APPENDIX A

A-1. LOWER NEW RIVER

A-1.1 Watershed Information

The Lower New River is the segment of New River between Bluestone Dam and its confluence with the Gauley River at Gauley Bridge. This Appendix addresses TMDL watersheds contributing to this segment of the New River, except the Piney Creek watershed, which is discussed in Appendix B, and the Greenbrier River, for which a separate TMDL report has been developed. The term "Lower New River watershed" is used in the remainder of this Appendix to refer to TMDL watersheds of the lower New River mainstem, exclusive of Piney Creek and the Greenbrier River.

The dominant landuse in this part of the New River watershed is forest, which covers 83.9 percent of the watershed. Other significant landuse types include grassland (7.4 percent), and urban/residential (3.5 percent). Table A-1-1 shows modeled landuses in the Lower New River watershed. There are 24 impaired streams in the watershed, including the Lower New River, which are addressed in this TMDL development effort. Figure A-1-1 shows the impaired segments and Table A-1-2 displays waterbody/impairment combinations for which total maximum daily loads (TMDLs) are developed.

Table A-1-1. Modeled landuse types in the Lower New River watershed

Landuse Type	Area of Watershed		Percentage
	Acres	Square Miles	
Water	6,272.5	9.8	1.8%
Wetland	582.4	0.9	0.2%
Barren	1,511.3	2.4	0.4%
Forest	298,089.7	465.8	83.9%
Grassland	26,415.7	41.3	7.4%
Cropland	156.3	0.2	0.0%
Pasture	5,782.1	9.0	1.6%
Urban/Residential	12,471.3	19.5	3.5%
Mining	1,357.7	2.1	0.4%
AML	2,688.0	4.2	0.8%
Total Area	**355,326.8**	**555.2**	**100.00%**

Table A-1-2. Waterbodies and impairments for which TMDLs have been developed

TMDL Watershed	Code	Trout	Stream Name	Fe	Al	pH	Mn	FC	BIO
Lower New River	WVKN-lo		New River (Bluestone Outlet-Mouth)					X	
Laurel Creek	WVKN-5		Laurel Creek					X	
Mill Creek	WVKN-7	T	Mill Creek					X	
Mill Creek	WVKN-7-0.5A		UNT/Mill Creek RM 1.7					X	
Mill Creek	WVKN-7-B		Osborne Creek	X				X	X
Mill Creek	WVKN-7-B-0.3		UNT/Osborne Creek RM 0.7					X	
Marr Branch	WVKN-9		Marr Branch	X				X	X
Marr Branch	WVKN-9-A		UNT/Marr Branch RM 0.9	X				X	X
Wolf Creek (WVKN-10)	WVKN-10	T	Wolf Creek (WVKN-10)	X				X	X
Wolf Creek (WVKN-10)	WVKN-10-A		House Branch					X	
Wolf Creek (WVKN-10)	WVKN-10-B		Crooked Run					X	
Wolf Creek (WVKN-10)	WVKN-10-C		Short Creek					X	
Wolf Creek (WVKN-10)	WVKN-10-M		UNT/Wolf Creek RM 8.7	X	X	X			
Keeney Creek	WVKN-15	T	Keeney Creek					X	
Coal Run	WVKN-16		Coal Run					X	
Manns Creek	WVKN-17-B		Floyd Creek	X	X	X			X
Arbuckle Creek	WVKN-21	T	Arbuckle Creek	X				X	X
Arbuckle Creek	WVKN-21-A		Rocklick Creek					X	
Dunloup Creek	WVKN-22-K		Mill Creek	X	X	X			X
Glade Creek	WVKN-29	T	Glade Creek					X	X
Meadow Creek	WVKN-32	T	Meadow Creek					X	
Brooks Branch	WVKN-42		Brooks Branch					X	
Madam Creek	WVKN-44		Madam Creek					X	
Beech Run	WVKN-45		Beech Run					X	

Note:
UNT = unnamed tributary.
FC indicates fecal coliform bacteria impairment
BIO indicates a biological impairment

Before establishing TMDLs, West Virginia Department of Environmental Protection (WVDEP) performed monitoring in each of the impaired streams in the New River watershed to better characterize water quality and refine impairment listings. Monthly samples were taken at 95 stations (station locations can be viewed using the ArcExplorer project) throughout the Lower New River watershed from July 1, 2004, through June 30, 2005. Monitoring suites at each site were determined based on past water quality data, field reconnaissance, and the use of statewide geographic information system (GIS) coverages to locate point and nonpoint sources that could cause stream impairments. Streams potentially impaired by metals and low pH were sampled monthly and analyzed for a suite of parameters including acidity, alkalinity, total iron, dissolved

iron, total aluminum, dissolved aluminum, total suspended solids (TSS), pH, sulfate, total selenium, and specific conductance. Monthly samples from streams potentially impaired by fecal coliform bacteria were analyzed for fecal coliform bacteria, pH, and specific conductance. In addition, benthic macroinvertebrate assessments were performed at specific locations on the biologically impaired streams during the pre-TMDL monitoring period. Instantaneous flow measurements were also taken at strategic locations during pre-TMDL monitoring.

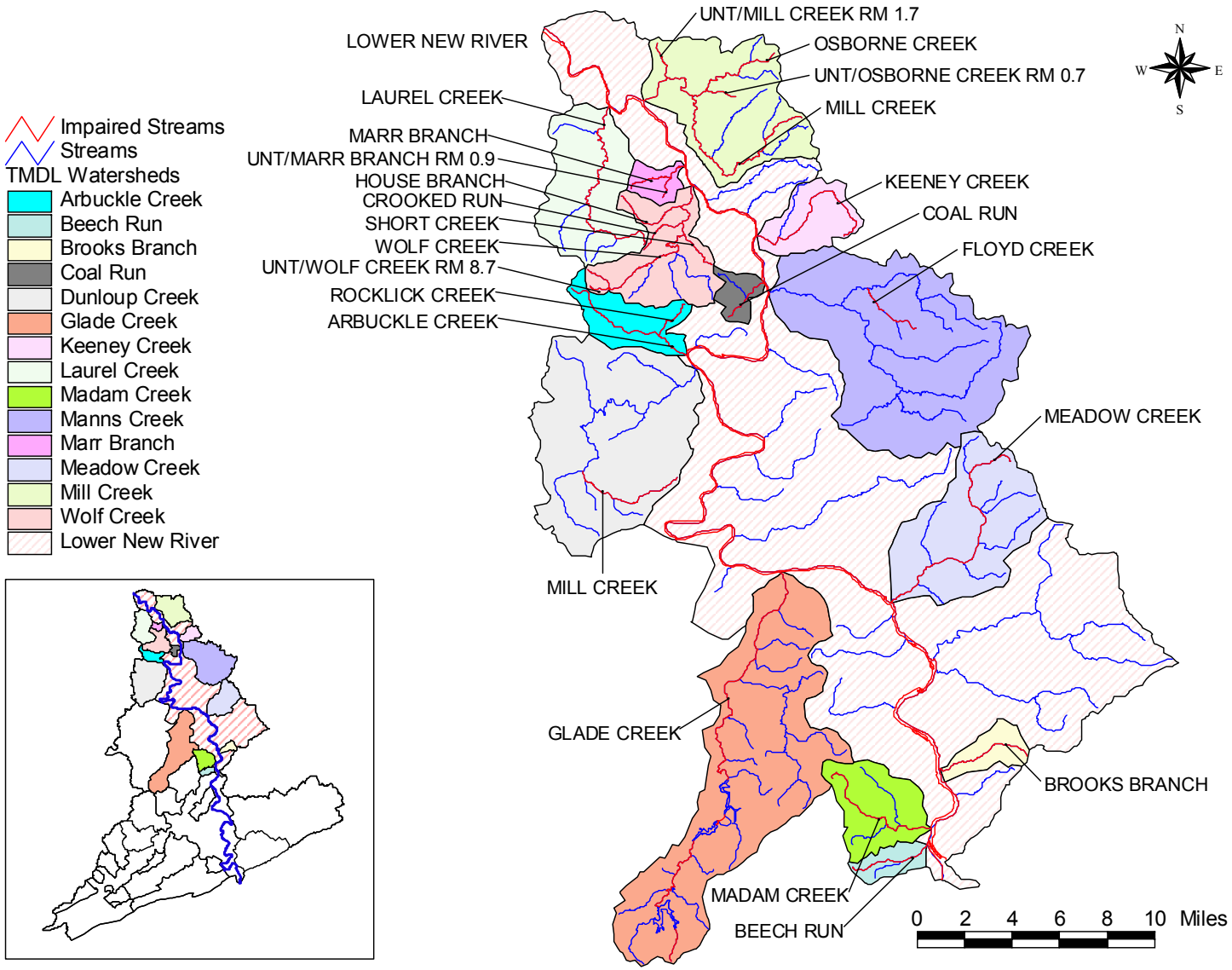

Figure A-1-1. Impaired waterbodies under TMDL development in the Lower New River watershed

A-1.2 Metals and pH Sources

This section identifies and examines the potential sources of aluminum, iron, and pH impairment in the Lower New River watershed. Sources can be classified as point sources (specific sources subject to a permit) or nonpoint sources (diffuse sources). Mining and non-mining-related permitted discharges are potential metals and pH point sources. Potential metals and pH nonpoint sources include non-permitted sources such as abandoned or forfeited mine sites, and sediment producing land disturbance activities and streambank erosion. Controls of sediment-producing sources were determined to be necessary in order to meet water quality criteria for total iron during critical high-flow conditions.

Pollutant sources were identified using statewide GIS coverages of point and nonpoint sources, and through field reconnaissance. As part of the TMDL process, WVDEP documented pollution sources by describing the pollutant source in detail, collecting Global Positioning System data, and if necessary, collecting a water quality sample for laboratory analysis. WVDEP personnel recorded physical descriptions of the pollutant sources, such as the number of outfalls, the source of the outfalls, and the general condition of the stream in the vicinity of each outfall. These records were compiled and electronically plotted on maps using GIS software. This information was used in conjunction with other information to characterize pollutant sources. Mining-related point and nonpoint sources are shown in Figure A-1-2, and specific details relative to these and other sources are discussed in the following sections.

A-1.2.1 Metals Point Source Inventory

As described in the TMDL Report, the National Pollutant Discharge Elimination System (NPDES) program, established under Clean Water Act Sections 318, 402, and 405, requires permits for the discharge of pollutants from point sources. Metals and pH point sources can be classified into two major categories: permitted non-mining point sources and permitted mining point sources.

In the Lower New River watershed there is one mining-related NPDES permit with two outlets. Because the permit contains iron and aluminum effluent limitations, the regulated discharges were determined to be contributing point sources of metals.

There are 14 sites in the watershed registered under the Multi-Sector Stormwater General Permit. That permit regulates stormwater associated with industrial activity (non-mining). All regulated outlets are subject to benchmark values for total iron and/or TSS. Those general permit registrations were determined to be contributing point sources of iron.

Permit and outlet information is provided in Appendix G of the Technical Report, which shows the name of each responsible party and the total number of outlets that discharge to the Lower New River watershed. Appendix G of the Technical Report also contains specific data for each permitted outlet including effluent type, drainage area, pump capacity, and permit limits for each of the mining-related NPDES outlets. Industrial stormwater permits in Appendix G show the permit number, and the concentration limits for aluminum, iron and TSS.

Construction Stormwater Permits

The discharges from construction activities that disturb more than one acre of land are legally defined as point sources and the sediment introduced from such discharges can contribute iron and aluminum. WVDEP issues a General NPDES Permit (permit WV0115924) to regulate stormwater discharges associated with construction activities with a land disturbance greater than one acre. These permits require that the site have properly installed best management practices (BMPs), such as silt fences, sediment traps, seeding / mulching, and riprap, to prevent or reduce erosion and sediment runoff. The BMPs will remain intact until the construction is complete and the site has been stabilized. Individual registration under the general permit is usually limited to less than one year.

Although there are no existing construction sites registered under the Construction Stormwater General Permit in the Lower New River, an area-based allocation for site registrations under the permit is provided for each Lower New River subwatershed.

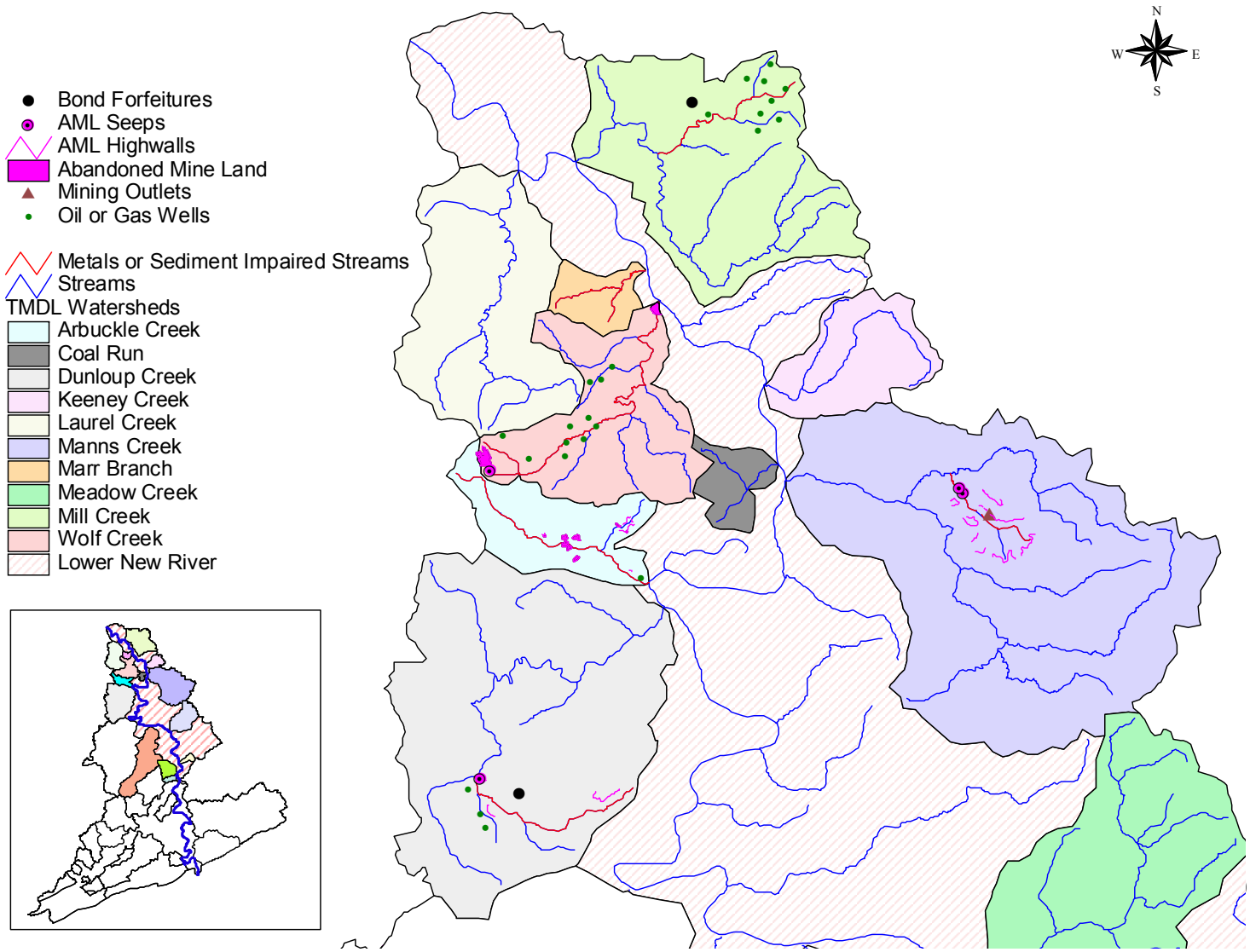

Figure A-1-2. Mining-related sources in the Lower New River watershed

A-1.2.2 Metals Nonpoint Sources

In addition to point sources, nonpoint sources also contribute to metals-related water quality impairments in the Lower New River watershed. Nonpoint sources are diffuse, non-permitted sources. The applicable land-disturbing activities in the Lower New River watershed are discussed below.

Abandoned Mine Lands and Bond Forfeiture Sites

Based on the identification of a number of abandoned mining activities in the Lower New River watershed, abandoned mine lands (AMLs) comprise approximately 2,687 acres and are a significant non-permitted source of metals and pH impairment in the watershed. WVDEP's Office of Abandoned Mine Lands identified the locations of highwalls and AMLs (2,688 acres) in the Lower New River watershed. In addition, source tracking efforts by WVDEP's Division of Water and Waste Management (DWWM) identified and characterized six abandoned mine seeps (AML seeps).

WVDEP's Division of Land Restoration, Office of Special Reclamation, provided bond forfeiture information and data. This information included the status of both land reclamation and water treatment activities. Two bond forfeiture sites were modeled as metals sources in the Lower New River watershed.

Land-Disturbance Activities

Land disturbance can increase sediment loading to impaired waters. The control of sediment-producing sources has been determined to be necessary to meet water quality criteria for total iron during high-flow conditions. Nonpoint sources of sediment include forestry operations, oil and gas operations, agriculture, stormwater from construction sites less than one acre, and stormwater from roads and urban and residential land in non-MS4 areas. Additionally, streambank erosion represents a significant sediment source throughout the watershed. Upland sediment nonpoint sources are summarized below.

During the pre-TMDL sampling period there were eight registered timber harvest sites in the watershed. The watershed also contains 21 active oil and gas wells, which, based on the survey by WVDEP's Office of Oil and Gas, are estimated to comprise 30 acres of disturbed area.

The length and area of paved roads were calculated using the Census 2000 TIGER/Line files roads coverage for West Virginia. Information on unpaved roads from TIGER was supplemented by digitizing any unpaved roads shown on topographic maps that were not included in the TIGER shapefile. There are 7.75 miles of paved roads and 26.18 miles of unpaved roads in the metals impaired subwatersheds of the Lower New River watershed. The upland loading of sediment and iron from residential and urban landuses and roads is not generally significant, with pollutant reductions prescribed in less than ten percent of the Lower New River subwatersheds.

The sediment loadings from non-pasture grasslands and forested areas are not considered to be significant sediment or iron sources. Iron loadings from those landuses are categorized as "background" in the load allocations and are not reduced from existing conditions. Agricultural

landuses (pasture and cropland) are not prevalent and are included in the unreduced background loadings.

A-1.3 Fecal Coliform Bacteria Sources

This section identifies and examines the potential sources of fecal coliform bacteria in the Lower New River watershed. Sources can be classified as either point sources or nonpoint sources. Potential point sources include effluent discharges of sewage treatment facilities and collection system overflows. Potential nonpoint sources of fecal coliform bacteria include failing or nonexistent on-site sewage disposal systems, stormwater runoff from pasture and cropland, direct deposition of wastes from livestock, and stormwater runoff from residential and urban areas.

A-1.3.1 Fecal Coliform Bacteria Point Sources

There are 35 permitted sewage treatment facilities with a total of 47 outlets discharging in the Lower New River watershed.

Individual NPDES Permits

WVDEP issues individual NPDES permits to both publicly owned and privately owned wastewater treatment facilities. Publicly owned treatment works (POTWs) are relatively large facilities with extensive wastewater collection systems, whereas private facilities are usually used in smaller applications such as subdivisions and shopping centers. Eight POTWs discharge treated effluent from nine outlets in the Lower New River watershed. An additional individual permit exists with four outlets in the watershed. The treated effluents of individually permitted facilities are not significant sources of fecal coliform bacteria because they are permitted to discharge only at limits more stringent than water quality criteria.

Overflows

Combined sewer overflows (CSOs) are outfalls from POTW sewer systems that carry untreated domestic waste and surface runoff. CSOs are permitted to discharge only during precipitation events. Sanitary sewer overflows (SSOs) are unpermitted overflows that occur as a result of excess inflow and/or infiltration to POTW separate sanitary collection systems. Both types of overflows contain fecal coliform bacteria. SSOs have not been identified in the Lower New River watershed. There are eight CSO outlets in the watershed that are associated with the POTW collection systems of Hinton and Fayetteville.

General Sewage Permits

General sewage permits are designed to cover like discharges from numerous individual owners and facilities throughout the state. General Permit WV0103110 regulates small, privately owned sewage treatment plants (“package plants”) that have a design flow of less than 50,000 gallons per day (gpd). General Permit WV0107000 regulates home aeration units (HAUs). HAUs are small sewage treatment plants primarily used by individual residences where site considerations preclude typical septic tank and leach field installation. Both general permits contain fecal

coliform effluent limitations identical to those in individual NPDES permits for sewage treatment facilities. Within the watersheds addressed by this report, 18 facilities are registered under the "package plant" general permit and eight are registered under the "HAU" general permit.

A-1.3.2 Fecal Coliform Bacteria Nonpoint Sources

Failing septic systems and/or straight pipe discharges are a significant fecal coliform bacteria source in the Lower New River watershed. Pollutant source tracking by WVDEP personnel identified scattered areas of high population density without access to public sewers in the Lower New River watershed. Human sources of fecal coliform bacteria from these areas include sewage discharges from failing septic systems, and possible direct discharges of sewage from residences (straight pipes). Information collected during source tracking efforts by WVDEP and using statewide 911 structures data yielded an estimate of 10,897 homes in the Lower New River watershed that are not served by centralized sewage collection and treatment systems. A septic system failure rate derived from geology and soil type was applied to the number of unsewered homes to calculate nonpoint source fecal coliform loading from failing septic systems. Estimated septic system failure rates across the watershed range from three percent to 28 percent. Figure A-1-3 shows the geographic distribution of estimated failing septic system nonpoint sources in the watershed.

Stormwater runoff is another potential nonpoint source of fecal coliform bacteria in both residential/urban and rural areas. Runoff from residential areas can deliver the waste of pets and wildlife to the waterbody. In addition, rural stormwater runoff can transport significant loads of bacteria from livestock pastures, livestock and poultry feeding facilities, and manure storage and application. Given the small portion of total land area in the Lower New River watershed that consists of agricultural areas, bacteria loadings in stormwater runoff were found to be problematic only in limited areas. The existing loadings of this nonpoint source category were reduced in only 34 of 203 modeled subwatersheds. Similarly, stormwater runoff from non-MS4 residential areas is not generally significant, with pollutant reductions prescribed in only five of 203 subwatersheds.

A certain "natural background" contribution of fecal coliform bacteria can be attributed to deposition by wildlife in forest and grassland areas. Accumulation rates for fecal coliform bacteria in those areas were developed using reference numbers from past TMDLs, incorporating wildlife estimates obtained from the Division of Natural Resources. Although wildlife contributions of fecal coliform bacteria were considered in modeling, they were not found to be a significant source, and reductions were not prescribed.

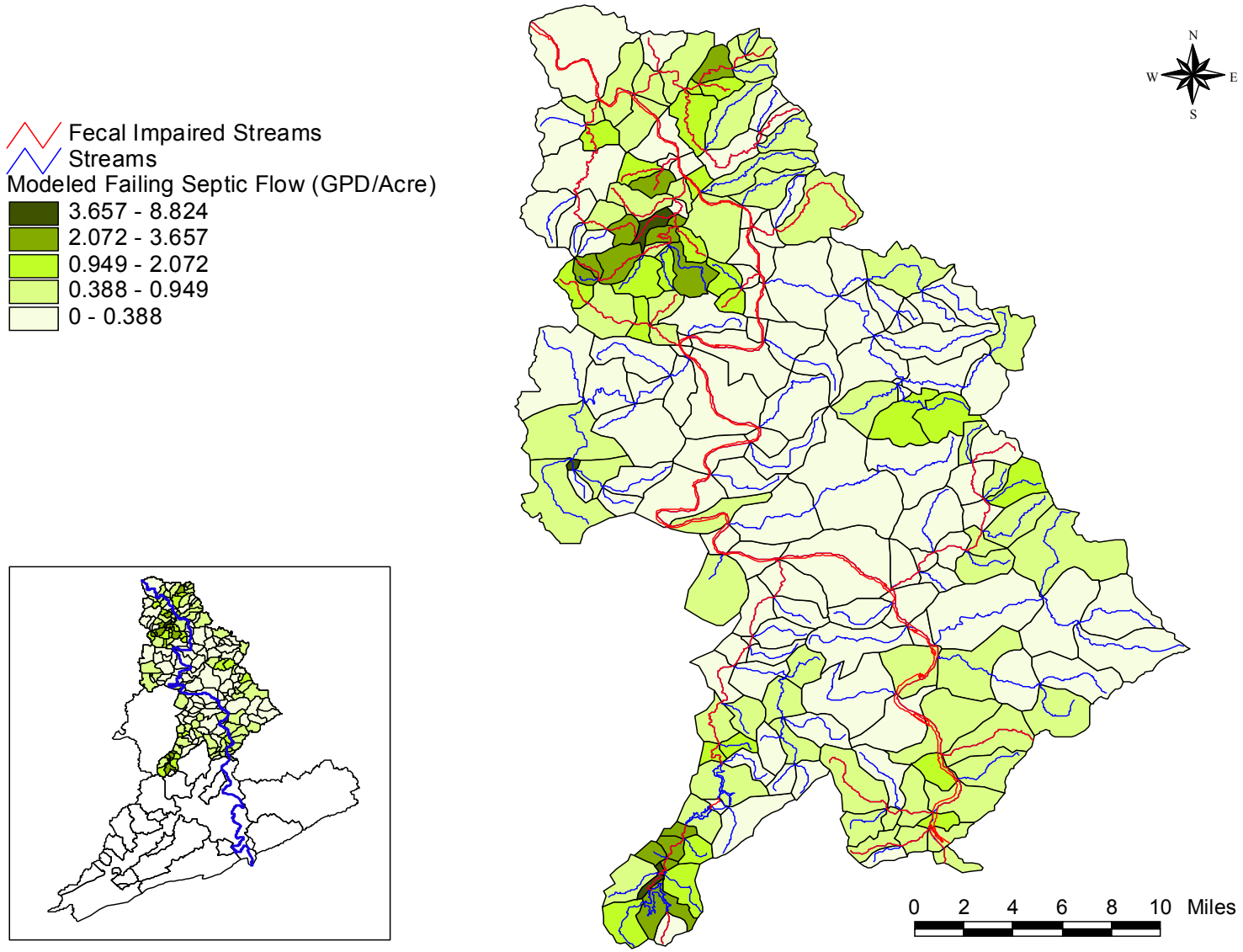

Figure A-1-3. Graphical representation of failing septic system flows in the Lower New River watershed

A-1.4 Stressors of Biologically Impaired Streams

The Lower New River watershed has eight biologically impaired streams for which TMDLs have been developed. These streams are identified in Table A-1-3 along with the biological stressors of the streams' benthic communities and the TMDLs required to address these impairments. A stressor identification (SI) process was used to evaluate and identify the significant stressors of impaired benthic communities. The SI process is detailed in Section 4 of the TMDL Report with additional information provided in the Technical Report.

Where identified as the biological stressor, organic enrichment was linked to violations of the numeric criteria for fecal coliform bacteria. WVDEP determined that implementation of fecal coliform TMDLs would remove untreated sewage and animal waste, thereby reducing the organic and nutrient loading causing the biological impairment. Therefore, fecal coliform TMDLs will serve as a surrogate where organic enrichment was identified as a stressor. All streams where the SI process indicated sedimentation as a causative stressor also exhibited impairment pursuant to total iron water quality criteria. WVDEP determined that the sediment reductions that are necessary to ensure compliance with iron criteria exceed those necessary to resolve biological impairments. As such, the iron TMDLs presented for the subject waters are appropriate surrogates for the necessary sediment TMDLs.

Table A-1-3. Significant stressors of biologically impaired streams in the Lower New River watershed

Stream	Biological Stressors	Biological Stressor	TMDLs Required
Osborne Creek	WVKN-7-B	Organic enrichment Sedimentation	Fecal coliform Iron
Marr Branch	WVKN-9	Organic enrichment Sedimentation	Fecal coliform Iron
UNT/Marr Branch RM 0.9	WVKN-9-A	Organic enrichment Sedimentation	Fecal coliform Iron
Wolf Creek	WVKN-10	Organic enrichment Sedimentation	Fecal coliform Iron
Floyd Creek	WVKN-17-B	pH Toxicity (acidity) Metals Toxicity (Aluminum, Iron) Sedimentation	pH (acidity) Dissolved Aluminum Total Iron Iron
Arbuckle Creek	WVKN-21	Organic enrichment Sedimentation	Fecal coliform Iron
Mill Creek	WVKN-22-K	pH Toxicity (acidity) Sedimentation	pH (acidity) Iron
Glade Creek	WVKN-29	Organic enrichment	Fecal coliform

A-1.5 TMDLs for the Lower New River Watershed

A-1.5.1 TMDL Development

A top-down methodology was followed to develop these TMDLs and allocate loads to sources. Headwaters were analyzed first because they have a profound effect on downstream water quality. Loading contributions were reduced from applicable sources for these waterbodies, and TMDLs were developed. Refer to Section 8.5.2 of the TMDL Report for a detailed description of the allocation methodologies used in developing the pollutant-specific TMDLs.

The TMDLs for iron, aluminum, pH, and fecal coliform bacteria are shown in Tables A-1-4 through A-1-8. The TMDLs for iron and aluminum are presented as average daily loads, in pounds per day. The TMDLs for fecal coliform bacteria are presented in number of colonies per day. The aluminum TMDLs are presented as an average daily load of total aluminum that is necessary to attain dissolved aluminum water quality criteria. All TMDLs were developed to meet TMDL endpoints under a range of conditions observed throughout the year.

A surrogate approach was used to develop pH TMDLs. It was assumed that reductions in metals concentrations to TMDL endpoints would result in compliance with the pH water quality standard. To verify this assumption, the Dynamic Equilibrium In-stream Chemical Reactions model (DESC-R) that was applied in the watersheds of dissolved aluminum impaired streams was evaluated for an extended period under TMDL conditions—conditions where TMDL endpoints for metals were met. A median equilibrium pH was calculated based on the daily equilibrium pH output from DESC-R to confirm the acceptability of the surrogate approach..

Iron Allocations for Troutwaters

Wolf Creek (WVKN-10) and Arbuckle Creek (WVKN-21) are troutwaters that require total iron TMDLs. Implementation of the described methodology for troutwater iron TMDLs does not assure complete attainment of the chronic aquatic life protection iron criterion. Non-attainment is predicted in response to extreme precipitation events or a series of significant storms that elevate instream TSS and iron concentrations. The magnitudes of the predicted exceedances under the initial allocation scenarios were not extreme, but exceedances were predicted much more often than the one per three year frequency prescribed by the criterion. Criterion attainment would require pollutant reductions from existing sources that are well beyond practical levels, coupled with significant reductions of undisturbed upland and streambank background loadings, and no construction stormwater allowances.

Therefore, phased implementation of the TMDLs is proposed, under which the source allocations necessary to universally achieve the iron criterion for warmwater fisheries (1.5 mg/L, 4-day average, once per three years average exceedance frequency) are implemented concurrently with additional study of the situation. WVDEP has initiated planning of a special monitoring effort for minimally impacted and documented viable troutwaters upon which model refinements and/or alternative criterion decision-making may be based. For additional information and a detailed description of the iron allocations for troutwaters, please refer to the Section 8.5 of the main report.

A-1.6 TMDL Tables: Metals and pH

Table A-1-4. Iron TMDLs for the Lower New River watershed

TMDL Watershed	Stream Code	Stream Name	Metal	Load Allocation (lbs/day)	Wasteload Allocation (lbs/day)	Margin of Safety (lbs/day)	TMDL (lbs/day)	Trout Waters
Mill Creek	WVKN-7-B	Osborne Creek	Iron	41	6	2	49	No
Marr Branch	WVKN-9	Marr Branch	Iron	28	4	2	34	No
Marr Branch	WVKN-9-A	UNT/Marr Branch RM 0.9	Iron	17	2	1	21	No
Wolf Creek (WVKN-10)	WVKN-10-M	UNT/Wolf Creek RM 8.7	Iron	17	1	1	19	No
Wolf Creek (WVKN-10)	WVKN-10	Wolf Creek	Iron	141	15	8	165	Yes
Arbuckle Creek	WVKN-21	Arbuckle Creek	Iron	52	6	3	61	Yes
Manns Creek	WVKN-17-B	Floyd Creek	Iron	21	7	1	29	No
Dunloup Creek	WVKN-22-K	Mill Creek	Iron	41	6	2	49	No

UNT = unnamed tributary, RM = river mile, NA = not applicable

Table A-1-5. Aluminum TMDLs for the Lower New River watershed

Major Watershed	Stream Code	Stream Name	Metal	Load Allocation (lbs/day)	Wasteload Allocation (lbs/day)	Margin of Safety (lbs/day)	TMDL (lbs/day)	Trout Waters
Wolf Creek (WVKN-10)	WVKN-10-M	UNT/Wolf Creek RM 8.7	Aluminum	3	0	0.2	3	Yes
Manns Creek	WVKN-17-B	Floyd Creek	Aluminum	3	2	0.3	6	No
Dunloup Creek	WVKN-22-K	Mill Creek	Aluminum	3	0	0.2	4	No

UNT = unnamed tributary, RM = river mile, NA = not applicable

Table A-1-6. pH TMDLs for the Lower New River watershed

Major Watershed	Stream Code	Stream Name	Parameter	pH* (Under TMDL conditions)
Wolf Creek (WVKN-10)	UNT/Wolf Creek RM 8.7	WVKN-10-M	pH	7.25
Manns Creek	Floyd Creek	WVKN-17-B	pH	8.11
Dunloup Creek	Mill Creek	WVKN-22-K	pH	7.90

UNT = unnamed tributary
*Predicted pH assumes that all metals (aluminum, iron) meet TMDL endpoints.

A-1.7 TMDL Tables: Fecal Coliform Bacteria

Table A-1-7. Fecal coliform bacteria TMDLs for the Lower New River watershed

Major Watershed	Stream Code	Stream Name	Parameter	Load Allocation (counts/day)	Wasteload Allocation (counts/day)	Margin of Safety (counts/day)	TMDL (counts/day)
New River	WVKN-lo	New River (Bluestone Dam to Mouth)	Fecal Coliform	1.62E+13	3.98E+11	8.72E+11	1.74E+13
Laurel Creek	WVKN-5	Laurel Creek (KN-5)	Fecal Coliform	8.67E+10	1.44E+08	4.57E+09	9.14E+10
Mill Creek	WVKN-7	Mill Creek	Fecal Coliform	1.72E+11	1.78E+09	9.17E+09	1.83E+11
Mill Creek	WVKN-7-0.5A	UNT/Mill Creek RM 1.7	Fecal Coliform	1.34E+10	NA	7.04E+08	1.41E+10
Mill Creek	WVKN-7-B	Osborne Creek	Fecal Coliform	5.28E+10	3.79E+06	2.78E+09	5.56E+10
Mill Creek	WVKN-7-B-0.3	UNT/Osborne Creek RM 0.7	Fecal Coliform	1.04E+10	3.79E+06	5.48E+08	1.10E+10
Marr Branch	WVKN-9	Marr Branch	Fecal Coliform	2.46E+10	3.92E+09	1.50E+09	3.00E+10
Marr Branch	WVKN-9-A	UNT/Marr Branch RM 0.9	Fecal Coliform	1.66E+10	3.92E+09	1.08E+09	2.16E+10
Wolf Creek	WVKN-10	Wolf Creek (KN-10)	Fecal Coliform	1.49E+11	3.88E+08	7.88E+09	1.58E+11
Wolf Creek	WVKN-10-C	Short Creek	Fecal Coliform	1.30E+10	NA	6.82E+08	1.36E+10
Wolf Creek	WVKN-10-B	Crooked Run	Fecal Coliform	8.95E+09	NA	4.71E+08	9.42E+09
Wolf Creek	WVKN-10-A	House Branch	Fecal Coliform	2.16E+10	1.87E+08	1.15E+09	2.29E+10
Keeney Creek	WVKN-15	Keeney Creek	Fecal Coliform	3.26E+10	NA	1.72E+09	3.44E+10
Coal Run	WVKN-16	Coal Run	Fecal Coliform	1.39E+10	NA	7.30E+08	1.46E+10
Arbuckle Creek	WVKN-21	Arbuckle Creek	Fecal Coliform	9.07E+10	8.82E+09	5.24E+09	1.05E+11
Arbuckle Creek	WVKN-21-A	Rocklick Creek	Fecal Coliform	6.86E+09	NA	3.61E+08	7.22E+09
Glade Creek	WVKN-29	Glade Creek	Fecal Coliform	3.55E+11	4.61E+08	1.87E+10	3.74E+11
Meadow Creek	WVKN-32	Meadow Creek	Fecal Coliform	1.68E+11	1.05E+09	8.88E+09	1.78E+11
Brooks Branch	WVKN-42	Brooks Branch	Fecal Coliform	1.80E+10	NA	9.50E+08	1.90E+10
Madam Creek	WVKN-44	Madam Creek	Fecal Coliform	7.45E+10	NA	3.92E+09	7.85E+10
Beech Run	WVKN-45	Beech Run	Fecal Coliform	1.60E+10	NA	8.41E+08	1.68E+10

NA = not applicable; UNT = unnamed tributary.

"Scientific notation" is a method of writing or displaying numbers in terms of a decimal number between 1 and 10 multiplied by a power of 10. The scientific notation of 10,492, for example, is 1.0492×10^4.

A-1.8 TMDL Tables: Biological

Table A-1-8. Biological TMDLs for the Lower New River watershed

Stream	Biological Stressor	Parameter	Load Allocation	Wasteload Allocation	Margin of Safety	TMDL	Units
Osborne Creek	Organic enrichment	Fecal coliform	5.28E+10	3.79E+06	2.78E+09	5.56E+10	(counts/day)
	Sedimentation	Iron	41	6	2	49	(lbs/day)
Marr Branch	Organic enrichment	Fecal coliform	2.46E+10	3.92E+09	1.50E+09	2.46E+10	(counts/day)
	Sedimentation	Iron	28	4	2	34	(lbs/day)
UNT/Marr Branch RM 0.9	Organic enrichment	Fecal coliform	1.66E+10	3.92E+09	1.08E+09	2.16E+10	(counts/day)
	Sedimentation	Iron	28	4	2	34	(lbs/day)
Wolf Creek (KN-10)	Organic enrichment	Fecal coliform	1.49E+11	3.88E+08	7.88E+09	1.58E+11	(counts/day)
	Sedimentation	Iron	141	15	8	165	(lbs/day)
Floyd Creek	pH Toxicity (acidity)	pH	Not Applicable			8.11	SU
	Metals Toxicity (Aluminum Iron)	Dissolved Aluminum	3	2	0.3	6	(lbs/day)
		Iron	21	7	1	29	(lbs/day)
	Sedimentation	Iron	21	7	1	29	(lbs/day)
Arbuckle Creek	Organic enrichment	Fecal coliform	9.07E+10	8.82E+09	5.24E+09	1.05E+11	(counts/day)
	Sedimentation	Iron	52	6	3	61	(lbs/day)
Mill Creek	pH Toxicity (acidity)	pH	Not Applicable			7.90	SU
	Sedimentation	Iron	41	6	2	49	(lbs/day)
Glade Creek	Organic enrichment	Fecal coliform	3.55E+11	4.61E+08	1.87E+10	3.74E+11	(counts/day)

NA = not applicable; UNT = unnamed tributary.

"Scientific notation" is a method of writing or displaying numbers in terms of a decimal number between 1 and 10 multiplied by a power of 10. The scientific notation of 10,492, for example, is 1.0492×10^4.