

APPENDIX 2

A-2. SLEEPY CREEK

A-2.1 Watershed Information

Sleepy Creek is in the western portion of the Potomac Direct Drains watershed TMDL study area and drains approximately 145 square miles (92,916 acres), as shown in Figure A-2-1.

Approximately 87 percent of the watershed is in West Virginia and 13 percent is in Virginia. The dominant landuse in the watershed is forest, which covers 75 percent of the watershed. Other important landuse types include grassland (14 percent), urban/residential (five percent), and pasture (three percent). Two impaired streams, Sleepy Creek and Indian Run, are addressed in this TMDL development effort. Both streams are impaired relative to numeric water quality criteria for fecal coliform bacteria. Figure A-2-2 shows the locations of the impaired streams.

. Before establishing Total Maximum Daily Loads (TMDLs), WVDEP performed monitoring throughout the Potomac Direct Drains watershed to better characterize water quality and refine impairment listings. Monthly samples were taken at 48 stations (station locations can be viewed using the ArcExplorer project) throughout the Sleepy Creek watershed from July 1, 2003 through June 30, 2004. Monitoring suites at each site were determined based on the types of impairments observed in each stream. Monthly samples from streams impaired by fecal coliform bacteria were analyzed for fecal coliform bacteria, pH, and specific conductance. Instantaneous flow measurements were also taken at strategic locations during pre-TMDL monitoring.

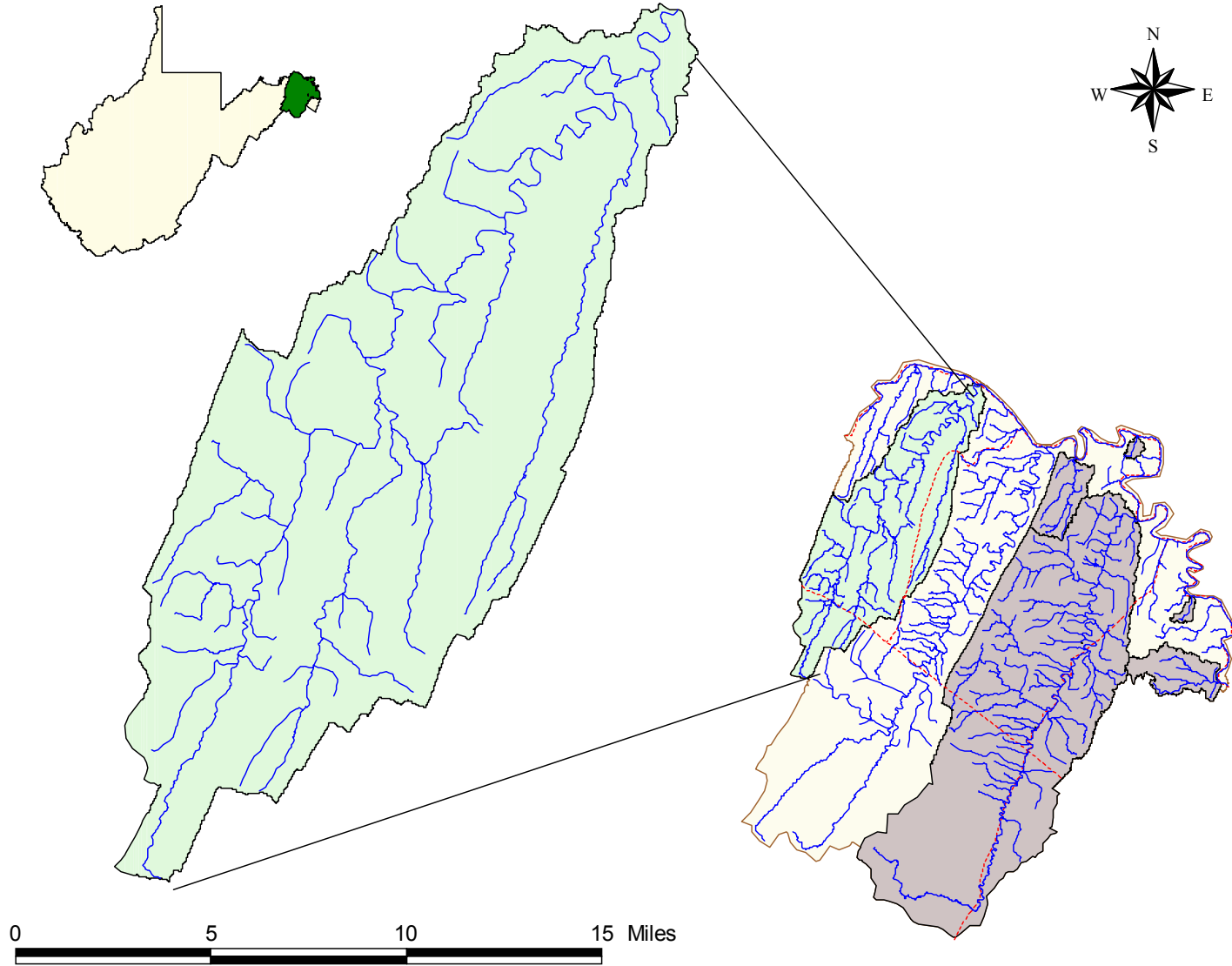


Figure A-2-1. Location of the Sleepy Creek watershed



TMDL	Impairment	
	Fecal Coliform	Biological
Sleepy Creek	x	
Indian Run	x	

Figure A-2-2. Waterbodies and impairments under TMDL development in the Sleepy Creek watershed

A-2.2 Fecal Coliform Bacteria Sources

This section identifies and examines the potential sources of fecal coliform bacteria in the West Virginia portion of the Sleepy Creek watershed. Sources can be classified as either point sources or nonpoint sources. Point sources include the permitted discharges from sewage treatment facilities. 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 urbanized areas.

A-2.2.1 Fecal Coliform Bacteria Point Sources

In the Sleepy Creek watershed there are 10 sewage treatment facilities that are operated under the General NPDES Sewage Permit. The locations of the NPDES outlets are shown in Figure A-2-3.

Runoff from residential and urbanized areas during storm events can be a significant fecal coliform source. USEPA's stormwater permitting regulations require public entities to obtain NPDES permit coverage for stormwater discharges from Municipal Separate Storm Sewers (MS4s) in specified urbanized areas. In contrast to other parts of the Potomac Direct Drains watershed, MS4 influence in the Sleepy Creek watershed is minimal. A small portion of Berkeley County's MS4 area of responsibility lies with the watershed, but the area corresponds to the Sleepy Creek Wildlife Management Area and is predominately forested. The pollutant loadings associated with precipitation and runoff from background landuses within the corporate boundaries of Berkeley County were aggregated to represent the baseline MS4 condition, and the MS4 wasteload allocation does not prescribe a pollutant reduction.

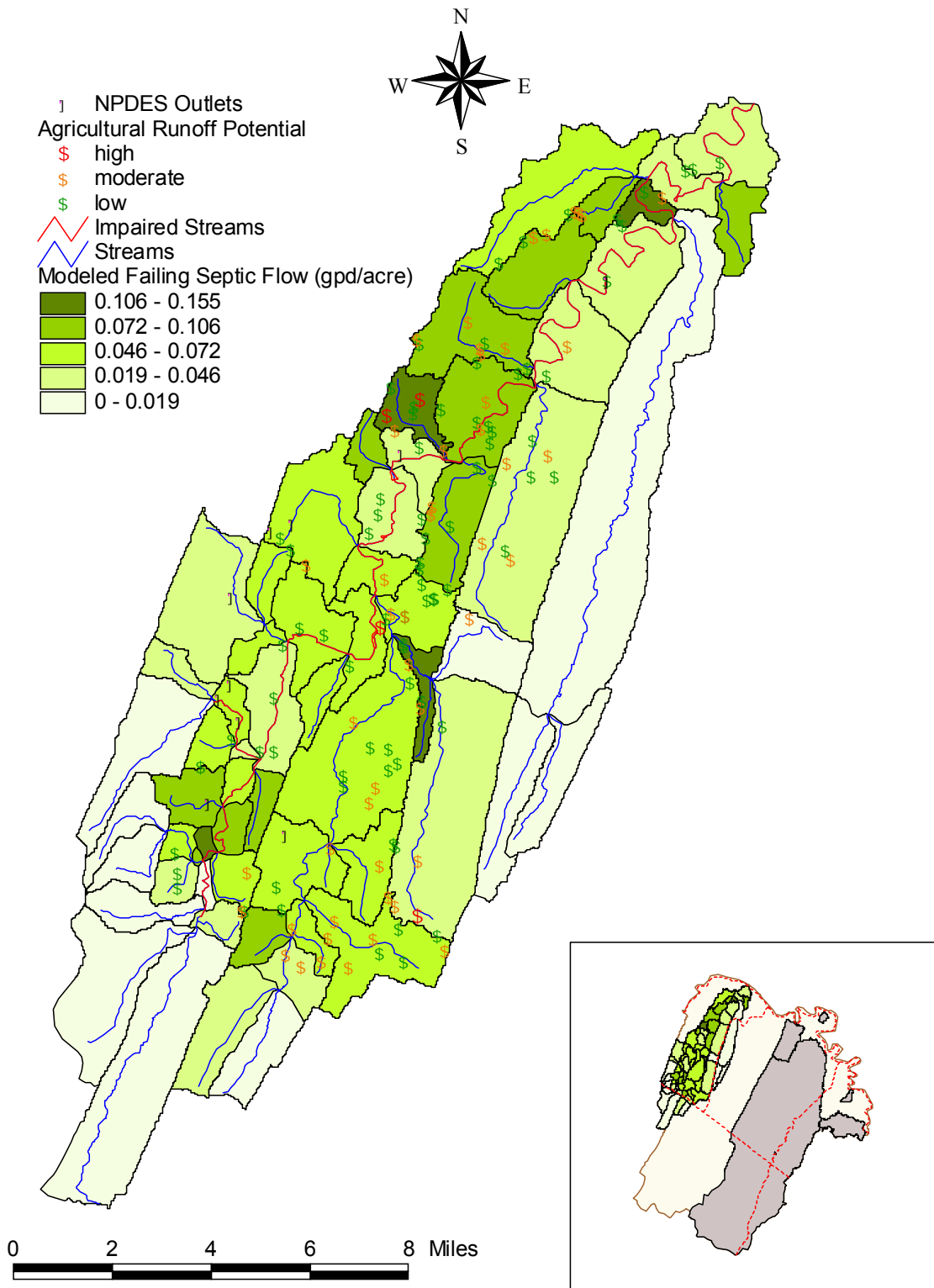


Figure A-2-3. Fecal coliform sources in the Sleepy Creek watershed

A-2.2.2 Fecal Coliform Bacteria Non-point Sources

Pollutant source tracking by WVDEP personnel identified scattered areas of high population density without access to public sewers in the Sleepy Creek 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). An analysis of 911 emergency response addressable structure data combined with WVDEP source tracking information yielded an estimate of 6,404 homes not connected to a publicly owned treatment facility in the Sleepy Creek watershed. A septic system failure rate derived from geology and soil type was applied to the number of unsewered homes to calculate non-point source fecal coliform loading from failing septic systems. Figure A-2-3 shows the estimated cumulative untreated flow from failing septic systems in each modeled subwatershed. For a more detailed description of failing septic system fecal coliform modeling, please refer to the Potomac Direct Drains watershed TMDL Technical Report.

Stormwater runoff from non-MS4 areas is another potential nonpoint source of fecal coliform bacteria in both residential/urban and rural areas. A significant fecal coliform loading is associated with agricultural landuses and urban/residential landuses in Morgan County. In rural areas, agricultural activities can contribute fecal coliform bacteria to receiving streams through surface runoff or direct deposition. Cropland and pasture landuses constitute 4 percent of the West Virginia portion of the Sleepy Creek watershed.

A certain “natural background” contribution of fecal coliform bacteria can be attributed to deposition by wildlife in forested areas. Accumulation rates for fecal coliform bacteria in forested areas were developed using reference numbers from past TMDLs, incorporating wildlife estimates obtained from West Virginia’s Division of Natural Resources (DNR). In addition, WVDEP conducted storm sampling on a 100 percent forested subwatershed (Shrewsbury Hollow) within the Kanawha State Forest, Kanawha County, West Virginia to determine wildlife contributions of fecal coliform. These results were used during the model calibration process. On the basis of the low fecal accumulation rates for forested areas, the storm water sampling results, and model simulations, wildlife is not considered to be a significant nonpoint source of fecal coliform bacteria in the Sleepy Creek watershed.

A-2.4 TMDLs for the Sleepy Creek Watershed

A-2.4.1 TMDL Development

Fecal coliform bacteria TMDLs and source allocations are shown in Table A-2-1, in number of colonies per day. Refer to Section 7 of the main TMDL Report for a detailed description of the allocation methodologies used in developing the pollutant-specific TMDLs. Detailed source allocations are provided in the allocation spreadsheets associated with this report. The filterable spreadsheets include multiple display formats that allow comparison of pollutant loadings among categories and facilitate implementation. A brief description of the information presented is included on the “Introduction” tab of each spreadsheet. Sections 7.4.1 and 7.4.2 of the main

TMDL report provides a more detailed discussion and identifies the operable allocations for point sources.

A-2.5 TMDL Tables: Fecal Coliform Bacteria

Table A-2-1. Fecal coliform bacteria TMDLs for the Sleepy Creek watershed

Major Watershed	Stream Code	Stream Name	Parameter	Load Allocation	Wasteload Allocation	Margin of Safety	TMDL
				(counts/day)	(counts/day))	(counts/day)	(counts/day)
Sleepy Creek	WVP-9	Sleepy Creek	Fecal coliform	1.81E+11	1.26E+10	1.02E+10	2.04E+11
Sleepy Creek	WVP-9-G	Indian Run	Fecal coliform	6.33E+09	6.82E+08	3.69E+08	7.38E+09

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 .