G E O R G E S C R E E K

Watershed **R**estoration **A**ction **S**trategies

P L A N

June 2002

IDEAS FOR TODAY AND TOMORROW.

Georges Creek
Watershed Restoration Action Strategies Plan

This plan was developed through a cooperative effort of federal, state, and local agencies, non-profit organizations, and the citizens of the Georges Creek Watershed. This project has been funded in part by a Section 319 Clean Water Act Grant from the U. S. EP A. Although, the EP A funds this Program, the contents of this report do not necessarily reflect the opinion or position of the EPA.

Special thanks are extended to the members of the Georges Creek Watershed Association who donated their time and ideas to this planning effort.

Abstract

The Georges Creek Watershed Restoration Action Strategies Plan has been developed by a steering committee comprised of representatives from both the public and private sector. This plan is intended to serve local decision-makers as a guide to planning, developing, and implementing comprehensive meaningful restoration projects that are a part of a larger watershed-wide approach. Listed within this plan are twelve problem categories divided into two large groups; water quality, and water quantity. Each problem category contains a brief problem description, associated data, and action examples. In the last section of this plan *"What Steps Do We Take To Get There?"* the Action Plan can be found. This Action Plan details next step items for the community to engage in. This section of the plan provided action items that the community can engage in making their vision of the Georges Creek Watershed a reality.

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EXECUTIVE SUMMARY

I. THE CHALLENGE

The Georges Creek valley, located in the rugged Allegheny Mountain coal-mining region of Western, Maryland, is rich in both cultural history and natural history. The area is also confronted by two challenging water resource problems that negatively impact the quality of life and economic climate for area residents. Two of the most challenging resource problems are 1) poor water quality due to non-point and point source pollution and 2)destabilized stream channels and stream banks, which are exacerbated by chronic flooding. For the past few decades various public and private entities have undertaken numerous initiatives to address each of these issues independently, and although progress has been made on a site-specific basis, only partial success has been achieved in developing long-term watershed-wide solutions.

The Georges Creek watershed is a Category I and Selected Category 3 Priority Watershed (*Maryland Clean Water Action Plan: Report of Unified Watershed Assessment, Watershed Prioritization and Plans for Restoration Action Strategies, 1998).* The Georges Creek Basin is seventy square miles in area and contains more than one hundred linear stream miles in the mainstem and tributaries. Located in the western Maryland, the Georges Creek watersheds occupies portions of eastern Garrett County and western Allegany County. Georges Creek has its headwaters in Frostburg, Maryland and flows in a southwest direction into the North Branch of the Potomac River at Westernport.

II. PROJECT HISTORY/BACKGROUND

In February of 1999, the PROJECT IMPACT Neff Run Planning Workgroup was organized consisting of federal, state, local, and non-profit entities. The Workgroup used a collaborative planning approach to project development, working closely with public, private, and non-profit entities. The Neff Run Restoration Plan was completed in the spring or 2000, and has served as a template for the Georges Creek WRAS Plan.

The lead agency for this project was the Allegany County Department of Public Works. Numerous partners served on a steering committee and various workgroups. The County, along with its partners, has developed and overseen the various stages of plan completion and implementation.

III. PURPOSE AND BENEFITS

The purpose of the Georges Creek Watershed Restoration Action Strategies Plan is to outline a multi-objective, community based strategy for protecting and enhancing the resources of the Georges Creek watershed. The Strategies Plan will build on past successes and expand the current knowledge of stream restoration and corridor management options by integrating the technical resources and expertise of various resource management and flood mitigation planning professionals. This type of plan will help the general public and local government set priorities, plan projects, and make sound

decisions regarding the future of the Georges Creek watershed. From the conception through the implementation stage local citizens and interest groups will play a key role in decision-making policy formation ensuring that all who are affected by this plan will benefit.

The Georges Creek Watershed Restoration Action Strategies Plan will not be a static document, but dynamic in nature. The plan will be a work in progress that will continue to mature and evolve over-time as new information and ideas become available.

IV. PLANNING APPROACH

A steering committee comprised of members from both the private and public sectors has overseen development of the Georges Creek Watershed Restoration Action Strategies Plan. From this steering committee, smaller workgroups were formed in order for small groups to work on different aspects of the plan. The workgroups included: mapping, public outreach, monitoring & assessment, plan development, and grant & special projects.

This plan is based upon data obtained during the Stream Corridor Assessment, which was a general assessment of problems such as water quality, water quantity, and habitat denigration throughout the Georges Creek Watershed, and information obtained from various public meetings. Also, background information and data was obtained from the Georges Creek Characterization produced by the Maryland Department of Natural Resources and written by Ken Shanks, MD DNR.

BACKGROUND

HISTORY

The Georges Creek watershed was settled in 1837 as a result of the Georges Creek Coal and Iron Company establishing a work site in the area near present day Lonaconing. Subsequently, additional towns began to develop around the coal mining operations. Mining reached its peak in the early 1900's and by 1910 employment in the mining industry totaled over 5,000 people in the Georges Creek Basin. By 1950 employment dropped to below 500 miners, and today mining employment remains near the same level. Between 1950 and 1980, county records indicate a shift in population away from older settled areas in Cumberland and Georges Creek communities to suburban development in LaVale, Frostburg, and the Cresaptown-Rawlings area. Due to population shift and lack of industry, the Georges Creek area has continued to decline both in population and economically.

Georges Creek has been impacted by mining, transportation, and improper residential development to the point that it no longer is able to maintain even a limited amount of stream stability. Poor water quality in the Georges Creek watershed primarily due to Acid Mine Drainage (AMD), and Combined Sewer Overflows (CSO) in the upper portion of the watershed. Current assessments indicate that about one third of the watershed's stream miles have degraded water quality associated with AMD. Surprisingly, Georges Creek also maintains some high quality aquatic habitats. These areas are isolated from each other due to the presence of AMD seeps throughout the watershed and CSO outfalls in the upper portion of the watershed.

MORE RECENTLY

For more than a decade Allegany County, MD has seen the need for an integrated planning approach to deal with the myriad of problems found within the Georges Creek Watershed. In the past, as one problem was identified and targeted, another problem would occur, barely giving officials and residents alike time to assess, take action, and reflect. The two floods of 1996 exemplify this concept. The first occurred in January and the second in September. As a result a cycle of dealing with problems based upon factors such as: citizen complaint, county official request, and difficulty of solving became the standard criteria for selecting projects. Allegany County residents and officials decided that an alternative existed, a way of breaking the cycle of engaging in site-specific projects without the benefit of analyzing watershed-wide problems and solutions.

In February of 1999 funding was made available through FEMA's PROJECT IMPACT program. The funding was for a pilot project that would enable the County to engage in an interdisciplinary, comprehensive planning initiative for the Neff Run Watershed; a small tributary of Georges Creek. Subsequently, the Neff Run Workgroup was organized. The Workgroup consisting of federal, state, local, and non-profit entities used a collaborative planning approach for the development of both the restoration plan and resulting implementation projects. Members of the Workgroup worked closely with

public, private, and non-profit partners, including the Appalachian Laboratory, and the newly formed Georges Creek Watershed Association. The result of this planning effort was the Neff Run Watershed Restoration Plan, which highlighted the findings of the Workgroup and its many partners. The plan provided background information, analysis of existing problems, and recommendations for improving watershed health. The plan also included information pertaining to a restoration project for the entire Neff Run Watershed. Phase I of the Neff Run Watershed Restoration Project was completed in January 2002, with Phase II to begin in the Summer of 2002. As a result of the Neff Run Restoration Plan in conjunction with the Restoration Project the effectiveness of multi-objective watershed restoration activities was demonstrated.

The success of the Neff Run Restoration Planning Initiative spurred the County into seeking funding for a Restoration Plan that would encompass the entire Georges Creek Watershed. The County applied for funding through the Maryland Department of Natural Resources (DNR) in December 2000 to complete a two-year comprehensive planning initiative in order to develop a Watershed Restoration Action Strategies Plan for the Georges Creek Watershed.

This WRAS plan is intended to provide guidance to citizens, government agencies, and other interested groups for the restoration and conservation of the Georges Creek Watershed. The anticipated outcomes from this planning initiative include identification of:

1. areas to reduce or eliminate acid mine drainage and non-point and point source pollution,
2. ways to increase species diversity and productivity,
3. ways to increase vegetative communities along the banks of Georges Creek and it's tributaries
4. areas where channel capacity can be increased
5. non-structural flood protection measures in floodprone areas, and
6. means of restoring stream stability to reduce excessive sediment transport and deposition.

WRAS STEERING COMMITTEE

The Georges Creek WRAS Steering Committee was formed in November, 2000. The Steering Committee is composed of thirty members from both the public and private sector. The Steering Committee has met on a quarterly basis since its formation.

STEERING COMMITTEE MEMBERS

The Honorable Craig Alexander
Mayor, Town of Midland

David Cotton
Maryland Department of Planning

Katharine Dowell
Maryland Department of Natural Resources

Warren Foote
Town of Lonaconing

Craig Hartsock
Allegany Soil Conservation District

Joseph Hoffman
Interstate Commission on the Potomac River Basin

William Kenny
Kenny Markets

Connie Lyons
MDE, Bureau of Mines

Joe Mills
MDE, Bureau of Mines

Alison Rice
Allegany County

The Honorable Donald Smith
Town of Westernport

Frank Williams
Waste Management Inc.

W. Stephen Young
Allegany County

William Richmond
Georges Creek Watershed Association

Tammy Davis
MDE, Bureau of Mines

Terri Belasco
Georges Creek Watershed Association

Fred Crozier
Maryland State Highway Administration

Keith Eshleman
Appalachian Laboratory, University of Maryland

Jeffrey Griffith
United States Geological Survey

James Kahl
Maryland Department of the Environment

Paul Kahl
Allegany County

Ursula Lemanski
National Parks Service

Virginia McGann
Maryland Emergency Management Agency

William Parrish
Maryland Department of the Environment

Benjamin Sansom
Allegany County

Andrea Walker
United States Army Corp of Engineers

John Winner
Town of Lonaconing

Larry Lubbers
Maryland Department of Natural Resources

Alan Klotz
Maryland Department of Natural Resources

Roger Thomas
Natural Resources Conservation Service

The members of the Georges Creek WRAS Steering Committee divided themselves into five workgroups. The five workgroups meet on an as needed basis. The five workgroups are as follows:

- Plan Development
- Mapping
- Watershed Assessment & Monitoring
- Grants & Special Projects
- Public Outreach

Plan Development:

Developed Georges Creek WRAS brochure. Reviewed and discussed plan layout and draft development.

Mapping:

Provided base maps for the Georges Creek Stream Corridor Assessment Survey. Discussed with Allegany County the possibility of ordering ortho photos and topography for the Garrett County portion of the watershed.

Watershed Assessment & Monitoring:

Collected and reviewed data as it was collected for the Stream Corridor Assessment. Discussed various issues and developed a strategy for monitoring and evaluation.

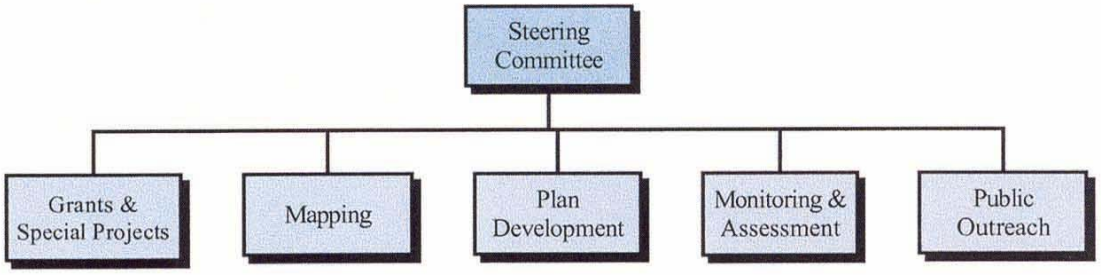
Grants & Special Projects:

Identified and discussed various problems found within the watershed. Proposed potential projects and associated funding sources.

Public Outreach:

Coordinating Watershed Tour for Public Officials (June 2002). Coordinating Watershed Awareness To Encourage Restoration (WATER) Days for area students scheduled for the fall of 2002.

ORGANIZATION CHART
Georges Creek Watershed Restoration Action Strategies



VISION STATEMENT

Knowing where you have been is vital in knowing were you want to be. Through numerous public meetings with the Georges Creek Watershed Association and the people who have worked diligently over the last decade to improve conditions in the Georges Creek area a picture has been formed in our minds that returns Georges Creek's vitality and health.

We envision a reduction and where possible the elimination from impact of Acid Mine Drainage and Combined Sewer Overflows. We envision healthy streams and tributaries that support a diversity of fish and other aquatic organisms; a community that aids in the development of activities and projects that result in the reduction of flooding impacts. We envision a trail and greenway system starting in Frostburg, MD and ending at the Potomac River in Westernport. We envision numerous public access points where fisherman, school children, and families will be able to enjoy and appreciate the stream. We envision a healthy community where citizens, public officials, scientists, and planners work side-by side to identify and address issues related to resource protection and quality of life.

By changing public perception of Georges Creek and striving to meet the goals and objectives formed by the community in the Watershed Restoration Action Strategies Plan for the Georges Creek Watershed, our vision will become reality.

PLANNING OBJECTIVES

Planning Objectives	Description	Status
1. Organize a steering committee to oversee plan development.	Twenty-seven member committee formed. Membership comprised of federal, state, local agencies, private, and non-profit entities.	Completed 11/00
2. Locate, collect, and review existing federal, state, and local data.	Draft Characterization developed by MD DNR – Kenneth Shanks WRAS Plan Reference List	Completed 02/01 Completed
3. Interpret available historic data for the verification of habitat losses (trends) overtime and approximate amounts.	Appalachian Laboratory	Completed 08/01
4. Identify floodprone areas and mitigate future losses.	Allegany County Flood Mitigation Plan	Adopted 09/99
5. Evaluate public access opportunities. Determine public needs and existing use of areas.	Map & Chart of existing public land produced	Completed 10/01
6. Determine ground water & surface water availability.	Allegany County Water & Sewer Plan	Draft 03/02
7. Develop a matrix of prioritized restoration sites.	WRAS Steering Committee	04/02
8. Develop an integrated restoration plan for the Georges Creek watershed with recommended actions to address water quality, acid mine drainage, flooding, habitat and stream stability issues.	WRAS Steering Committee	05/02

DEMONSTRATION PROJECTS

Location	Problem Description	Source and/or Cause	Possible Solutions
Mill Run Below Barton, MD	1. Degraded stream bed 2. Lack of vegetation 3. Waterfall at confluence with Georges Creek 4. Channelization 5. Acid Mine Drainage	1. Channel alterations due to residential development. 2. Lawns mowed to stream bank edge. 3. Reynolds Road 4. Residential development 5. Two AMD Sites	1. Installment of rock vane weirs to create step pools. 2. Stream bank planting and public education. 3. Construct wetlands to improve water quality of feeder streams 4. Use of geomorphologic design to restore stream. House acquisitions. 5. Installment of lime dozer and other AMD abatement projects.
Neff Run Pilot Project	1. Degraded stream bed 2. Lack of Vegetation 3. Fish Blockages 4. Pipe Outfalls 5. Channelization 6. Acid Mine Drainage 7. Erosion sites	1. Channel alternations due to residential dev. and infrastructure. 2. Lack of vegetative buffer. 3. Pipe outfalls undercut and improperly designed. 4.Designproblems 5. Infrastructure 6. Preston property & Mathews Run 7. Steep banks & lack of vegetation	1. Insallation of rock vane wiers to create step pools 2. Vegetative plantings. 3. Redesign rock vane weirs and culverts. 4. Redesign 5. Geomorphic design practices 6. Preston well sealed, Alkaline Leach Bed & Limestone Sand Afflication Planned 7. Planting and sloping of streambanks
Oakhill Project	1. Gob pile 2. Acid Mine Drainage	1. Gob Pile removal & bank stabilization 2. Treat AMD coming from tributary 3. Elevated pH level in Georges Creek	1. Removal of coal mining waste 2. Construct a series of “SAPPS” cells (limestone filled beds) 3. Additional alkalinity in Georges Creek

Where are we now?

COMMUNITY ASSESSMENT/PROFILE

The Georges Creek Watershed Association (GCWA) participates in monthly public meetings at the Shaw Mansion Inn in Barton, Maryland. At these meeting various watershed issues are discussed along with potential solutions, and subsequent project development. As such at the monthly meetings of the GCWA a community assessment/profile was conducted. Topic areas included: community assets/liabilities, major facilities found within the watershed, and local recreation/attractions. At one of their monthly meetings the following list was compiled:

- Assets in the community:

PEOPLE
Boy Scouts
Church Groups
Dan's Mountain State Park
Public Works Facilities & Staff
Retired People
Appalachian Laboratory
Frostburg State University
Bureau of Mines
Public Water & Sewer Systems
Watershed Association
Local Schools (3)
Mayors of the Four Communities
Town Councils
Volunteer Fire Departments
Board of Education
Trout Unlimited
State Highway Administration
Private Companies

- Liabilities:

Stream Channel Degradation
Reclamation Areas
Railroad Bridges
Steep Slopes
Low Income
Illegal Dumping
Acid Mine Drainage
Poor Land Use
Highway Encroachment
Deep Mine/Surface Mining
Waters Supply
Floodplain Encroachment
Poor Land Use Ordinance Enforcement
Combined Sewer Overflows

- Recreation in Area:

Fishing
Hunting
Dan's Mountain State Park
Dan's Mountain Wildlife Management Area
Dan's Rock Scenic Overlook
Westernport Greenway Park (Creekside Park)
Lonaconing Greenway Park
Midland Ballfield
Westmar High School Field
Barton Little League Field
Lonaconing Little League Field

Town Parks (Midland, Lonaconing, Barton, Westernport)
Savage River State Forest

- Major Facilities:
  Dan's Mountain State Park-Pool
  Westmar High & Middle School, Georges Creek Elementary, Westernport Elementary, Beall High School, Beall Elementary, and Frost Elementary
  Three Water Treatment Plants, Lonaconing System
  Frostburg State University
  Koontz, Elk Lick, Charlestown Reservoirs
  Town Hall (Midland, Lonaconing, Westernport, Barton, Frostburg)
  Moran Manor Nursing Home
  Egle Nursing Home
  Fire Hall (Midland, Barton, Lonaconing, Westernport, Shaft)
  State Highway Maintenance Facility (Westernport, Frostburg)
  Mountainview Landfill
  Communications Towers (Dan's Rock)
  Numerous Strip Mine Sites
  Coal Loading Facilities
  Allegany County Roads Maintenance Facility
  Georges Creek Watershed Water Treatment Plant

- Data:
  Population:~13,000
  Average Medium Income: $21,481
  Average Age: 35.9
  Local Media Outlets-News 25 Alive, Cumberland Times News, WTBO, WCBC, GO106, Q94

The Compilation of this information aids the Georges Creek Watershed Association and other interested stakeholders in determining their priorities.

COMMUNITY TRENDS ANALYSIS

At a public meeting held in June, 2000 residents were asked to identify trends occurring in the community.

- Young people continuing to move out of the community
- School closings; Barton Elementary
- Conversion to public water & sewer system
- Improvements in water quality, some streams are now stocked, and AMD projects continue to be completed
- Impacts from truck/industrial traffic on roads designed for passenger cars, traffic impacting quality of life, completion of Route 36
- Interstate impacts: fiber optics and technical improvements, and
- Mountainview Landfill only landfill in the state that is privately owned

The following are the number of blighted properties and their corresponding towns.

Midland:	6
Lonaconing:	12
Westernport:	20
Barton:	4
Pekin:	2
Moscow:	1
Franklin:	5
Frostburg:	21

The following are the percentages of families with incomes in 1989 below poverty.

District 8 Westernport:	12.8%
District 9 Barton:	7.0%
District 10 Lonaconing:	15.8%
District 11 Frostburg:	5.5%
District 12 East Frostburg:	8.0%
District 18 Ocean:	13.0%
District 26 Frostburg:	14.5%
District 28 Frostburg:	4.7%

****Average percent for the State of Maryland is 6.0%. The source is the 1990 Census of Population and Housing, Summary of Population and Housing Characteristics, 1990 CPH-1-22, as issued in August 1991.*

The following are landscape indicators published in the *Maryland Clean Water Action Plan,* 1998 for the Georges Creek watershed summarized in the table below. Most indicator ranking (pass/fail) is a relative measure that compares the Georges Creek watershed with the other 137 watersheds of similar size that covers the entire State of Maryland.

Landscape Indicator	Finding	Rank	Bench Mark
Impervious Surface	10.2% of watershed is impervious	Fail	Of the 138 watersheds in Maryland, this one is among the highest 25%
Population Density	0.21 people per acre	Pass	Of the 138 watersheds in Maryland, this one is among the lower 75%
Historic Wetland Loss Density	2,042 acres	Pass	Of the 138 watersheds in Maryland, this one is among the lower 75%
Unforested Stream Buffer	27 percent	Pass	Of the 138 watersheds in Maryland, this one is among the lower 75%
Soil Erodibility	0.31 value per acre	Fail	Of the 138 watersheds in Maryland, this one is among the highest 25%

PROBLEM STATEMENTS

This section contains information based on data from a variety of sources including the draft Stream Corridor Assessment data tables.

To aid the WRAS Steering Committee in the identification process and in the subsequent decision-making process an assessment of current stream conditions was conducted. The following information was taken from the Maryland Department of Natural Resources web site discussing the Stream Corridor Assessment.

> Maryland's Stream Corridor Assessment Survey has been developed as a Watershed management tool to help identify both environmental problems and restoration opportunities the exist within a watershed.
>
> The 4 main goals of the Stream Corridor Assessment are:

1. To provide a list environmental problems within a stream system and riparian corridor.
2. To provide sufficient information on each problem so the preliminary determining of both its severity and restoration potential can be made.
3. To provide sufficient information so that restoration efforts can be prioritized.
4. To provide a quick assessment of both in-kind and near-stream habitat conditions so that comparative assessments can be made of the condition of different stream segments.

> The Stream Corridor Assessment Survey is intended to provide a rapid method of examining an entire drainage network so future monitoring and management efforts can be better targeted. The Stream Corridor Assessment Survey is designed so that teams of 2 or 3 volunteers are able to survey 2 or more stream miles per day. Individuals performing the survey receive a full week of training in both stream ecology and how to conduct the survey.
>
> In addition to identifying potential problems, the survey also records information on the location of potential Wetlands Creation/Water Quality Retrofit Sites and collects data on the general conditions of both in-stream and riparian habitat.

The information contained in this plan reflects the compilation of several sources of information including individual agency reports, and studies. A complete reference list can be found on page 36 of this plan. In addition, hard copies of all reports and studies will be maintained for public use a the Georges Creek Library in Lonaconing, MD.

The information is organized into three topic categories: **Water Quantity (flooding and base flow), Water Quality, Habitat (aquatic and riparian). See Appendix A for SCA Data Survey Sheets.**

WATER QUANTITY

I. FLOODING

In January and September of 1996 Georges Creek experienced two major flood events in what residents referred to as back-to-back episodes of flooding. Damage reports estimate that ____ number of homes sustained flood damage. ____ homes where considered to have sustained substantial damage. Substantial damage is defined as damages exceeded more than 50% of the home's assessed value. As a result several flood acquisition projects were initiated and completed. The table below lists the various acquisition grant applications and associated funding amounts with each completed grant.

Georges Creek Flood Acquisition Projects							
Grant	**NRCS**	**FEMA**	**MDE**	**County**	**POS**	**SHA**	**TOTAL**
MDE Georges Creek			$278,010	$152,640	$166,899	$ 10,000	$607,549
FEMA HMGP 1094 – 1039		$328,506	$ 51,000	$ 51,000			$430,540
FEMA HMGP 1303		$299,923	$ 49,987	$ 49,987			$399,897
FEMA HMGP 1324		$455,837	$ 60,778	$ 60,778			$577,393
FEMA FMA 2000 GC I & II		$101,133		$ 33,712			$134,845
FEMA FMA 2000 Foutz		$ 52,969	$ 8,625	$ 8,625			$ 70,219
FEMA FMA 2000 Pekin		$ 94,875	$ 15,800	$ 15,800			$126,475
Westernport Project	$320,054			$403,382		$1,747,903	$2,471,339
						TOTAL:	**$4,696,896**

While completing several flood acquisition projects it became apparent that additional work was needed to repair the damage to Georges Creek and its tributaries that resulted form improper land development. For instance, improper land development had caused a whole host of stream stability and stream habitat problems. To make way for development Georges Creek and its tributaries have been straightened, dredged, and encroached upon to points that became detrimental to overall stream health and vitality. To this end several planning initiatives and projects were implemented in order to comprehensively address problems in the Georges Creek watershed. For instance the "Westernport Flood Mitigation Project", which entailed the purchase of twenty-seven homes, stream restoration using fluvial geomorphologic restoration design, and the development of a community greenway park. Completing projects such as this that not only include flood hazard mitigation, but also stream and habitat restoration, is the cornerstone of the WRAS Steering Committee's overall goal.

The WRAS Flood Hazard Mitigation goal is to develop a holistic approach to problem solving by establishing long-term stream stability, stream health, and provide protection from flood damage.

Issue #1: The FEAM **F**lood **I**nsurance **R**ate **M**aps that are currently being used are not accurate and need to be updated.

Action: Update FEMA FIRM Maps for the Georges Creek Basin.

Example: FEMA FIRM Maps are being updated and will incorporate as-built data from the State Bond Money Flood Projects

Issue #2: Homes located in the 100-year floodplain.

Action: Purchase floodprone homes using a variety of funding sources such as: FEMA FMA & HMGP fund, MDE, and DHCD, with priority given to repetitive loss properties. Repetitive loss properties are properties that have suffered losses in at least tow flood events while covered by flood insurance.

Examples: Grant funds are continuously applied for and the County utilizes its Flood Mitigation Plan to prioritize flood acquisition projects.

Issue #3: Disrepair of flood walls along Jackson Run, Neff Run, Koontz Run, and Georges Creek.

Action: Secure funding and repair flood protection walls.

Example: State Bond Money has been awarded to Allegany County for these projects and projects are underway.

Issue #4: Structures such as railroad bridges, culverts, road crossings have realigned the stream and has caused the stream to lose its natural profile and configuration.

Action: Where applicable reconfigure or take away stream obstructions.

Status: State Highway culvert along Neff Run has been re-designed to allow for increased flow conveyance and so that it is no longer a fish blockage.

II. DEWATERING

Georges Creek loses water to deep mines between Midland and Woodland Creek and between Sand Spring Run and the Route 936 crossing (Green Associates, Inc. and others, 1974). Also south of Borden Shaft most or all of the flow of Georges Creek is intercepted by the Hoffman Tunnel drainage system during periods of extremely low base flow (Slaughter and Darling). Tributaries of Georges Creek with dewatering problems are locate north of Midland and include Vale Run, the lower portion of Squirrel Neck Run, the lower and middle portions of Woodland Creek and Staub Run (Green Associates, Inc. and others, 1974).

During the 1980's and 1990's various areas of the Georges Creek Watershed encountered chronic drought problems. Short term emergency solutions included drilling new wells and providing emergency tanks of water. More permanent solutions have included the following:

1. Abandoning the Town of Barton water supply system and connecting the Barton system to the Town of Lonaconing water system (1987). The Lonaconing system was reinforced by connecting it to the Town of Frostburg water system (1999).
2. Abandoning Carlos area water supply system and connecting that area to the City of Forstburg water systems (1999).
3. Abandoning the Klondike area water system and connecting that area to the City of Forstburg water system (planned for 2003).

Aside from reinforcing the quantity of water available throughout the Georges Creek Watershed, the connection to the Forstburg water system provides Carlos and Klondike areas with high quality treated water.

WATER QUALITY

III. ACID MINE DRAINAGE

Acid Mine Drainage (AMD) has significantly impacted the water quality of the Georges Creek watershed. Direct mine run-off & discharge, and intermittent nonpoint source discharges from coal triples (coal handling and loading facilities), gob piles (mine waste) and sediment form active and abandon sites have a profound effect on the water quality of Georges Creek. A study completed in 1974 identified 290 mine drainage discharge (Green Associated, Inc. and others, 1974). The severity of AMD in most of the watershed's streams varies. The Stream Corridor Assessment (SCA) though visual identification listed 49 AMD sites.

The MDE Bureau of Mines (BOM) has the most complete documentation of AMD discharges and seeps in the Georges Creek Watershed. This information can be requested on the MDE website at: www.mde.state.md.us.

Issue #1: AMD information from various sources.

Action: AMD information needs to be complied, crosschecked, and updated.

Example: MDE Bureau of Mines is currently assembling all data in various formats to be compiled. A library containing all the available information will be established.

Issue #2: Encourage partnership and cooperative project development with Allegany County.

Action: Potential project between Allegany County and MDE BOM concerning the Deshong property, located adjacent to Mill Run. This project area has the potential for wetland development along Mill Run.

Example: Partnership between Allegany County and the Maryland State Highway Administration for the Westernport Project the included: acquisition of twenty-seven homes, channel realignment and stabilization, sloping of stream banks, rock vane weirs for grade stabilization, utilities repair and protection, and the establishment of a greenway community park.

The Maryland Department of the Environment, Bureau of Mines has many projects in various stages of development and implementation. The following project status report was provided by: Joseph E. Mills, MDE BOM.

2001 Construction Season

NEFF RUN AMD REMEDIATION PROJECT (WELL RETRO-FIT)

Status: Seven monitoring wells have been drilled and retrofit with water samples being collected on a monthly basis. Survey of the site has been completed and supplied to National Mine Land Reclamation Center. NMLRC will develop plans for abatement project.

MILL RUN DIVERSION WELL (AKA-PULSE LIMESTONE BEDS)

Status: Project is complete. System is generating approximately 400 mg/l alkalinity.

CONEY CLEANERS ACID MINE DRAINAGE PROJECT

Status: Project is complete. Successive Alkalinity Producing System, SAPS1 does not yet have any AMD entering it. This may be due to low groundwater table. The situation will monitored until the groundwater table rises. Modifications will be made if necessary. SAPS2 is treating as per design. The oxidation pond is leaking.

PRESTON WELL SEALING PROJECT

Status: Project is complete. Polyurethane grout was used to seal the well. Landscaping work will be completed this spring 2002.

2002 Construction Season

McDONALD MINE DOSER PROJECT

Status: Plans are developed. Permits and Right of Entry (ROE) are being sought. Construction planned for summer 2002.

FAZENBAKER AMD ABATEMENT PROJECT

Status: Construction has begun and is expected to be completed by July 2002.

OAK HILL LANDSLIDE-AMD TREATMENT PROJECT

Status: NRCS is bidding the project. Construction planned for summer 2002.

RAILROAD STREET (CONEY SILK MILL) PROJECT

Status: Design is complete. ROE and permits are being sought.

NEFF RUN AMD, HABITAT AND FLOOD IMPROVEMENT PROJECT

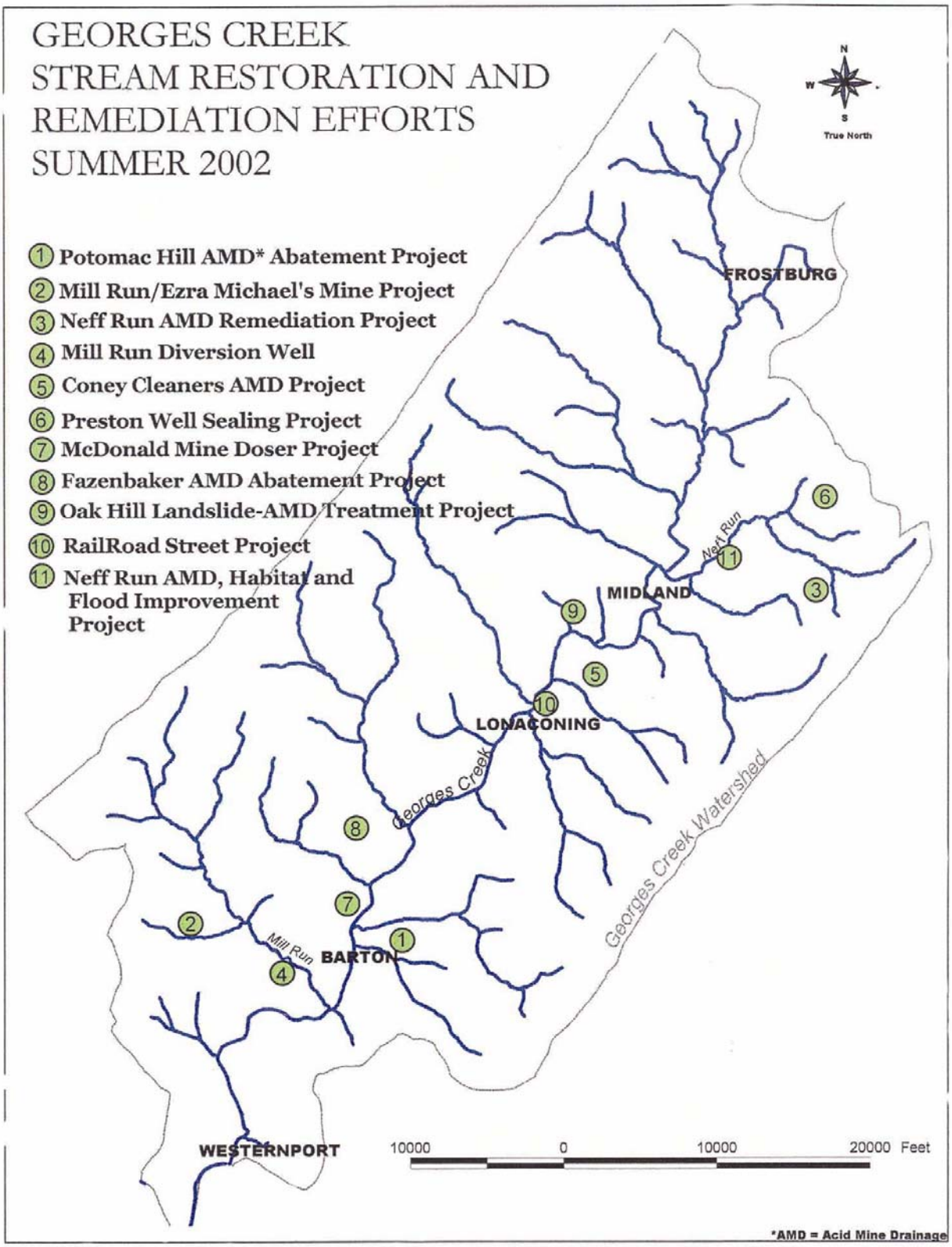
Status: Treatment plan is being developed by National Mined Land Reclamation Center.

POTOMAC HILL AMD ABATEMENT PROJECT

Status: Plans are being developed and reviewed by Allegany County and BOM. Construction planned for summer 2002.

MILL RUN/ELZA MICHAEL'S MINE PROJECT

Status: Funding, and landowner approval is needed prior to beginning any project at the site.


GEORGES CREEK
STREAM RESTORATION AND
REMEDIATION EFFORTS
SUMMER 2002
1 Potomac Hill AMD* Abatement Project
2 Mill Run/Ezra Michael's Mine Project
3 Neff Run AMD Remediation Project
4 Mill Run Diversion Well
5 Coney Cleaners AMD Project
6 Preston Well Sealing Project
7 McDonald Mine Doser Project
8 Fazenbaker AMD Abatement Project
9 Oak Hill Landslide-AMD Treatment Project
10 RailRoad Street Project
11 Neff Run AMD, Habitat and Flood Improvement Project
N
W
S
True North
FROSTBURG
Neff Run
MIDLAND
LONACONING
Georges Creek
Georges Creek Watershed
Mill Run
BARTON
WESTERNPORT
10000
0
10000
20000 Feet
*AMD = Acid Mine Drainage

IV. COMBINED SEWER OVERFLOWS (CSO)

The City of Frostburg owns a combined sanitary wastewater and storm water sewer system ("combined sewer system") that conveys waste to Allegany County's Wright Crossing sewage pumping station and then through one or more downstream sewer systems, to the Cumberland Wastewater Treatment Plant. During wet weather, these combined sewers exceed the pumping station capacity resulting in the discharge of untreated sanitary and storm water to waters of the State.

Although Allegany County and the City of Frostburg have permits authorizing discharges during wet weather, from their respective combined sewer system through certain CSO outfalls to various designated waters of the State. Each permit prohibits dry weather discharges.

Both Allegany County and the City of Frostburg along with the Water Sanitary Commission and City of Cumberland entered into a Consent Decree and Judgement on December 14, 2001. The purpose of this legal action is to ensure the development of Long Term Control Plans and to implement solutions to the combined sewer overflow problems within the next twenty years. The Compliance schedule is as follows:

Submission of Long Term Control Plans (LTCPs)- Development and Implementation

Frostburg: On or before March 31, 2003, Forstburg shall submit to the Department (MDE) for review and approval, and to each other defendant for review and comment, a detailed proposed LTCP including a schedule for implementation.

Allegany County: Within sixty (60) days after receiving notice of MDE's approval of Frostburg's LTCP, Allegany County shall submit to the Department for review and approval, and to each other defendant for review and comment, a detailed proposed LTCP including a schedule for its implementation and completion on or before October 1, 2003.

Types of CSO Controls:

a) Source Controls- remove root drains, street sweeping, etc.
b) Sewer Separation- still produces stream pollution, untreated storm water
c) Off-line Storage- reintroduce to sewer when flow drops for treatment
d) Treatment- clarification & disinfection

Issue #1: Lack of Long Term Control Plans

Action: Development of Long Term Controls Plans- Development and Implementation

Example: Frostburg's plan is due March 31, 2003 and Allegany County's plan is due sixty (60) days after MDE approves Frostburg's Plan.

Issue #2: Illegal residential connections and leakages in the sanitary sewer system.

Action: Field investigations (sanitary sewer evaluation study) conducted by Allegany County and their consultant URS Greiner.

Example: Allegany County has adopted Utility Use Regulations which state that the problem mentioned above is illegal. Allegany County has sent letters to residents who have been found to have a downspout connected to the sanitary sewer system in December of 2001. Allegany County granted a grace period until December 1, 2003 to repair the problem. After that time, County officials will begin to enforce the regulations and if the problem is ignored, the building owner will be fined. Financial assistance is available to the families that are income eligible.

The County will also address leakage problems within the sanitary sewer system.

V. NON-POINT SOURCE POLLUTION

Mining and Acid Mine Drainage is the most widespread significant nonpoint source pollution found in the watershed. Other nonpoint source issues include sedimentation, urban stormwater, and failing septic systems. The Georges Creek watershed has been shown to exhibit elevated Total Maximum Daily Loads of Biological Oxygen Demand (BOD) that reduce oxygen available for aquatic life.

In a report submitted by the Maryland Department of the Environment entitled **Total Maximum Daily Loads of Carbonaceous Biochemical Oxygen Demand (CBOD) and Nitrogenous Biochemical Oxygen Demand (NBOD) for Georges Creek in Allegany and Garrett Counties, Maryland** a Water Quality Characterization has been completed along with the Targeted Water Quality Goal. The Targeted Water Quality Goal as listed in the above report is as follows:

> *Georges Creek is a Use I-P designated water body according to the Code of Maryland Regulations (COMAR) 26.08.02. The dissolved oxygen standards For a Use I-P water is 5.0 mg/l at any time. The minimum dissolved oxygen (DO) concentration observed in all segments of Georges Creek during the summer stream surveys of 1999 was 7.8 mg/l. Since the observed dissolved oxygen values in Georges Creek consistently exceed the water quality minimum standards of 5.0 mg/l, it is better than the minimum required standards and needs to be maintained. The in-stream DO minimum concentration of 7.8 mg/l will assure that observed dissolved oxygen concentrations are maintained in Georges Creek. The overall objective of the TMDLs for Georges Creek is to determine the maximum allowable BOD inputs from point and nonpoint sources that will allow for maintenance of the existing, higher than the minimum standard dissolved oxygen level.*

Issue #1: Thirty-two homes in the Town of Westernport with failing septic systems. During heavy rain storms a greenish-blue trail of raw sewage flows down the steep hill on its southern border into streets and yards.

Action: Connect the thirty-two homes with failing septic systems to Westernport's public sewer system.

HABITAT

VI. FISH BARRIERS

The draft stream corridor assessment identified approximately ninety-nine fish blockages along Georges Creek and its tributaries. In reviewing the data, the greatest number of fish blockages appears to be concentrated in the upper portion of the watershed, which includes Georges Creek I (Upper), Sand Spring Run, Winebrenner Run, Woodland Creek, Staub Run, Neff Run, and Mathews Run. Many of these blockages are caused by infrastructure and debris. Fish population surveys in the Georges Creek Watershed shows that native brook trout and associated cold water fish species are present and thus need to be protected.

Issue #1: Ninety-nine fish blockages were found in the Georges Creek Watershed during the SCA.

Action: Evaluate fish blockages caused by infrastructure and debris for potential long-term solutions, in collaboration with Public Works, and Highway Departments to identify opportunities for redesign. Permitting agencies require new and replaced pipes and culverts to be positioned in order to prevent fish barriers.

Example: Trout Unlimited worked with the Allegany Soil Conservation District and the Natural Resources Conservation Service to ensure that no fish barriers remained in Neff Run.

Issue #2: When stream structures are installed and/or repaired fish barriers need to be considered during the process.

Action: Coordinate stream restoration work with fish habitat improvement. Discuss projects during the development phase with groups such as the Maryland Department of Natural Reserouces Fisheries Service, Georges Creek Watershed Association, and Trout Unlimited.

Example: In the early development stage of the Lonaconing Stream Restoration and Greenway Park Project, Trout Unlimited was approached and secured as a project partner.

VII. CHANNELIZATION, EROSION, DEBRIS

The Stream Corridor Assessment identified 106 channelization sites. Neff Run, Koontz Run, Jackson Run, and Georges Creek (Lower) were identified by the survey to be the heaviest impacted by channelization. Most channelized sites are located adjacent to roads and railroad tracks.

A related problem, erosion is typically found downstream of these channelized sections. The SCA identified 147 erosion sites. Neff Run, Winebrenner Run, Potomac Hill Run, and Mill Run displayed the highest number of erosion sites. The George's Creek Watershed has "high" soil erodibility considering the soil types and steep slope. A stony classification of soil covers nearly 86% of the Georges Creek watershed. Approximately three quarters of the Georges Creek watershed has a slope greater than 15%. Both of these conditions coupled together create soil movement problems such as: surface erosion, sedimentation, and streambank erosion.

In addition to channelization and erosion another related problem is excessive debris. Although debris flows are part of the natural geomorphic process in high gradient valleys, they can be problematic if their frequency and magnitude increase due to alterations to natural hydrologic processes and change in land use. There were thirty-one debris sites identified in the Stream Corridor Assessment. The site represented are the most severe sites found during the survey. This number does not take into account the sites that had been cleared by Allegany County and the Natural Resources Conservation Service following flooding events.

Issue #1: Due to the inter-relationship of erosion, deposition, and stream channel alternations to stream stability, it is apparent that all three issues must be considered together before trying to address any one problem at a given site.

Action: Identify various stream reaches throughout the watershed that exhibit a multitude of problems and develop projects that provide solutions to all problems in the identified stream reaches.

Example: Neff Run Demonstration Project Phase I, complete; Phase II design stage.

Issue #2: Excessive soil erosion and sedimentation.

Action: Employ soil erosion and sedimentation.

Example: Stream buffers planted along the Neff Run Demonstration Project site and the Lonaconong Greenway Park Project Site.

VIII. EXPOSED PIPES

The draft Stream Corridor Assessment Survey identified fifty-four exposed pipes located throughout the watershed. The largest concentrations of exposed pipes are in the Upper and Lower segments of the Georges Creek Watershed. Neff Run, Jackson Run, and Winebrenner Run have the largest numbers of identified exposed pipes.

It is common practice to run utilities parallel to, or under the streambed due to gravitational flow requirements. As can be seen from the sheer number of exposed pipes Georges Creek and its tributaries lack stream stability.

Issue #1: Fifty-four exposed pipes located throughout the watershed.

Action: Determine which pipes are currently in use and which are not. Those pipes that are not service should be removed to prevent any further undercutting.

Example: Two exposed pipes in Neff Run were found not to be in use.

Action: Determine which exposed pipes need protection and reinforcement.

Example: A sewer line crossing Georges Creek at the Lonaconing Park site was found to be exposed and in need of protection and reinforcement. The sewer line was excased in concrete and rock vane weirs were installed to grade control and protection. (Winter 2002).

IX. PIPE OUTFALLS

Pipe outfalls include any pipes or small manmade channels that discharge into the stream through the stream corridor. Pipe outfalls are considered a potential environmental threat because that carry uncontrolled runoff and pollutants such as: oil, heavy metals and nutrients to a stream system. A total of 217 pipe outfalls were identified in the draft Stream Corridor Assessment Survey making it the most frequently report problem.

Need more info on severity rating and associated water quality problems.

Issue #1: Pipe outfalls with undetermined purpose.

Action: Determine which pipes are still in use and it they serve a legitimate purpose.

Example: Neff Run Project Phase I where several pipes were surveyed to determine their purpose and functionality.

X. INADEQUATE BUFFER

The draft Stream Corridor Assessment identified one hundred and twenty-five sites as having inadequate buffers. As a general rule of thumb, vegetative buffers should be fifty feet wide on either side of the stream. Vegetative buffers provide numerous essential habitat functions: shade to keep water temperatures down in warm months, leaf litter "food" for aquatic organisms, roots to stabilize stream banks, vegetative cover for wildlife, etc. In addition to the numerous essential habitat functions, vegetative buffers also provide strong root systems that help maintain stream bank stability and prevent accelerated erosion from occurring.

Issue #1: Inadequate vegetative buffer along stream banks.

Action: Conduct a series of planting activities utilizing volunteers.

Example: Plantings where completed by various volunteers along Neff Run.

XI. TRASH DUMPINGS

Twenty-four trash dumping sites were identified in the Stream Corridor Assessment Survey. The majority of the sites were found in the section identified as the middle portion of the watershed. Survey results indicate that Kootz Run, Jackson Run, and Orr Run has the greatest number of trash dumping sites.

Issue #1: Trash dumping sites along Georges Creek and its tributaries are in need of clean-up.

Action: Conduct a series of clean-up days utilizing volunteers and area students thereby educating area students as to the importance of streams free of trash.

Example: The Georges Creek Watershed Association, and area schools partnering n additional WATER Days help to clean-up the watershed.

What steps do we take to get there?

ACTION PLAN

Analyze Stream Corridor Assessment Data

- Divide watershed into three sub-basins, making allowances for watershed wide issues to be addressed.

- Prioritize groups of related problems geographically so that they can be treated comprehensively.

- For each sub-basin pick the top 2 or 3 projects and make rough estimations of restorative costs and potential funding sources. Keeping in mind that many problems can be addressed through existing infrastructure budgets for operations, maintenance, and mitigation.

- After a project is developed for implementation, develop project specific monitoring that will measure the changes that were planned.

- Publicize existing and future demonstration projects in order to generate support and momentum for additional projects.

- Develop long-term schedule of meetings and events to look at monitoring results, review/modify strategy and promote new projects. An annual watershed wide strategy meeting could be used for both evaluating and planning. Other events and sub-basin projects would flow from annual meeting.

- Determine appropriate location(s) for a river gaging station(s) and associated funding sources.

- Continue quarterly meeting schedule of the Georges Creek WRAS Steering Committee and some or all of the sub-committees as needed.

RESOURCES

Demonstration Project Upper

NEFF RUN WATERSHED RESTORATION PROJECT – PHASE II

The Neff Run 1999 Stream Corridor Assessment (SCA) completed by the Department of Natural Resources detailed an array of problems that need to be addressed. In addition, the Project Impact Neff Run Workgroup completed a comprehensive strategic plan for Neff Run. By using these two documents projects have been developed with confidence and ease. Phase I of the project concentrated on the lower and middle portions of Neff Run and was ompleted in December 2001.

The Neff Run Watershed Restoration Project - Phase II involves the stabilization of severely eroding stream banks in the upper reaches of Neff Run and it's two major tributaries - Mathews Run and Dans Rock Run, as outlined in the Neff Run Watershed Restoration Plan.

Project objectives include:

- Installation of 15 rock vane weirs to reduce further down-cutting of the stream bed
- Restoration of 800 linear feet of stream bank by planting live stakes, fascines, and installing root wads
- Establishment of 100 linear feet of wooded riparian buffer with native tree species
- Installation of one fish habitat structure in Mathews Run
- Sponsorship of watershed awareness days
- Hosting a watershed tour highlighting the various projects throughout the watershed for government officials from the local, state, and federal levels of government

This project is slated for construction in the fall of 2002. Funds for this project have been allocated to the Allegany Soil Conservation District by the Maryland Department of Natural Resources

Demonstration Project Middle

OAKHILL LANDSLIDE AND AMD TREATMENT PROJECT

The Oakhill Project is a cooperative project between the Natural Resources Conservation Service and the Maryland Bureau of Mines. The project utilizes funding from both agencies to remove a gob pile, which is currently sliding into Georges Creek. After the removal of the gob pile a series of "SAPPS" cells (limestone filled beds) will be constructed to treat acid mine discharge.

Project objectives include:

- Removal of gob pile on Oakhill
- Installation of "SAPPS" cells along tributary
- Possibility of additional alkalinity added to Georges Creek Mainstem

Construction for the project is planned for the Fall of 2002.

Demonstration Project Lower

MILL RUN STREAM RESTORATION PROJECT

The Mill Run Stream Restoration Project is in currently in the planning stages, which includes approximately 6,000 linear feet of stream miles in Allegany County, MD. This project will address both water quality and water quantity issues in addition to habitat restoration.

The Georges Creek Watershed Restoration Action Strategies Steering Committee recommended that this project is a high priority project based upon the unstable nature of the stream and the fact that several acid mine drainage projects have already been developed and funded in the watershed.

Project objectives include:

- Stabilization and restoration of 6,000 linear feet of stream channel using natural geomorphologic techniques, which utilizes rock cross vanes, stream channel cross section identification, realignment, and profile changes
- Reduction of high bedload sediment supply by stopping downcutting through the use of hydraulic grade control structures
- Improvement in riparian planting through indigenous plantings
- Protection of Reynolds Road with the installation of three rock vanes in Georges Creek and one w weir upstream of Mill Run Road

Funding has not been secured for this project. However, the Maryland Bureau of Mines in partnership with the Georges Creek Watershed Association have completed Acid Mine Drainage Abatement Projects on Mill Run for the improvement of water quality.

MONITORING STRATEGY

Monitoring and Evaluation

Watershed monitoring activities generally serve two purposes. The first is an *assessment* of conditions, which leads to targeted implementation actions, and the second is an *evaluation* of implemented projects. The Stream Corridor Assessment (SCAM), water chemistry Synoptic Surveys, and flooding studies are examples of baseline assessments. These activities have already been initiated in Neff Run and some have already been completed in other areas of Georges Creek. This information in combination with the Georges Creek Characterization (DNR 2001) provides a very good overview of conditions in the watershed. With a few exceptions there is little need to spend more resources on watershed-wide assessments. Locating and quantifying the source of combined sewer overflows is one of the outstanding monitoring need in the watershed.

Evaluation of the effectiveness of specific implementation projects is the second type of monitoring activity. The Appalachian Environmental Laboratory Small Watershed Study and biological evaluation of the Neff Run Stream Restoration Project would fall into the evaluation category.

In order to provide a comprehensive explanation of watershed management activities there are four inter-related elements that should be considered in every aquatic monitoring plan. They include water chemistry, water quantity (base flow & storm flow hydrology), biological (fish, macroinvertebrates, vegetation), and physical structure (geomorphology and biological habitat). The level of effort and specific monitoring techniques for each element will vary depending on the individual watershed or sub-basin and the type of project(s) being evaluated. See attachment for monitoring services that DNR can provide.

Proposed Monitoring Components

- Chemical assessments: general water chemistry (DNR, students and volunteers)
- Acidity/acid mine drainage (BOM, students, and volunteers)
- Biological assessment: fish and macro invertebrates (MD_DNR & BOM) . Physical Assessment: geomorphological and habitat (MD_DNR, NRCS)
- Hydrological Assessment: including effectiveness of flood mitigation/stream stabilization structures, and impacts of restoration activities on flood flows (MDE & Allegany County)
- Small watershed research: hydrologic and water quality impacts of mining activities (AEL)

Monitoring Strategy: It is recommended that a Monitoring Work Group be established to pursue development of a detailed monitoring strategy. The following principles were developed to provide guidance to the Work Group and a framework for development of the monitoring program.

- Monitoring is not the same as restoration-the program will need to establish up front what "restore" means, how will it be accomplished, and a means for evaluation, in order to determine if and when restoration actions are successful.
- There needs to be clear identifiable goals in order to determine "restoration success."
- Goals should not.be limited to only strict quantitative measures (e.g. the Chesapeake Bay goal of 40% nutrient reduction), but should take into account the projects value as a demonstration project, furthering education, outreach, and working with the community.
- The monitoring program should be designed to document improvement in water quality and aquatic resources from restoration activities including the following: 1) reduction in acid mine drainage and combined sewer overflow impacts; and 2) increase in fish population and aquatic health.
- The monitoring program should be designed to document improvement in stream stability from restoration activities including reduction in bank erosion, down-cutting, and sediment loading.
- The monitoring program should document the effectiveness of various in-stream and riparian morphological restoration measures at different flow levels.
- The monitoring program should provide data to better understand the impacts of land use alterations from mining activities including water quality, hydrology and watershed/ecosystem health.
- Monitoring projects can be expensive & labor intensive. Quality assurance & quality control (QA/QC) protocols must be adhered to. Good record keeping requires a dedicated source of labor for data management and an accessible repository for copies of all the studies.
- Monitoring activities should be tied directly to an evaluation of specific management actions. In order to be useful over the long run, data collection and analysis methods must be well documented and comparable between projects.
- Reference stations in relatively undisturbed sub-basins, or paired watersheds of similar size should be used in. the evaluation studies. This will provide some stability to factor out the natural variability of climatic conditions that change from year to year.

Fish Population Survey:

Information in this section provided by Alan Klotz of Am DNR Fisheries Service (April, 2002).

A comprehensive fish population survey for the Georges Creek watershed will be conducted in 2008-2009. The MD DNR Fisheries Service will survey the same stations that were established in the 1999 survey (Johnson *2000).* We will be conducting fish population estimates, fish species in relative abundance, and compiling a complete list of fish species present in the watershed. Also, we will be re-evaluation in-stream habitat and riparian conditions within the sampling stations.

The MD DNR Fisheries Service will also be conducting individual stream studies in response to current AMD and stream restoration projects in the watershed as follows:

- Neff Run baseline biological stream study will be conducted in 2002 in response to the recently completed stream habitat restoration and prior to the AMD abatement projects scheduled for this sub-basin of Georges Creek. We will be surveying for fish and aquatic macro-invertebrates in three stations within Neff Run and two stations within the Mathews Run tributary. A detailed description of the study plan is contained in Klotz (2002).
- Mill Run is scheduled to be re-surveyed for fish and aquatic macro invertebrates in 2004 in response to the operation of the carbon dioxide/limestone diversion well AMD treatment system that became operational in 2002. A baseline biological was conducted to document current conditions (Belasco 2001), and we will conduct the study at the same sample stations.
- Georges Creek mainstem in the vicinity of the McDonald Mine AMD source will be re-surveyed one year after the proposed limestone doser at this site is in operation. A baseline biological study has been conducted (Belasco 2001), and we will conduct the biological study has already been conducted (Belasco 2001), and we will conduct the biological study at the same sampling stations, probably in 2004.
- MD DNR Fisheries Service will consider conducting other individual baseline stream studies as stream restoration and AMD abatement projects are proposed.

INDICATORS FOR TRAGETED GOALS

Fish Population Survey

From a fisheries management standpoint, population increases in native brook trout and associated coldwater fish species as well as increases in the abundance of certain species of mayflies, stoneflies, and caddisflies would be a measurable goal of watershed restoration. These fish and aquatic macro-invertebrate species are highly sensitive to thermal pollution, organic pollution, AMD, sedimentation, and poor stream habitat. As AMD, de-watering, organic pollution, fish barriers, channelization, and inadequate buffer zones are addressed and corrected in the watershed, the biological populations in the watershed should improve and provide a measure of success.

SCHEDULE FOR EVALUATION

A comprehensive fish population survey in the Georges Creek watershed will be completed by 2009. Individual stream studies for fish and aquatic macro-invertebrates will be conducted on an annual basis as water quality and stream habitat improvements are made.

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