North Fork of Elkhorn Creek
Watershed Based Plan

Northfork of Elkhorn Creek in Gilliam, WV
Photo taken August 2007 Jennifer DuPree

Submitted by:
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The following agencies and organizations contributed to this watershed based plan:

Wastewater Treatment Coalition of McDowell County (WTCMC)

Canaan Valley Institute (CVI)

SAFE Housing and Economic Development (SHED)

Ashland Community Utilities, Inc.

Travel Beautiful Appalachia Inc. (TBAI)

WV Ministries of Advocacy and Workcamps (WVMAW)

Mountain Resource Conservation and Development (RC&D)

WV Division of Natural Resources (WVDNR)

Table of Contents

Table of Tables

Table of Figures

.

Introduction

The Wastewater Treatment Coalition of McDowell County

The Wastewater Treatment Coalition of McDowell County (Coalition) began as a loose-knit group of organizations and local officials who grew increasingly concerned about the lack of adequate wastewater treatment in many parts of the county. The Coalition started meeting with community leaders, elected officials, and state agency staff in January, 2003. Repeatedly, Coalition members were advised to help develop a comprehensive approach to address McDowell's wastewater needs.

Since these initial meetings, the Coalition has completed a septic system database, developed a comprehensive assessment of wastewater treatment in the county, conducted workshops on wastewater options, toured successful alternative system sites, completed demonstration models in the county, secured support from the County Commission and Public Service Districts, and completed a Wastewater Treatment Plan for the county. In 2007, the Coalition began focusing on the implementation of projects, and has since secured funding for projects, completed an engineering design, and developed a local program utilizing available State Revolving Funds for onsite systems.

The Coalition's Wastewater Treatment Plan consists of three main elements:

1. A detailed assessment of current wastewater treatment,
2. A preliminary treatment prescription for all communities without adequate facilities, and
3. A prioritized list of the 97 project areas identified.

Assessment

The assessment compiled data from a variety of wastewater treatment systems including municipal treatment plants, package plants, and individual home septic systems. Based on this information, 67% of households in McDowell County (7,480 homes) were determined to be without adequate wastewater treatment. Subsequent water quality sampling conducted by the Coalition and the WV Department of Environmental Protection (WVDEP) showed high levels of fecal coliform throughout the county. This water quality data led to the addition of six streams to the 2006 WV 303(d) list.

Prescriptions

Preliminary treatment prescriptions were developed by a technical committee of the Coalition comprised of agency staff, private sector wastewater professionals, local system installers, health department staff, service providers and other practioners. Prior to the technical committee's efforts, the Coalition had conducted several workshops and tours to neighboring states focusing on traditional and non-traditional treatment technologies. As a result, Coalition members agreed that *alternative, decentralized* wastewater treatment would be a necessary component of a county-wide solution. Decentralized technologies, along with traditional centralized sewer options and onsite septic systems, were therefore considered by the technical committee. Utilizing the wastewater expertise

and the local knowledge, as well as available GIS spatial data, project areas were identified and treatment options were considered on a case-by-case basis.

Prioritization

The Coalition project prioritization was based on the following criteria:

- Community willingness – assessed through surveys distributed throughout the county;
- Cost per household;
- Amount of project area parcels outside a floodplain;
- Proximity to planned or ongoing economic development activity; and
- Ability of project to leverage additional funding.

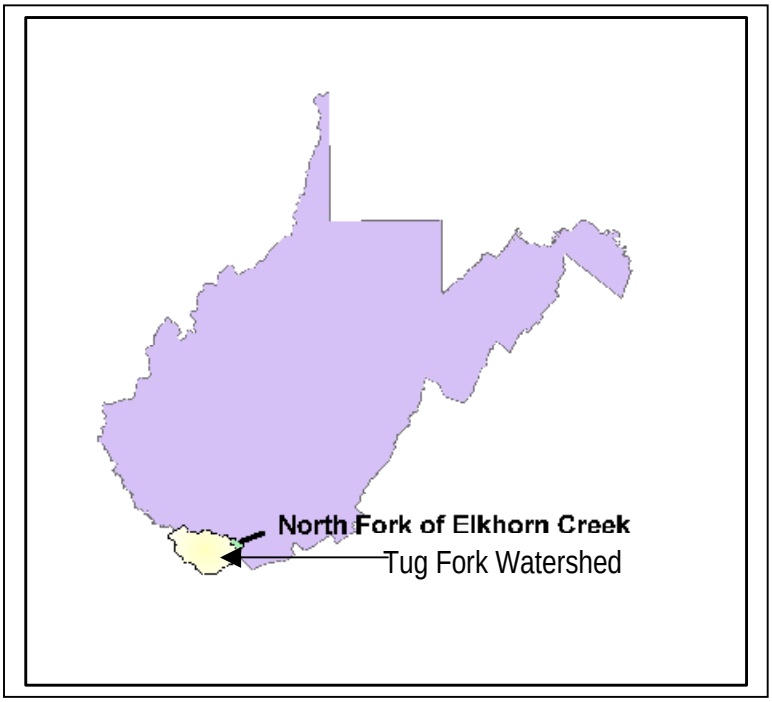
The community willingness and cost per household criteria were weighted more heavily than the other criteria. Of the 97 project areas identified, two of the top ten prioritized projects are located in the North Fork of the Elkhorn Creek watershed. The Coalition is proposing a watershed based plan for the North Fork of the Elkhorn Creek watershed to help secure funds to improve the health of the watershed and the health of the communities in the watershed. The upper reaches of the North Fork of Elkhorn Creek extend into Mercer County for approximately .9 stream miles and contain one business with a permitted treatment system and eight residences for which the Mercer County Health Department cannot verify permitted septic systems. For the purposes of the watershed based plan, those household are assumed to have inadequate wastewater treatment.

The entire Wastewater Treatment Plan for McDowell County can be downloaded from Canaan Valley Institute's website: www.canaanvi.org.

The Tug Fork watershed (HUC 05070201) is located in the southern coalfields of Southwestern West Virginia bordering Kentucky and Virginia in the Big Sandy River Basin (see Figure 1). The Tug Fork watershed lies within McDowell, Mingo and Wayne counties, encompassing 932 square miles. Steep-sided hills and mountains with numerous rock cliffs make this watershed one of the most rugged in West Virginia. The majority of rock strata exposed in the watershed are classified as Pennsylvanian Age. The alkaline nature of most of the strata has resulted in soils and streams that are well-buffered against acidic atmospheric deposition (DEP Tug Fork Report 2003).

The North Fork of Elkhorn Creek is the headwaters of the Tug Fork River that flows northwest into Mingo and Wayne County. The area of interest stretches from Windmill Gap Creek on the eastern end, to the North fork of Elkhorn Creek in Ashland to Algoma on the western end, also known as North Fork Hollow. There are several communities along this stretch of North Fork Creek including Ashland, Cherokee, McDowell, Worth, Rolfe, Gilliam, Northfork, Crumpler and Algoma of which many have been affected by major flooding events in the past. The entire watershed makes up approximately 11,904 acres and was heavily mined and since the 1950's the population has been declining substantially in McDowell County (McDowell County Population Growth).

Figure 1. Location of North Fork of Elkhorn Creek watershed within the Tug Fork



The population demographics of McDowell County are well below the national average income, home values, and education (see Table 1 below).

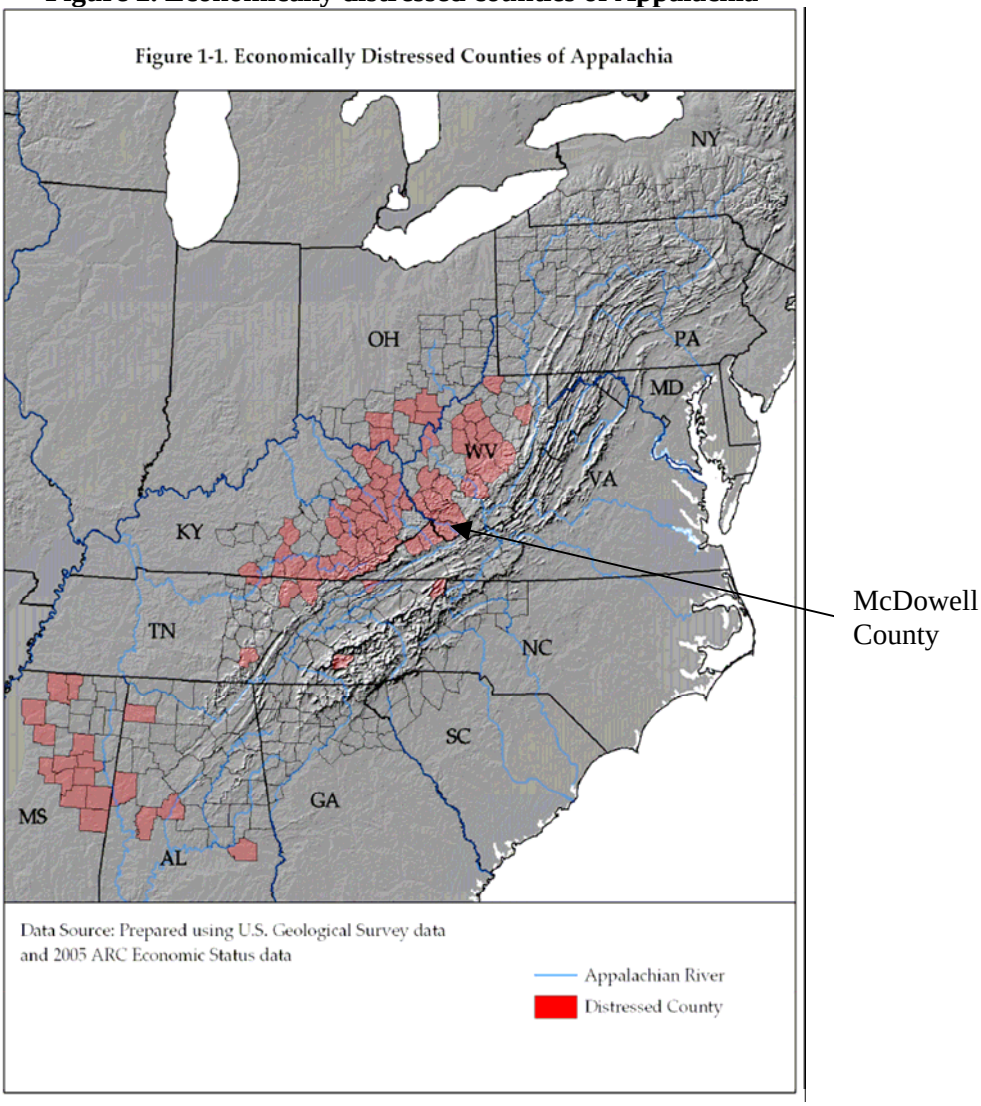
Table 1. US Census Bureau demographic data for McDowell County, WV

Demographic	United States	West Virginia	McDowell County
Median household income in 1999	$41,994	$29,696	$16,931
Percent of residents living below poverty level	12.4%	17.5%	37.7%
Median value of owner occupied homes	$119,600	$72,800	$22,600
Percent residents 25 years and older with high school graduate or higher education	80.4%	75.2%	50.0%
Percent residents 25 years and older with bachelor's degree or higher	24.4%	14.8%	5.6%

Source: US Census Bureau (2000).

The data from the US Census Bureau shows that McDowell County has a large percentage of residents (37%) living below poverty level and need financial assistance to install wastewater treatment to these communities. Figure 2 shows McDowell County to be a distressed county.

Figure 2. Economically distressed counties of Appalachia

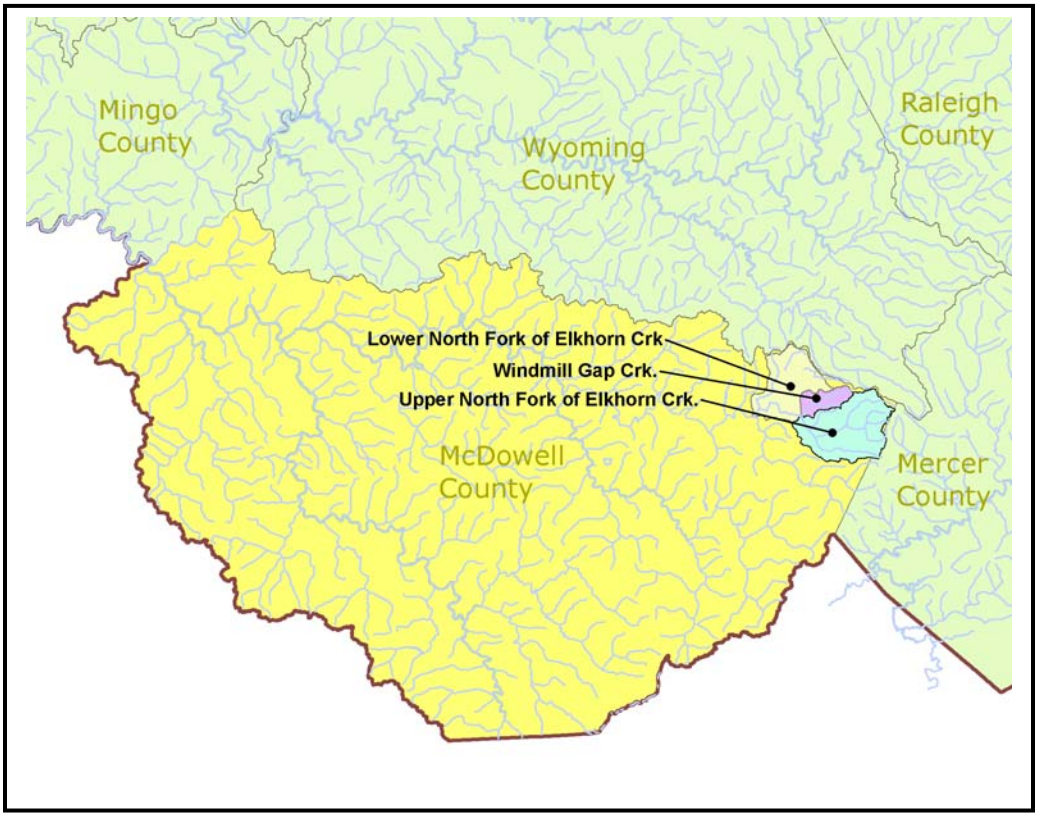


Source: University of North Carolina and Appalachian Regional Commission's Drinking Water and Wastewater Infrustructure in Appalachia an Analysis of Capital Funding and Funding Gaps 2005

The population of McDowell County has had a 12.6% decrease from 2000 to 2006 according to the US Census Bureau. In 2004, the median household income for McDowell County increased to $19,090 and percent of residents living below poverty level decreased to 33%. This is probably due to the increase in mining activity in McDowell County but not within the North Fork of Elkhorn Creek watershed.

The North Fork of Elkhorn Creek watershed consists of three subwatersheds: the Lower North Fork of the Elkhorn (id #382), Windmill Gap Creek (id # 384), and the Upper North Fork of the Elkhorn (id# 385). See Figure 3 below.

Figure 3. Location of the three sub-watersheds making up the North Fork of Elkhorn Creek Watershed



The Northfork of Elkhorn Creek Watershed consists of approximately 11,904 acres and is primarily forested land. The following land uses were obtained from WV GAP data 1997.

Table 2. Land-use for North Fork of Elkhorn Creek Sub-watershed

Land-Use Categories	Acres	Percent
Barren	201.5	1.69
Forested	11145.7	93.63
Open brush	138.1	1.16
Row crops	252.2	2.12
Urban	157.5	1.32
Water	1.8	0.02
Wetlands	7.3	0.06

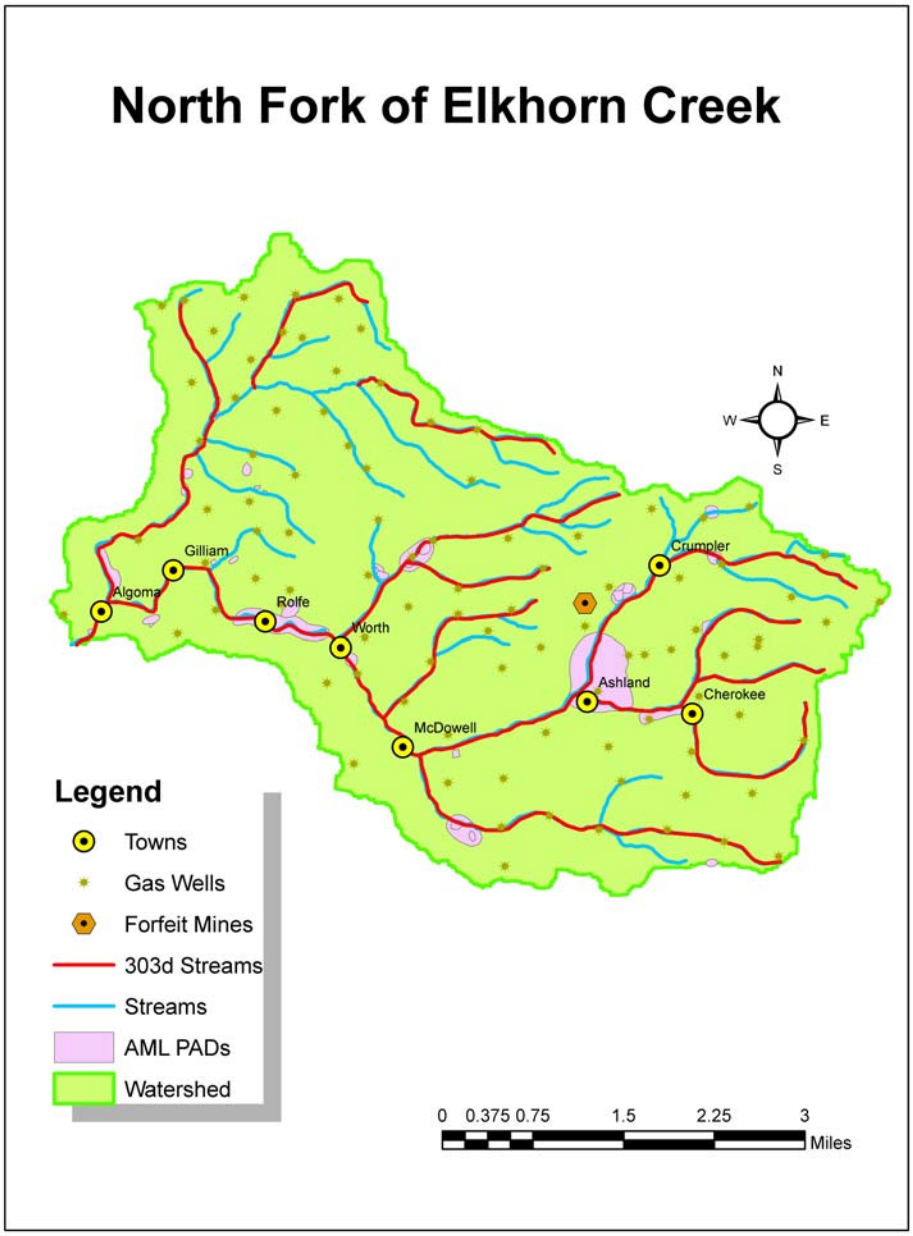
Source: WVDEP ???? how to site data

A. Non-Point Source Problems and Sources

The Department of Environmental Protection's Section 303(d) list in 2002 has the Tug Fork River listed for biological impairment from mile mark 54.2 to its headwaters while many of its tributaries are listed due to Acid Mine Drainage (AMD).

The West Virginia Department of Environmental Protection conducted a watershed assessment of the Tug Fork watershed in 1998 and 2003 using biological, water quality, and habitat evaluation techniques. In 1998, 87 of the streams were tasted for fecal coliforms and 54% of the sites contained high levels. Then in 2003-4, 29 sites were tested and registered high levels. The primary non-point source problem within this watershed is pollution from fecal coliform bacteria. This area is largely un-sewered with an estimated 67% of households lacking wastewater treatment. Water quality data collected in 2005 showed violations of the state's water quality standard for fecal coliform and resulted in Windmill Gap being listed on the West Virginia's 303(d) List of Impaired Streams in 2006 (see Figure 4).

Figure 4. Impaired streams in the North Fork of Elkhorn Creek sub-watershed

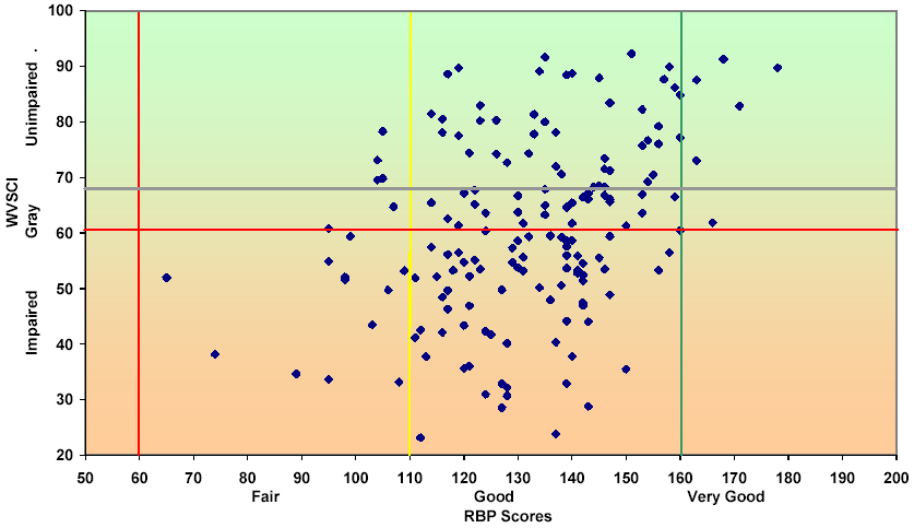


Source: WVDEP (2006)

Aside from fecal coliform impairments, this area has rather high habitat value. The Tug Fork Watershed Report stated Windmill Gap as a pretty little headwaters stream that has been determined "unimpaired – very good" by the West Virginia DEP. The Watershed Assessment Branch used EPA's Rapid Bioassessment Protocols (RBPs) to evaluate habitat within the Tug Fork watershed. The following ten parameters were evaluated: epifaunal substrate/fish cover, riffle frequency, embeddedness, channel flow status, velocity/depth regimes, bank stabilization, channel alteration, bank vegetation protection, sediment deposition, and width of undisturbed vegetation zone. All of these variables were combined to create a RBP score. The scores from North Fork of Elkhorn Creek range from 111-130 falling in the lower end of the good category.

Also from the DEP Tug Fork Report biological health of the stream was evaluated using benthic macro-invertebrate sampling. Data from 1998 and 2003 showed the North Fork of Elkhorn West Virginia Stream Condition Index (WVSCI) scores ranging from 51-83. WVSCI scores lower than 60.1 were considered impaired. The North Fork of the Elkhorn scored at 51.87 falling into the impaired category while Windmill Gap Creek scored at 82.93 in the unimpaired (see Figure 4). Many of the sampled sites showed results in the Tug Fork watershed of negative impacts to benthic macroinvertebrate communities from coal mining activities both past and ongoing. pH values within the North Fork of Elkhorn were within the states water quality standards yet produced impaired WVSCI scores (Tug Fork Report 2003).

Figure 5. Tug Fork 1998 & 2003 data, WVSCI scores vs. RBP habitat scores



1. Fecal coliform bacteria

Many of the small communities within this watershed are old coal camps with houses in close proximity to the creek on small, densely packed lots. The river has a narrow bottom that frequently floods with little room for expansion without negatively impacting the stream environment. These communities have inadequate or no wastewater treatment in place. Wastewater is being discharged directly into Windmill Gap Creek and the North Fork of Elkhorn Creek through straight PVC pipes. This effluent has biological oxygen demand (BOD) and nutrient levels that could affect the plant and animal life in the creek, and thereby in the North Fork and Elkhorn River. The steep gradient of the creeks in this area provide a considerable amount of re-aeration, thus limiting the damage caused by high BOD levels. However the untreated levels of pathogens discharged directly affect wildlife populations and endanger any direct human contact with the creek, through fishing, wading or swimming.

The narrative water quality criterion of 46 CSR 1-3.2.i. prohibits the presence of wastes in state waters that cause or contribute to significant adverse impacts to the chemical, physical, hydrologic and biological components of aquatic ecosystems. Numeric fecal coliform water quality criteria are applicable to the Water Contact Recreation and Public Water Supply designated uses. Section 8.12 of Appendix E of the West Virginia Water Quality Standards states:

> *Maximum allowable level of fecal coliform content for Primary Contact Recreation shall not exceed 200/100ml as a monthly geometric mean based on not less than five samples per month; nor to exceed 400/100ml in more than 10 percent of all samples taken during the month.*

(came from handout found in Ashley's files)

The **entire 8 miles of the** North Fork of Elkhorn Creek (WVBST-99-L) and **2.8 miles of** a tributary, Windmill Gap Branch (WVBST-99-L-4), were placed on West Virginia's 303(d) list in 2006 for exceeding water quality parameters for fecal coliform bacteria (Table 1). TMDL development is slated for 2021. With **little to no** agricultural activity in the watershed, no known municipal wastewater treatment system, and no permitted wastewater treatment at 90% of the homes, the primary source of fecal coliform contamination is assumed to be failing septic systems and illicit discharges of untreated wastewater from individual homes.

Even though this area is remote and economically challenged, it does have a lot of recreational value. The Hatfield and McCoy ATV trail runs nearby, a new KOA campground, and the newly renovated Coal Company Store in Ashland. The economic success of these communities relies on the protection of these resources. This influx of visitors will require sewage treatment as well as the current population that is on failing septic and straight pipes.

Table 3: Fecal Coliform Sampling North Fork Elkhorn Creek

Stream Code	Site Name	Sampling Type	Sampling Date	Analysis Date	Parameter	Result
BST-99-L-{0.6}	Northfork Elkhorn u.s. of Buzzard Br	Fecal	10/26/2005	10/26/2005	col/100ml	24,000
BST-99-L-{0.6}	Northfork Elkhorn u.s. of Buzzard Br	Fecal	9/30/2005	9/30/2005	col/100ml	835
BST-99-L-{0.6}	Northfork Elkhorn u.s. of Buzzard Br	Fecal	10/14/2005	10/14/2005	col/100ml	3,170
BST-99-L-{6.3}	Northfork Elkhorn u.s. of Windmill Gap	Fecal	10/206/2005	10/26/2005	col/100ml	29,000
BST-99-L-{6.3}	Northfork Elkhorn u.s. of Windmill Gap	Fecal	9/30/2005	9/30/2005	col/100ml	1,060
BST-99-L-{6.3}	Northfork Elkhorn u.s. of Windmill Gap	Fecal	10/14/2005	10/14/2005	col/100ml	234
BST-99-l-4-{0.1}	Windmill Gap near mouth	Fecal	10/26/2005	10/26/2005	col/100ml	620
BST-99-l-4-{0.1}	Windmill Gap near mouth	Fecal	9/30/2005	9/30/2005	col/100ml	2,670
BST-99-l-4-{0.1}	Windmill Gap near mouth	Fecal	10/14/2005	10/14/2005	col/100ml	4,000

Failing Septic Systems

A wastewater treatment assessment was completed and mapped for all of McDowell County in 2005. The assessment was updated for the North Fork of Elkhorn Creek in 2007 (Figure 1). The assessment compiled data from an inventory of occupied homes, existing municipal treatment facilities, National Pollution Discharge Elimination System (NPDES) and Underground Injection Control (UIC) permits for private and/or commercial wastewater treatment systems, and local health department records of permitted septic systems.

The assessment identified 426 occupied homes in the watershed. The review of wastewater treatment records for the watershed revealed the following:

- No municipal or otherwise publicly-managed wastewater treatment systems in the watershed,
- 1 commercial treatment facilities serving a campground (NPDES Permit # WVG551385), and
- 39 permitted septic systems in the watershed (9.2% of households).

All households lacking a wastewater treatment disposal system permit are assumed to be inadequate. Therefore, 90.8% of households in the North Fork of the Elkhorn watershed have inadequate wastewater treatment. Anecdotal information and site inspections confirm that many of these homes lack adequate wastewater disposal and are discharging raw sewage to the stream via “straight pipes.”

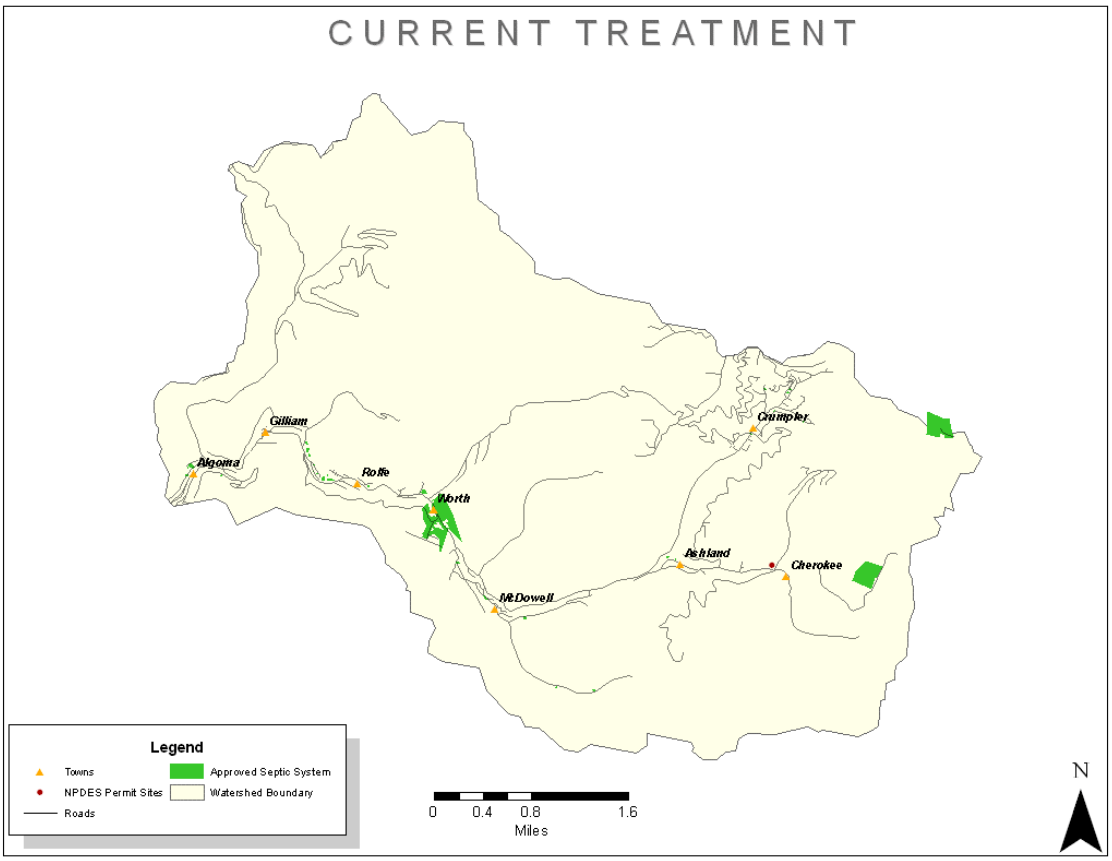


Figure 6: Current wastewater treatment by parcel in the North Fork of Elkhorn Creek watershed

a. Agriculture

There is very little livestock within McDowell County as a whole and within this area of concern the only agriculture spotted in the field was one house with approximately 2-3 horses, 2-3 goats, and 5 chickens. This house is just upstream from the mouth of Greenbrier Creek. This could account for some of the higher fecal values from water samples collected just downstream at the mouth at the Greenbrier site 3 but otherwise is not considered a significant impact to the watershed.

According to the USDA/NRCS 150 acres of unfenced grassland was found near the community of Windmill Gap. These lands are within Mercer County and being used for hay production and no significant amount of fertilizer appears to be applied therefore is not a concern pertaining to water quality.

b. Wildlife

Wildlife populations are not considered overabundant within the Tug Fork therefore high values of bacterial contamination are most likely from untreated and inadequate sewage. (Tug Fork Report)

?→Get number of deer from DNR District 4- Larry Berry 304-256-6947 waiting on results……

2. Sediment

Many of the main sources of sediment are eroding stream banks, dirt roads, and exposed earth after a major disturbance such as mining or logging. Several other common disturbances found in the Tug Fork watershed in descending order are roadways, power lines, residences and lawns, some of which can be a source of sediment. However, according to the Tug Fork report the combined habitat parameter category of embeddedness plus sediment deposition did slightly better compared to statewide samples indicating that it is not a major concern.

The only logging activity within the past 5 years within the North Fork of Elkhorn Creek watershed includes a timber harvest completed in 2003 on 1,242 acres in Buzzard Branch with 481 acres draining into North Fork of Elkhorn Creek. Currently, there are no active forestry permits.

AML sites can provide sources of sediment if they are near a stream. Information provided by the WV DEP AML Department show that there are a couple sites that were sources of sediment to the nearby stream when they were inspected last in the late 80's. Many of these sites need to be revisited and water samples collected after a high water event to see if these sites are currently a source of sediment.

? Look at TMDL data to see if sediment/embeddedness is issue for macro-invertebrates couldn't find the data on cd

3. Metals

Federal and state regulations are determined for water quality standards pertaining to metals. Several parameters are tested for metals that include: Aluminum (dissolved), Iron (total), pH and Manganese (total). Streams within the North Fork of Elkhorn are Category B2 (trout streams) and Category C (water contact recreation). The water quality standards are as follows: dissolved Aluminum is not to exceed 87 ug/L (chronic) or 750 ug/L (acute), total Iron not to exceed 1.5mg/L (chronic), total manganese none, and pH no values below 6.0 nor above 9.0.

The 1998 the TMDL placed 64 streams of the Tug Fork watershed on the 303(d) list due to metals and mining activity as the primary point source. The sediment from mining, logging, gas, oil and roads are identified as potential sources of high metal concentrations. Abandoned Mine Land (AML), are considered a significant source of non-point source metals. Water sampling results from 2002 showed that the Tug Fork watershed had a higher percentage of stream miles with sulfate concentrations indicating mine drainage when compared to the statewide data. The TMDL calls for iron and aluminum reductions in the North Fork of Elkhorn Creek based off modeling data.

Mountaintop removal, and other forms of mining are the primary source of dissolved solids to the streams in this watershed since the 20th century.

Generally, the abandoned surface and/or deep mines, collectively referred to as abandoned mine lands, produce AMD flows (WVDNR, 1985). Data regarding AML sites in the West Virginia portion of the Tug Fork watershed were compiled from spatial coverages provided by WVDEP DMR and the *Big Sandy River - Tug Fork Basin Plan* (WVDNR, 1986).

Past mining activity within this area resulted in areas known as Abandoned Mine Lands (AML) where reclamation has not been completed. These AML sites are given Problem Area Descriptions (PAD) and their locations are shown on Figure 2. Each site is prioritized with regard to health and safety. The following are the priority categories used as general guidelines for selecting AML projects to be submitted to OSM as defined in West Virginia Code (22-2-4). Only levels 1-3 were found in the North Fork of Elkhorn Creek watershed.

1. Protection of public health, safety, general welfare, and property from extreme danger resulting from the adverse effects of past coal mining practices.
2. Protection of public health, safety and general welfare from adverse effects of past coal mining practices which do not constitute an extreme danger.
3. Restoration of eligible land and water and the environment previously degraded by adverse effects of past coal mining practices, including measures for the conservation and development of soil (excluding channelization), woodland, fish and wildlife, recreation resources, and agricultural productivity.
4. Protection, repair, replacement, construction, or enhancement of public facilities such as utilities, roads, recreation, and conservation facilities adversely affected by past coal mining practices.
5. Development of publicly owned land adversely affected by past coal mining practices for recreation and historic purposes, conservation, and reclamation purposes and open space benefits.

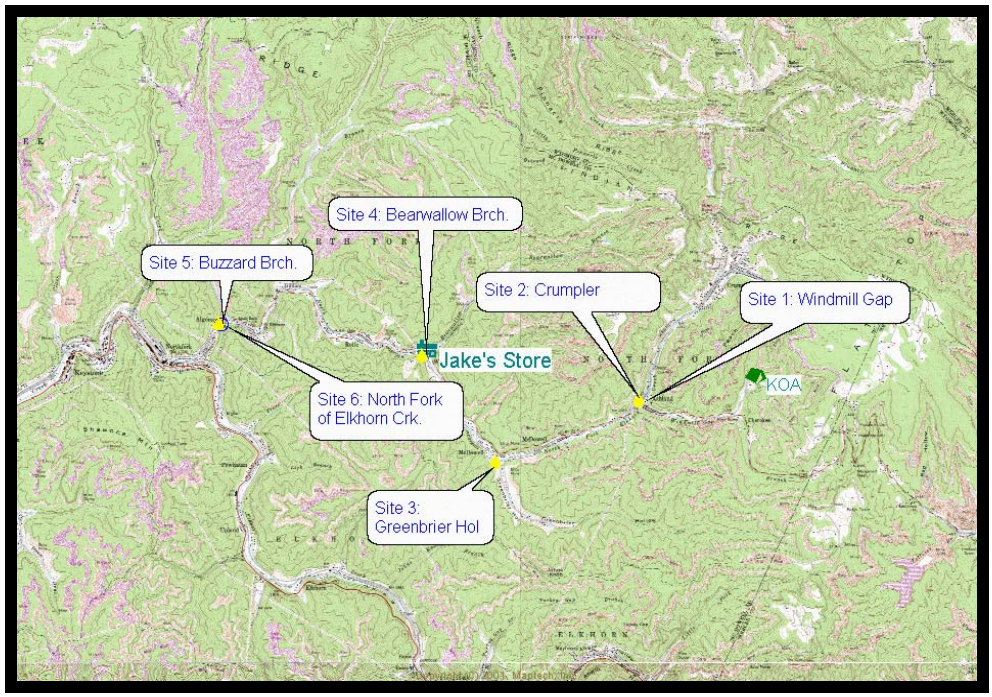
The types of AML sites found within the North Fork of Elkhorn Creek watershed are primarily refuse piles from underground mining, open portals, and high walls. Currently none of the PADs are in the process of being reclaimed and field site visits by WV DEP AML Department will be conducted again to reassess concerns within a few years. Below is a table of AML sites with Priority 3 issues that could impact water quality. These concerns will be addressed after re-evaluation of the PAD sites is completed to determine which, if any, is a water quality issue. Meanwhile, our water quality monitoring will continue for 1 year all flow conditions.

Table 4. PADs located within North Fork of Elkhorn Creek Watershed with descriptions

Name	Water quality concerns
Worth Refuse Pile	Possible sediment source
Algoma Refuse Pile	Possible sediment source
Elkhorn Refuse Pile	heavily eroded, possible sediment source
Greenbrier Refuse Pile	possible sediment source
Greenbrier Portals	possible source of acidic water
Peach Ridge Complex	possible sediment source, illegal dumping near stream

Water monitoring began in the North Fork of the Elkhorn on August 30, 2007. Six sites were established along the mouth of the main tributaries flowing into Elkhorn Creek as well as on the mainstem. (see Figure 7). This data will be used to determine if and/or where there are current metal concerns.

Figure 7. Established water monitoring sites for North Fork of Elkhorn Creek



Results showed that metals (total iron, dissolved aluminum and total manganese) are not a concern at low water (see table 5 and 6 below).

Table 5. Results from water monitoring in North Fork of Elkhorn in August 2007 (low flow)

		In Field Parameters			Lab Results				
Site Name	Sample time	pH	E/C	Flow (cfs)	Al (dis) mg/L	Fecal col/100ml	Fe (total) mg/L	Mg (total) mg/L	TSS mg/L
Windmill Gap	1:55pm	7.7	354	0.4523	0.0043	1760	0.0856	0.0121	<300
Crumpler	1:45pm	7.8	486	0.5516	0.006	680	0.1474	0.0084	<300
Greenbrier	12:13pm	8	548	1.1464	0.0062	6800	0.1886	0.017	<300
Bearwallow	11:58am	8.1	534	0.4587	0.0093	4400	0.1302	0.0064	<300
Buzzard Brch.	10:30am	8.4	775	3.186	0.0024	360	<.0114	0.002	<300
Northfork of Elkhorn	10:50am	8.3	515	3.623	0.0047	18500	0.1138	0.0105	<300

Table 6. Results from water monitoring in North Fork of Elkhorn in October 2007 (mid-flow)

		In Field Parameters			Lab Results					
Site Name	Sample time	pH	E/C	Flow (cfs)	Al (dis) mg/L	Fecal col/100ml	Fe (total) mg/L	Mg (total) mg/L	TSS mg/L	celcius temp
Windmill Gap	2:11pm	7.8	385	4.3322	<.0013	9200	.0260	.0108	< 300	11
Crumpler	2:06pm	8.1	505	4.38	<.0013	108	.1260	.0083	< 300	11
Greenbrier	12:40pm	8.2	593	6.9498	<.0013	10400	.1614	.0153	11	9
Bearwallow	12:05pm	8.2	585	1.9719	<.0013	288	.0748	.0077	< 300	7
Buzzard Brch.	11:20am	8.2	818	18.421	<.0013	7800	.0167	.0100	< 300	7
North Fork of Elkhorn	11:18am	8.2	510	25.795	.0028	4800	.0914	.0039	< 300	4

3b. Other sources of metals

→ get info on bond forfeiture sites

Bond forfeiture/revoked mines, only one in Northfork requires reductions 98% metal

B. Expected Load Reductions

1. Fecal Coliform

The TMDL sets goals for pollutant reductions from nonpoint and point source activities that, if enacted, should improve water quality so that the stream segments are removed from the 303(d) list and meet standards (USEPA, 2004).Current fecal coliform loads and estimated fecal coliform load reductions following implementation of the proposed wastewater treatment were estimated for the watershed (Table 2). Loads were estimated based on calculations found in the EPA

approved Upper Guyandotte River Watershed Based Plan (UGWA, 2006). Loads were based on the number of homes, the average number of people per home in the study area (2.5) (US Census Bureau, 2000), the average amount of wastewater generated per person per day, the number of fecal coliform bacteria counts present in untreated wastewater discharge, and the efficiency of the proposed treatment system. Subsurface dispersal was assumed to be 99% efficient while surface dispersal was assumed to be 90% efficient (UGWA, 2006). Although the 39 currently permitted septic systems were not identified with a particular site, the fecal load currently being treated by these systems was subtracted before the load reduction was totaled.

Table 7: Estimated fecal coliform loads

Site	Number of Homes	Estimated Daily Flow (Gal)	Estimated Fecal Load (cfu/year)	
			Current	Reduction
Algoma	78	13650	1.88722E+14	1.69849E+14
Gilliam I	47	8225	1.13717E+14	1.02345E+14
Gilliam II	10	1750	2.41951E+13	2.39531E+13
Gilliam-Rolfe	8	1400	1.93561E+13	1.91625E+13
Rolfe I	8	1400	1.93561E+13	1.91625E+13
Rolfe II	12	2100	2.90341E+13	2.61307E+13
Worth	23	4025	5.56487E+13	5.50922E+13
Bearwallow Branch I	10	1750	2.41951E+13	2.39531E+13
Bearwallow Branch II	16	2800	3.87121E+13	3.48409E+13
McDowell I	15	2625	3.62926E+13	3.59297E+13
McDowell II	15	2625	3.62926E+13	3.26634E+13
McDowell III	22	3850	5.32292E+13	4.79063E+13
Greenbrier Hollow	14	2450	3.38731E+13	3.35344E+13
McDowell-Ashland	11	1925	2.66146E+13	2.63484E+13
Ashland	18	3150	4.35511E+13	3.9196E+13
Cherokee	12	2100	2.90341E+13	2.87438E+13
Crumpler	129	22575	3.12116E+14	2.80905E+14
Permitted Septic Systems	-39	6825	9.43608E+11	-9.43608E+11
Total Homes:	**409**	**Total Load Reduction:**		**9.98773E+14**

2. Metals

Recent manganese criteria changes

When the TMDL was written, the manganese criterion applied to all waters. Since then, the criterion was modified so that it only applies within the five-mile zone immediately upstream above a known public or private water supply used for human consumption (46 CSR 1 6.2.d). Currently there are no public water sources within the North Fork of Elkhorn therefore the manganese criterion do not apply in this situation and the costs of manganese removal may be avoided entirely. Because the TMDL has not been updated to

account for this water quality standard change, this Watershed Based Plan calculates load reductions and costs based on the standard in place when the TMDL was approved.

Recent aluminum criteria changes

After the TMDL was being written, the aluminum criterion was changed from total to dissolved aluminum, and then the more stringent chronic dissolved aluminum criterion was suspended in all but trout waters until July 2007. On January 9, 2006 USEPA approved this suspension. Because the total aluminum standard no longer applies, streams previously listed for total aluminum therefore accurate load reductions can't be determined for the North Fork of Elkhorn Creek.

Iron

Since Iron has not changed from total to aluminum, we can use the reductions provided in the TMDL shown in table 6 below.

Table 8. Required load reductions from the Tug Fork.

SWS #	Stream Name
82	Lower North Fork of Elkhorn Creek
384	Windmill Gap Creek/ Bearwallow Branch
385	Upper North Fork of Elkhorn Creek

		Total Aluminum (lbs/yr)			*Total Iron (lbs/yr)*			*Total Manganese(lbs/yr)*		
	SWS #	**382**	**384**	**385**	**382**	**384**	**385**	**382**	**384**	**385**
AML	Baseline (lbs/yr)	12,604	4,437	26,626	16,629	5,853	35,127	5,526	1,945	11,674
	Allocated (lbs/yr)	252	89	533	6,825	1,567	6,667	5,526	1,459	7,004
	Reduction (lbs/yr)	*12,352*	*4,348*	*26,093*	*9,804*	*4,286*	*28,460*	*0*	*486*	*4,670*
	% Reduction	98	98	98	59	73	81	0	25	40
Revoked Mines	Baseline (lbs/yr)	309	0	0	355	0	0	308	0	0
	Allocated (lbs/yr)	6	0	0	355	0	0	308	0	0
	Reduction (lbs/yr)	*303*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
	% Reduction	98	0	0	0	0	0	0	0	0
Forestry	Baseline (lbs/yr)	1,003	313	2,034	1,267	2,569	1,115	79	25	159
	Allocated (lbs/yr)	1,003	188	1,017	1,267	1,285	558	79	15	80
	Reduction (lbs/yr)	*0*	*125*	*1,017*	*0*	*1,284*	*557*	*0*	*10*	*79*
	% Reduction	0	40	50	0	50	50	0	40	50
Oil & Gas	Baseline (lbs/yr)	353	149	655	449	827	260	28	12	51

	Allocated (lbs/yr)	353	89	327	449	414	130	28	7	26
	Reduction (lbs/yr)	*0*	*60*	*328*	*0*	*413*	*130*	*0*	*5*	*25*
	% Reduction	0	40	50	0	50	50	0	42	49
Roads	Baseline (lbs/yr)	673	198	932	848	1,176	395	60	18	84
	Allocated (lbs/yr)	673	122	483	848	608	204	60	12	49
	Reduction (lbs/yr)	*0*	*76*	*449*	*0*	*568*	*191*	*0*	*6*	*35*
	% Reduction	0	38	48	0	48	48	0	33	42

Source: WV DEP 2000 TMDL.

C. Proposed Management Measures

1. Wastewater Treatment Measures

Similar to much of southern West Virginia, the North Fork of Elkhorn Creek watershed is characterized by steep slopes and narrow river valleys. The average slope for the Elkhorn Watershed is 48%. In addition, the landscape and topography of the watershed have been dramatically altered over time by coal extraction and related activities. Many homes, therefore, are built on fill material removed from the mines. Poor soil quality and restricted land availability limit opportunities for onsite wastewater treatment systems.

A team comprised of Coalition partners conducted a field survey and assessment of viable wastewater treatment options in September of 2007. The team included staff from the WV Bureau of Public Health, the WVDEP, non-profit service organizations, a wastewater engineer, a local septic system installer with installation experience in the watershed, and the County Sanitarian. The initial preliminary treatment prescriptions were reviewed and refined based on information collected during the field assessment, providing a more detailed consideration of feasible and cost-effective treatment options. Additional soil tests and/or engineering assessments will be needed to identify site-specific options.

Windmill Gap is a headwater tributary of the North Fork of Elkhorn Creek. Projects within this tributary watershed were previously prioritized by the Coaliton, and detailed engineering designs were completed in early 2007 to expedite implementation. Thirty homes will be treated by a combination of clustered collection and treatment as well as traditional septic systems. The cluster component, treating eighteen households and one business, calls for a Septic Tank Effluent Gravity (STEG) collection system and a

constructed wetland treatment system. Dispersal will be subsurface through a low pressure pipe distribution system. The remaining twelve homes will be treated by traditional onsite septic systems.

Homes within the North Fork of Elkhorn Creek watershed are at least fifteen miles away from the nearest centralized treatment plant, and there are currently no plans to construct either an extended sewer system or a centralized treatment plant elsewhere in the watershed (Region I Planning and Development, Princeton, WV). Large-scale centralized collection and treatment was therefore not considered as a feasible option for the North Fork of Elkhorn. Instead, a number of alternative collection and treatment options were explored.

Collection and treatment of wastewater will either be handled through traditional onsite septic systems for individual homes, by clustering and treating close to the source for multiple homes, or by piping wastewater to a small central treatment plant (package plant) for mid-sized communities (Figure8).

The one exception is the community of Algoma, at the downstream end of the watershed and immediately adjacent to the city of Northfork (pop. 512, *2000 Census*). Given the extremely high density and the absence of any available land, the most effective treatment option for Algoma is to be incorporated into Northfork's wastewater planning efforts.

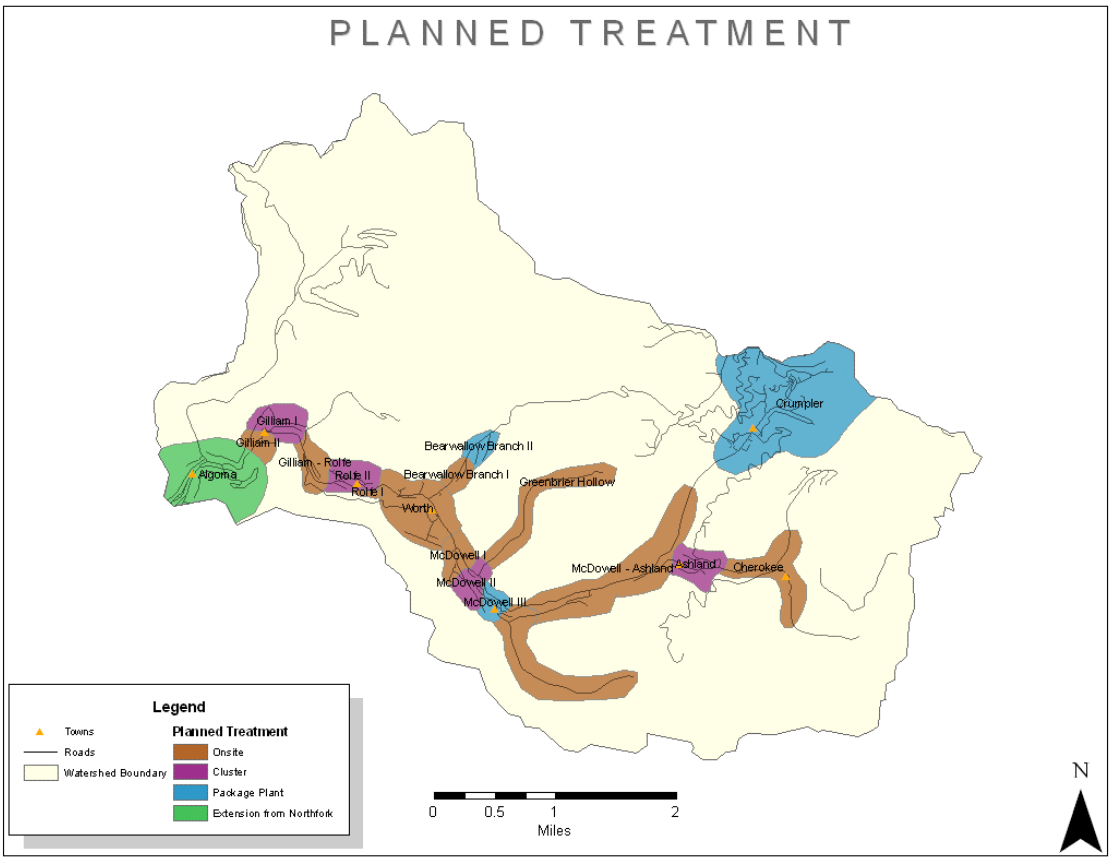


Figure 8: Planned wastewater treatment by site for the North Fork of Elkhorn Creek watershed: Site names correspond to names in Tables 7 and 10.

Collection and Treatment Technologies

Collection

Septic Tank Effluent collection is an alternative, small-diameter sewer that collects only the effluent and uses septic tanks at each dwelling to separate out solids. The sewer can use gravity (STEG systems) or pressure (STEP systems)

Vacuum collection is an alternative, small-diameter sewer that uses a vacuum collection station to pull wastewater through the pipes. Vacuum valve pits at each dwelling control the influx of sewage and air, which creates the pressure difference to drive the flow.

Large diameter sewer (LDS) is a conventional gravity sewer using large pipes laid on a grade to collect sewage. Pump stations are required to overcome adverse terrain in many cases.

Treatment

In the case of individual onsite septic systems and small cluster systems, no additional treatment will be needed after primary treatment at the septic tank and before subsurface

soil dispersal. Because of poor soil quality and site limitations, however, most cluster systems will require an additional type of treatment technology.

Media filters filter wastewater through media (typically sand, gravel, peat, or a manufactured substance like textile, foam cubes or plastic lattices) to remove contamination. The media provides a surface for bacteria to fix on as they biologically treat the passing wastewater.

Constructed wetlands (CW) contain a horizontally aligned gravel filter supporting wetland plants (cattails, reeds, bulrushes, etc.). The gravel acts as a media filter (see above) while the plants introduce oxygen and remove nutrients and water through their roots.

Package plants are pre-manufactured wastewater treatment plants that can be easily delivered to the site and rapidly set up. Typically, package plants use aeration and return of activated sludge to provide treatment, but pre-manufactured media filters could also be called package plants.

Dispersal

Traditional treatment fields (drain fields or leach fields) distribute effluent by gravity from the septic tank through a series of trenches that allow percolation, seepage into, the soil. Traditionally the field is composed of perforated pipes in a gravel base but plastic chambers, textile-wrapped pipes ('gravelless pipes') or geotextile filter units (the ELJEN system) can also be used.

Low pressure pipes (LPP) use a pump tank after the septic tank to distribute pressurized flow evenly through a network of small pipes. Because of the even distribution and time-dosing, these trenches can be smaller, shallower, and installed with less separation to a limited zone.

Drip irrigation (Drip) uses a pump tank to disperse pressurized flow through a network of shallowly-lain tubes in the soil. There is less trenching involved due to the shallow placement and reduced separation requirements. However, because of the small tubes and tiny emitters, most installers recommend pre-treatment which can make drip systems expensive.

Surface discharge is an alternative to subsurface dispersal. Effluent that has been treated, disinfected, and meets water quality standards can be discharged to a stream.

2. Metals

Abandoned Mine Land (AML) sites will be revisited by the WV DEP AML Dept. by 2020 to give update restoration recommendations. With this information we will work with the DEP to determine what remediation technique is best and practical for each PAD determined by feasibility and funding availability.

D Technical Assistance and Funding

Many partners including federal and state agencies, the watershed association, consultants, nonprofit assistance providers, academic institutions, and citizens will collaborate in order to provide the technical and financial resources needed to implement this Watershed Based Plan.

All or relevant parts of this WBP will be published and distributed to potential technical and/or financial assistance providers in order to provide background information, demonstrate the need for the projects being proposed, and leverage the resources needed to implement this plan.

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1. Wastewater Treatment Projects

Cost Assessments
Cost assumptions for various components of collection and treatment systems have been compiled and refined by Canaan Valley Institute and project partners in McDowell County and the neighboring Upper Guyandotte Watershed over the last several years (Table 3). Assigned costs are not meant to be an accurate estimate of real installation costs, but rather to provide a relative ranking based on current component costs in the region.

Table 9: Treatment Technology Cost Assumptions

Technology	Includes Installation and:	Cost/ House	Annual O&M Cost/ House
New individual onsite septic system with traditional drain field	New tank and drain field	$5,000	$50
STEP (Septic Tank Effluent Pump) system	New septic tank with street-side hookup	$9,000	$180
STED (Septic Tank Effluent Discharge [gravity]) system	New septic tank with street-side hookup	$6,000	$50
Vacuum Valve Pit	Valve pit can handle 2-4 homes	$2,000	$50
Vacuum Collection Station		$325,000	
Septic Tank		$1,000	
Textile Filter		$11,000	$240
Peat Filter		$8,500	$240
Recirculating Sand Filter (RSF)		$7,000	$240
Sand Filter (SF)-Single Pass		$2,500	$240
Drain field	Area 0.2gals/sqft for individual home	$2,500	
Drip field (Drip)	For individual home	$8,000	
Low Pressure Pipe (LPP)	For individual home	$5,000	
RSF with Direct Discharge	For individual home	$5,040	$200
Package Plant with Direct Discharge	Treatment plant only	$2,800	$425
8" Line Installed per foot	Includes manholes, no lift station	$100	
4" Line Installed per foot		$50	
Connection Tap fee		$300	
UV Treatment	Home-sized Unit	$800	$150

These assumed treatment technology costs were used to generate total project costs for the assigned treatment options for each of the communities in the North Fork of the Elkhorn Creek watershed (Table 4).

Table 10: Site specific treatment type and cost

Site	Number of Homes	Sewer		Treatment		Total Cost
		Type (Length ft)	Cost	Type	Cost	
Algoma	78	Gravity (6500)	$673,400	Connection to Northfolk	$0	$673,400
Gilliam I	47	STEG (1600)	$362,000	Cluster SF-Drip	$376,000	$738,000
Gilliam II	10	Onsite	$0	Onsite	$50,000	$50,000
Gilliam-Rolfe	8	Onsite	$0	Onsite	$40,000	$40,000
Rolfe I	8	Onsite	$0	Onsite	$40,000	$40,000
Rolfe II	12	STEG (1000)	$122,000	Cluster foam filter LPP	$72,000	$194,000
Worth	23	Onsite	$0	Onsite	$115,000	$115,000
Bearwallow Branch I	10	Onsite	$0	Onsite	$50,000	$50,000
Bearwallow Branch II	16	STEG (1500)	$171,000	RSF (Package Plant)	$80,640	$251,640
McDowell I	15	Onsite	$0	Onsite	$75,000	$75,000
McDowell II	15	STEG (2000)	$190,000	Cluster SF-Drip	$120,000	$310,000
McDowell III	22	STEG (3000)	$282,000	Package Plant	$110,880	$392,880
Greenbrier Hollow	14	Onsite	$0	Onsite	$70,000	$70,000
McDowell-Ashland	11	Onsite	$0	Onsite	$55,000	$55,000
Ashland	18	STEG (1700)	$272,000	Cluster-CW-LPP	$160,000	$432,000
Cherokee	12	Onsite	$0	Onsite	$60,000	$60,000
Crumpler	129	STEP (6000)	$600,000	Package Plant	$650,160	$1,250,160
Total Homes	**448**			**Total Cost**		**$4,797,080**

Funding Sources

Given the diversity of collection and treatment systems planned for the watershed, funding will be sought from both traditional infrastructure sources as well as non-traditional sources.

The two larger planned systems for Crumpler (package plant) and Algoma (central sewer extension) will require funding from one or more traditional funding sources:

- The **WV Infrastructure and Jobs Development Council** acts as the primary clearinghouse for public infrastructure funding in the state,
- **USDA's Rural Utility Services** funding is administered through the Rural Development program,
- **Small Cities Block Grants,**
- **Appalachian Regional Commission,**
- **US Army Corps of Engineers,**
- **EPA's State and Tribal Assistance Grant Program,** and
- **WV State Revolving Fund Program**, administered by WVDEP.

Project partners have seen limited success in accessing alternative sources of funding for smaller community systems and individual onsite systems. These include:

- The **WV Onsite State Revolving Fund Program**, which is administered through a local housing non-profit in coordination with the WVDEP. This program can be used to provide loan funding for individual onsite systems as well as homeowner-owned components of decentralized systems,
- **319 Program** through WVDEP for systems incorporating subsurface disposal,
- **Faith-based organizations,**
- **WV Housing Development Fund** and other housing-related funding, and
- **Local businesses**, often when providing service to those businesses and surrounding homes.

Responsible Management

Limited management capacity remains one of the most significant hurdles to addressing wastewater pollution throughout the Southern Coalfields. In McDowell County, there is currently no public management entity in place with the authority to own and operate wastewater treatment systems, outside of municipalities.

Public and private utilities are regulated by the WV Public Service Commission (WVPSC). The WVPSC created a Task Force in early 2007 to draft changes to rules that govern wastewater management in order to better accommodate alternative systems for small communities, and several Coalition partners participate in that Task Force. It is anticipated that the proposed rule revisions will be completed in early 2008, and may strongly influence how future small systems are operated and managed.

The Coalition is currently working with existing public water managers to extend both their authority and their capacity. At the same time, the Coalition is supporting the creation of at least one private community organization to provide management of a proposed small local system. The experience of Coalition partners has revealed that community groups and homeowners associations have typically not been successful infrastructure managers. While new WVPSC rules will hopefully provide for mechanisms to address the shortfalls, the Coalition will also continue to work closely with these groups to insure that the proper safeguards are put in place.

Table 11. Tasks required for implementation of wastewater treatment projects.

Tasks	Task Lead Agency/ Partners
Coordinate and apply for various funding sources	WTCMC, CVI
Collect water quality data at sources of untreated wastewater	WVDEP, WTCMC
Create preliminary engineering reports	Consultants, CVI
Create detailed engineering designs of wastewater treatment projects	Engineering firm
Coordinate training opportunities to increase the capacity of local installers and system designers	CVI, WTCMC
Perform project management, including putting projects out for bid, Projects out for bid, managing projects, and tracking their progress	WTCMC all partners
Coordinate program to install individual onsite systems and provide homeowners instruction on proper maintenance	WTCMC
Coordinate education and outreach efforts to raise public awareness of nonpoint source wastewater pollution	WTCMC

Monitor instream and source water quality following the installation of wastewater treatment projects in order to document their effectiveness	WTCMC, WVDEP

Table 12. Technical Assistance for AML sites

Table%. Tasks required for implementation of projects.

Task	Lead Agency/Partners
Coordinate and apply for various funding sources	WTCMC
Collect data at sources of metals in preparation for the design of remediation projects	WVDEP, WTCMC
Create conceptual designs of remediation projects	OSM
Create detailed engineering designs of remediation Projects	Consultants, NRCS
Perform project management, including putting projects out for bid, managing projects, and tracking Progress	WTCMC and project partners
Monitor instream and source water quality following the installation of remediation projects in order to document their effectiveness	WVDEP, WTCMC

Financial Assistance

Multiple funding sources have been explored for implementation of this Watershed Based Plan. Potential sources include state and federal agencies, as well as private and foundation funding, and are listed below.

• WV Infrastructure and Jobs Development Council (IJDC). Most sources of public funding for wastewater infrastructure are administered by the IJDC.
• WV Department of Environmental Protection, 319 Program & State Revolving Fund and Stream Partners Grant
• USDA Rural Utility Services
• Small Cities Block Grants
• Appalachian Regional Commission
• US Army Corps of Engineers
• US Environmental Protection Agency (i.e. State/Tribal Assistance Grants)
• Canaan Valley Institute
• USDA 504(b) program (on-site septic systems)
• US Department of Housing and Urban Development (203(k) program for on-site septic systems)
• Private Foundations
• Local government
• Local land-owners, industry and other private investments

→???? Help with funding sources!!!
List where monies are coming from mentioned previously in section C. A spreadsheet like CVI. Can use spreadsheet if strategies are correct.

E. Information, Education, and Public Participation Component

The following is a tentative plan for youth and adult outreach and education. The Wastewater Treatment Coalition of McDowell County will be responsible for executing this plan.

Public Meetings and Radio Spots

The Coalition conducts monthly public meetings that are announced on local radio, email, and within the local paper. "In Focus" radio spots are slated for continued exposure of issues confronting efforts to eliminate the use of straight pipes to remove waste and to encourage the public to be conscious of their effects on the environment.

Website

A website has been established and is under construction to serve as an educational component and as a research and data collection site. This website will contain both project status reports and anticipated construction sites. All water quality monitoring results will continually be updated to keep the public abreast of current levels of contamination. Upcoming training sessions will be posted along with links to DEP regulations and EPA guidelines for wastewater treatment and health and wellness issues related to water quality.

Publications

The onsite loan program for the installation of septic systems is a target subject in an upcoming brochure that will be published by the Coalition to inform citizens of available funding. This program is being heavily supported by the Coalition and will be promoted through newspaper articles and radio spots. Another anticipated publication is a brochure promoting proper wastewater treatment and discussing the importance of proper treatment.

Programs

The Coalition is currently sponsoring a youth watershed education project called FLOWs UNITE (Future Leaders of Watersheds Understanding Needs in the Environment). Over forty Mount View Middle School students have participated since the inception of the program in September, 2007. The students are conducting water quality monitoring tests, using GPS technology, and developing leadership skills. All these efforts are in anticipation of furthering this outreach program to include grades K-5 and some adult audiences.

Additional outreach and education activities will be created as needed to meet the needs of individual communities within the county. The Coalition will partner with member organizations when needed to further their education and outreach efforts.

Education and outreach has begun with the first public meeting with residence of the Ashland community to discuss plans and address concerns. Continued outreach will occur with the help of several organizations and through multiple venues. In the community of Ashland, one-on-one meetings and discussion will continue to be the primary means of community engagement and information sharing. Two local organizations, the Wastewater Treatment Coalition and Travel Beautiful Appalachia, Inc., have committed the time of their respective VISTA members to assist with outreach in the Ashland community. The Coalition and other project partners will regularly be on-hand as the project is underway.

In order to highlight the working treatment system, an interpretive kiosk will be constructed for the site. Additional outlets will also be used to focus attention on the completed project, including the local newspaper, radio station, and a billboard. The project will also be highlighted in the Wastewater Treatment Coalition's publications.

The Wastewater Treatment Coalition will utilize the Windmill Gap project as a demonstration in their ongoing efforts to educate elected officials and community decision-makers on the need for improved regulatory and management programs. Educational outreach to the general public will be key as individuals are made aware of on-site alternatives and encouraged to adopt this demonstrated technology. Through funding made available from the WV Development Office, training has been made available to local infrastructure managers, contractors, and local installers on the installation and management of alternative systems. And finally, the installation of these systems in various parts of West Virginia will provide for demonstration of this technology to other watershed groups, government officials, on-site system installers, schools and the public to encourage adoption in other areas of the state.

F/G. Schedule and Milestones

An implementation strategy for treating wastewater in the North Fork of Elkhorn Creek will follow two tracks:

A. Individual onsite systems will be promoted throughout the watershed over a six-year period. Because of the lack of capacity, the widespread nature of the problem, and statutory limitations placed on local inspectors, an incentive-based approach will be implemented to encourage homeowners to install systems. Funding through the WV Onsite State Revolving Fund and other related sources will be made available on a first-come, first-served basis. An annual 16% reduction in fecal loading is anticipated for each of the six years.
   The one exception to this approach is the community of Cherokee, where installation of septic systems will be accelerated in order to improve water quality in the entire Windmill Gap tributary.

B. Community systems will be designed and installed beginning at the headwaters of the watershed and moving downstream.

H. Milestone Schedules

Our goal is to achieve 50% load reductions achieved by 2010. The Tug Fork TMDL does not indicate North Fork of Elkhorn Creek to be impaired for metals. Recent monitoring found that indeed metals are not a concern but fecal coliform is. We are going to continue monitoring to see if the model from the TMDL overestimated the load of metals in the North Fork of Elkhorn Creek. Water monitoring will continue before and after the implementation of the Ashland Project to see exactly what the load reductions are from the removal of straight pipes in Ashland.

For the Wastewater Treatment Plan project areas were prioritized due to several criterion: cost per household, community willingness, leverage for funding, as well as proximity to floodplain and development. Rankings (1-5) were assigned to all criteria with 1 as a low score and 5 as the highest. Weighted scores for each community are listed in table below. The Ashland community ranked at the top of the prioritization list with a score of 4.25 making it number one for the North Fork of Elkhorn Creek subwatershed. Currently the WTCMC is working on this known as the Windmill Gap watershed project, a direct result of this county-wide planning process.

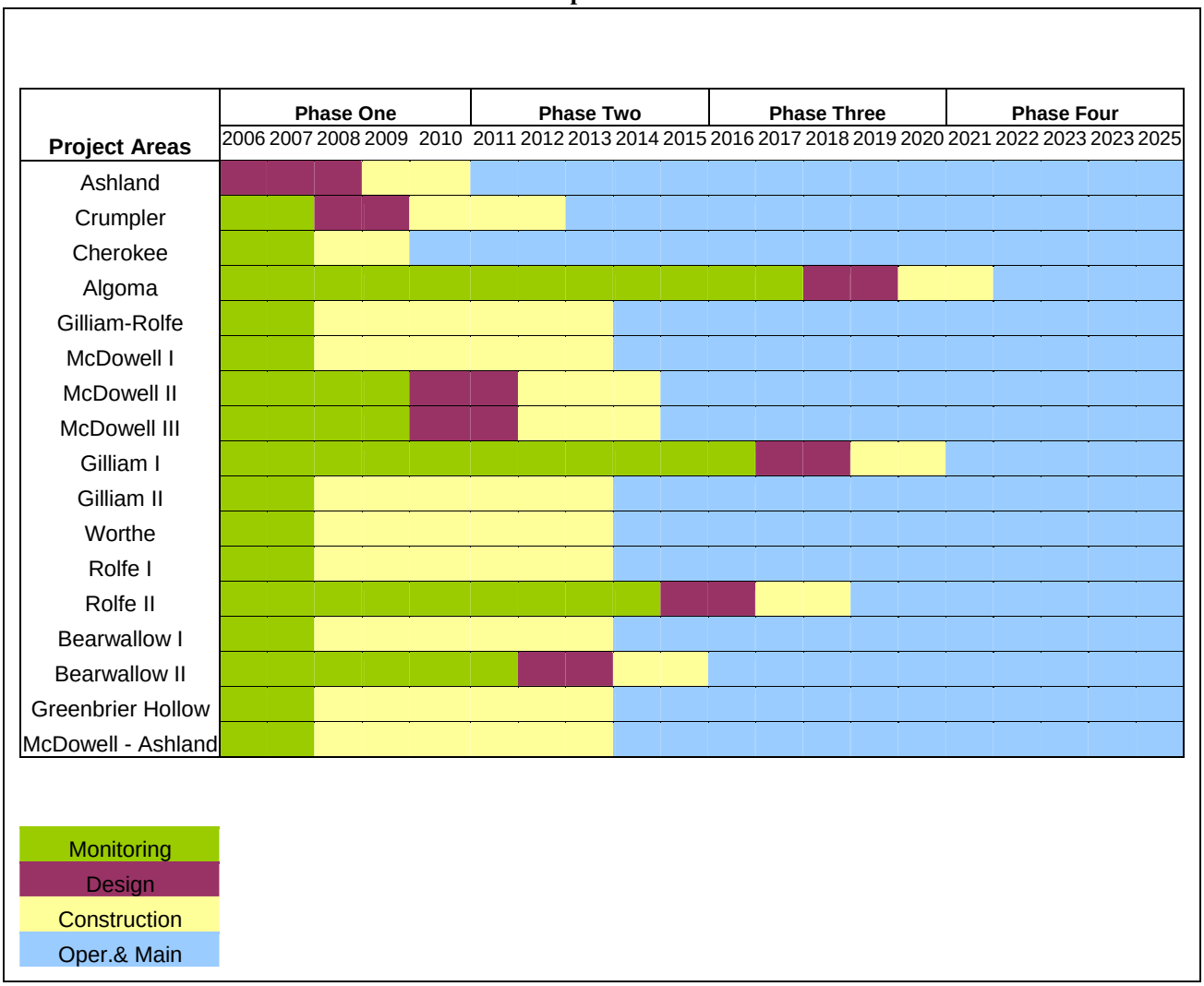
Implementation Schedule

Each project will occur in four phases: monitoring, design, construction and operation and maintenance. The top priority projects like Ashland will enter the construction phase upon approval of this Watershed Based Plan. For all projects qualified engineers will be selected to prepare detailed engineered reports to solicit funds for construction. When the funding is complete, the project will then enter the construction phase. Upon completion of the construction the Responsible Management Entity designated before construction, will take over long-term operation and maintenance. Lower priority projects will remain on the monitoring phase until top priority projects have entered the construction phase and resources are available for additional projects to enter the design phase.

Whenever applicable, efforts to assist homeowners obtain individual onsite wastewater treatment systems will occur concurrently with design and construction of community wastewater treatment systems.

Table 11 gives an approximate implementation schedule for the North Fork of Elkhorn Creek watershed. This schedule represents an idea, though realistic, scenario. All progress made towards achieving milestones is contingent on available funding.

Table 13. Implementation schedule.



I. Monitoring Component

Windmill Gap Branch

The Wastewater Treatment Coalition of McDowell County, along with the Nonpoint Source Program's Basin Coordinator, will be responsible for pre- and post-construction monitoring of water quality. The water sampling procedures will follow the WV DEP quality assurance procedures (QAP) This will assure not only that the installed system is functioning properly, but will also give us measurable reductions in fecal contamination associated with these streams as it pertains to the streams 303(d) listing.

The fecal coliform monitoring will be started immediately following the completion of any and all necessary work to this system. The monitoring will be conducted monthly for the first six (6) months after the Ashland project is complete. During this time care will

be taken sample at various flow patterns associated with changing weather conditions. This will be important to establish the functionality of the system during varied conditions. After the initial six (6) months, samples will be taken quarterly for the subsequent six (6) months. This time period should provide a measure of assurance that the system is fully functioning, and that Windmill Gap is in compliance with West Virginia's Water Quality Standards for fecal coliform.

The sampling will be done in accordance with the DEP Division of Water and Waste Management Watershed Assessment Branch's established QAPP.

North Fork of Elkhorn Creek

Water monitoring has occurred at 6 sites for 2 sampling periods: August 2007 and October 2007 and will be sampled again in December 2007 (See Figure 7). Monitoring will include rate of flow, metals, pH, temperature, electro-conductivity, TDS and fecal. The results will be used to determine what and where specific pollutants are coming into the North Fork of Elkhorn and whether metals are truly an issue within this watershed.

Appendix

Appendix A. Results from water monitoring from the Tug Fork Report by WV DEP Watershed Assessment Branch.

TABLE 10. Elkhorn Creek Subwatershed

Date	Stream Name	ANCode	Mile Point	WVSCI	RBP	pH	Sp Cond (umhos/cm)	Sulfate (mg/L)	TSS (mg/L)	Total Al (mg/L)	Total Fe (mg/L)	Fecal (col./ 100mL)
6/22/1998	Elkhorn Creek	WVBST-99	16.4	59.38	147	7.80	336	59		<0.05	0.268	1300
6/22/1998	North Fork/Elkhorn Creek	WVBST-99-L	0	50.58	138	8.30	448	90		<0.05	0.277	>20000
6/16/1998	North Fork/Elkhorn Creek	WVBST-99-L	6.2	35.47	150	7.60	247	35		<0.05	0.0886	5600
6/22/1998	Buzzard Branch	WVBST-99-L-1		63.76	130	8.00	608	140		<0.05	0.05	4600
9/16/2003	Elkhorn Creek	WVBST-99	2.5	55.56	145	7.89	598					2000
9/17/2003	Elkhorn Creek	WVBST-99	16.6	56.48	158	8.30	499					11000
9/17/2003	Laurel Branch	WVBST-99-E	0	23.15	112	8.73	385		3			>12000
9/15/2003	North Fork/Elkhorn Creek	WVBST-99-L	0.3	51.87	111	8.23	521					>12000
6/5/2003	Windmill Gap Branch	WVBST-99-L-4	1.7	82.93	123	7.68	309	68.7	80	0.65	0.82	

Appendix B. WV DEP 303 (d) list for 2004 Tug Fork TMDL Report.

WEST VIRGINIA 2004 Section 303(d) List **WEST VIRGINIA**

Stream Name	Stream Code	Criteria Affected	Cause	Impaired Length (stream-mi) (lake-acres)	Reach Description	Projected TMDL Year (No Later Than)	2002 list?
TUG FORK WATERSHED - HUC# 05070201 - *13 streams 175 miles*							
Tug Fork River	WVBST	CNA-Biological	Unknown	103.4	RM 51.6 to headwaters	2016	Yes
Silver Creek	WVBST-16	CNA-Biological	Unknown	2.5	Entire length	2016	Yes
Pigeon Creek	WVBST-24	Aluminum (dis)	Unknown	32.0	Entire length	2016	No
Rockhouse Fork	WVBST-24-Q	Aluminum (dis)	Unknown	9.6	Entire length	2016	No
Mate Creek	WVBST-40	Aluminum (dis)	Unknown	9.9	Entire length	2016	No
Sulphur Creek	WVBST-41	CNA-Biological	Unknown	1.7	Entire length	2016	Yes
Greenbrier Fork	WVBST-60-A	CNA-Biological	Unknown	3.5	Entire length	2016	Yes
Grapevine Branch	WVBST-70-F	CNA-Biological	Unknown	1.8	Entire length	2016	Yes
Wolfpen Branch	WVBST-70-M-3	CNA-Biological	Unknown	1.6	Entire length	2016	No
Mountain Fork	WVBST-70-W-1-A	CNA-Biological	Unknown	3.6	Entire length	2016	Yes
Badway Branch	WVBST-78-G	CNA-Biological	Unknown	1.3	Entire length	2016	Yes
Upper Shannon Branch	WVBST-95	CNA-Biological	Unknown	2.4	Entire length	2016	Yes
Rock Narrows Branch	WVBST-103	CNA-Biological	Unknown	1.7	Entire length	2016	Yes

References

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