferably calibrated in gallons). The flow rate in gallons per minute can then be calculated utilizing the following formula:

$$\textbf{Flow (gal/min)} = \frac{\textbf{Gallons}}{\textbf{Seconds}} \times \textbf{60}$$

On the inspection sheet **(Section J)**:

- Pipe discharge: Flows should be taken at each pipe. Flow data (gallons measured and time in seconds) can be entered in and then calculated later. If a pipe is not flowing, a "0" should be placed in the "Gallons Measured" column.
- Maintenance required: If any pipes are broken, plugged or leaking, the condition of the pipe should be documented in the individual components section.

H. Schematic

A site schematic **(section K)** has been provided to orient the inspector to the site and is keyed to the various sections of the inspection report. The schematic can also be used to identify specific locations where maintenance is needed. This is particularly valuable for locations within the site that do not already have a specific identified name and location. For instance, if a section of the site was not well vegetated and experiencing erosion, that area could be circled on the schematic and then a copy or fax could be provided to the person(s) responsible for addressing the issue.

SLUDGE ACCUMULATION

It is recommended that the amount of sludge accumulating within the wetland is regularly noted. The primary purpose of this inspection is to assess the amount of sludge that is accumulating within the passive treatment system. This can give an indication as to how the system is functioning and when action may be needed to remove the sludge from the component. The sludge condition may be noted in Wetland section of the inspection form (Section G).

MISCELLANEOUS MAINTENANCE CONSIDERATIONS

All materials used in repairs should be of equal or better quality and have the same capacity and function as shown on the "As-Built" plans.

Removal and disposal of accumulated precipitate or sediment

Precipitates from chemical reactions and other solids (sludge) will be retained within passive treatment system. This sludge should be removed when the volume of the component is reduced to the point where overtopping of berm may occur in the near future. Inlet and outlets should be kept clear of debris and obstructions. Sludge removal is planned for every fifteen to twenty-five years or as needed. Opportunities may be available to utilize the sludge for metal recovery or the sludge may be allowed to drain/dewater for placement on an appropriate disposal area.

REPLACEMENT

The passive treatment system has been designed with a projected life of up to 25 years based upon available data. Higher flow rates and poorer water quality can substantially affect the design life. Accumulated sludge will need to be removed and additional organic matter may need to be added for the reestablishment of wetland vegetation. Additional plantings may also be necessary. At the time of sludge removal, advances in technology and changes in raw drainage quality and quantity should be considered to determine if revisions to the size and/or design of the system would be advantageous. Replacement considerations include:

- Estimating Best Management Practice (BMP) design life;
- Determining replacement responsibility, including a successor, as necessary;
- Determining approximate costs for the following possible needs:
    - removing accumulated sediments;
    - re-sizing the system to accommodate changed water quality or quantity;
    - recharging organic matter in wetlands;

PASSIVE TREATMENT SYSTEM O&M INSPECTION REPORT

6/2005

Inspection Date:		Project Name:	BC19 & 19B Remediation Project
Inspected by:		Municipality:	Marion Township
Organization:		County:	Butler State: PA
Time Start:	End:	Project Coordinates:	41° 09' 20" Lat 79° 54' 10" Long
Receiving Stream:	Blacks Creek	Subwatershed:	Slippery Rock Creek Watershed: Beaver River

Weather (circle one): Snow Heavy Rain Rain Light Rain Overcast Fair/Sunny Temp(°F): #32 33-40 41-50 51-60 60+

Is maintenance required? ***Yes / No*** If yes, provide explanation:

A. Site Vegetation (Uplands and Associated Slopes)

Overall condition of vegetation on site: 0 1 2 3 4 5 (0=poor, 5=excellent, circle one) (See instructions.)

Does the site have any areas that need to be stabilized? ***Yes / No*** If yes, explain maintenance performed or needed:

B. Pull Off Area – Site Access

Does the pull-off area need to be cleared of debris or stabilized? ***Yes / No***

If yes, explain maintenance performed or needed:

C. Culvert 1 (18" CMP) & Culvert 2 (24" N-12)

Do the culverts need to be cleaned, repaired or otherwise maintained (i.e. are they handling all the water with no significant erosion)? ***Yes / No***

If yes, explain maintenance performed or needed (specify culvert #):

D. Wildlife Utilization

Animal sighted or tracks observed _____

Invasive plants observed _____

Describe any damage caused to treatment system by wildlife (especially muskrats) and required maintenance:

E. Blacks Creek Upstream (905 UP)

Enter pH, temp, alkalinity, flow and other field data as applicable in Section J. If water samples were collected enter bottle numbers.

F. Abandoned Mine Discharge (BC 19)

Enter pH, temp, alkalinity, flow and other field data as applicable in Section J. If water samples were collected enter bottle numbers.

Calculate Flow by subtracting the flow measured at BC19B from the flow measured at Wetland (WL).

Maintenance performed?_____

Maintenance needed?_____

Additional comments?_____

G. Wetland (WL)

Enter effluent pH, temp, alkalinity, flow and other field data as applicable in Section J. If water samples were collected enter bottle numbers.

Berm condition: Stable? ***Yes / No*** Slumping? ***Yes / No*** Erosion rills? ***Yes / No*** Tension cracks? ***Yes / No*** Vegetation successful? ***Yes / No***

Is there evidence of water overtopping berm? ***Yes / No***

Does the wetland appear to be short-circuiting? ***Yes / No*** Were haybales placed? ***Yes / No*** Do haybales need to be placed? ***Yes / No***

Outlet spillway condition: Stable? ***Yes / No*** Erosion rills? ***Yes / No*** Debris present? ***Yes / No*** Significant siltation? ***Yes / No***

Water level control structure (level spreader): Stable? ***Yes / No*** Cracks? ***Yes / No*** Debris present? ***Yes / No*** Debris removed? ***Yes / No***

Effluent flow pipe condition: Pipe present? ***Yes / No*** Good? ***Yes / No*** Crushed? ***Yes / No*** Plugged? ***Yes / No*** Broken? ***Yes / No***

Is all water going through the pipe? ***Yes / No*** If no, was this corrected? ***Yes / No***

Does sludge need to be removed? (if water is overtopping the berm or is about to over top the berm, sludge will need to be removed) ***Yes / No***

Maintenance performed?_____

Maintenance needed?_____

Additional comments?_____

H. Abandoned Mine Discharge (19B)

Enter pH, temp, alkalinity, flow and other field data as applicable in Section J. If water samples were collected enter bottle numbers.

Pipe condition: Pipe present? ***Yes / No*** Good? ***Yes / No*** Crushed? ***Yes / No*** Plugged? ***Yes / No*** Broken? ***Yes / No***

Is all water going through the pipe? ***Yes / No*** If no, was this corrected? ***Yes / No***

Maintenance performed?_____

Maintenance needed?_____

Additional comments?_____

I. Blacks Creek Downstream (905 DN)

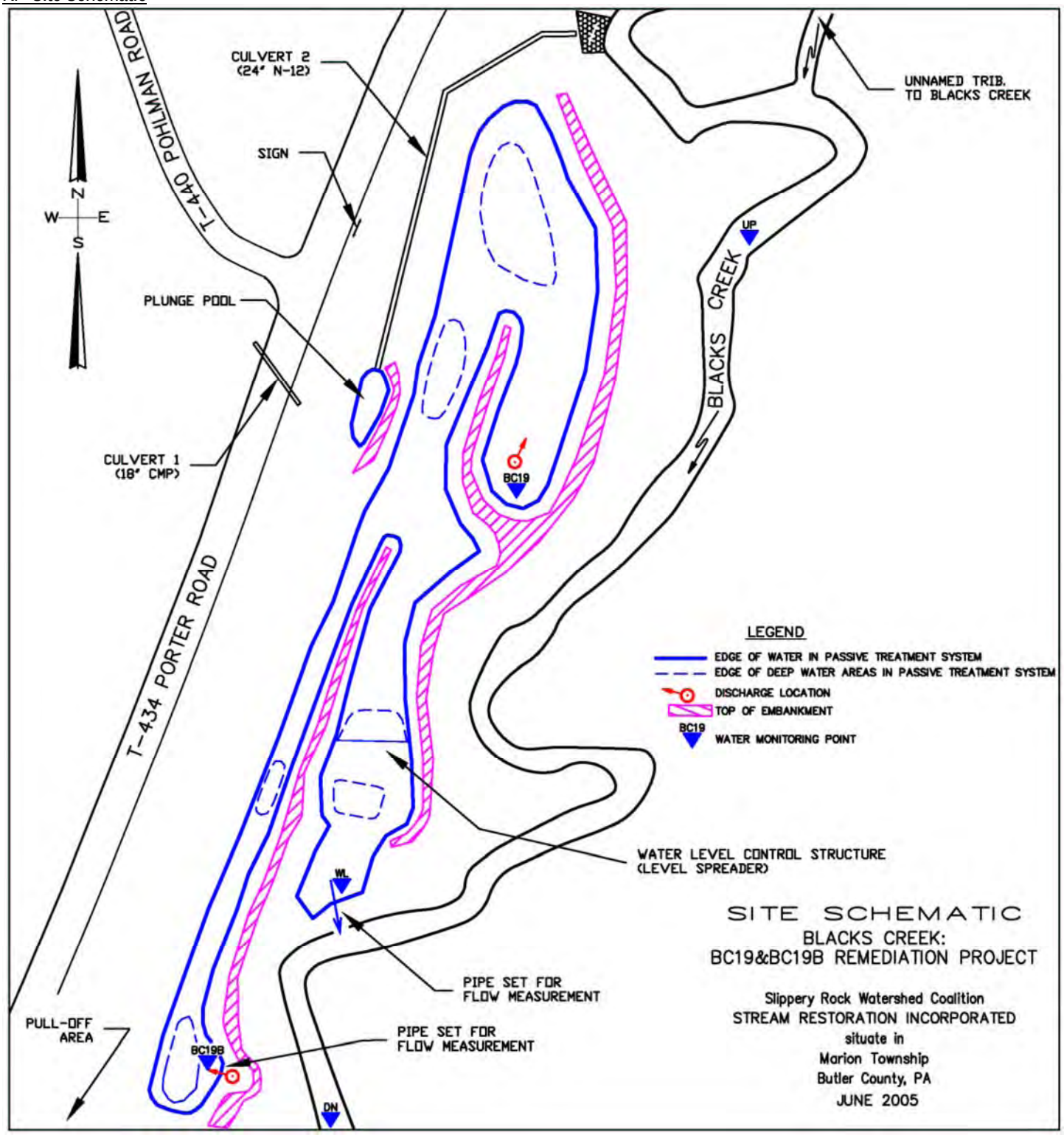
Enter pH, temp, alkalinity, flow and other field data as applicable in Section J. If water samples were collected enter bottle numbers.

J. Field Water Monitoring and Sample Collection

Raw water sample locations as marked on plan. ☐ - Not monitored

Sampling Point	Flow Measurements		Calculated Flow (gpm)	pH	Temp (°C)	Alkalinity (mg/L)	DO (mg/L)	Iron (mg/L)	Comments	Bottle #	Bottle # (total metals)	Bottle # (diss. metals)
	gals	sec.										
BC19												
BC19B												
Wetland (WL)												
905 UP (UP)												
905 DN (DN)												

K. Site Schematic



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Growing Greener
Goals and Accomplishments Worksheets

Project Name BC19 & BC19B Remediation Project

Project Number NW20377 / ME#3521010 County Butler

State Watershed Plan Name and Code Slippery Rock Creek - 20C
(e.g., Clark-Paxton Creeks – 7C)

Date Prepared 6 / 27 / 05 (month/day/year)

This Report is *(choose one)*:

☐ Project Goals

☒ Project Accomplishments *(to be submitted with final report)*

Project Type *(check all that apply)*

☐ Organization of a Watershed Group *(fill out Sheet A*)*

Watershed Assessments and Development of Restoration and/or Protection Plan
(check all that apply and fill out sheet B)*

- ☐ AML/AMD
- ☐ Non-Point Source
- ☐ Assessment
- ☐ Development of Restoration Plan
- ☐ Development of Protection Plan

Implementation of Watershed Restoration and/or Protection Project
(check all that apply and fill out Sheets C, D, E, F, and G)*

- ☒ AML/AMD
- ☐ Oil and Gas
- ☐ Non-Point Source
- ☐ Restoration
- ☐ Protection

☐ Demonstration *(fill out Sheet H*)*

☐ Education/Outreach *(fill out Sheet I*)*

*Please fill out all the appropriate information on the sheets corresponding to your project type. Leave blank any sheets or information on the sheets that do not apply to your specific project. If you have any questions call the Grants Center at 717-705-5400.

Receiving Stream Blacks Creek (Tributary to Slippery Rock Creek, Marion Twp., Butler Co., PA) name/location

Receiving Stream Benefits

Upstream Quality		Downstream Quality	
Before	**After**	**Before**	**After**
Iron 14.53	6.83 mg/L	Iron 7.65	6.40 mg/L
pH 6.52	6.56 S.U.	pH 6.65	6.74 S.U.
Acid 0	0 mg/L as $CaCO_3$	Acid 0	0 mg/L as $CaCO_3$
Alk 78.58	75.60 mg/L as $CaCO_3$	Alk 88.00	80.80 mg/L as $CaCO_3$
Al 1.42	1.33 mg/L	Al 1.30	1.12 mg/L
Mn 7.85	4.18 mg/L	Mn 7.15	4.05 Mg/L

AMD Treatment

- ☐ Anoxic Limestone Drain _____ tons Limestone(LS)
- ☐ Successive Alkalinity Producing System (SAP)
  _____ tons (LS) _____ tons organic matter
- ☒ Wetlands 0.39 aerobic acres
  _____ anaerobic acres
- ☐ Diversion Wells _____ #
  _____ total LS capacity
- ☐ Settling Ponds _____ # _____ capacity (gpm)
- ☐ Limestone Channel _____ ft. OLC _____ ft. MOLC
- ☐ Limestone Dosing/Dumping _____ tons LS
- ☐ Reverse Alkalinity Producing Systems _____ #
- ☐ Bactericide Remediation _____ lbs/acre
- ☐ Beneficial Use of Dredged Material _____ tons
- ☐ Manganese Oxidizing Bacteria Systems _____ #

Total Treated Flow Rate

60 gpm average 66 gpm high

Predicted lifespan of system 25 years

Sludge Capacity 25 years

Contaminants removed/Contained by system (average)

Iron 11.7 ppd Al 0 ppd

Mn 0.8 ppd Acid 0 ppd

Excess Alkalinity added 0 ppd

pH change 6.5 influent 7.2 effluent

AML

- ☐ Openings Closed _____ #
- ☐ High Walls Removed _____ Feet
- ☐ Land Remined _____ Acres
- ☐ Wildlife Habitat Improved _____ Acres
- ☐ Trees Planted _____ #
- ☐ Sealing Mine Portals _____ #
  _____ wet or dry seal
- ☐ Revegetation _____ acres
- ☐ Grout Injection _____ tons
- ☐ Mine Capping _____ acres

Oil and Gas

Wells Plugged _____ #

Total Flow Before _____ gpm

Total Flow After _____ gpm

Contaminants Removed/Prevented

Iron _____ (ppd) pounds per day

Acidity _____ (ppd)

Alkalinity _____ (ppd)

Wildlife Habitat Created _____ acres

Describe Activities to Date: The BC19&BC19B Remediation Project involved construction of a treatment wetland for two discharges of mine drainage that flow into Blacks Creek within the Slippery Rock Creek Watershed in northern Butler County. Prior to construction, approximately 30 volunteers joined in the removal of a trash dump from the project area as part of the statewide Pennsylvania River Sweep. Following construction of the passive treatment system, wetland plantings were conducted on August 24, 2004 and September 2, 2004. A volunteer wetland planting was also conducted on June 4, 2005 to supplement vegetation establishment within the wetland. The treatment wetland is preventing approximately 4,286 lbs/year of iron and 276 lbs/year of manganese from entering Blacks Creek. Participants in the Slippery Rock Watershed Coalition are continuing to monitor the treatment system and Blacks Creek beyond the term of the grant for the BC19 & BC19B Remediation Project.

Sheet G

Streams

Name of Project: **BC19 & BC19B Remediation Project** **303D Listed** ☒ Yes ☐ No

Chapter 93 Designation
☐ WWF ☒ CWF ☐ TSF
☐ HQ ☐ EV

Riparian buffers installed _____ length (ft) _____
avg width (ft) _____ _____ type (trees, shrubs, grasses)
(Report both sides of stream if appropriate)

Latitude 41deg 09' 47" Longitude 79deg 55' 7"

Prior land use where established Wooded, scrub-shrub riparian type

Filter Strips installed _____ length (ft) _____ avg width (ft)

Land use where established _____ type

Stream bank protection with fencing _____ length (ft) _____ avg. width (FT)

Stream bank protection without fencing _____ length (ft) _____ avg. width (FT)

Sheet G

Barerooted plantings ☐ _____ type/species (trees, shrubs, grasses)

Container grown plants ☒ 60 trees and shrubs, approx. 500 herbaceous (not including transplants) type/species (trees, shrubs, grasses)

Protected root stock ☐ _____ type/species (trees, shrubs, grasses)

Weed control ☐ _____ type/species (trees, shrubs, grasses)

Invasive species removed ☐ _____ type/species (trees, shrubs, grasses)

Dams removed _____ number _____ length (ft) _____ height (ft)

Fluvial Geomorphology (FGM) _____ (ft)

Stream channel restoration _____ length (ft)

Fish structures _____ number _____ type

Rootwads ☐ _____ length

J-hook vanes _____ ☐ _____ number

Trash removed 2 tons 1 number of sites

Protection Measures Implemented (describe below)

Please describe activities to date: (include sources of technical assistance)

The BC19&BC19B Remediation Project involved construction of a treatment wetland for two discharges of mine drainage that flow into Blacks Creek within the Slippery Rock Creek Watershed. Prior to construction, approximately 30 volunteers joined in the removal of a trash dump from the project area as part of the statewide Pennsylvania River Sweep. Following construction of the passive treatment system, wetland plantings were conducted on August 24, 2004 and September 2, 2004.

Wetlands

Existing Site Conditions

Are wetlands present on the site? ☒ Yes ☐ No

If present, what are the types and acreages:

Type:	Size:
☐ PEM (palustrine emergent)	
☒ PSS (palustrine scrub/shrub)	0.4
☐ PFO (palustrine forested)	
☐ POW (palustrine open water)	
Total Size:	0.4

Are any water course(s) affected by the project? ☐ Yes ☐ No

If affected, what are the Ch. 93 Classification(s):

☐ WWF (Warm Water Fishery) ☐ CWF (Cold Water Fishery) ☐ TSF (Trout Stocks) ☐ HQ (High Quality) ☐ EV (Exceptional Value)

What is the contributing drainage area to the wetland project (in acres)?

Approximately 1 acres

What is the predominant land use in the contributing drainage area?

wooded

Are prior Converted Wetlands Areas Present? ☐ Yes ☒ No

Sheet G

Wetland Protection/Restoration/Creation Projects

Hydrogeomorphic Classification of Wetland
(stream areas are considered riverine):

Existing Wetland Acreage Impacted (0.0): Type	Size	Acreage Restored or created (0.0): Type	Size
☐ PEM		☒ PEM	0.3
☒ PSS	0.4	☐ PSS	
☐ PFO		☐ PFO	
☐ POW		☒ POW	0.1

Latitude _____ Longitude _____ Latitude _____ Longitude _____

Enhancement/Functional Gain Projects

Hydrogeomorphic Classification of Wetland
(stream areas are considered riverine):

Enhancement Activity Type	Size of area affected (0.0)
☐ Streambank Fencing	
☐ Wetland Fencing	
☐ Exotic/Invasive Sp. Cont	
☒ Hydrologic Manipulation	0.4
☐ Other	

Other Desc.: _____

Latitude _____ Longitude _____

Please describe activities to date:

The existing wetland was degraded by the presence of abandoned mine drainage discharges. The existing wetland was impacted to allow for construction of a treatment wetland to manipulate the hydrologic manipulation of the discharges to provide effective treatment before flows enter Blacks Creek.

Education Project / Outreach

Schools reached		number
Children reached		number
Adults reached	30	number
Brochures distributed		number
Newspaper/Newsletter articles	4	number
Radio/TV spots		number
Magazines		number
Web site hits	3	number
Training sessions held		number
		attendance
Workshops held		number
		attendance

Describe your efforts to date:

On June 15, 2002, approximately 30 volunteers joined in the removal of a trash dump from the BC19/19B Remediation Project as part of the statewide Pennsylvania River Sweep. Project Partners involved in the cleanup included Americorps, the Marion Township Environmental Advisory Council, PA Cleanways of Butler County, and Slippery Rock Watershed Coalition participants.

Slippery Rock Watershed Coalition participants have also constructed and installed blue bird boxes and a wood duck box in the project area, and participated in supplemental wetland planting and monitoring event of the treatment wetland at the BC19 & BC19B Remediation Project.