APPENDIX D

D-1. UPPER NEW RIVER

D-1.1 Watershed Information

The Upper New River is the segment of the New River upstream of Bluestone Dam to the Virginia/West Virginia border. This appendix addresses TMDL watersheds contributing to this segment of the New River, except the Bluestone River watershed, which is discussed in Appendix C. The term "Upper New River watershed" is used in the remainder of this Appendix to refer to TMDL watersheds of the upper New River mainstem, exclusive of the Bluestone River. Pipestem Creek, although coded as the first tributary of the Bluestone River (WVKNB-1) is considered to be a direct drainage to the New River because it flows into the New River arm of Bluestone Lake. As such, the Pipestem Creek TMDL watershed is addressed in this appendix.

The dominant landuse in this part of the New River watershed is forest, which covers 65.8 percent of the watershed. Other significant landuse types include grassland (17.1 percent), and pasture (14.8 percent). Table D-1-1 shows modeled land uses in the Upper New River watershed. There are 26 impaired streams in the watershed that are addressed in this total maximum daily load (TMDL) development effort. Figure D-1-1 shows the impaired segments and Table D-1-2 displays waterbody/impairment combinations for which TMDLs are developed

Table D-1-1. Modeled landuse types in the Upper New River watershed

Landuse Type	Area of Watershed		Percentage
	Acres	Square Miles	
Water	1,005.9	1.6	0.5%
Wetland	170.5	0.3	0.1%
Barren	92.2	0.1	0.0%
Forest	144,215.1	225.3	65.8%
Grassland	37,485.5	58.6	17.1%
Cropland	467.8	0.7	0.2%
Pasture	32,468.9	50.7	14.8%
Urban/Residential	2,769.4	4.3	1.3%
Mining	347.0	0.5	0.2%
AML	0.0	0.0	0.0%
Total Area	**219,022.3**	**342.2**	**100.0%**

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

TMDL Watershed	Code	Trout	Stream Name	Fe	Al	pH	Mn	FC	BIO
Pipestem Creek	WVKNB-1		Pipestem Creek					X	
Indian Creek	WVKN-51		Indian Creek					X	X
Indian Creek	WVKN-51-A		Bradshaw Creek					X	
Indian Creek	WVKN-51-B		Stinking Lick Creek					X	
Indian Creek	WVKN-51-D		Hans Creek					X	
Indian Creek	WVKN-51-G		Indian Draft					X	
Indian Creek	WVKN-51-G-1		UNT/Indian Draft RM 1.5					X	
Indian Creek	WVKN-51-H-(S)	T	Laurel Creek					X	
Indian Creek	WVKN-51-I		Cooks Run					X	
Indian Creek	WVKN-51-K		Rock Camp Creek					X	
Indian Creek	WVKN-51-O	T	Turkey Creek					X	
Indian Creek	WVKN-51-R		Gin Hollow					X	
Indian Creek	WVKN-51-S-1-(S)		Burnside Branch					X	
Adair Run	WVKN-59		Adair Run					X	
East River	WVKN-60	T	East River					X	
East River	WVKN-60-C		Fivemile Creek					X	
East River	WVKN-60-C-2		Possum Hollow					X	
East River	WVKN-60-C-3		Hales Branch					X	
East River	WVKN-60-C-4		Payne Branch					X	
Rich Creek (WVKN-61)	WVKN-61	T	Rich Creek (WVKN-61)					X	
Rich Creek (WVKN-61)	WVKN-61-A		Brush Creek					X	
Rich Creek (WVKN-61)	WVKN-61-B		Scott Branch					X	
Rich Creek (WVKN-61)	WVKN-61-C		Crooked Creek					X	
Rich Creek (WVKN-61)	WVKN-61-D		Mud Run					X	
Rich Creek (WVKN-61)	WVKN-61-E		Dry Creek	X				X	X
Rich Creek (WVKN-61)	WVKN-61-E-1		Painter 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 58 stations (station locations can be viewed using the ArcExplorer project) throughout the Upper 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, 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.

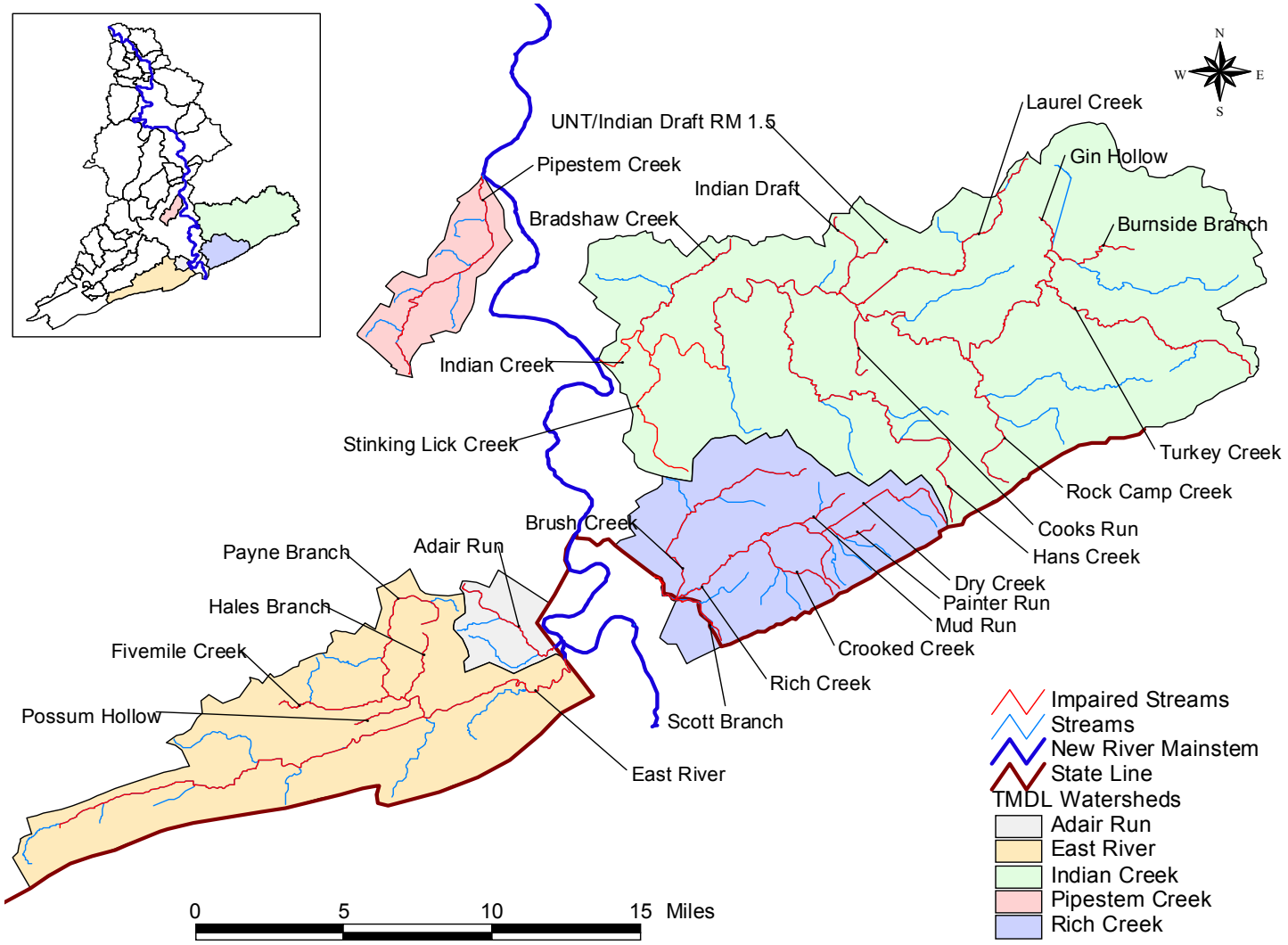

Figure D-1-1. Impaired waterbodies under TMDL development in the Upper New River watershed

D-1.2 Iron Sources

This section identifies and examines the potential sources of iron impairment in the Upper New River watershed. The only iron impaired stream is Dry Creek of Rich Creek (WVKN-61-E). Sources can be classified as point sources (specific sources subject to a permit) or nonpoint sources (diffuse sources). There are no known permitted point sources contributing metals in the Dry Creek watershed. Potential iron nonpoint sources include non-permitted sources such as abandoned or forfeited mine sites, sediment producing land disturbance activities, and streambank erosion.

Pollutant sources were identified using statewide geographic information system (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.

D-1.2.1 Metals Point Source Inventory

There are no known permitted point sources contributing iron in the Dry Creek watershed.

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. Only one existing construction site is registered under the Construction Stormwater General Permit for a total of 1.10 acres in Dry Creek. Although a specific wasteload allocation is not prescribed for this site, an area-based allocation for site registrations under the permit is provided for each Dry Creek subwatershed and the existing disturbed acreage conforms to the subwatershed allocations.

D-1.2.2 Metals Nonpoint Sources

Abandoned mine lands (AML) and facilities that were subject to the Surface Mining Control and Reclamation Act of 1977, and forfeited their bonds or abandoned operations can be a significant non-permitted source of iron. Non-mining land disturbance activities can also be a nonpoint source of metals, causing metals to enter waterbodies as a component of sediment. Examples of such land disturbance activities are agriculture, forestry, oil and gas wells, streambank erosion, roads, and urban and residential lands.

Streambank erosion is the primary source of the iron impairment of Dry Creek. There are no known AML sources, bond forfeiture sites, or oil and gas wells. The sediment loadings from non-pasture grasslands and forested areas are not considered to be significant sediment or iron sources. Other upland sediment producing nonpoint sources such as stormwater runoff from forestry operations, roads, and urban/residential and agricultural lands were also found to be negligible. Iron loadings from all upland nonpoint sources are not reduced from existing conditions.

D-1.3 Fecal Coliform Bacteria Sources

This section identifies and examines the potential sources of fecal coliform bacteria in the Upper 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.

D-1.3.1 Fecal Coliform Bacteria Point Sources

There are nine permitted sewage treatment facilities with a total of ten outlets discharging in the Upper 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. Three POTWs discharge treated effluent from four outlets in the Upper New River 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. CSOs and SSOs have not been identified within the Upper New River watershed.

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, six facilities are registered under the "package plant" general permit.

D-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 Upper New River watershed. Pollutant source tracking by WVDEP personnel identified scattered areas of high population density without access to public sewers in the Upper 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). WVDEP source tracking information yielded an estimate of 7,944 unsewered homes in the Upper New River watershed. 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. Figure D-1-2 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. Bacteria loading in stormwater runoff from agricultural landuses is significant in parts of the watershed, with pollutant reductions prescribed in over 50 percent of the modeled subwatersheds. Stormwater runoff from urban/residential areas is problematic in very limited areas, with pollutant reductions prescribed in only four of 129 modeled 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.

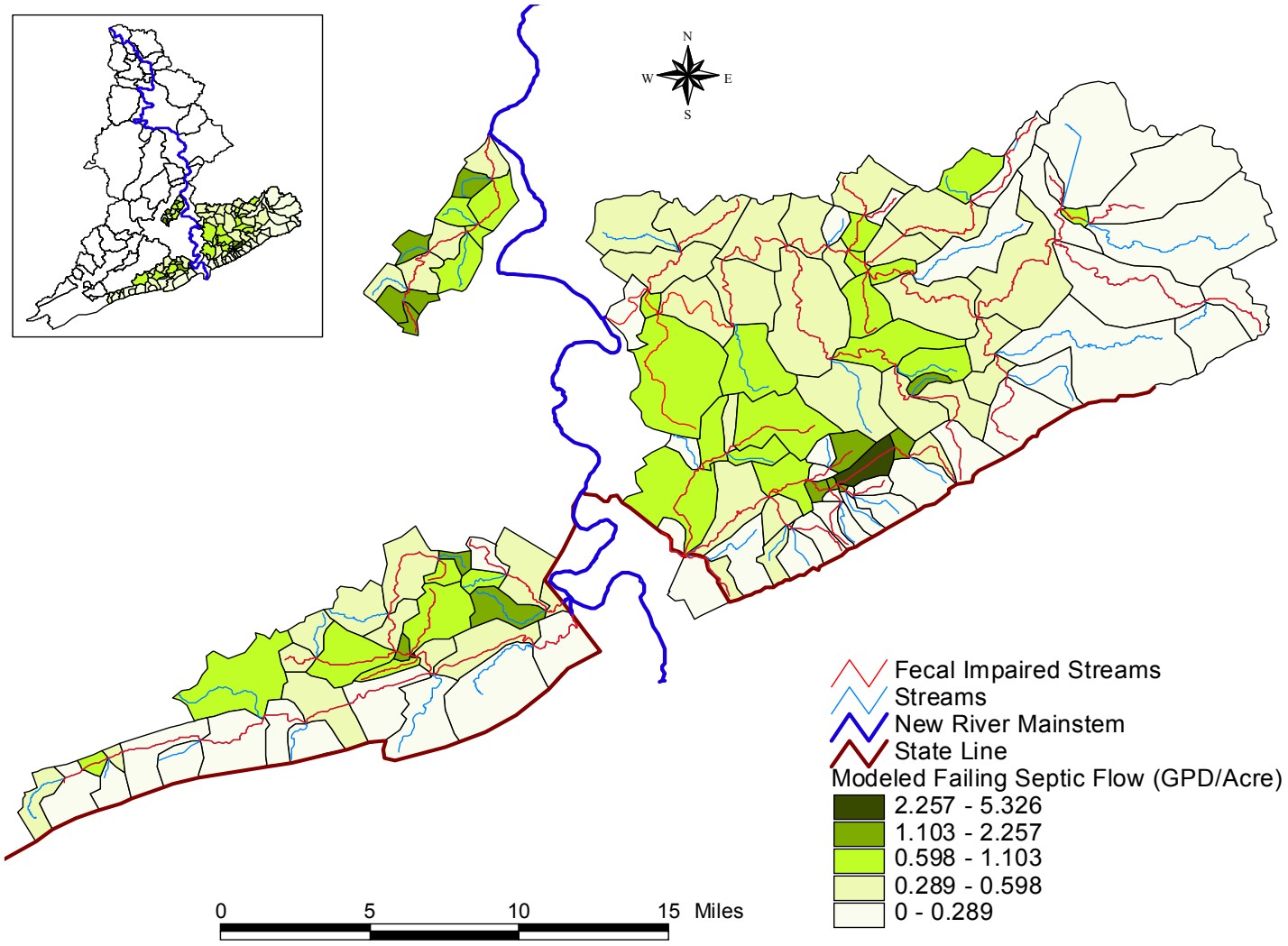

Figure D-1-2. Graphical representation of failing septic system flows in the Upper New River watershed

D-1.4 Stressors of Biologically Impaired Streams

The Upper New River watershed has two biologically impaired streams for which TMDLs have been developed. These streams are identified in Table D-1-3 along with the biological stressors of the streams' benthic communities and the TMDLs required addressing these impairments. A stressor identification (SI) process was used to evaluate and identify the primary stressors of impaired benthic communities. The SI process is detailed in Section 4 of the main 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 D-1-3. Significant stressors of biologically impaired streams in the Upper New River watershed

TMDL Watershed	Stream	Code	Biological Stressors	TMDLs Required
Indian Creek	Indian Creek	WVKN-51	Organic enrichment	Fecal coliform
Rich Creek	Dry Creek	WVKN-61-E	Organic enrichment Sedimentation	Fecal coliform Iron

D-1.5 TMDLs for the Upper New River Watershed

D-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 and fecal coliform bacteria and biological impairments are shown in Tables D-1-4 through D-1-6. The TMDLs for iron are presented as average daily loads, in pounds per day. The TMDLs for fecal coliform bacteria are presented in number of colonies per day. All TMDLs were developed to meet TMDL endpoints under a range of conditions observed throughout the year.

D-1.6 TMDL Tables: Metals and pH

Table D-1-4. Iron TMDLs for the Upper 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 Water
Rich Creek	WVKN-61-E	Dry Creek	Iron	29	5	2	36	No

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

D-1.7 TMDL Tables: Fecal Coliform Bacteria

Table D-1-5. Fecal coliform bacteria TMDLs for the Upper 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)
Pipestem Creek	WVKNB-1	Pipestem Creek	Fecal coliform	8.70E+10	6.82E+07	4.58E+09	9.17E+10
Indian Creek	WVKN-51	Indian Creek	Fecal coliform	8.48E+11	7.46E+08	4.47E+10	8.94E+11
Indian Creek	WVKN-51-A	Bradshaw Creek	Fecal coliform	4.70E+10	NA	2.47E+09	4.94E+10
Indian Creek	WVKN-51-B	Stinking Lick Creek	Fecal coliform	3.91E+10	3.79E+07	2.06E+09	4.12E+10
Indian Creek	WVKN-51-D	Hans Creek	Fecal coliform	1.46E+11	2.65E+07	7.70E+09	1.54E+11
Indian Creek	WVKN-51-G	Indian Draft	Fecal coliform	2.24E+10	NA	1.18E+09	2.36E+10
Indian Creek	WVKN-51-G-1	UNT/Indian Draft RM 1.5	Fecal coliform	4.23E+09	NA	2.23E+08	4.46E+09
Indian Creek	WVKN-51-H-(S)	Laurel Creek	Fecal coliform	5.32E+10	NA	2.80E+09	5.60E+10
Indian Creek	WVKN-51-I	Cooks Run	Fecal coliform	6.33E+09	NA	3.33E+08	6.67E+09
Indian Creek	WVKN-51-K	Rock Camp Creek	Fecal coliform	5.80E+10	NA	3.06E+09	6.11E+10
Indian Creek	WVKN-51-O	Turkey Creek	Fecal coliform	4.61E+10	NA	2.43E+09	4.85E+10
Indian Creek	WVKN-51-R	Gin Hollow	Fecal coliform	4.07E+09	NA	2.14E+08	4.28E+09
Indian Creek	WVKN-51-S-1-(S)	Burnside Branch	Fecal coliform	5.86E+10	NA	3.08E+09	6.16E+10
Adair Run	WVKN-59	Adair Run	Fecal coliform	2.81E+10	NA	1.48E+09	2.96E+10
East River	WVKN-60	East River	Fecal coliform	2.64E+11	9.19E+09	1.44E+10	2.88E+11
East River	WVKN-60-C	Fivemile Creek	Fecal coliform	8.79E+10	9.06E+07	4.63E+09	9.26E+10
East River	WVKN-60-C-2	Possum Hollow	Fecal coliform	4.23E+09	NA	2.22E+08	4.45E+09
East River	WVKN-60-C-3	Hales Branch	Fecal coliform	1.46E+10	NA	7.70E+08	1.54E+10
East River	WVKN-60-C-4	Payne Branch	Fecal coliform	3.41E+10	NA	1.79E+09	3.59E+10
Rich Creek	WVKN-61	Rich Creek	Fecal coliform	2.66E+11	1.69E+09	1.41E+10	2.82E+11
Rich Creek	WVKN-61-A	Brush Creek	Fecal coliform	9.85E+10	NA	5.18E+09	1.04E+11
Rich Creek	WVKN-61-B	Scott Branch	Fecal coliform	3.02E+10	NA	1.59E+09	3.18E+10

Major Watershed	Stream Code	Stream Name	Parameter	Load Allocation (counts/day)	Wasteload Allocation (counts/day)	Margin of Safety (counts/day)	TMDL (counts/day)
Rich Creek	WVKN-61-C	Crooked Creek	Fecal coliform	2.59E+10	NA	1.36E+09	2.72E+10
Rich Creek	WVKN-61-D	Mud Run	Fecal coliform	1.72E+10	NA	9.05E+08	1.81E+10
Rich Creek	WVKN-61-E	Dry Creek	Fecal coliform	3.41E+10	NA	1.79E+09	3.59E+10
Rich Creek	WVKN-61-E-1	Painter Run	Fecal coliform	1.02E+10	NA	5.38E+08	1.08E+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.

D-1.8 TMDL Tables: Biological

Table D-1-6. Biological TMDLs for the Upper New River watershed

Stream	Biological Stressor	Parameter	Load Allocation	Wasteload Allocation	Margin of Safety	TMDL	Units
Indian Creek WVKN-51	Organic enrichment	Fecal coliform	2.24E+10	NA	1.18E+09	2.36E+10	(counts/day)
Dry Creek WVKN-61-E	Organic enrichment	Fecal coliform	3.41E+10	NA	1.79E+09	3.59E+10	(counts/day)
	Sedimentation	Iron	29	5	2	36	(lbs/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.