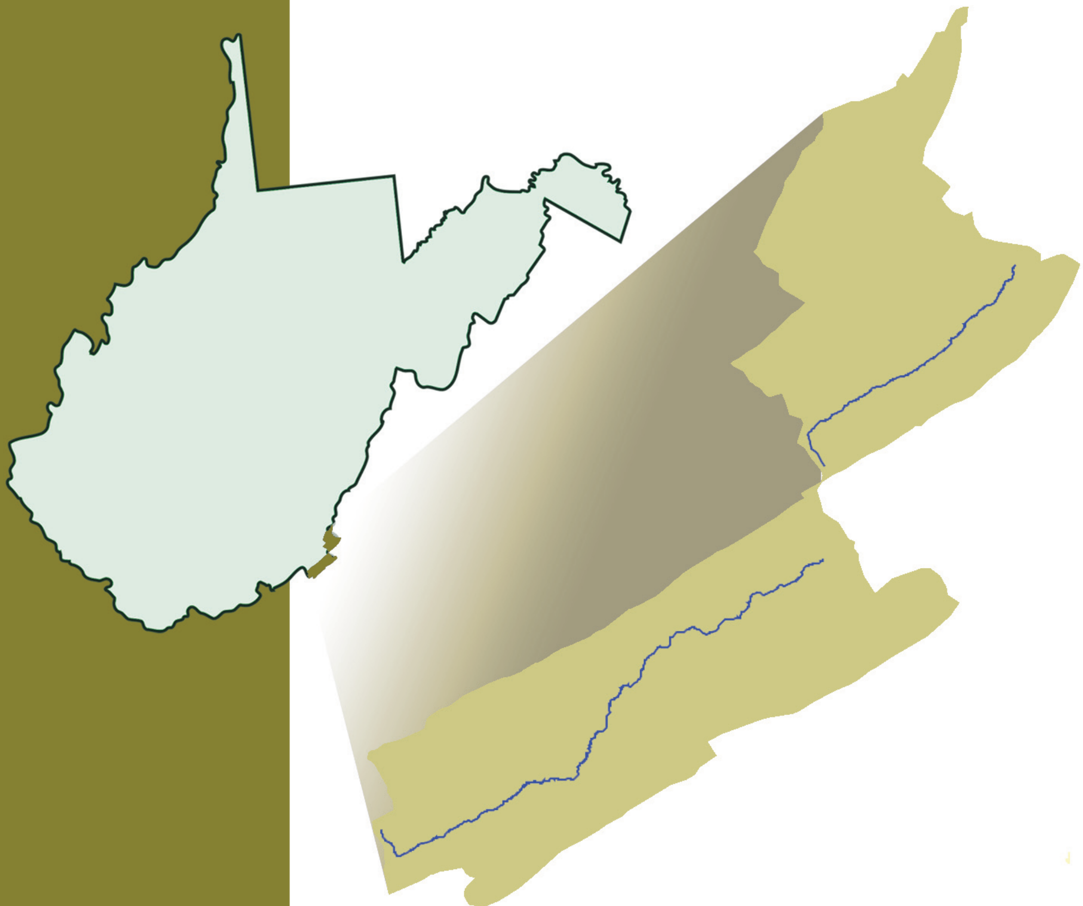

June 2008

Final Approved Report

Total Maximum Daily Loads for Selected Streams in the James River Watershed West Virginia

Prepared for:

West Virginia Department of Environmental Protection

Division of Water and Waste Management

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Total Maximum Daily Loads for Selected Streams in the James River Watershed, West Virginia

FINAL APPROVED REPORT

June 2008

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ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

7Q10	7-day, 10-year low flow
AD	Acid Deposition Model
AMD	acid mine drainage
AML	abandoned mine land
AML&R	[WVDEP] Office of Abandoned Mine Lands & Reclamation
BMP	best management practice
BOD	biochemical oxygen demand
BPH	[West Virginia] Bureau for Public Health
CAIR	Clean Air Interstate Rule
CFR	Code of Federal Regulations
CSO	combined sewer overflow
CSR	Code of State Rules
DEM	Digital Elevation Model
DESC-R	Dynamic Equilibrium In-stream Chemical Reactions model
DMR	[WVDEP] Division of Mining and Reclamation
DNR	[WVDEP] Division of Natural Resources
DO	dissolved oxygen
DWWM	[WVDEP] Division of Water and Waste Management
ERIS	Environmental Resources Information System
GAP	Gap Analysis Land Cover Project
GIS	geographic information system
gpd	gallons per day
GPS	global positioning system
HAU	home aeration unit
LA	load allocation
µg/L	micrograms per liter
MDAS	Mining Data Analysis System
mg/L	milligram per liter
mL	milliliter
MF	membrane filter counts per test
MPN	most probable number
MOS	margin of safety
MS4	municipal separate storm sewer system
NED	National Elevation Dataset
NOAA-NCDC	National Oceanic and Atmospheric Administration, National Climatic Data Center
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OOG	[WVDEP] Office of Oil and Gas
POTW	publicly owned treatment works

PSD	public service district
SI	stressor identification
SMCRA	Surface Mining Control and Reclamation Act
SRF	State Revolving Fund
SO2	sulfur dioxide
SSO	sanitary sewer overflow
STATSGO	State Soil Geographic database
TMDL	Total Maximum Daily Load
TSS	total suspended solids
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UNT	unnamed tributary
WLA	wasteload allocation
WVDEP	West Virginia Department of Environmental Protection
WVSCI	West Virginia Stream Condition Index
WVU	West Virginia University

Watershed

A general term used to describe a drainage area within the boundary of a United States Geologic Survey's 8-digit hydrologic unit code. Throughout this report, the James River watershed refers to all of the tributary streams in West Virginia that eventually drain to the James River in Virginia. The term "watershed" is also used more generally to refer to the land area that contributes precipitation runoff that eventually drains to the James River.

TMDL watershed

This term is used to describe the total land area draining to an impaired stream for which a TMDL is being developed. This term also takes into account the land area drained by un-impaired tributaries of the impaired stream. This report addresses three impaired streams located in three TMDL watersheds (Figures 3-1 and 6-1).

Subwatershed

The subwatershed delineation is the most detailed scale of the delineation that breaks each TMDL watershed into numerous catchments for modeling purposes. The entire West Virginia portion of the James River watershed has been subdivided into a total of 25 subwatersheds. Only 10 of these subwatersheds (those which contain or contribute to impaired waters) were modeled as part of this effort. Pollutant sources, allocations and reductions are presented at the subwatershed scale to facilitate future permitting actions and TMDL implementation. An example of a watershed, TMDL watershed and subwatershed are shown in Figure I-1.

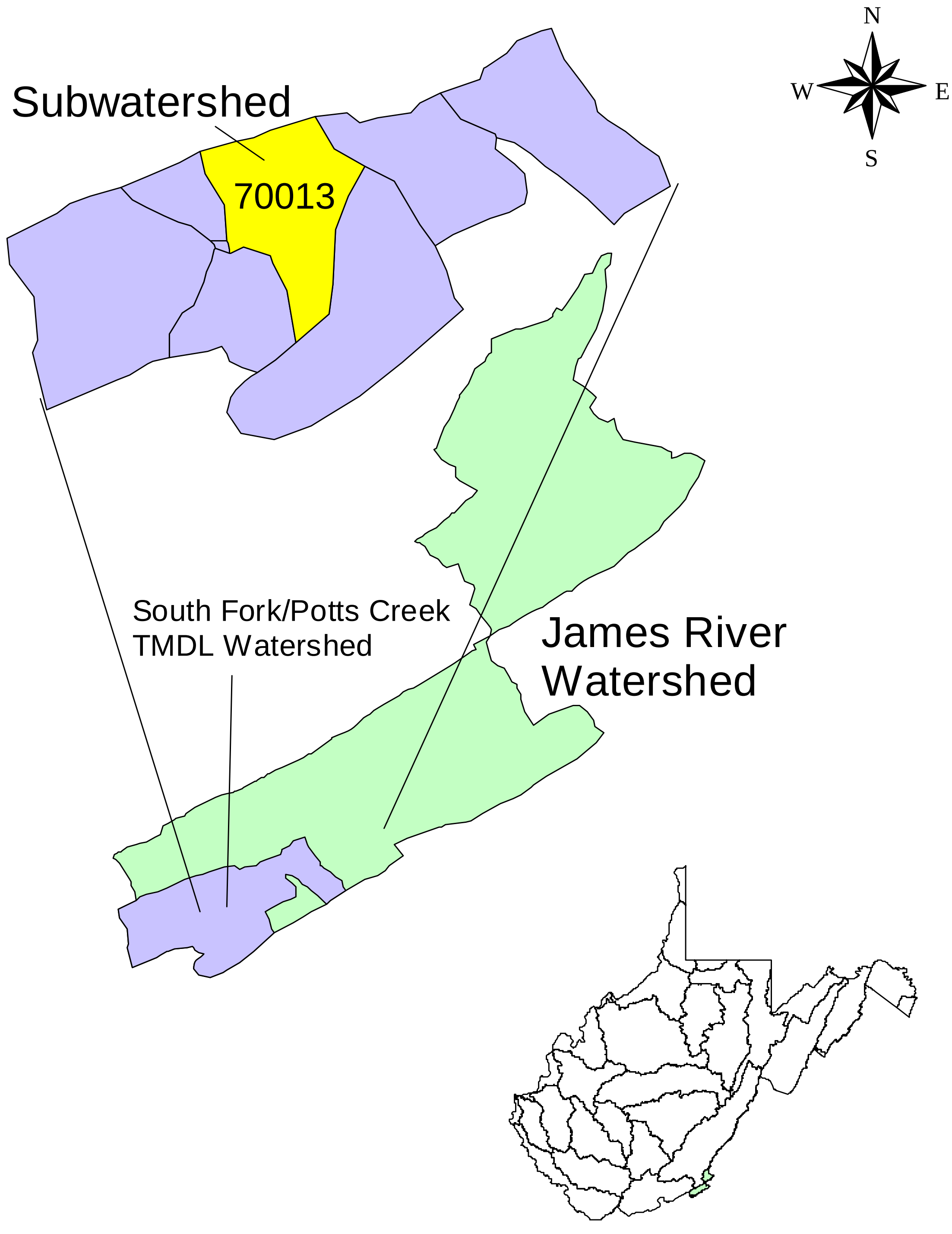


Figure I-1. Examples of a watershed, TMDL watershed, and subwatersheds

EXECUTIVE SUMMARY

The James River watershed is in southeastern West Virginia and encompasses approximately 71 square miles. The West Virginia portion of the James River watershed lies entirely within Monroe County. Major West Virginia tributaries include Potts Creek, North Fork, and South Fork of Potts Creek.

This report includes Total Maximum Daily Loads (TMDLs) for three fecal coliform impaired streams in the James River watershed. A TMDL establishes the maximum allowable pollutant loading for a waterbody while still complying with water quality standards, distributes the load among pollutant sources, and provides a basis for actions needed to restore water quality.

West Virginia's water quality standards are codified at Title 47 of the *Code of State Rules* (CSR), Series 2, and titled *Legislative Rules, Department of Environmental Protection: Requirements Governing Water Quality Standards*. The standards include designated uses of West Virginia waters and numeric and narrative criteria to protect those uses. The West Virginia Department of Environmental Protection (WVDEP) routinely assesses use support by comparing observed water quality data with criteria and reports impaired waters every two years as required by Section 303(d) of the Clean Water Act ("303(d) list"). The act requires that TMDLs be developed for listed impaired waters.

All of the subject streams are included on West Virginia's 2006 Section 303(d) list. Documented impairments are related to numeric water quality criteria for fecal coliform bacteria. Ray Fork is also biologically impaired based on the narrative water quality criterion of 47 CSR 2–3.2.i, which 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.

Impaired waters were organized into three TMDL watersheds. For hydrologic modeling purposes, impaired and unimpaired streams in these TMDL watersheds were further divided into 10 subwatersheds. The subwatershed delineation provided a basis for georeferencing pertinent source information, monitoring data, and presentation of the TMDLs.

The Mining Data Analysis System (MDAS) was used to represent the source-response linkage for fecal coliform bacteria. Currently, only nonpoint sources contribute to the fecal coliform bacteria impairments in the watershed. Failing on-site systems and precipitation runoff from agricultural areas are significant nonpoint sources of fecal coliform bacteria.

In addition to impairment related to fecal coliform bacteria, Ray Fork of the South Fork of Potts Creek has been determined to be biologically impaired. Biological integrity/impairment is based on a rating of the stream's benthic macroinvertebrate community using the multimetric West Virginia Stream Condition Index (WVSCI). The first step in TMDL development for biologically impaired waters is stressor identification (SI). Section 4 discusses the complete SI process. The causative stressor to the benthic community in Ray Fork was identified in this effort as organic enrichment. SI was followed by stream-specific determinations of the pollutants for which TMDLs must be developed. It was determined that implementation of the Ray Fork fecal coliform TMDL would remove untreated sewage and reduce agricultural animal wastes, thereby reducing the organic and nutrient loading causing the biological impairment.

The main section of the report describes the TMDL development and modeling processes, identifies impaired streams and existing pollutant sources, discusses future growth and TMDL achievability, describes allocation methodologies and documents the public participation associated with the process. Various provisions attempt to ensure the attainment of criteria throughout the watershed, achieve equity among categories of sources, and target pollutant reductions from the most problematic sources.

An accompanying spreadsheet provides TMDLs and example allocations of loads to categories of nonpoint sources that achieve the total TMDL. Also provided is an interactive ArcExplorer geographic information system (GIS) project that allows for the exploration of spatial relationships among the source assessment data.

Considerable resources were used to acquire recent water quality and pollutant source information upon which the TMDLs are based. The TMDL modeling is among the most sophisticated available, and incorporates sound scientific principles. TMDL outputs are presented in various formats to assist user comprehension and facilitate use in implementation.

1.0 REPORT FORMAT

This report consists of a main section, a supporting geographic information system (GIS) application, and spreadsheet data tables. The main section describes the overall Total Maximum Daily Load (TMDL) development process for the James River watershed, identifies impaired streams, and outlines the assessment of fecal coliform sources and biological stressors. It also describes the modeling process, presents TMDL allocations, and lists measures that will be taken to ensure that the TMDLs are met. The main section is supported by a compact disc containing an interactive ArcExplorer GIS project that provides further details on the data and allows the user to explore the spatial relationships among the source assessment data. With this tool, users can magnify streams and other features of interest. Also included on the CD are spreadsheets (in Microsoft Excel format) that provide the data used during the TMDL development process, as well as detailed source allocations associated with successful TMDL scenarios. A Technical Report that describes the detailed technical approaches used throughout the TMDL development process is also included.

2.0 INTRODUCTION

The West Virginia Department of Environmental Protection (WVDEP), Division of Water and Waste Management (DWWM), is responsible for the protection, restoration, and enhancement of the state's waters. Along with this duty comes the responsibility for TMDL development in West Virginia.

2.1 Total Maximum Daily Loads

Section 303(d) of the federal Clean Water Act and the U.S. Environmental Protection Agency's (USEPA) Water Quality Planning and Management Regulations (at Title 40 of the *Code of Federal Regulations* [CFR] Part 130) require states to identify waterbodies that do not meet water quality standards and to develop appropriate TMDLs. A TMDL establishes the maximum allowable pollutant loading for a waterbody to achieve compliance with applicable standards. It also distributes the load among pollutant sources and provides a basis for the actions needed to restore water quality.

A TMDL is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. TMDLs can be expressed in terms of mass per time or other appropriate units. Conceptually, this definition is denoted by the following equation:

$$\text{TMDL} = \text{sum of WLAs} + \text{sum of LAs} + \text{MOS}$$

WVDEP is developing TMDLs in concert with a geographically-based approach to water resource management in West Virginia—the Watershed Management Framework. Adherence to the Framework ensures efficient and systematic TMDL development. Each year, TMDLs are developed in specific geographic areas. The Framework dictates that 2007 TMDLs should be pursued in Hydrologic Group D, which includes the James River watershed. Figure 2-1 depicts the hydrologic groupings of West Virginia's watersheds; the legend includes the target year for finalization of each TMDL. This document provides TMDLs for the James River watershed stream/impairment listings from West Virginia's 2006 Section 303(d) list.

WVDEP is committed to implementing a TMDL process that reflects the requirements of the TMDL regulations, provides for the achievement of water quality standards, and ensures that ample stakeholder participation is achieved in the development and implementation of TMDLs. A 48-month development process enables the agency to carry out an extensive data generating and gathering effort to produce scientifically defensible TMDLs. It also allows ample time for modeling, report finalization, and frequent public participation opportunities.

The TMDL development process begins with the selection of streams to be addressed. The selected streams are then advertised for public comment. A meeting is held in the affected watershed to present the proposed sampling plan and to address any questions from the public. The next steps in the process are pre-TMDL water quality monitoring and source identification and characterization. Data obtained from pre-TMDL efforts are compiled, and the impaired waters are modeled to determine baseline conditions and the gross pollutant reductions needed to achieve water quality standards. WVDEP then presents its allocation strategies in a second public meeting, after which a draft TMDL report is developed. The draft TMDL is advertised for public review and comment, and a third informational meeting is held during the public comment period. Public comments are addressed, and the draft TMDL is submitted to USEPA for approval.

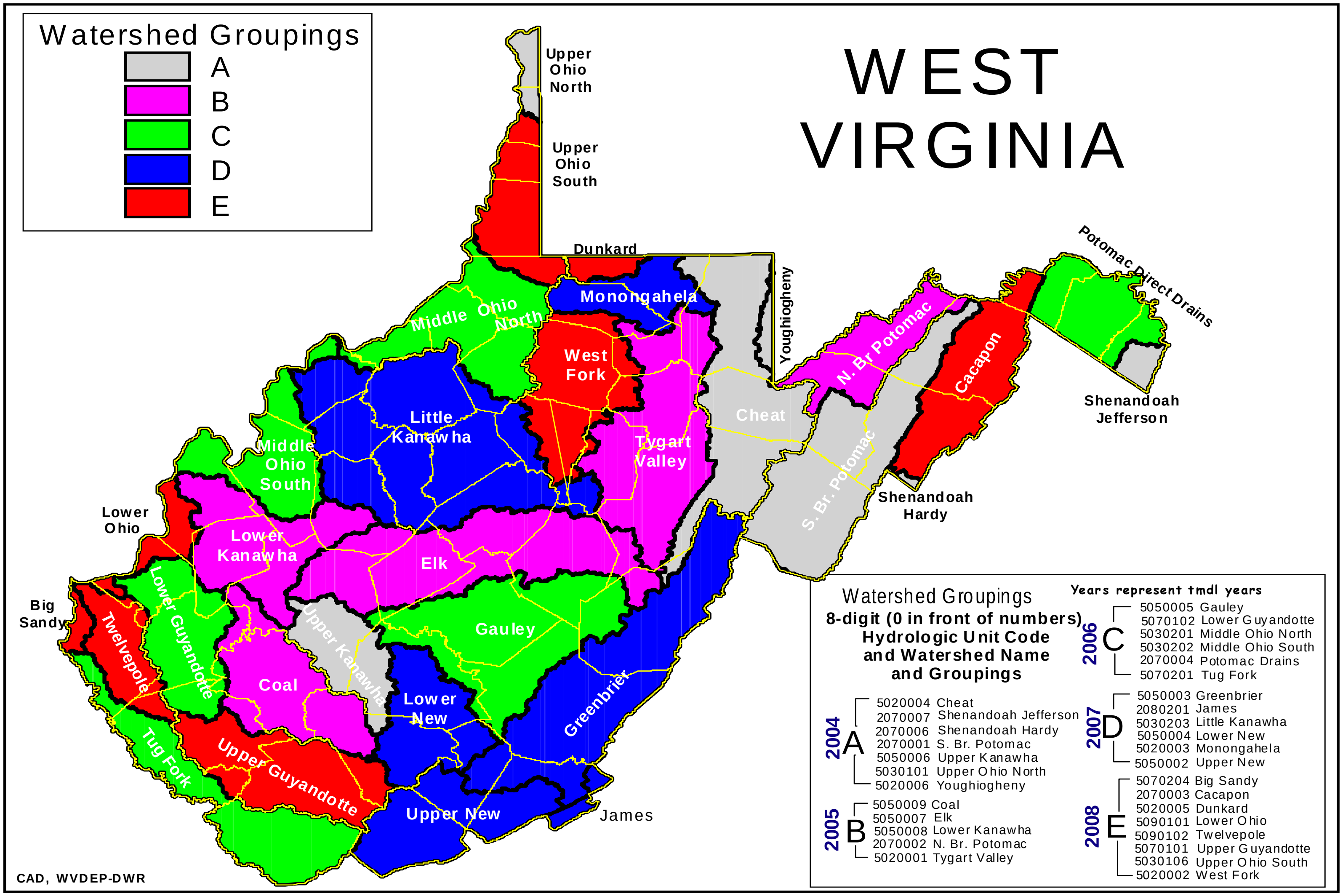


Figure 2-1. Hydrologic groupings of West Virginia's watersheds

2.2 Water Quality Standards

The determination of impaired waters involves comparing instream conditions to applicable water quality standards. West Virginia's water quality standards are codified at Title 47 of the *Code of State Rules* (CSR), Series 2, titled *Legislative Rules, Department of Environmental Protection: Requirements Governing Water Quality Standards*. These standards can be obtained online from the West Virginia Secretary of State internet site (http://www.wvsos.com/csr/verify.asp?TitleSeries=47-02).

Water quality standards consist of three components: designated uses; narrative and/or numeric water quality criteria necessary to support those uses; and an antidegradation policy. Appendix E of the Standards contains the numeric water quality criteria for a wide range of parameters, while Section 3 contains the narrative water quality criteria. Designated uses include: propagation and maintenance of aquatic life in warmwater fisheries and troutwaters, water contact recreation, and public water supply.

In the West Virginia portion of the James River watershed, water contact recreation and public water supply uses have been determined to be impaired pursuant to numeric water quality criteria for fecal coliform bacteria. In addition to those impairments, the aquatic life use in Ray Fork has been determined to be impaired pursuant to narrative water quality criteria in Section 3 of the Standards. That section, titled "Conditions Not Allowable in State waters," contains various general provisions related to water quality. The narrative water quality criterion at Title 47 CSR Series 2 – 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. This provision is the basis for the "biological impairment" of Ray Fork. Biological impairment signifies a stressed aquatic community, and is discussed in detail in Section 4.

The numeric water quality criteria for fecal coliform bacteria are shown in Table 2-1. The stream-specific impairments are displayed in Table 3-3.

Table 2-1. Applicable West Virginia water quality criteria

POLLUTANT	USE DESIGNATION
	Human Health
	Contact Recreation/Public Water Supply
Fecal coliform bacteria	**Human Health Criteria** Maximum allowable level of fecal coliform content for Primary Contact Recreation (either MPN [most probable number] or MF [membrane filter counts/test]) shall not exceed 200/100 mL as a monthly geometric mean based on not less than 5 samples per month; nor to exceed 400/100 mL in more than 10 percent of all samples taken during the month.

Source: 47 CSR, Series 2, *Legislative Rules, Department of Environmental Protection: Requirements Governing Water Quality Standards.*

3.0 WATERSHED DESCRIPTION AND DATA INVENTORY

3.1 Watershed Description

As shown in Figure 3-1, the West Virginia portion of the James River watershed lies entirely within Monroe County in southeast West Virginia. The remainder of the James River watershed is located in the state of Virginia. A component of the Chesapeake Bay Drainage, the West Virginia portion of the James River watershed encompasses nearly 71 square miles. Impaired streams in West Virginia are headwaters of the James River. The average elevation in the watershed is 2,676 feet. The highest point is at 4,033 feet at Arnolds Knob in the Potts Mountain chain, which is the southern watershed divide between West Virginia and Virginia. The minimum elevation is 1,868 feet along Potts Creek at the border between West Virginia and Virginia. The total population for Monroe County West Virginia, according to the 2000 U.S. Census data, is 14,583 people. The population in the 10 modeled subwatersheds is estimated to be 100 people.

Landuse and land cover estimates were originally obtained from vegetation data gathered from the West Virginia Gap Analysis Land Cover Project (GAP). The Natural Resource Analysis Center and the West Virginia Cooperative Fish and Wildlife Research Unit of West Virginia University (WVU) produced the GAP coverage. The GAP database for West Virginia was derived from satellite imagery taken during the early 1990s, and it includes detailed vegetative spatial data. Enhancements and updates to the GAP coverage were made to create a modeled landuse by custom edits derived primarily from WVDEP source tracking information and 2003 aerial photography with 1-meter resolution. Additional information regarding the modeled landuse manipulation is provided in Appendix C of the Technical Report. The categories for vegetation cover were consolidated to create eight landuse categories, summarized in Table 3-1.

As shown in Table 3-1, the dominant modeled landuse type in the 10 subwatersheds is forest, which constitutes 87.47 percent of the total landuse area. Other important modeled landuse types are grassland (7.66 percent), pasture (3.97 percent), and urban/residential (0.52 percent). Individually, all other land cover types compose less than one percent of the total watershed area.

Table 3-1. Modified modeled landuse for the 10 modeled subwatersheds in the James River watershed

Landuse Type	Area of Watershed		
	Acres	Square Miles	Percentage
Water	< 0.01	0.00	< 0.01%
Wetland	0.45	0.00	0.01%
Forest	6730.04	10.52	87.46%
Barren	3.79	0.01	0.05%
Grassland	589.67	0.92	7.66%
Cropland	24.92	0.04	0.32%
Pasture	305.58	0.48	3.97%
Urban/Residential	40.00	0.06	0.52%
Total Area	**7694.45**	**12.02**	**100.00%**

Note: < = less then

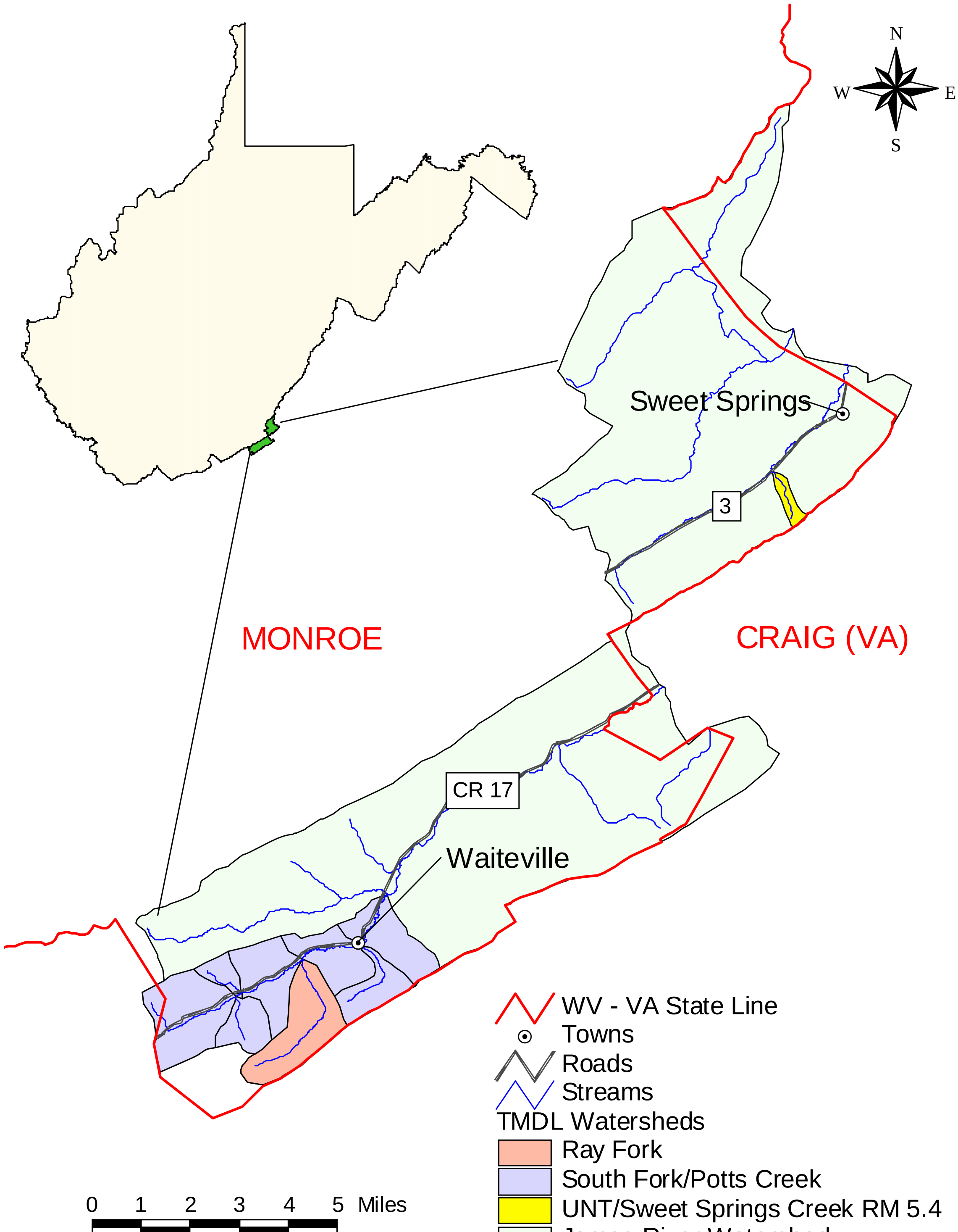


Figure 3-1. Location of the James River watershed

3.2 Data Inventory

Various sources of data were used in the TMDL development process. The data were used to identify and characterize sources of pollution and to establish the water quality response to those sources. Review of the data included a preliminary assessment of the watershed's physical and socioeconomic characteristics and current monitoring data. Table 3-2 identifies the data used to support the TMDL assessment and modeling effort for the James River watershed. These data describe the physical conditions of the TMDL watersheds, the potential pollutant sources and their contributions, and the impaired waterbodies for which TMDLs need to be developed. Prior to TMDL development, WVDEP collected comprehensive water quality data throughout the watershed. This pre-TMDL monitoring effort contributed the largest amount of water quality data to the process and is summarized in the Technical Report, Appendix I. The geographic information is provided in the ArcExplorer GIS project included on the CD version of this report.

Table 3-2. Datasets used in TMDL development

Type of Information		Data Sources
Watershed physiographic data	Stream network	West Virginia Division of Natural Resources (WVDNR)
	Landuse	WV Gap Analysis Project (GAP)
	2003 Aerial Photography (1-meter resolution)	WVDEP
	Counties	U.S. Census Bureau
	Cities/populated places	U.S. Census Bureau
	Soils	State Soil Geographic Database (STATSGO) U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) soil surveys
	Hydrologic Unit Code boundaries	U.S. Geological Survey (USGS)
	Topographic and digital elevation models (DEMs)	National Elevation Dataset (NED)
	Dam locations	USGS
	Roads	U.S. Census Bureau TIGER, WVU WV Roads
	Water quality monitoring station locations	U.S. Census Bureau, WVDEP, USEPA STORET
	Meteorological station locations	National Oceanic and Atmospheric Administration, National Climatic Data Center (NOAA-NCDC)
	Permitted facility information	WVDEP Division of Water and Waste Management (DWWM), WVDEP Division of Mining and Reclamation (DMR)
	Timber harvest data	WV Division of Forestry
	Oil and gas operations coverage	WVDEP Office of Oil and Gas (OOG)
	Abandoned mining coverage	WVDEP DMR
Monitoring data	Historical Flow Record (daily averages)	USGS
	Rainfall	NOAA-NCDC
	Temperature	NOAA-NCDC
	Wind speed	NOAA-NCDC
	Dew point	NOAA-NCDC

Type of Information		Data Sources
	Humidity	NOAA-NCDC
	Cloud cover	NOAA-NCDC
	Water quality monitoring data	USEPA STORET, WVDEP
	National Pollutant Discharge Elimination System (NPDES) data	WVDEP DMR, WVDEP DWWM
	Discharge Monitoring Report data	WVDEP DMR
	Abandoned mine land data	WVDEP DMR, WVDEP DWWM
Regulatory or policy information	Applicable water quality standards	WVDEP
	Section 303(d) list of impaired waterbodies	WVDEP, USEPA
	Nonpoint Source Management Plans	WVDEP

3.3 Impaired Waterbodies

WVDEP conducted extensive water quality monitoring from July 2004 through June 2005 in the James River watershed. The results of that effort were used to confirm the impairments of waterbodies identified on previous 303(d) lists and to identify other impaired waterbodies that were not previously listed. TMDLs were developed for three impaired streams in the James River watershed (Figure 3-1). Table 3-3 displays the TMDL watershed, stream code, stream name, and impairments for each of the three streams.

Table 3-3. Waterbodies and impairments for which TMDLs have been developed

TMDL Watershed	Code	Stream Name	FC	BIO
South Fork/Potts Creek	WVJ-1-E	South Fork/Potts Creek	**X**	
Ray Fork	WVJ-1-E-1	Ray Fork	**X**	**X**
UNT/Sweet Springs Creek RM 5.4	WVJ-2-H	UNT/Sweet Springs Creek RM 5.4	**X**	

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

4.0 BIOLOGICAL IMPAIRMENT AND STRESSOR IDENTIFICATION

Initially, TMDL development in biologically impaired waters requires identification of the pollutants that cause the stress to the biological community. Sources of those pollutants are often mine drainage, untreated sewage, and sediment. The Technical Report discusses biological impairment and the SI process in detail.

4.1 Introduction

Assessment of the biological integrity of a stream is based on a survey of the stream's benthic macroinvertebrate community. Benthic macroinvertebrate communities are rated using a multimetric index developed for use in wadeable streams of West Virginia. The West Virginia Stream Condition Index (WVSCI; Gerritsen et al., 2000) is composed of six metrics that were selected to maximize discrimination between streams with known impairments and reference streams. In general, streams with WVSCI scores of less than 60.6 points, on a normalized 0–100 scale, are considered biologically impaired.

Biological assessments are useful in detecting impairment, but they may not clearly identify the causes of impairment, which must be determined before TMDL development can proceed. USEPA developed *Stressor Identification: Technical Guidance Document* (Cormier et al., 2000) to assist water resource managers in identifying stressors and stressor combinations that cause biological impairment. Elements of the SI process were used to evaluate and identify the significant stressors to the impaired benthic communities. In addition, custom analyses of biological data were performed to supplement the framework recommended by the guidance document.

The general SI process entailed reviewing available information, forming and analyzing possible stressor scenarios, and implicating causative stressors. The SI method provides a consistent process for evaluating available information. TMDLs were established for the responsible pollutants at the conclusion of the SI process. As a result, the TMDL process established a link between the impairment and benthic community stressors.

4.2 Data Review

WVDEP generated the primary data used in SI through its pre-TMDL monitoring program. The program included water quality monitoring, benthic sampling, and habitat assessment. In addition, the biologists' comments regarding stream condition and potential stressors and sources were captured and considered. Other data sources reviewed were: source tracking data, WVDEP mining activities data, GAP2000 landuse information, Natural Resources Conservation Service (NRCS) STATSGO soils data, NPDES point source data, and literature sources.

4.3 Candidate Causes/Pathways

The first step in the SI process was to develop a list of candidate causes, or stressors. The candidate causes responsible for biological impairments are listed below:

- Metals contamination (including metals contributed through soil erosion) causes toxicity
- Acidity (low pH) causes toxicity
- High sulfates and increased ionic strength cause toxicity
- Increased total suspended solids (TSS)/erosion and altered hydrology cause sedimentation and other habitat alterations
- Altered hydrology causes higher water temperature, resulting in direct impacts
- Altered hydrology, nutrient enrichment, and increased biochemical oxygen demand (BOD) cause reduced dissolved oxygen (DO)
- Algal growth causes food supply shift
- High levels of ammonia cause toxicity (including increased toxicity due to algal growth)
- Chemical spills cause toxicity

A conceptual model was developed to examine the relationship between candidate causes and potential biological effects. The conceptual model (Figure 4-1) depicts the sources, stressors, and pathways that affect the biological community.

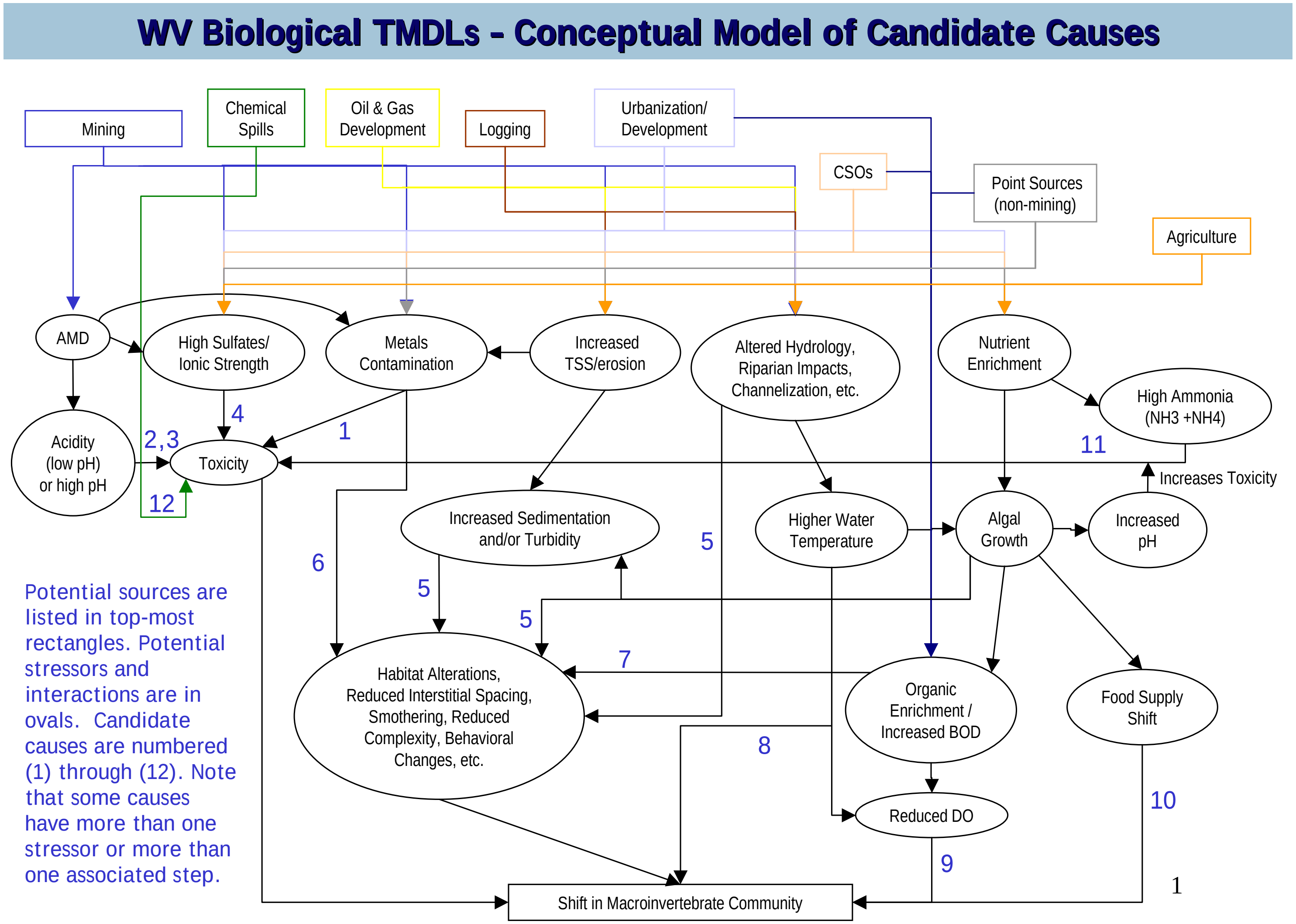


Figure 4-1. Conceptual model of candidate causes and potential biological effects

4.4 Stressor Identification Results

The SI process identified organic enrichment as the cause of biological impairment in Ray Fork, where data also indicated violations of the fecal coliform water quality criteria. The predominant sources of both organic enrichment and fecal coliform bacteria in the watershed are inadequately treated sewage and runoff from pasture landuse. WVDEP determined that implementation of fecal coliform TMDLs would remove untreated sewage and reduce agricultural runoff thereby reducing the organic and nutrient loading causing the biological impairment in Ray Fork. Therefore, fecal coliform TMDLs will serve as a surrogate where organic enrichment was identified as a stressor.

Table 4-1 summarizes the significant stressors' contributions to biological impairment in the watershed.

Table 4-1. Significant stressors of biologically impaired streams in the watershed

TMDL Watershed	Stream	Stream Code	Biological Stressor	TMDL Developed
Ray Fork	Ray Fork	WVJ-1-E-1	Organic enrichment	Fecal coliform

5.0 FECAL COLIFORM SOURCE ASSESSMENT

This section identifies and examines the potential sources of fecal coliform impairments. Sources can be classified as point (permitted) or nonpoint (non-permitted) sources.

A point source, according to 40 CFR 122.3, is any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, and vessel or other floating craft from which pollutants are or may be discharged. 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. For purposes of this TMDL, NPDES-permitted discharge points are considered point sources.

Nonpoint sources of pollutants are diffuse, non-permitted sources. They most often result from precipitation-driven runoff. For the purposes of these TMDLs only, WLAs are given to NPDES-permitted discharge points, and LAs are given to discharges from activities that do not have an associated NPDES permit, such as septic systems. The assignment of LAs to failing septic systems and straight pipes do not reflect any determination by WVDEP or USEPA as to whether there are, in fact, unpermitted point source discharges within these landuses. Likewise, by establishing these TMDLs with failing septic system and straight pipe discharges treated as LAs, WVDEP and USEPA are not determining that these discharges are exempt from NPDES permitting requirements.

The physiographic data discussed in Section 3.2 enabled the characterization of pollutant sources. As part of the TMDL development process, WVDEP performed additional field-based source tracking activities to supplement the available source characterization data. WVDEP staff recorded physical descriptions of pollutant sources and the general stream condition in the vicinity of the sources. WVDEP collected global positioning system (GPS) data and water quality samples for laboratory analysis as necessary to characterize the sources and their impacts. Source tracking information was compiled and electronically plotted on maps using GIS software. Detailed information, including the locations of pollutant sources, is provided in the following sections, the Technical Report, and the ArcExplorer project on the CD version of this TMDL report.

5.1 Fecal Coliform Point Sources

The most common fecal coliform point sources are the permitted discharges from sewage treatment plants. These facilities (including publicly and privately owned treatment works,) are regulated by NPDES permits. Permits require effluent disinfection and compliance with strict fecal coliform limitations (200 counts/100 milliliters (mL) [average monthly] and 400 counts/100 mL [maximum daily]).

Additionally, USEPA's stormwater permitting regulations require municipalities to obtain permit coverage for all stormwater discharges from municipal separate storm sewer systems (MS4s) in urbanized areas. Such discharges are potential point sources.

Collection system overflows are also point sources that may contribute significant loadings of fecal coliform bacteria to receiving streams. 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.

WVDEP determined that there are no publicly owned or privately owned wastewater treatment facilities, combined sewer overflows, sanitary sewer overflows, or municipal separate storm sewer systems, within the TMDL watersheds of the James River watershed. Therefore, the potential impacts and characterization of these source types will not be discussed further.

The following sections discuss the specific types of fecal coliform point sources that were identified in the James River watershed.

5.2 Fecal Coliform Nonpoint Sources

5.2.1 On-site Treatment Systems

Overall, failing septic systems and straight pipes represent a significant nonpoint source of fecal coliform bacteria in the watershed. Information collected during source tracking efforts by WVDEP yielded an estimate of 40 homes in the fecal coliform impaired watersheds that are not served by centralized sewage collection and treatment systems. These homes are represented in the model as having completely or periodically failing septic systems. Estimated septic system failure rates across the watershed ranged from 3 percent to 28 percent.

Due to a wide range of available literature values relating to the bacteria loading associated with failing septic systems, a customized Microsoft Excel spreadsheet tool was created to represent the fecal coliform bacteria contribution from failing on site septic systems. WVDEP's pre-TMDL monitoring and source tracking data were used in the calculations. To calculate failing septic wastewater flows, the watershed was divided into four septic failure zones. The TMDL watersheds contain only two failure zones, moderate and high. During the WVDEP source tracking process, septic failure zones were delineated by geology (soil permeability, depth to bedrock, depth to groundwater and drainage capacity) as shown in USDA county soil survey maps, and defined by rates of septic system failure. Two types of failure were considered, complete failure and periodic failure. For the purposes of this analysis, complete failure was defined as 50 gallons per house per day of untreated sewage escaping a septic system as overland flow to receiving waters. Periodic failure was defined as 25 gallons per house per day of untreated sewage escaping a septic system as overland flow to receiving waters. Figure 5-1 shows the failing septic flows in the modeled subwatersheds.

Once failing septic flows had been modeled, the next step was to develop a modeled fecal coliform concentration for failing septic system discharges in the TMDL watersheds. Based on past experience with other West Virginia TMDLs, a base concentration of 10,000 counts per 100 mL was used as a beginning concentration. This concentration was used as a starting point and was further refined during model calibration. A sensitivity analysis was performed by varying the modeled failing septic concentrations in multiple model runs, and then comparing model output to pre-TMDL monitoring data. Additional details of the failing septic analyses are presented in the Technical Report

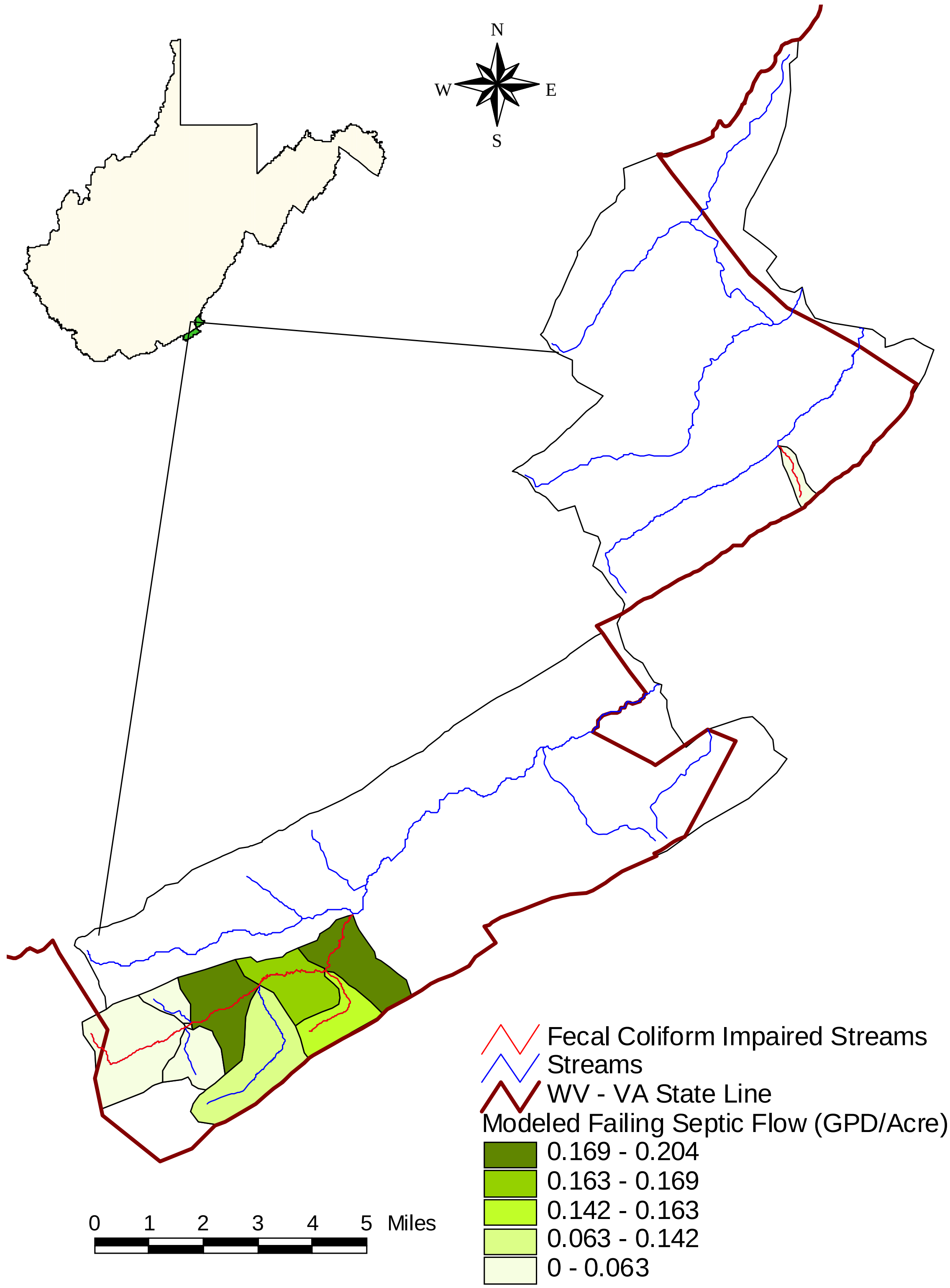


Figure 5-1. Failing septic flows

5.2.2 Urban/Residential Runoff

Stormwater runoff represents another nonpoint source of fecal coliform bacteria in residential and urbanized areas. Runoff from residential and urbanized areas during storm events can be a significant source, delivering bacteria from the waste of pets and wildlife to the waterbody. GAP 2000 landuse data were used to determine the number of acres of residential and urbanized areas and literature reference values were used to determine fecal accumulation rates for these areas. Although represented in the modeling, residential and urban landuse accounts for only a small percentage of the TMDL watersheds and urban/residential runoff is not considered to be a significant fecal coliform source.

5.2.3 Agriculture

Agricultural activities can contribute fecal coliform bacteria to receiving streams through surface runoff or direct deposition. Grazing livestock and land application of manure result in the deposition and accumulation of bacteria on land surfaces. These bacteria are then available for wash-off and transport during rain events. In addition, livestock with unrestricted access can deposit feces directly into streams.

Agriculture activities are present in portions of the TMDL watersheds. Source tracking efforts identified pastures and feedlots near impaired segments that have significant impacts on instream bacteria levels. GAP 2000 landuse data was used in conjunction with WVDEP source tracking assessments of livestock (density and access to streams) to develop fecal coliform bacteria loadings for agricultural sources.

5.2.4 Natural Background (Wildlife)

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 (WVDNR). 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 TMDL watersheds.

6.0 MODELING PROCESS

Establishing the relationship between the instream water quality targets and source loadings is a critical component of TMDL development. It allows for the evaluation of management options that will achieve the desired source load reductions. The link can be established through a range of techniques, from qualitative assumptions based on sound scientific principles to sophisticated modeling techniques. Ideally, the linkage will be supported by monitoring data that allow the TMDL developer to associate certain waterbody responses with flow and loading conditions. This section presents the approach taken to develop the linkage between sources and instream response for TMDL development.

6.1 Modeling Technique for Fecal Coliform Bacteria

Selection of the appropriate analytical technique for TMDL development was based on an evaluation of technical and regulatory criteria. The following key technical factors were considered in the selection process:

- Scale of analysis
- Point and nonpoint sources
- Fecal coliform bacterial impairments are temporally variable and occur at low, average, and high flow conditions
- Time-variable aspects of land practices have a large effect on instream bacteria concentrations
- Bacteria transport mechanisms are highly variable and often weather-dependent

The primary regulatory factor that influenced the selection process was West Virginia water quality criteria. According to 40 CFR Part 130, TMDLs must be designed to implement applicable water quality standards. The applicable water quality criteria for fecal coliform bacteria in West Virginia are presented in Section 2, Table 2-1. West Virginia numeric water quality criteria are applicable at all stream flows greater than the 7-day, 10-year low flow (7Q10). The approach or modeling technique must permit representation of instream concentrations under a variety of flow conditions to evaluate critical flow periods for comparison with criteria.

The TMDL development approach must also consider the dominant processes affecting pollutant loadings and instream fate. In the James River watershed, only nonpoint sources contribute to the impairments. Some of the nonpoint sources are rainfall-driven with pollutant loadings primarily related to surface runoff, but others such as inadequate on-site residential sewage treatment systems, function as continuous discharges. While loading function variations must be recognized in the representation of the various sources, the TMDL allocation process must prescribe WLAs for any contributing point sources and LAs for all contributing nonpoint sources.

The MDAS was developed specifically for TMDL application in West Virginia to facilitate large scale, data intensive watershed modeling applications. The MDAS is a system designed to support TMDL development for areas affected by nonpoint and point sources. The MDAS component most critical to TMDL development is the dynamic watershed model because it provides the linkage between source contributions and instream response. The MDAS is used to simulate watershed hydrology and pollutant transport as well as stream hydraulics and instream water quality. It is capable of simulating different flow regimes and pollutant loading variations. A key advantage of the MDAS' development framework is that it has no inherent limitations in terms of modeling size or upper limit of model operations. In addition, the MDAS model allows for seamless integration with modern-day, widely available software such as Microsoft Access and Excel. Fecal coliform bacteria were modeled using the MDAS.

6.1.1 MDAS Setup

Configuration of the MDAS model involved subdividing the James River watershed into subwatershed modeling units connected by stream reaches. Physical characteristics of the subwatersheds, weather data, landuse information, continuous discharges, and stream data were used as input. Flow and water quality were continuously simulated on an hourly time-step.

The entire James River watershed within West Virginia was broken into a total of 25 separate subwatershed units. However, only 10 subwatersheds contribute to the three impaired streams, as shown in Figure 3-1. The subwatersheds were divided to allow evaluation of water quality and flow at pre-TMDL monitoring stations. This subdivision process also ensures a proper stream network configuration within the basin. The subwatershed delineation is shown in Figure 6-1.

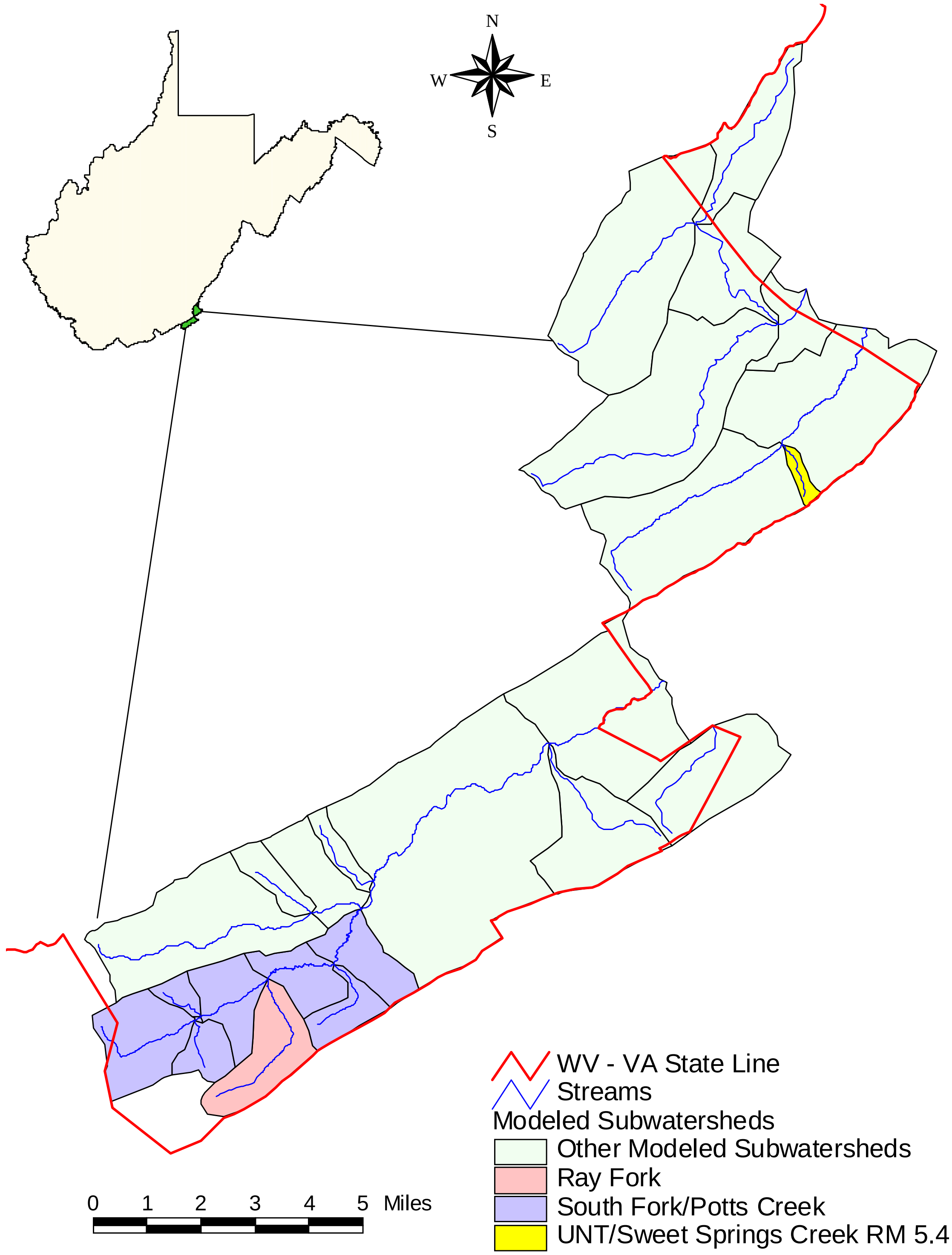


Figure 6-1. James River subwatershed delineation

Modeled landuse categories contributing to bacteria loads include pasture, grassland, cropland, urban/residential pervious lands, urban/residential impervious lands, and forest (including barren and wetlands). Other sources, such as failing septic systems and straight pipes were modeled as direct, continuous-flow sources in the model.

The MDAS was configured to model hydrology, and water quality for fecal coliform bacteria. In the James River watershed, pollutant loads are delivered to the tributaries with surface runoff, subsurface flows, and direct discharges to the streams. The MDAS provides mechanisms for representing all of these various pathways of pollutant delivery.

The basis for the initial bacteria loading rates for landuses and direct sources is described in the Technical Report. The initial estimates were further refined during the model calibration. A variety of modeling tools were used to develop the fecal coliform bacteria TMDLs, including the MDAS, and a customized spreadsheet to determine the fecal coliform loading from failing residential septic systems identified during source tracking efforts by WVDEP. Section 5.2.1 describes the process of assigning flow and fecal coliform concentrations to failing septic systems. The failing septic system analysis provided initial values for model input; however, these values were further refined during the model calibration process.

After model configuration, calibration of the hydrology followed by calibration of water quality was performed. The goal of the calibration was to obtain realistic model prediction by selecting parameter values that reflect the unique characteristics of the watershed. Spatial and temporal aspects were evaluated through the calibration process.

The model selection process, modeling methodologies, and technical approaches are discussed further in the Technical Report.

6.1.2 Hydrology Calibration

Hydrology and water quality calibration were performed in sequence because water quality modeling is dependent on an accurate hydrology simulation. Typically, hydrology calibration involves a comparison of model results to instream flow observations from USGS flow gauging stations throughout the watershed. However, USGS flow gauging stations are not present in the West Virginia portion of the James River watershed. Therefore hydrology calibration of the James River watershed was completed in conjunction with the hydrology calibration of the Greenbrier River watershed. Both models were calibrated to the observed data recorded at three USGS gages: USGS 03184000 Greenbrier River at Hill Dale, USGS 03183500 Greenbrier River at Alderson, and USGS 03182500 Greenbrier River at Buckeye. Hydrology calibration was based on observed data from those stations and the landuses present in the watersheds at that time. Key considerations for hydrology calibration included the overall water balance, the high- and low-flow distribution, storm flows, and seasonal variation. The hydrology was validated for the time period of January 1, 1992 to September 30, 2005. As a starting point, many of the hydrology calibration parameters originated from the USGS Scientific Investigations Report 2005-5099 (Atkins, 2005). Final adjustments to model hydrology were based on flow measurements obtained during WVDEP's pre-TMDL monitoring in the James River watershed. A detailed description of the hydrology calibration and a summary of the results and validation are presented in the Technical Report.

6.1.3 Fecal Coliform Bacteria Calibration

Following hydrology calibration, water quality calibration was performed for fecal coliform bacteria. The water quality was calibrated by comparing modeled versus observed instream fecal coliform bacteria concentrations. The water quality calibration consisted of executing the MDAS model, comparing the model results to available observations, and adjusting water quality parameters within reasonable ranges. Available monitoring data in the watershed was identified and assessed for applicability to calibration. Monitoring stations with observations that represented a range of hydrologic conditions, source types, and pollutants were selected. The time-period for water quality calibration was selected based on the availability of the observed data and their relevance to the current conditions in the watershed. WVDEP also conducted storm monitoring on Shrewsbury Hollow in Kanawha State Forest, Kanawha County, West Virginia. The data gathered during this sampling episode was used in the calibration of fecal coliform and to enhance the representation of background conditions from undisturbed areas. The results of the fecal coliform storm sampling and fecal coliform model calibration are shown in Figure 6-2.

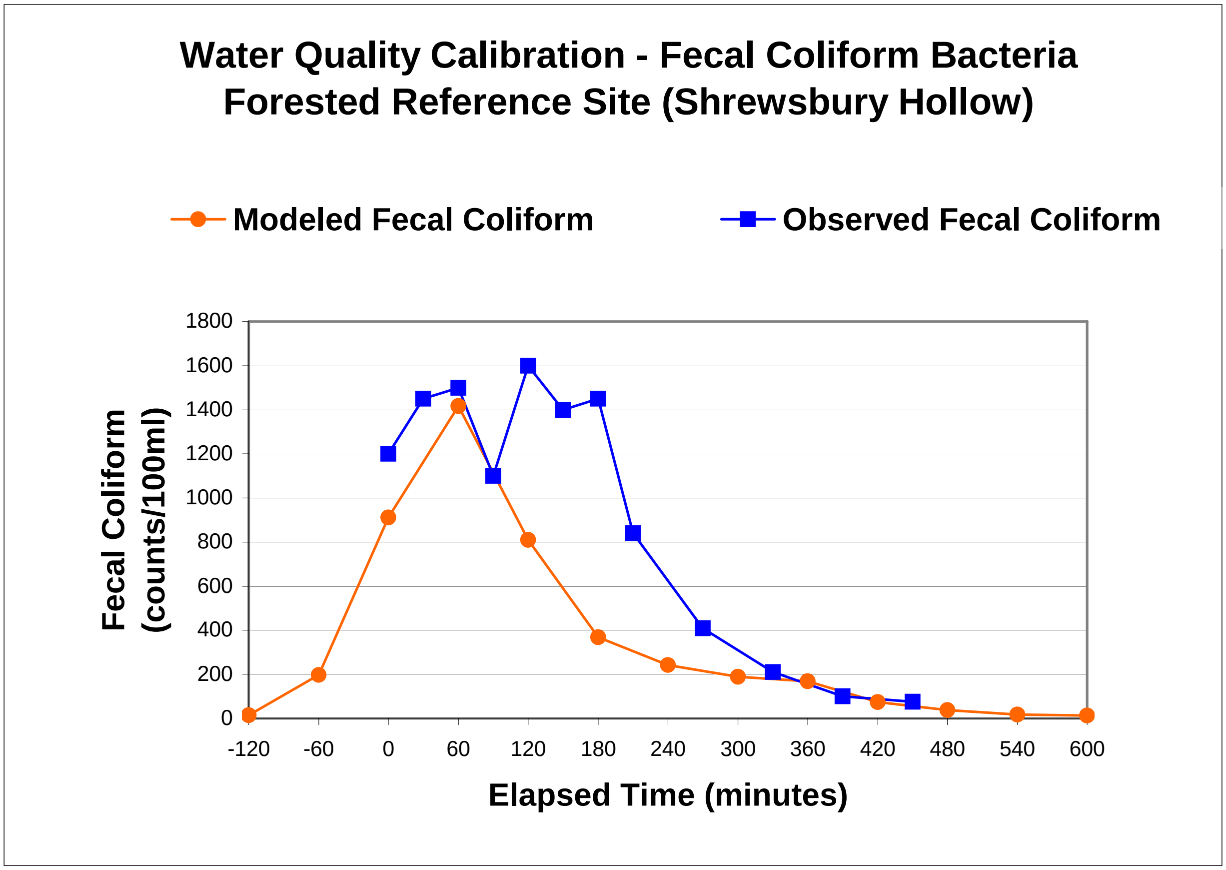


Figure 6-2. Shrewsbury Hollow fecal coliform observed data

6.2 Allocation Analysis

As explained in Section 2, a TMDL is composed of the sum of individual WLAs for point sources, LAs for nonpoint sources, and natural background levels. In addition, the TMDL must include a MOS, implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. TMDLs can be expressed in terms of mass per time or other appropriate units. Conceptually, this definition is denoted by the equation:

$$\text{TMDL} = \text{sum of WLAs} + \text{sum of LAs} + \text{MOS}$$

To develop fecal coliform bacteria TMDLs for each of the waterbodies listed in Table 3-3 of this report, the following approach was taken:

- Define TMDL endpoints
- Simulate baseline conditions
- Assess source loading alternatives
- Determine the TMDL and source allocations

6.2.1 TMDL Endpoints

TMDL endpoints represent the water quality targets used to quantify TMDLs and their individual components. In general, West Virginia's numeric water quality criteria for the subject pollutants (identified in Section 2) and an explicit five percent MOS were used to identify endpoints for TMDL development.

The five percent explicit MOS was used to counter uncertainty in the modeling process. Long-term water quality monitoring data were used for model calibration. Although these data represented actual conditions, they were not of a continuous time series and might not have captured the full range of instream conditions that occurred during the simulation period. The explicit five percent MOS also accounts for those cases where monitoring might not have captured the full range of instream conditions. The TMDL endpoints for the various criteria are displayed in Table 6-1.

Table 6-1. TMDL endpoints

Water Quality Criterion	Designated Use	Criterion Value	TMDL Endpoint
Fecal Coliform	Water Contact Recreation and Public Water Supply	200 counts / 100mL (Monthly Geometric Mean)	190 counts / 100mL (Monthly Geometric Mean)
Fecal Coliform	Water Contact Recreation and Public Water Supply	400 counts / 100mL (Daily, 10% exceedance)	380 counts / 100mL (Daily, 10% exceedance)

6.2.2 Baseline Conditions and Source Loading Alternatives

The calibrated model provides the basis for performing the allocation analysis. The first step is to simulate baseline conditions, which represent existing nonpoint source loadings. Baseline conditions allow for an evaluation of instream water quality under the highest expected loading conditions.

Baseline Conditions for MDAS

The MDAS model was run for baseline conditions using hourly precipitation data for a representative six-year simulation period (January 1, 1998 through December 31, 2003). The precipitation experienced over this period was applied to the landuses and pollutant sources, as they existed at the time of TMDL development. Predicted instream concentrations were compared directly with the TMDL endpoints. This comparison allowed for the evaluation of the magnitude and frequency of exceedances under a range of hydrologic and environmental conditions, including dry periods, wet periods, and average periods.

Figure 6-3 presents the annual rainfall totals for the years 1980 through 2004 at the Union 3 SSE (WV9011) weather station in Union, West Virginia. The years 1998 to 2003 are highlighted to indicate the range of precipitation conditions used for TMDL development in the James River watershed.

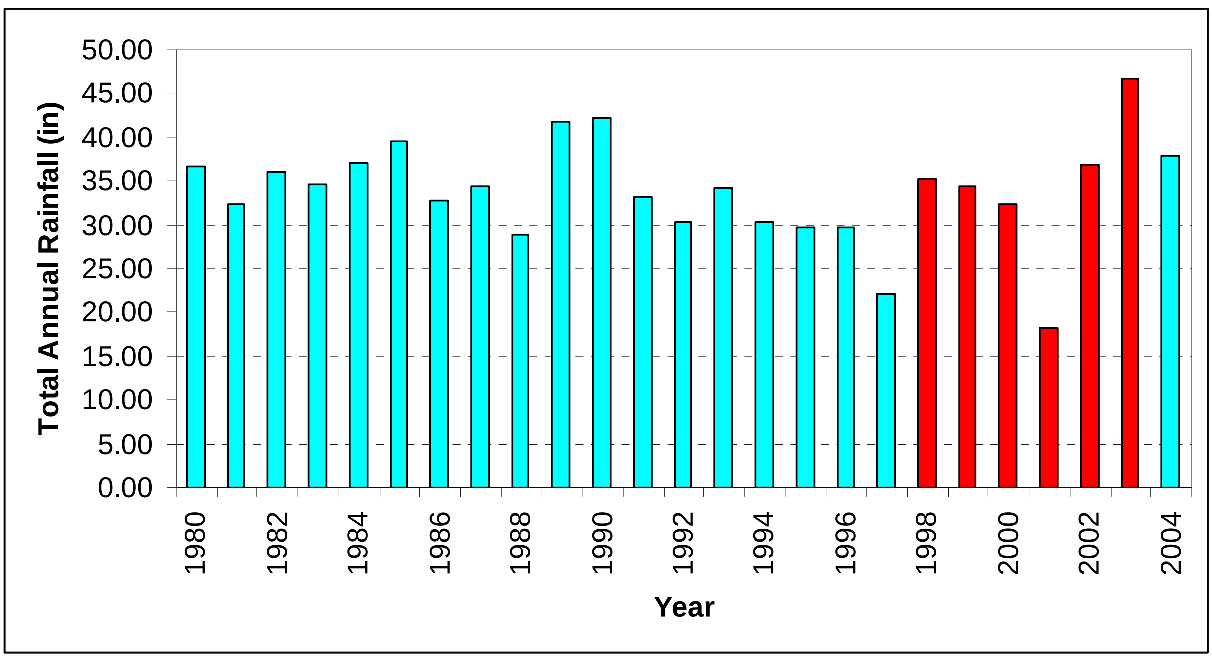


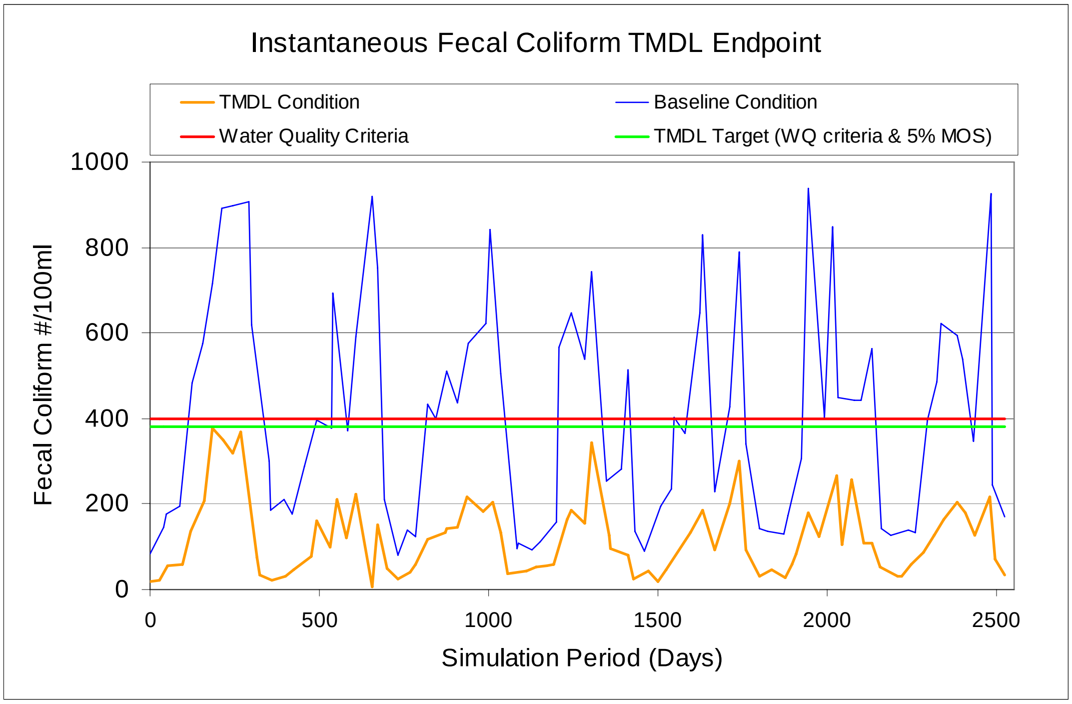
Figure 6-3. Annual precipitation totals and percentile ranks for the Union 3 SSE (WV9011) weather station in Union, West Virginia

Source Loading Alternatives

Simulating baseline conditions allowed for the evaluation of each stream's response to variations in source contributions under a variety of hydrologic conditions. This sensitivity analysis gave insight into the dominant sources and the mechanisms by which potential decreases in loads would affect instream pollutant concentrations. The loading contributions from nonpoint sources were individually adjusted; the modeled instream concentrations were then evaluated.

Multiple allocation scenarios were run for the impaired waterbodies. Successful scenarios were those that achieved the TMDL endpoints under all flow conditions throughout the modeling period. The averaging period and allowable exceedance frequency associated with West Virginia water quality criteria were considered in these assessments. In general, loads contributed by sources that had the greatest impact on instream concentrations were reduced first. If additional load reductions were required to meet the fecal coliform TMDL endpoints, less significant source contributions were subsequently reduced.

Figure 6-4 shows examples of model output for a fecal coliform baseline condition and a successful TMDL scenario for both instantaneous output and the 30 day geometric mean of the output.



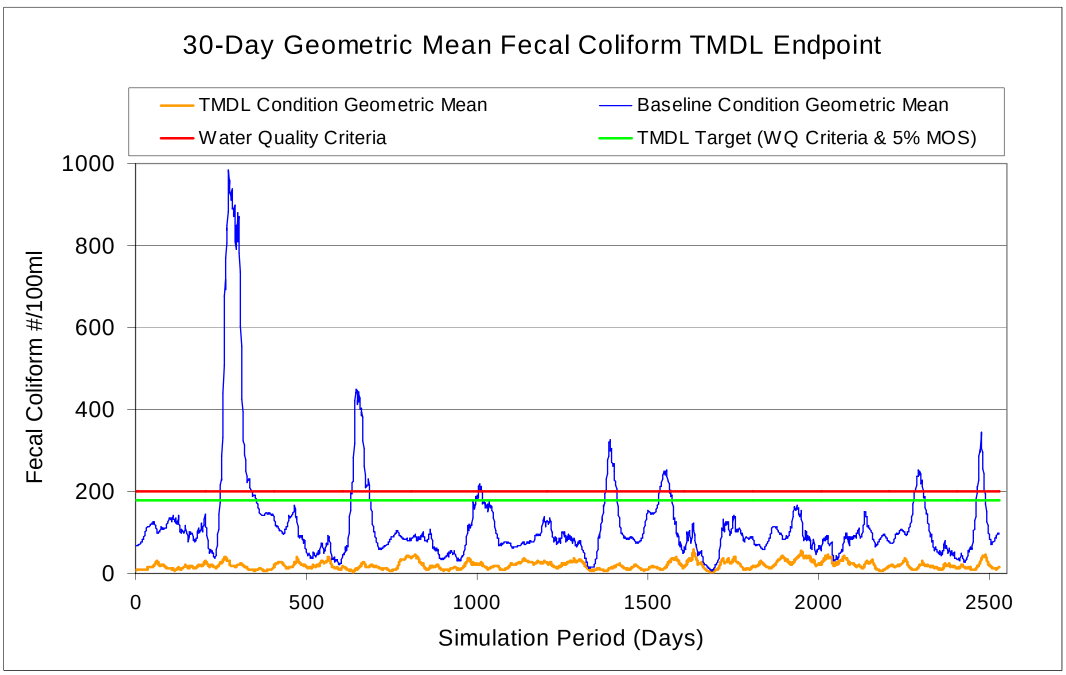


Figure 6-4. Examples of baseline and TMDL conditions (instantaneous and geometric mean) for fecal coliform bacteria

6.3 TMDLs and Source Allocations

6.3.1 Fecal Coliform Bacteria TMDLs

TMDLs and source allocations were developed for impaired segments and their tributaries on a subwatershed basis. A top-down methodology was followed to develop these TMDLs and allocate loads to sources. Headwaters were analyzed first because their loading affects downstream water quality. The loading contributions of unimpaired headwaters and the reduced loadings for impaired headwaters were then routed through downstream waterbodies. Using this method, contributions from all sources were weighted equitably. Reductions in sources affecting impaired headwaters ultimately led to improvements downstream and effectively decreased necessary loading reductions from downstream sources. Nonpoint source reductions did not result in loadings less than natural conditions

The following general methodology was used when allocating loads to fecal coliform bacteria sources. Because West Virginia Bureau for Public Health (BPH) regulations prohibit the discharge of raw sewage into surface waters, all illicit discharges of human waste from failing septic systems and straight pipes were reduced by 100 percent in the model. If further reduction was necessary, nonpoint source loadings from agricultural lands were subsequently reduced until instream water quality criteria were met.

Wasteload Allocations
Because no existing point sources were identified in the TMDL watersheds, the prescription of wasteload allocations was unnecessary.

Load Allocations (LAs)
LAs were assigned as required to the following the source categories:

- Pasture
- On-site Sewage Systems — loading from all illicit, non-disinfected discharges of human waste (including failing septic systems and straight pipes)
- Residential — loading associated with urban/residential runoff
- Background and Other Nonpoint Sources — loading associated with wildlife sources from forest and grasslands (contributions/loadings from wildlife sources were not reduced)

6.3.2 Seasonal Variation

The TMDL must consider seasonal variation. For the James River watershed fecal coliform TMDLs, seasonal variation was considered in the formulation of the modeling analysis. Continuous simulation (modeling over a period of several years that captured precipitation extremes) inherently considers seasonal hydrologic and source loading variability**.** The fecal coliform concentrations simulated on a daily time step by the model were compared with TMDL endpoints. Allocations that met these endpoints throughout the modeling period were developed.

6.3.3 Critical Conditions

A critical condition represents a scenario where water quality criteria are most susceptible to violation. Analysis of water quality data for individual streams within the James River watershed shows high pollutant concentrations during both high- and low-flow thereby precluding selection of a single critical condition. Both high-flow and low-flow periods were taken into account during TMDL development by using a long period of weather data that represented wet, dry, and average flow periods.

Nonpoint source loading is typically precipitation-driven and impacts tend to occur during wet weather and high surface runoff. During dry periods little or no land-based runoff occurs, and elevated instream pollutant levels may be due to straight pipes and failing on-site sewage systems. These sources (categorized as nonpoint sources but represented as continuous flow discharges) often have associated low-flow critical conditions, particularly where such sources are located on small receiving waters.

6.3.4 TMDL Presentation

TMDLs, LAs, and WLAs are shown in Tables 7-1 and 7-2 as well as in the allocation spreadsheets associated with this report. TMDLs and their components are presented as average daily loads and average annual loads and were developed to meet TMDL endpoints throughout the range of conditions simulated over the design precipitation period.

Pollutant source representation attempted to capture the functionality and conveyance methods of both storm runoff from precipitation-induced sources and continuous discharges that are not directly related to precipitation. Simulation of baseline conditions on an hourly time-step provided a basis for evaluating in-stream response to varying source contributions under a wide range of precipitation and stream flow conditions. Hourly model outputs were aggregated into daily values. TMDL allocations were developed by reducing baseline pollutant contributions until model output at each subwatershed outlet demonstrated attainment of water quality criteria, exactly in accordance with the prescribed criterion value, averaging period and exceedance frequency. For each impaired stream, annual average TMDLs were derived by calculating the total pollutant load associated with the TMDL condition exiting the mouth subwatershed for each year simulated by the model and then averaging those annual loads. The average daily TMDLs were calculated by dividing the annual average loads by 365 days.

The filterable allocation spreadsheets include multiple display formats that allow comparison of pollutant loadings among categories and facilitate implementation. A brief description of presented information is included on the “Introduction” tab of the spreadsheet. Load allocations for nonpoint source categories are presented for each model subwatershed as annual average loads, along with the associated percentage pollutant reduction from baseline conditions.

7.0 TMDL RESULT TABLES

TMDLs and source allocations were developed for the impairments displayed in Table 3-3. The TMDLs for fecal coliform bacteria are shown in Table 7-1 and the TMDL for the biological impairment in Ray Fork is displayed in Table 7-2. The TMDLs for fecal coliform bacteria are presented in number of colonies (counts) per day.

Detailed source allocations are provided in the allocation spreadsheets associated with this report.

Table 7-1. Fecal coliform bacteria TMDLs for the James River watershed

TMDL Watershed	Stream Code	Stream Name	Load Allocation (counts/day)	Wasteload Allocation (counts/day)	Margin of Safety (counts/day)	TMDL (counts/day)
South Fork/Potts Creek	WVJ-1-E	South Fork/Potts Creek	4.49E+10	NA	2.36E+09	4.73E+10
Ray Fork	WVJ-1-E-1	Ray Fork	3.74E+09	NA	1.97E+08	3.94E+09
UNT/Sweet Springs Creek RM 5.4	WVJ-2-H	UNT/Sweet Springs Creek RM 5.4	1.62E+09	NA	8.55E+07	1.71E+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.

Table 7-2. Biological TMDLs for the James River watershed

TMDL Watershed	Stream Code	Stream Name	Load Allocation (counts/day)	Wasteload Allocation (counts/day)	Margin of Safety (counts/day)	TMDL (counts/day)
Ray Fork	WVJ-1-E-1	Ray Fork	3.74E+09	NA	1.97E+08	3.94E+09

NA = not applicable

"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.

8.0 FUTURE GROWTH

8.1 Fecal Coliform Bacteria

Specific fecal coliform bacteria future growth allocations are not prescribed. The absence of specific future growth allocations does not prohibit new development in the watersheds of streams for which fecal coliform bacteria TMDLs have been developed, or preclude the permitting of new sewage treatment facilities.

In some instances, the implementation of the TMDLs will consist of providing public sewer service to unsewered areas. The NPDES permitting procedures for sewage treatment facilities include technology-based fecal coliform effluent limitations that are more stringent than applicable water quality criteria. Therefore, a new sewage treatment facility may be permitted anywhere in the watershed, provided that the permit includes monthly average and maximum daily fecal coliform limitations of 200 counts/100 mL and 400 counts/100 mL, respectively. Furthermore, WVDEP will not authorize construction of combined collection systems or permit overflows from newly constructed collection systems.

9.0 PUBLIC PARTICIPATION

9.1 Public Meetings

Informational public meetings were held on May 6, 2004 at the New River Community and Technical College and June 11, 2007 at the public library in Lewisburg, West Virginia. The May 6, 2004 meeting occurred prior to pre-TMDL stream monitoring and pollutant source tracking and included a general TMDL overview and a presentation of planned monitoring and data gathering activities. The June 11, 2007 meeting occurred prior to allocation of pollutant loads and included proposed WVDEP allocation strategies. A public meeting was held to present the draft TMDLs on February 11, 2008 at the public library in Lewisburg. The meeting began at 7:00 PM. and provided information to stakeholders to facilitate comments on the draft TMDLs.

9.2 Public Notice and Public Comment Period

The availability of Draft TMDLs was advertised in various local newspapers between January 29, 2008 and January 31, 2008. Interested parties were invited to submit comments during the public comment period, which began on February 1, 2008 and ended March 3, 2008. WVDEP did not receive any comments on the Draft TMDLs. The electronic documents are available on the WVDEP's internet site at http://www.wvdep.org/wvtmdl.

10.0 REASONABLE ASSURANCE

Reasonable assurance for maintenance and improvement of water quality in the affected watershed rests primarily with two programs. The NPDES permitting program is implemented by WVDEP to control point source discharges. The West Virginia Watershed Network is a cooperative nonpoint source control effort involving many state and federal agencies, whose task is protection and/or restoration of water quality.

WVDEP's Division of Water and Waste Management (DWWM) is responsible for issuing non-mining NPDES permits within the State. As part of the permit review process, permit writers have the responsibility to incorporate the required TMDL wasteload allocations into new or reissued permits. Because no existing point sources are present, permit reissuance activities are not relevant to the implementation of the subject TMDLs. New facilities may be permitted in accordance with the future growth provisions discussed in Section 8.1.

10.1 Watershed Management Framework Process

The Watershed Management Framework is a tool used to identify priority watersheds and coordinate efforts of state and federal agencies with the goal of developing and implementing watershed management strategies through a cooperative, long-range planning effort.

The West Virginia Watershed Network is an informal association of state and federal agencies, and nonprofit organizations interested in the watershed movement in West Virginia. Membership is voluntary and everyone is invited to participate. The Network uses the Framework to coordinate existing programs, local watershed associations, and limited resources. This coordination leads to the development of Watershed Based Plans to implement TMDLs and document environmental results.

The principal area of focus of watershed management through the Framework process is correcting problems related to nonpoint source pollution. Network partners have placed a greater emphasis on identification and correction of nonpoint source pollution. The combined resources of the partners are used to address all different types of nonpoint source pollution through both public education and on-the-ground projects.

Among other things, the Framework includes a management schedule for integration and implementation of TMDLs. In 2000, the schedule for TMDL development under Section 303(d) was merged with the Framework process. The Framework identifies a six-step process for developing integrated management strategies and action plans for achieving the state's water quality goals. Step 3 of that process includes "identifying point source and/or nonpoint source management strategies - or Total Maximum Daily Loads - predicted to best meet the needed [pollutant] reduction." Following development of the TMDL, Steps 5 and 6 provide for preparation, finalization, and implementation of a Watershed Based Plan to improve water quality.

Each year, the Framework is included on the agenda of the Network to prioritize watersheds within a certain Hydrologic Group. This selection process includes a review and evaluation of TMDL recommendations for the watersheds under consideration. The Network intends to prioritize Hydrologic Group D watersheds in March 2008. Development of Watershed Based Plans for priority watersheds is based on the efforts of local project teams. These teams are composed of Network members and stakeholders having interest in or residing in the watershed. Team formation is based on the type of impairment(s) occurring or protection(s) needed within the watershed. In addition, teams have the ability to use the TMDL recommendations to help plan future activities. Additional information regarding upcoming Network activities can be obtained from the Nonpoint Source Program Southern Basin Coordinator Jennifer DuPree (jdupree@wvdep.org).

10.2 Public Sewer Projects

Within WVDEP DWWM, the Engineering and Permitting Branch's Engineering Section is charged with the responsibility of evaluating sewer projects and providing funding, where available, for those projects. All municipal wastewater loans issued through the State Revolving Fund (SRF) program are subject to a detailed engineering review of the engineering report, design report, construction plans, specifications, and bidding documents. The staff performs periodic on-site inspections during construction to ascertain the progress of the project and compliance with the plans and specifications. Where the community does not use SRF funds to undertake a project, the staff still performs engineering reviews for the agency on all POTWs prior to permit issuance or modification. For further information on upcoming projects, a list of funded and pending water and wastewater projects in West Virginia can be found at http://www.wvinfrastructure.com/projects/index.html.

11.0 MONITORING PLAN

The following monitoring activities are recommended:

11.1 Nonpoint Source Project Monitoring

All nonpoint source restoration projects should include a monitoring component specifically designed to document resultant local improvements in water quality. These data may also be used to predict expected pollutant reductions from similar future projects.

11.2 TMDL Effectiveness Monitoring

TMDL effectiveness monitoring should be performed to document water quality improvements after significant implementation activity has occurred where little change in water quality would otherwise be expected. Full TMDL implementation will take significant time and resources, particularly with respect to the abatement of nonpoint source impacts. WVDEP will continue monitoring on the rotating basin cycle and will include a specific TMDL effectiveness component in waters where significant TMDL implementation has occurred.

12.0 REFERENCES

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