WEST VIRGINIA

WATER QUALITY STATUS ASSESSMENT

2000
305(b) Report

for the period
1997-1999

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The Office of Water Resources would like to take this opportunity to thank the many individuals and agencies that volunteered data and who dedicated time and resources in completion of this report.

An electronic version of this report, as well as other reports prepared by the Office of Water Resources, are accessible through the Division of Environmental Protection's home page on the internet (www.dep.state.wv.us).

PART I: EXECUTIVE SUMMARY/OVERVIEW

This report has been prepared to meet the requirements of section 305(b) of the federal Clean Water Act (CWA). It is compiled from data collected by a number of state, interstate and federal agencies, including the West Virginia Division of Environmental Protection (DEP), West Virginia Division of Natural Resources (DNR), West Virginia Bureau for Public Health (BPH), Ohio River Valley Water Sanitation Commission (ORSANCO), United States Geological Survey (U. S. G.S.), United States Forest Service (U. S. F.S.), and United States Army Corps of Engineers (U. S. C.E). Also, data from a number of third party sources was utilized to prepare this report, including colleges and universities, public utilities, private consultants, and volunteer monitors. The report provides a general assessment of the quality of West Virginia's surface and ground water resources.

The report addresses public health/aquatic life concerns and provides updated assessments on West Virginia's lakes, wetlands, and nonpoint source programs. It also discusses special State concerns and describes existing programs for the monitoring and control of water pollution. In addition, the report provides a list of recommendations for the improvement of water quality management in West Virginia.

There are more than 9,000 streams in West Virginia, comprising a total length of more than 32,000 miles (>21,000 miles perennial; >11,000 miles intermittent). Only a broad overview can be included in an assessment of this type. More specific information on individual streams can be found in the various watershed assessment reports being published annually by the (DEP). A brief inventory of West Virginia's water resources is provided in Table 1.

The majority of data used in this report were collected by WAP as part of its rotating basin assessment strategy. Beginning in 1996, the Office of Water Resources (OWR) established a 5-year rotating basin approach to stream monitoring. For five consecutive years beginning in 1996, WAP will be responsible for collecting water quality data in a subset of the State's 32 major watersheds (8-digit U. S. G.S. Hydrologic Units). Approximately 5-8 watersheds will be monitored per year for five years, then the process will begin again. In this manner, DEP can achieve comprehensive coverage of the State's waters every five years.

The format used in this 305(b) report is similar to that used in the 1998 report, which focused on seven of the State's 32 major watersheds. This report will focus on 11 additional watersheds, or hydrologic units. The watersheds included in this report are the Coal River, Elk River, Lower Kanawha River, North Branch Potomac River, and Tygart Valley River (Figure 1, group B) and the Gauley River, Lower Guyandotte River, Middle Ohio River North, Middle Ohio River South, Potomac River Direct Drains, and Tug Fork River (Figure 1, group C). The Office of Water Resources' Watershed Assessment Program (WAP) monitored the group B watersheds in 1997 and the group C watersheds in 1998.

Table 1

Water Resources Atlas

State population (1990)	1,793,477
State surface area (square miles)	24,282
Number of water basins	32
(according to State subdivisions)	
Total number of River and stream miles	32,278
Number of perennial River miles (subset)	21,114
Number of intermittent stream miles (subset)	11,164
Number of ditches and canals (subset)	18
Number of border miles (subset)	619
Number of lakes/reservoirs/ponds (publicly owned)	108
Acres of lakes/reservoirs/ponds (publicly-owned)	22,373
Acres of freshwater wetlands	102,000

Data collected by WAP is not the only data used in the 305(b) assessment. Data collected from other sources, including those mentioned in paragraph one of this section, will be utilized. However, only data that pertain to the watersheds currently being monitored will be considered. Data from other watersheds will be kept on file until WAP completes those assessments. Thus, only watersheds visited by WAP in 1997 and 1998 appear in this assessment. Watersheds visited by WAP in 1999 and 2000 (Figure 1, groups D and E, respectively) will be included in he year 2002 305(b) Report. (Note: data from watersheds monitored in 1999 and 2000 were not available at the time this report was initiated).

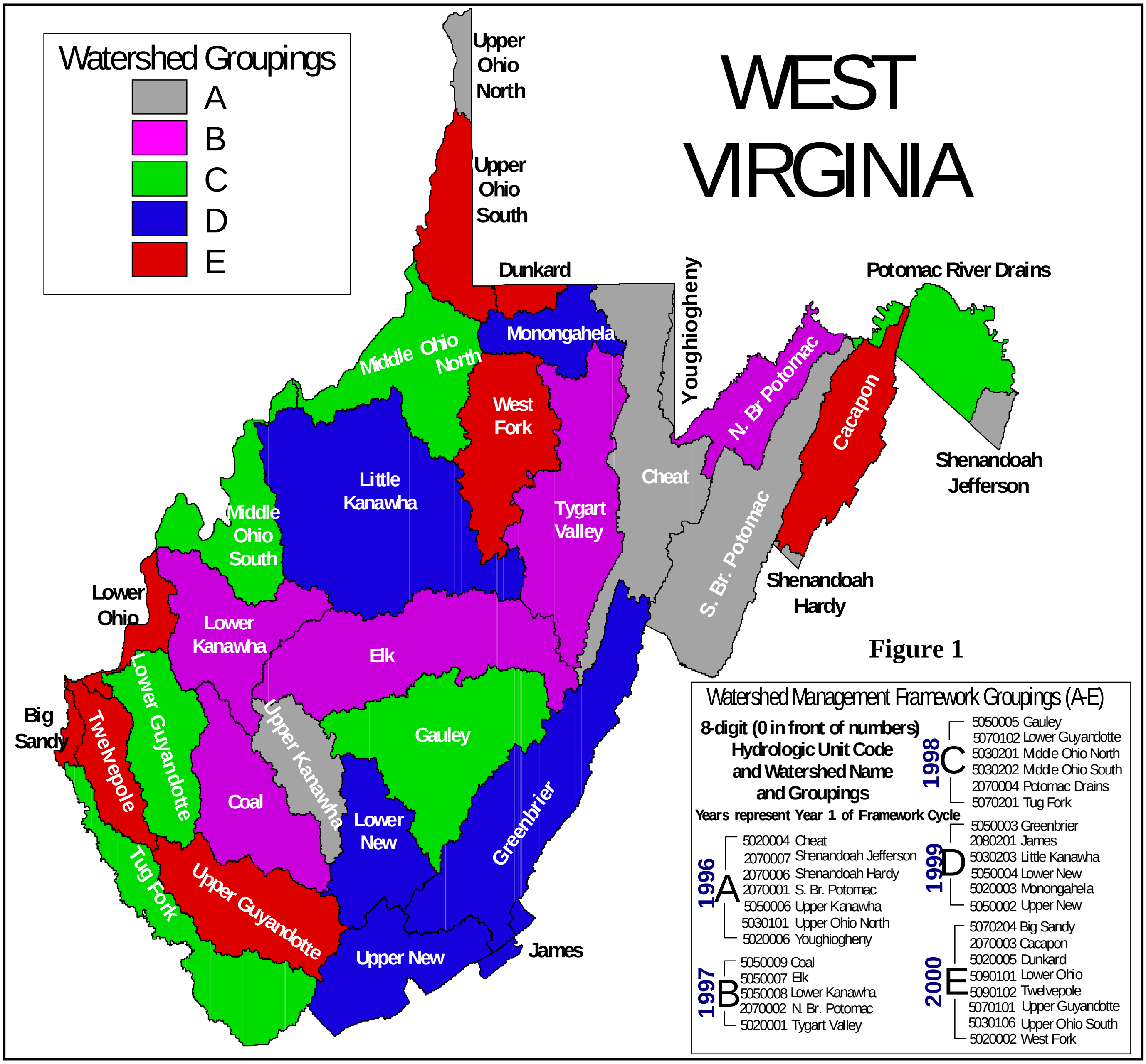

Watershed Groupings
A
B
C
D
E
WEST VIRGINIA
Upper Ohio North
Upper Ohio South
Dunkard
Monongahela
Youghiogheny
Potomac River Drains
Middle Ohio North
West Fork
N. Br Potomac
Cacapon
Shenandoah Jefferson
Little Kanawha
Cheat
Tygart Valley
Middle Ohio South
S. Br. Potomac
Shenandoah Hardy
Lower Ohio
Lower Kanawha
Elk
Big Sandy
Twelvepole
Lower Guyandotte
Upper Kanawha
Gauley
Coal
Lower New
Greenbrier
Tug Fork
Upper Guyandotte
Upper New
James
Watershed Management Framework Groupings (A-E)
8-digit (0 in front of numbers) Hydrologic Unit Code and Watershed Name and Groupings
Years represent Year 1 of Framework Cycle
1996 A
5020004 Cheat
2070007 Shenandoah Jefferson
2070006 Shenandoah Hardy
2070001 S. Br. Potomac
5050006 Upper Kanawha
5030101 Upper Ohio North
5020006 Youghiogheny
1997 B
5050009 Coal
5050007 Elk
5050008 Lower Kanawha
2070002 N. Br. Potomac
5020001 Tygart Valley
1998 C
5050005 Gauley
5070102 Lower Guyandotte
5030201 Middle Ohio North
5030202 Middle Ohio South
2070004 Potomac Drains
5070201 Tug Fork
1999 D
5050003 Greenbrier
2080201 James
5030203 Little Kanawha
5050004 Lower New
5020003 Monongahela
5050002 Upper New
2000 E
5070204 Big Sandy
2070003 Cacapon
5020005 Dunkard
5090101 Lower Ohio
5090102 Twelvepole
5070101 Upper Guyandotte
5030106 Upper Ohio South
5020002 West Fork

Figure 1

The majority of data used in this report is less than five years old. The only exceptions to this are data from mine drainage and acid rain impacted streams, in which case water quality is not likely to change much over time unless treatment has been initiated. Thus, this report provides a current and accurate account of the quality of the State's assessed waters.

It is important to note that many of the streams selected for monitoring during this reporting period were not selected in random fashion, but were sampled because of known or suspected pollution problems. Because sampling of streams in West Virginia traditionally has not been performed in random fashion, it is prudent not to make general inferences about the overall quality of West Virginia streams based solely upon the data used in this report.

However, in order to provide a more accurate picture regarding general water quality conditions in the State, WAP established a random monitoring program in 1997 to complement its targeted stream program. Random monitoring will enable DEP to make general inferences regarding the State's overall water quality in a statistically valid manner. However, it will probably take at least one more reporting cycle before WAP fully develops the capabilities to analyze and interpret the data. A general discussion regarding the targeted and random monitoring protocols WAP utilizes is contained in OWR's Quality Assurance Project Plan for the Watershed Assessment Program (OWR, 1999).

During this reporting period, 15 public lakes were evaluated. These lakes were monitored in 1996 and were the last lakes to be monitored under the State's Clean Lakes Program. The program has since been phased out due to lack of federal funding. The federal Clean Lakes Program originally was the State's primary funding source for lake monitoring and assessment.

West Virginia's wetlands (102,000 acres) comprise less than one percent of the State's total acreage. The State takes great interest in the management of these areas. Such management efforts are mainly geared toward protection of wetlands either by regulatory proceedings or acquisition. Permitting authority for activities impacting wetlands (Section 404) lies with the U. S. Army Corps of Engineers. West Virginia insures protection through an active Section 401 certification program.

The Wildlife Resources Section of the DNR updated its wetlands inventory in 1996. Current wetland information is described in a booklet entitled "West Virginia's Wetlands...Uncommon, Valuable Wildlands" (Tiner, 1996). This publication is available from the DNR's Wildlife Resources Section, Technical Support Unit, P. O. Box 67, Elkins, WV 26241.

The State's groundwater resources are regulated by OWR's Groundwater Program. Passage of the Groundwater Protection Act in 1991 has had a significant positive impact on the way the resource is managed. The Groundwater Protection Act requires that DEP provide a biennial report to the Legislature on the status of the State's groundwater and groundwater management program. Current information on the State's groundwater programs and activities can be found in the biennial report to the West Virginia 2000 Legislature (OWR, 2000).

Water pollution control in the State is primarily achieved through the National Pollutant Discharge Elimination System (NPDES) permitting program. These permits emphasize the use of either the best available technology approach to point source control, or water quality based requirements, particularly on smaller streams. Water pollution control encompasses facility inspections, complaint investigations, compliance monitoring, biological monitoring and chemical monitoring. Inspections of the various activities covered under the nonpoint control program also are performed and are intended to reduce this source of pollution. The vast majority of these nonpoint source inspections have been directed toward silviculture and construction activities.

West Virginia's surface water monitoring program is comprised of compliance inspections, intensive biological and/or chemical surveys on a site-specific basis, ambient chemical monitoring, rotating watershed surveys, total maximum daily load (TMDL) support studies, and citizens monitoring.

Site-specific fish tissue evaluation is carried out on an annual basis in order to respond to human health concerns. Whenever necessary, fish consumption advisories are issued. A list of current fish consumption advisories is contained in this report.

In this report, a cost/benefit assessment is provided not only to give an idea of some of the costs involved in maintaining acceptable water quality, but also to provide information relating to the benefits resulting from clean water.

LITERATURE CITED

Tiner, R.W. 1996. West Virginia's Wetlands, Uncommon, Valuable Wildlands. U. S. Fish and Wildlife Service, Ecological Services, Northeast Region, Hadley, MA. 20 pp.

West Virginia Division of Environmental Protection. 1999. Quality Assurance Project Plan for the Watershed Assessment Program. 45pp.

West Virginia Division of Environmental Protection. 2000. Groundwater Programs and Activities, Biennial Report to the West Virginia 2000 Legislature. 161 pp.

PART II: SURFACE WATER ASSESSMENT

The Coal River Watershed

Background

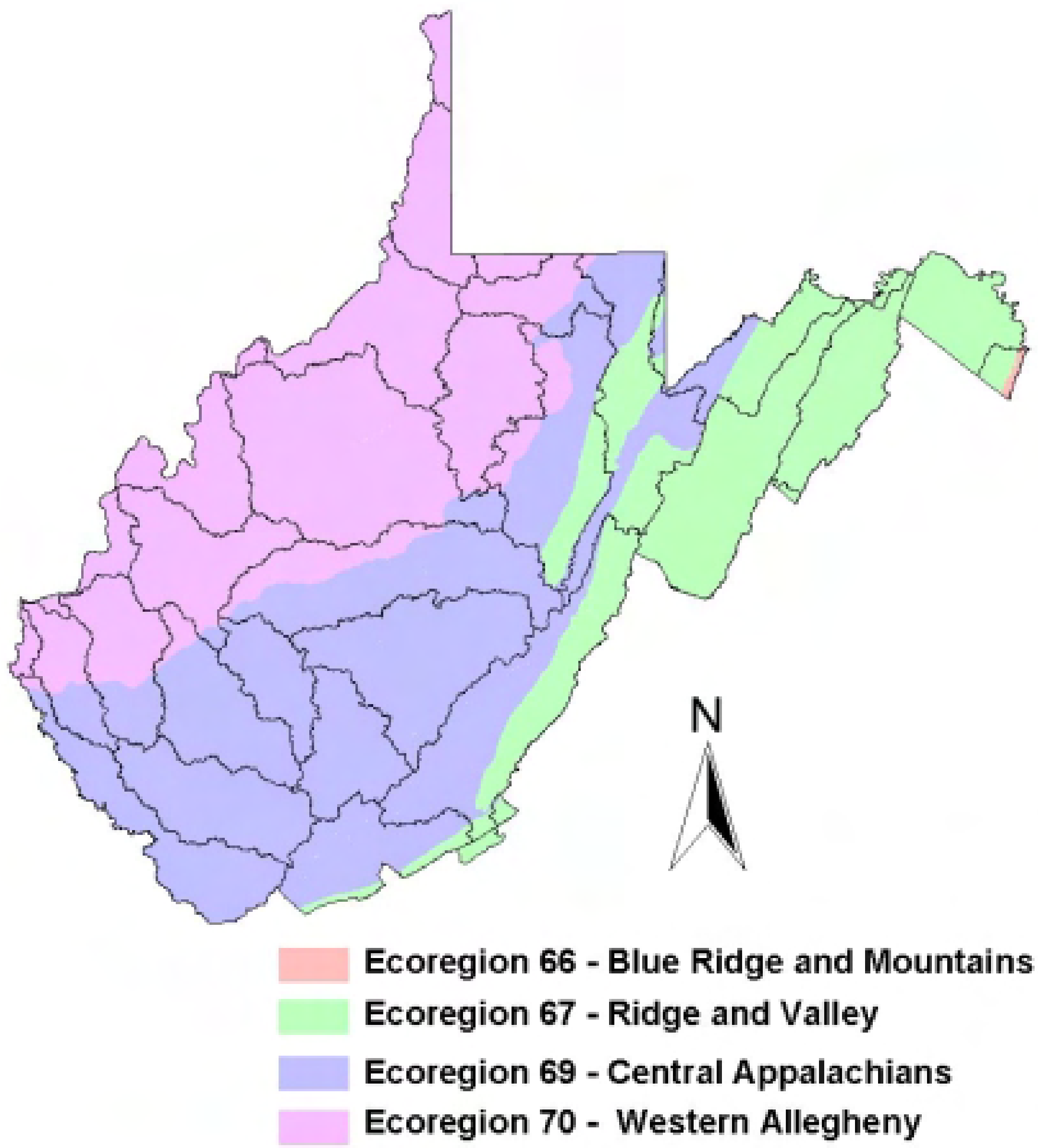
The Coal River (HUC # 05050009) and its many tributaries generally flow from southeast to northwest through the lower hills of the southwestern portion of the State. This watershed lies within the Western Allegheny Plateau (70) and the Central Appalachian (69) Ecoregions (Figure 2). Only a small portion of this watershed, near its confluence with the Kanawha River is in the Western Appalachian Plateau ecoregion. Sandstone, siltstone, shale, limestone and coal underlie this ecoregion. The original vegetation of this region was primarily Appalachian oak forest and mixed mesophytic forest. Urban, suburban, and industrial development dominates some local areas, especially the narrow River valleys that serve as transportation corridors. Most of the acreage is too steep to be farmed and is reverting to woodlands. Nevertheless, some farms grow corn and hay on the ridges and some pastures remain on the slopes. Grazing and cultivation has caused slope erosion and upland soil is often thin or non-existent. Coal mining and oil and gas production occur within this ecoregion.

The Central Appalachian Ecoregion (69), which covers most of this watershed, is generally more rugged, more forested and cooler than the Western Allegheny Plateau ecoregion. Typically, interbedded limestone, shale, sandstone, and coal underlie this ecoregion. Extraction of coal, oil and natural gas is common and has degraded stream habitat in much of this ecoregion.

DEP records indicate there are 492 streams totaling 1,118 miles in the Coal River watershed. However, these figures do not include all of the intermittent and unnamed tributaries in the watershed. In addition, the watershed contains 681.7 acres of Palustrine wetlands and an additional 36.3 acres of Riverine wetlands. There are 321.7 acres of Lacustrine waters and 1,391.9 acres of Riverine waters.

Climate within the watershed is considered mild. Generally summers are warm and winters are moderately cold. Summer temperatures may reach the low nineties on occasion while winter lows average in the middle twenties. Precipitation occurs on an average of 152 days a year. While 1996 set the record as the wettest year for West Virginia in more than a century of keeping records,

Figure 2
Ecoregions in West Virginia
With Major Watershed Boundaries



(Friedlander, Jr., Blaine P., 1996), 1997 was much closer to the average.

The elevation in the Coal watershed ranges from over 980 meters (3,200 feet) near the headwaters of Pond Fork, to a low of approximately 360 meters (1,170 feet) at its confluence with the Kanawha River.

The Coal River was first altered to support navigation by construction of eight locks and dams during the early 1800s. These structures suffered from neglect during the War Between the States to the point they were never again operable (Harris, 1974). Remnants of these locks and dams can still be seen along the Coal River, especially just upstream from Lower Falls, some three to five miles from the mouth of the River.

The largest population centers in the Coal River Watershed are Madison (3,051) and Danville (595) in Boone County. St. Albans' population of 11,194 is split between the Coal River and Lower Kanawha River watersheds. The total population of the Coal River Watershed is approximately 59,287. The average population density for this watershed is approximately 68 people per square mile.

Appalachian Highway Corridor G parallels Little Coal River from the Forks of the Coal upstream to Danville. Development along this four-lane highway has increased tremendously. However, most of the development is in the adjacent Lower Kanawha River watershed.

Water Quality Summary

During this reporting period, 80 streams totaling 480.60 miles were assessed in the Coal River watershed. Figure 3 is a map depicting sampling stations in the Coal River watershed, while Table 2 provides a list of these stations. A summary of overall designated use support is provided in Table 3 while a use support matrix summary of all designated uses is given in Table 4.

Of the 480.60 stream miles assessed, 99.33 (20.7%) were fully supporting their overall designated uses, 226.36 (47.1%) were fully supporting but threatened, 127.44 (26.5%) were partially supporting, and 27.47 (5.7%) were non-supporting.

The fishable goal of the Clean Water Act (CWA) essentially is assessed in two parts: Aquatic Life Support use and Fish Consumption use. Of the 461.64 miles assessed for Aquatic Life Support use, 116.01 (25.1%) were fully supporting, 193.00 (41.8%) were fully supporting but threatened, 132.57 (28.7%) were partially supporting, and 20.06 (4.4%) were non-supporting.

Figure 3
Coal River Watershed
Hydrologic Unit – 05050009

STORET Sampling Locations
1994-1998

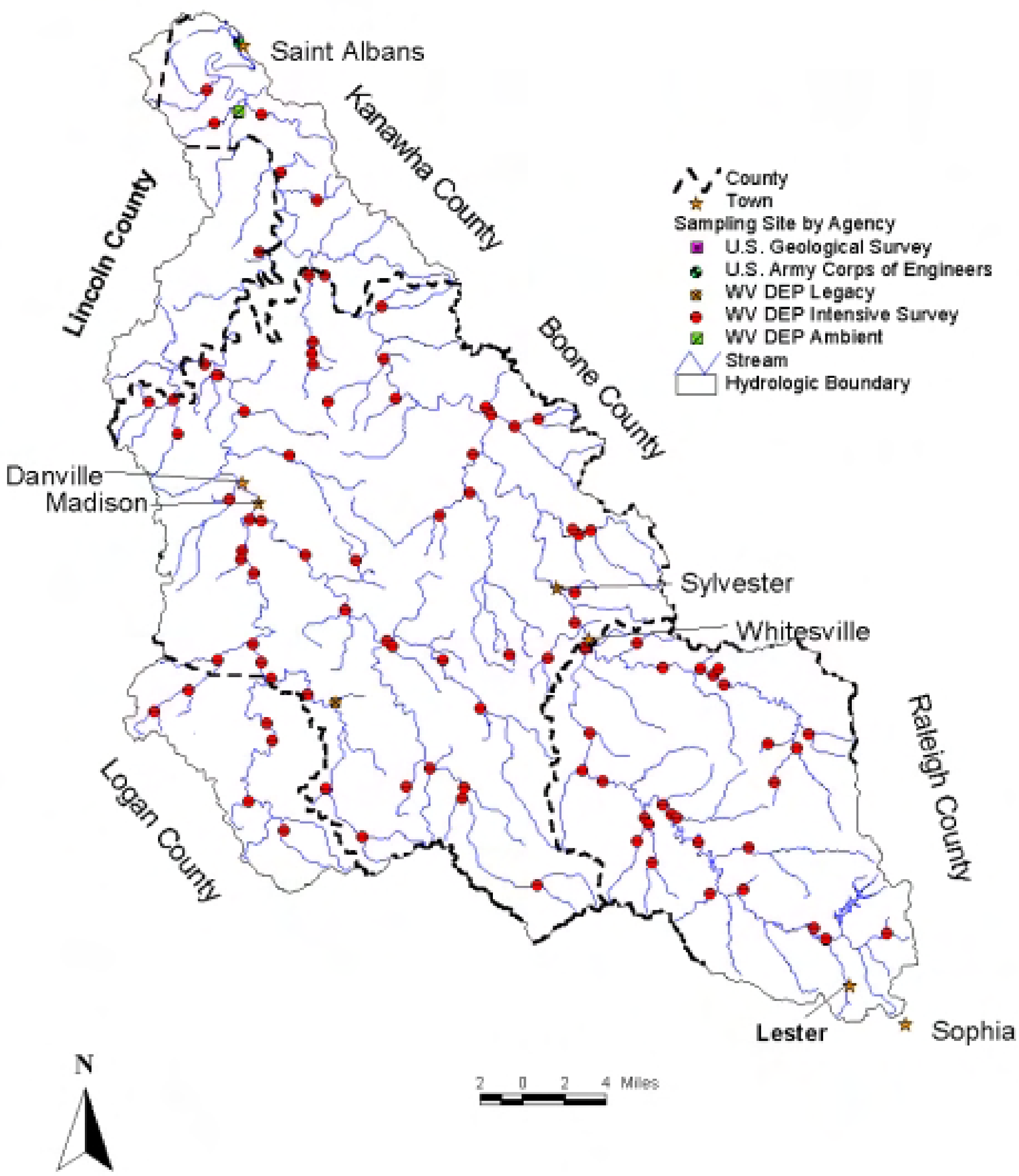


Table 2
STORET Sampling Locations for
Coal River Watershed
Hydrologic Unit Code – 05050009
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
112WRD	3198350	CLEAR FORK AT WHITESVILLE, WV
21WVWQAS	WA96-K03	Coal River at Tornado, W. Va.
21WV7IWQ	550476	Coal River at Tornado, W. Va.
21WV7IWQ	551073	Spruce Laurel Fork below Stark, W.Va.
21WVINST	KC-00-{23.80}	Big Coal River below Dartmont, WV
21WVINST	KC-00-{35.00}	Big Coal River below Peytona, WV
21WVINST	KC-00-{44.00}	Big Coal River at Comfort, WV
21WVINST	KC-00-{58.40}	Big Coal River below Whitesville, WV
21WVINST	KC-02-{02.00}	Browns Creek near Tornado, WV
21WVINST	KC-04-{02.50}	Smith Creek near Tornado, WV
21WVINST	KC-05	Falls Creek at Tornado, WV
21WVINST	KC-09	Crooked Creek near Alum Creek, WV
21WVINST	KC-10-{03.60}	Little Coal River near Fork Creek WMA, WV
21WVINST	KC-10-{17.00}	Little Coal River at Julian, WV
21WVINST	KC-10-I-{0.0}	Big Horse Creek near Julian, WV
21WVINST	KC-10-I-{05.6}	Big Horse Creek at Breece, WV
21WVINST	KC-10-I-{12.5}	Big Horse Creek above Breece, WV
21WVINST	KC-10-I-6-C	Rattlesnake Hollow near Morrisvale, WV
21WVINST	KC-10-J	Little Horse Creek at Julian, WV
21WVINST	KC-10-L-{0.1}	Camp Creek above Lory, WV
21WVINST	KC-10-N-{03.0}	Rock Creek at Rock Creek, WV
21WVINST	KC-10-P-.5	Long Branch near Madison, WV
21WVINST	KC-10-T-{00.30}	Spruce Fork at Madison, WV
21WVINST	KC-10-T-{04.60}	Spruce Fork at Coalbottom, WV
21WVINST	KC-10-T-{17.40}	Spruce Fork above Sharples, WV
21WVINST	KC-10-T-{18.50}	Spruce Fork near Sharples, WV
21WVINST	KC-10-T-10	Stollings Branch at Ottawa, WV
21WVINST	KC-10-T-11-{00}	Spruce Laurel Fork at Clothier, WV
21WVINST	KC-10-T-11-{15}	Spruce Laurel Fork South of Stark, WV
21WVINST	KC-10-T-11-{4}	Spruce Laurel Fork near Owatta, WV
21WVINST	KC-10-T-11-H.5	Tickle Britches Fork South of Stark, WV
21WVINST	KC-10-T-2	Laurel Branch at Washington Heights, WV
21WVINST	KC-10-T-21	Adkins Fork at Sovereign, WV
21WVINST	KC-10-T-24-{1}	Brushy Fork near Kelly, WV
21WVINST	KC-10-T-3	Low Gap Creek at Low Gap, WV
21WVINST	KC-10-T-9-{0.0}	Hewitt Creek at Jeffery, WV
21WVINST	KC-10-T-9-B	Missouri Fork at Hewett, WV
21WVINST	KC-10-T-9-B.5	Isom Branch near Isom, WV
21WVINST	KC-10-T-9-C-2	Sycamore Branch near Lake, WV
21WVINST	KC-10-U-{00.4}	Pond Fork at Madison, WV

Table 2 STORET Sampling Locations for Coal River Watershed Hydrologic Unit Code – 05050009 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Location**
21WVINST	KC-10-U-{04.90}	Pond Fork at Quinland, WV
21WVINST	KC-10-U-{09.00}	Pond Fork at Lanta, WV
21WVINST	KC-10-U-{24.4}	Pond Fork at Bald Knob, WV
21WVINST	KC-10-U-12-A	Trace Fork near Barrett, WV
21WVINST	KC-10-U-13	Grapevine Branch near Barrett, WV
21WVINST	KC-10-U-17	Jasper Workman Br. near Bald Knob, WV
21WVINST	KC-10-U-21	Lacey Fork South of Bald Knob, WV
21WVINST	KC-10-U-3-B	Bennett Fork near Quinland, WV
21WVINST	KC-10-U-7-{0.0}	West Fork in Van, WV
21WVINST	KC-10-U-7-{4.3}	West Fork Pond Fork above Van, WV
21WVINST	KC-10-U-7-{7.9}	West Fork Pond Fork at Twilight, WV
21WVINST	KC-10-U-7-A	Roach Branch at Van, WV
21WVINST	KC-11-{05.6}	Alum Creek near Alum Creek, WV
21WVINST	KC-14	Fork Creek in Fork Creek WMA, WV
21WVINST	KC-14-C	Jimmy Fork in Fork Creek WMA, WV
21WVINST	KC-14-D	Wilderness Fork in Fork Creek WMA, WV
21WVINST	KC-14-D-2	Dave Fork in Fork Creek WMA, WV
21WVINST	KC-16-A	Left Fork Bull Creek near Dartmont, WV
21WVINST	KC-21-{00.00}	Brush Creek at Costa, WV
21WVINST	KC-21-C	Ridgeview Hollow at Ridgeview, WV
21WVINST	KC-28	Joes Branch at Maxine, WV
21WVINST	KC-29-{00.2}	Joes Creek at Comfort, WV
21WVINST	KC-29-A	Left Fork Joes Creek near Comfort, WV
21WVINST	KC-29-A-3	Spicelick Fork near Comfort, WV
21WVINST	KC-31-{00.40}	Laurel Creek at Seth, WV
21WVINST	KC-31-B-{00.20}	Hopkins Fork above Hopkins Fork, WV
21WVINST	KC-31-B-{10.90}	Hopkins Fork near Whitesville, WV
21WVINST	KC-31-C	Cold Fork near Hopkins, WV
21WVINST	KC-35-{03.00}	White Oak Creek near Orgas, WV
21WVINST	KC-35-G	Road Fork near Sylvester, WV
21WVINST	KC-35-I	Left Fork Whiteoak Creek near Sylvester, WV
21WVINST	KC-43-{00.0}	Elk Run at Whitesville, WV
21WVINST	KC-43-{02.8}	Elk Run near Blue Pennant, WV
21WVINST	KC-46-{00.00}	Marsh Fork in Whitesville, WV
21WVINST	KC-46-{05.80}	Marsh Fork above Montcoal, WV
21WVINST	KC-46-{15.30}	Marsh Fork at Rock Creek, WV
21WVINST	KC-46-{20.20}	Marsh Fork at Arnett, WV
21WVINST	KC-46-{32.80}	Marsh Fork at Glen Daniel, WV
21WVINST	KC-46-C	Hazy Creek at Edwight, WV
21WVINST	KC-46-E	Stink Run at Sundial, WV

Table 2 STORET Sampling Locations for Coal River Watershed Hydrologic Unit Code – 05050009 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Location**
21WVINST	KC-46-G	Peachtree Creek above Pine Knob, WV
21WVINST	KC-46-G-1	Drews Creek at Pine Knob, WV
21WVINST	KC-46-G-1-.5A	Canterbury Branch near Pine Knob, WV
21WVINST	KC-46-G-2	Martin Fork near Pine Knob, WV
21WVINST	KC-46-H	Dry Creek at Dry Creek, WV
21WVINST	KC-46-I	Rock Creek at Rock Creek, WV
21WVINST	KC-46-J-2	Bee Branch near Arnett, WV
21WVINST	KC-46-K	Cove Creek at Saxon, WV
21WVINST	KC-46-L.5	Shiloh Fork at Shiloh, WV
21WVINST	KC-46-P	Surveyor Creek at Surveyor, WV
21WVINST	KC-46-Q	Millers Camp Branch at Surveyor, WV
21WVINST	KC-46-Q-5	Jehu Run near Eccles, WV
21WVINST	KC-47-{00.00}	Clear Fork in Whitesville, WV
21WVINST	KC-47-A-{01.50}	Rockhouse Creek near Dorothy, WV
21WVINST	KC-47-C	Panther Branch at Dorothy, WV
21WVINST	KC-47-F	Stonecoal Branch near Ameagle, WV
21WVINST	KC-47-G	Long Fork at Ameagle, WV
21WVINST	KC-47-G-1	Dow Fork near Ameagle, WV
21WVINST	KC-47-H	Mare Branch near Ameagle, WV
21WVINST	KC-47-L-{00.80}	Toney Fork at Clear Creek, WV
21WVINST	KC-47-N-{01.40}	McDowell Branch near Clear Creek, WV
21WVINST	KC-47-O-{0.0}	Workman Creek near Clear Creek, WV
21WVINST	KC-47-O-{02.40}	Workman Creek near Clear Creek, WV

Note: Following is a list of agency identifier codes that are used with this and subsequent STORET sampling site tables.

Agency Identifier Code	Name of Agency
112WRD	U.S. Geological Survey
11COEHUN	U.S. Army Corps of Engineers
31ORWUNT	ORSANCO
21WV7IWQ	West Virginia DEP Legacy
21WVWQAS	West Virginia DEP Ambient Network
21WVTMDL	West Virginia DEP TMDL Program
21WVINST	West Virginia DEP Watershed Assessment Program

Table 3 USE SUMMARY REPORT: OVERALL USE SUPPORT COAL RIVER WATERSHED Waterbody Type: River			
Total Number of River/Streams Assessed:	80		
Total Number of River/Streams Monitored:	77		
Total Number of River/Streams Evaluated:	3		
	ASSESSMENT BASIS IN MILES		
DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	99.33	99.33
SUPPORTING BUT THREATENED	0.00	226.36	226.36
PARTIALLY SUPPORTING	0.00	127.44	127.44
NOT SUPPORTING	3.30	24.17	27.47
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	3.30	477.30	480.60

No streams in the Coal River watershed were assessed for Fish Consumption use during this reporting period.

The swimmable goal of the CWA, like the fishable goal, generally is assessed in two parts: Primary Contact Recreation use and Secondary Contact Recreation use. The Secondary Contact Recreation use is not recognized in the State's water quality standards, therefore it is not assessed. Of the 471.22 miles assessed for Primary Contact Recreation use, 193.61 (41.1%) were fully supporting, 207.62 (44.1%) were fully supporting but threatened, and 69.99 (14.8%) were partially supporting.

TABLE 4 USE SUPPORT MATRIX SUMMARY COAL RIVER WATERSHED WATERBODY TYPE: RIVER UNITS IN MILES				
USE	**Supporting**	**Supporting but Threatened**	**Partially Supporting**	**Not Supporting**
Overall Use	99.33	227.88	127.44	27.47
Aquatic Life	116.01	193.00	132.57	20.06
Cold Water Fishery - Trout	7.00	2.40		
Warm Water Fishery	42.38	116.63	111.64	9.00
Bait Minnow Fishery	78.87	118.47	48.72	11.06
Primary Contact Recreation	193.61	207.62		69.99
Drinking Water Supply	64.89	60.30		58.32

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Coal River watershed is provided in Table 5.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Cause Unknown (71.17 miles), Fecal Coliform (66.69 miles), and Siltation (64.40 miles).

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Coal River watershed is provided in Table 6.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Unknown Source (64.64 miles), Abandoned Mining (63.83 miles), and Silviculture, Raw Sewage, and Highway Maintenance/Runoff (58.32 miles each).

Table 5
Complete Summary of Causes, Including User-Defined
Coal River Watershed
Sizes of Waterbodies Not Fully Supporting Uses
Affected by Various Cause Categories
Waterbody Type: River

Code	Cause Category	Major Impact in Miles	Moderate/Minor Impact in Miles
0000	CAUSE UNKNOWN	9.95	61.22
0500	METALS	6.80	10.11
0900	NUTRIENTS	0.01	0.00
0910	Phosphorus	0.01	0.00
0920	Nitrogen	0.01	0.00
1000	pH	2.32	0.00
1100	SILTATION	0.95	63.45
1600	HABITAT ALTERATION (non-flow)	0.00	3.48
1700	PATHOGENS	66.69	0.00
1710	Fecal Coliform Bacteria	66.69	0.00
3300	CAUSTIC CHEMICALS	3.30	0.00

Size of Waters Affected by Toxics

For purposes of this report, toxics monitoring refers only to streams sampled for priority pollutants listed in Section 307 of the Clean Water Act. During this reporting cycle, 305.47 stream miles in the Coal River watershed were monitored for toxics. Of these, 10.11 miles (3.3%) contained elevated levels.

Public Health/Aquatic life Impacts

All fish consumption advisories and/or revisions are based on extensive data collection by State, interstate, and federal agencies. Risk assessment information and FDA action levels are taken into consideration when developing advisories. Details of all current fish consumption advisories are contained in Table 73.

Currently, no streams within the Coal River Watershed are under a fish consumption advisory.

Table 6 Complete Summary of Sources, Including User-Defined Coal River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0200	MUNICIPAL POINT SOURCES	0.01	0.00
0230	Package Plants (Small Flows)	0.01	0.00
2000	SILVICULTURE	0.00	58.32
2300	Logging Road Construction/Maintenance	0.00	58.32
5000	RESOURCE EXTRACTION	65.12	65.11
5800	Acid Mine Drainage	2.32	0.00
5900	Abandoned Mining	63.83	0.00
6000	LAND DISPOSAL	58.32	0.00
6800	Raw Sewage	58.32	0.00
8300	HIGHWAY MAINTENANCE AND RUNOFF	0.00	58.32
8400	SPILLS	3.30	0.00
8600	NATURAL SOURCES	0.00	3.27
9000	SOURCE UNKNOWN	8.36	56.28

Information on public drinking water supply/bathing beach closures was obtained from the State Bureau for Public Health (BPH). During this reporting period, no bathing beach or public water supply closures were documented in the watershed.

The Division of Natural Resources (DNR) Wildlife Resources Section maintains information pertaining to pollution-caused fish kills. During this reporting period, two fish kills were reported in the watershed, both resulting from spills related to mine drainage treatment. A moderate kill occurred along 0.8 miles of Little Marsh Fork in Raleigh County due to potassium hydroxide and a total kill occurred along 2.5 miles of Jack Smith Branch of Big Horse Creek in Boone County due to sodium hydroxide and potassium permanganate.

Section 303(d) Waters

Table 7 includes streams from the Coal River watershed that are on the current 303(d) list. Ten streams from the watershed are on the list, all impaired by mine drainage. Currently, no 303(d) listed streams in the Coal River watershed have had TMDL's completed.

LITERATURE CITED

Freidlander, Jr., Blaine P. 1996. "News from the Northeast Regional Climate Center: West Virginia, Massachusetts, Pennsylvania, and New York shatter precipitation records for January-November period." Cornell University Science News, 13 December 1996.

Harris, V. B. 1974. Great Kanawha: A Historic Outline. Commissioned by the Kanawha County Court, 6 December 1974.

TABLE 7
West Virginia
1998 303(d) List
Coal River Watershed

Waterbodies Impaired by Mine Drainage						
Stream Name	**Stream Code**	**Miles Affected**	**Use Affected**	**Pollutant**	**Source**	**TMDL Priority**
Shumate Ck	KC-46-D	3.23	Aquatic Life	Metals	Mine Drainage	Medium
Peachtree Ck	KC-46-G	3.76	Aquatic Life	Metals	Mine Drainage	Medium
Drews Ck	KC-46-G-1	4.48	Aquatic Life	Metals	Mine Drainage	Medium
Martin Fk / Peachtree Ck	KC-46-G-2	3.01	Aquatic Life	Metals	Mine Drainage	Medium
Jehu Br	KC-46-Q-5	1.71	Aquatic Life	Metals	Mine Drainage	Medium
Clear Fk	KC-47	21.55	Aquatic Life	Metals	Mine Drainage	Medium
Long Fk / Clear Fk	KC-47-G	2.55	Aquatic Life	Metals	Mine Drainage	Medium
Dow Fk	KC-47-G-1	1.29	Aquatic Life	Metals	Mine Drainage	Medium
Toney Fk	KC-47-L	2.36	Aquatic Life	Metals	Mine Drainage	Medium
Workman Ck / Clear Fk	KC-47-O	3.46	Aquatic Life	Metals	Mine Drainage	Medium

TMDL = Total Maximum Daily Load

The Elk River Watershed

Background

The Elk River watershed (HUC # 05050007) extends from Snowshoe Resort above the town of Linwood (now called Snowshoe by some people) in Pocahontas County west to its confluence with the Kanawha River at Charleston. The elevation in this watershed ranges from over 4,300 feet near the headwaters to 566 feet at Charleston. The Elk River itself flows about 186 miles from Slaty Fork and drops about 2,070 feet in this distance. The Elk River drains approximately 1,536 square miles.

The Elk is formed by the junction of Big Springs Fork and Old Fields Fork at the town of Slaty Fork. The Elk River originates in the western edge of the limestone deposits in Pocahontas County and flows north to Elk River Springs (sometimes called Cowger Mill or Cougar Mill Springs) where it turns to the west and flows to Charleston.

During the summer, the water expected in Big Spring Fork flows through and out of the six springs and over 60 caves found in this vicinity. This scenario of surface water flowing underground via a network of limestone solution cavities or faults and then resurging at a down gradient spring is common in the upper Elk River watershed. Black Hole Cave, located some four miles below the junction of Big Springs Fork and Old Fields Fork, is an insurgence for My Cave. On dry summer days the entire Elk River can sink into this hole (Dasher, personal communication).

The underground flow of the Elk River appears in the downstream sections of the Simmons Mingo/My Cave system and resurges at Elk River Springs at the lowermost outcrop of Greenbrier Limestone. Part of this flow is water diverted from Mingo Run in the Tygart Valley River watershed through the Simmons Mingo/My Cave system into the Elk River Springs.(Jones) Thus water from Mingo Run can flow into the Tygart Valley River or into the Elk River. Simmons Mingo Cave is the deepest cave in West Virginia (680 feet) and the longest in Randolph County (6 miles).

Downriver from Elk River Springs, the River predominantly flows through sandstone, shales and siltstones on its way to Charleston except for a small outcrop of Greenbrier Limestone near Webster Springs (Town of Addison). This outcrop is in the middle of the Elk River and is less than one mile long and a few hundred yards wide. No caves have been found in this outcrop, but there is one resurgence, Fork Lick Spring. This spring is reportedly one of the original Webster Springs

(Dasher, personal communication).

According to geologists the Elk River is older than the Gauley River immediately to the south. (Byrne, 1995) Near Webster Springs these two Rivers are within two miles of each other. Yet the Elk River is about 800 feet lower in elevation than the Gauley River.

DEP records indicate there are 752 streams totaling 2,214 miles in the Elk River watershed. In addition, the watershed has 611.2 acres of Palustrine wetlands, 97.3 acres of Riverine wetlands and 0.9 acres of Lacustrine wetlands for a total of 709.4 acres of total wetlands. The watershed has 1,560.6 acres of Lacustrine waters and 2,853.3 acres of Riverine waters for a total of 4,395.9 acres of deepwater habitat.

The Elk River was renowned for its excellent fishery during the early 1800s. In 1837 the West Virginia Iron Mining and Manufacturing Company reported pike between 4 and 5 feet in length and weighing 30 to 40 pounds. Catfish up to 5 feet in length and weighing 120 pounds were reported in the same document. However, modern records list the largest Northern Pike caught in West Virginia at 22.06 pounds and the largest Flathead catfish at 70 pounds (Stauffer, et. al., 1995). One endangered species, the crystal darter (Crystallaria asperella) is found only in the Elk River between Clendenin and Charleston in West Virginia. This fish also is found in other tributaries of the Mississippi in other States. The U. S. Fish and Wildlife Service collected two specimens in the vicinity of Clendenin during September 1995. (http://www.fws.gov/r9endspp/esb/96/jannews.html)

An important flood control/recreational impoundment is located on the Elk River at Sutton in Braxton County. This lake, which drains 537 square miles, was completed in 1961 and has a maximum capacity of 265,300 acre feet.

Just who the first settler along the Elk River was and where he lived is subject to debate. According to some reports the first settler was located near Charleston in 1778 (Harris, 1974). Other accounts indicate the first settler was Jerry Carpenter who established his dwelling about 17 miles below present day Sutton on Laurel Creek before the Revolutionary War (Byrne, 1995).

The total population of the Elk River watershed is approximately 60,495. Although the capitol of West Virginia, Charleston, is partially within this watershed, the population density is only approximately 40 people per square mile.

The Elk River watershed includes coal, oil, gas, timbering and sandstone quarries among its important industries. Agriculture is dominated by livestock and related products.

Coal in this area was mined for local needs until better transportation became available to get it to market. While some locks and dams had been constructed to improve navigation on the Coal and Kanawha Rivers to aid in transporting coal, the Elk had to wait until after the War Between the States and construction of railroads. Residents of the area also were aware of the presence of oil and natural gas, but it was not used except incidentally until after the War Between the States (Harris, 1974).

The timber industry has been important in the Elk River watershed since before the War Between the States. A number of steam powered rotary saw mills operated on tributaries of the Elk during this period to cut lumber out of the logs floated down the Elk to Charleston (Harris, 1974).

The Elk River watershed is in the unglaciated Appalachian Plateau Physiographic Province and the Central Appalachian Ecoregion. The lower reaches of the Elk River are in the Cumberland Mountains sub-ecoregion (69d) while the upper reaches are in the Forested Hills and Mountains sub-ecoregion (69a).

The Forested Hills and Mountains sub-ecoregion occupies the highest and most rugged parts of the Ecoregion. It is characterized by dissected hills, mountains and ridges with steep sides and narrow valleys. Erosion resistant sandstone and conglomerate of the Pennsylvanian Pottsville group, sandstone of the Missisippian Pocono Formation and sedimentary rocks of the Mississippian Mauch Chunk Formations are commonly exposed at the surface. Characteristically the streams of this sub-ecoregion do not have much buffering capacity and many reaches, including some not affected by mine drainage, are too acidic to support fish.

The Cumberland Mountain sub-ecoregion has steep slopes and very narrow ridgetops. The boundary between this sub-ecoregion and the Forested Hills and Mountains sub-ecoregion divides different fish assemblages. It generally follows a topographic and elevation break. The Cumberland Mountain sub-ecoregion is slightly lower and more highly dissected than the Forested Hills and Mountains sub-ecoregion.

<u>Water Quality Summary</u>

During this reporting period, 153 streams totaling 832.41 miles were assessed in the Elk River watershed. Figure 4 is a map depicting sampling stations in the Elk River watershed, while Table 8 provides a list of these stations. A summary of overall designated use support is provided

Figure 4

Elk River Watershed

Hydrologic Unit – 05050007

STORET Sampling Locations

1994-1998

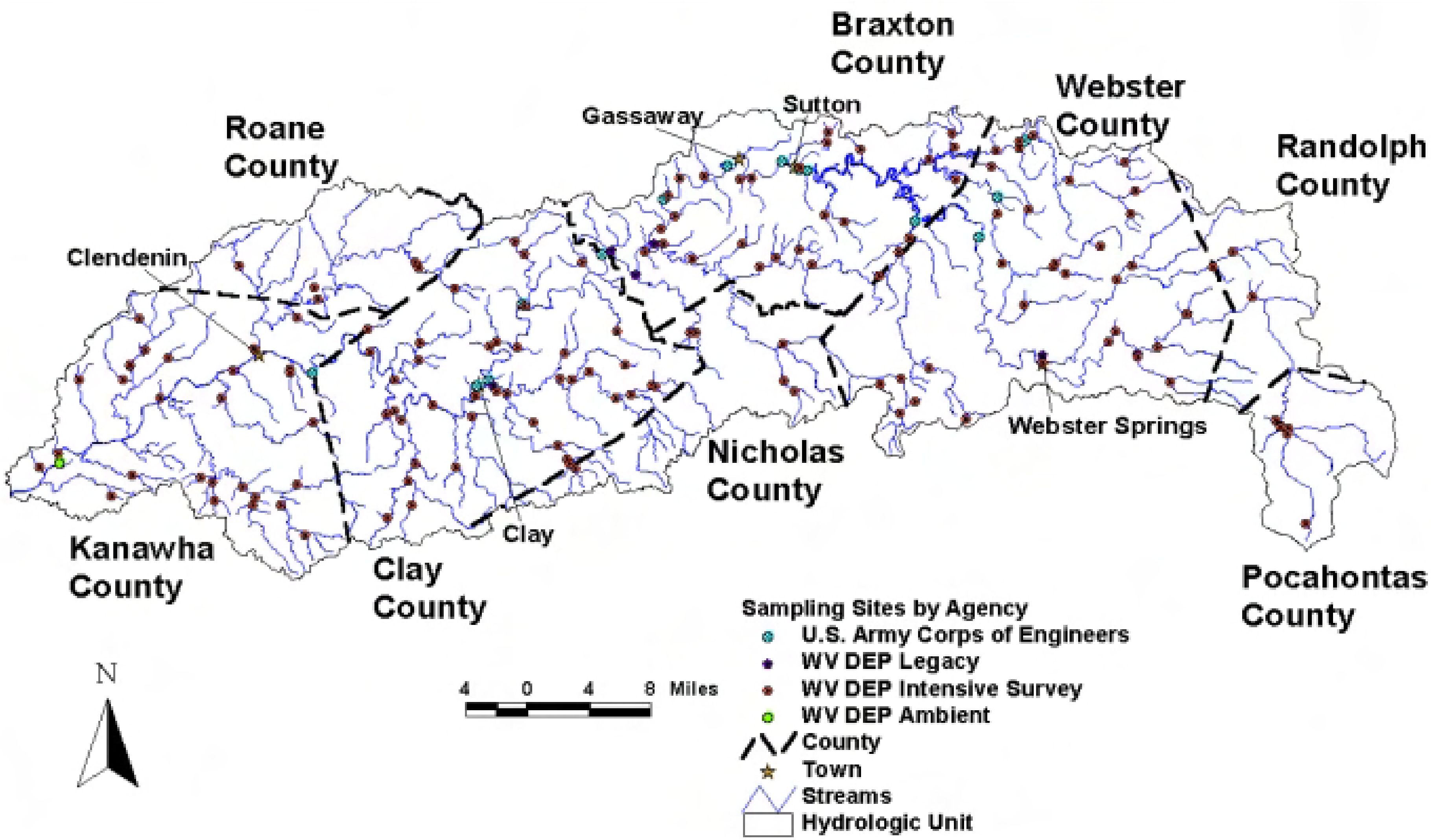


Table 8
STORET Sampling Locations for
Elk River Watershed
Hydrologic Unit Code – 05050007
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
11COEHUN	1SUTW0007	ELK RIVER
11COEHUN	1SUTW0008	RIGHT FK HOLLY RIVER
11COEHUN	1SUTW0009	LEFT FORK OF HOLLY RIVER
11COEHUN	1SUTW0012	ELK RIVER
11COEHUN	1SUTW0048	Elk River below Frametown, WV
11COEHUN	1SUTW0049	Elk River below Clay, WV
11COEHUN	1SUTW0050	Elk River at Clay, WV Water Treatment Plant
21WVWQAS	WA96-K04	Elk River at Coonskin Park, above Charleston, WV
21WV7IWQ	550544	Elk River at Coonskin Park, above Charleston,WV
21WV7IWQ	550603	Leatherwood Creek at Bergoo, W. Va.
21WV7IWQ	550604	Bergoo Creek near Community of Bergoo, WV
21WV7IWQ	551057	Birch River at Glendon, W. Va.
21WV7IWQ	551058	Strange Creek above Strange Creek, W.Va.
21WV7IWQ	551059	Tate Creek near Duck, W. Va.
21WV7IWQ	551060	Big Otter Creek near Ivydale, W.Va.
21WV7IWQ	551061	Buffalo Creek in Dundon, W.Va.
21WV7IWQ	551137	Big Run near Bergoo, W. Va.
21WV7IWQ	551138	Back Fork at Webster Springs, W.Va.
21WVINST	KE-000-{001.2}	Elk River at Coonskin Park, WV
21WVINST	KE-000-{016.0}	Elk River above Blue Creek, WV
21WVINST	KE-000-{046.6}	Elk River below Elkhurst, WV
21WVINST	KE-000-{049.8}	Elk River at Elkhurst, WV
21WVINST	KE-000-{063.0}	Elk River at Spread, WV
21WVINST	KE-000-{087.4}	Elk River below Frametown, WV
21WVINST	KE-000-{105.2}	Elk River below Gassaway, WV
21WVINST	KE-000-{156.2}	Elk River below Bergoo, WV
21WVINST	KE-002-E	Green Bottom at Charleston, WV
21WVINST	KE-003	Newhouse Branch at Charleston, WV
21WVINST	KE-004	Coonskin Branch in Coonskin Park, Charleston, WV
21WVINST	KE-006-{05.6}	Mill Creek near Villa, WV
21WVINST	KE-007-E	Kaufman Branch near Big Chimney, WV
21WVINST	KE-009-{01.5}	Little Sandy Creek above Sandy, WV
21WVINST	KE-009-{15.0}	Little Sandy Creek above Frame, WV
21WVINST	KE-009-B-1	Big Fork near Elkview, WV
21WVINST	KE-009-C-{0.6}	Aarons Fork at Willis, WV
21WVINST	KE-009-E	Bullskin Branch near Elkview, WV
21WVINST	KE-009-G	Ruffner Branch near Elkview, WV
21WVINST	KE-009-I-1-A	Harper Hollow near Frame, WV

Table 8 STORET Sampling Locations for Elk River Watershed Hydrologic Unit Code – 05050007 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Location**
21WVINST	KE-009-J	Jakes Run near Frame, WV
21WVINST	KE-013	Narrow Branch at Blue Creek, WV
21WVINST	KE-014-G-1-{.8}	Right Fork Slack Branch near Quick, WV
21WVINST	KE-014-G-2	Whiteoak Fork near Quick, WV
21WVINST	KE-014-G-2-A	Schoolhouse Fork near Quick, WV
21WVINST	KE-014-K	Joe's Hollow at Sanderson, WV
21WVINST	KE-014-M	Morris Fork near Sanderson, WV
21WVINST	KE-014-M-2	Mudlick Branch near Sanderson, WV
21WVINST	KE-014-O-{5.2}	Middle Fork near Spangler, WV
21WVINST	KE-014-O-0.5	McBride Hollow near Sanderson, WV
21WVINST	KE-014-P	Panther Hollow near Sanderson, WV
21WVINST	KE-019-B	Two Mile Fork near Reamer, WV
21WVINST	KE-019-H	Petes Fork near Reamer, WV
21WVINST	KE-021	Leatherwood Creek above Reamer, WV
21WVINST	KE-023-{0.4}	Big Sandy Creek above Clendenin, WV
21WVINST	KE-023-{12.6}	Big Sandy Creek below Amma, WV
21WVINST	KE-023-D-6	Coleman Run near Cotton, WV
21WVINST	KE-023-F-1	Doelick Run near Clendenin, WV
21WVINST	KE-023-P-{03.0}	Right Fork Big Sandy Creek above Newton, WV
21WVINST	KE-023-P-1	Cutoff Run near Newton, WV
21WVINST	KE-023-P-3-A	Horse Run near Wallback, WV
21WVINST	KE-023-P-3-B	Simons Fork near Wallback, WV
21WVINST	KE-026	Morris Creek near Clendenin, WV
21WVINST	KE-026-A-{0.2}	Left Fork Morris Fork near Turner, WV
21WVINST	KE-032-{1.0}	Upper King Shoals Run near Procious, WV
21WVINST	KE-034	Camp Creek near Procious, WV
21WVINST	KE-037	Laurel Creek near Procious, WV
21WVINST	KE-037-B	Laurel Fork near Paxton, WV
21WVINST	KE-037-D	Summers Fork near Paxton, WV
21WVINST	KE-040	Little Sycamore Creek near Dorfee, WV
21WVINST	KE-041	Sycamore Creek near Dorfee, WV
21WVINST	KE-041-A	Charley Branch near Indore, WV
21WVINST	KE-041-B-{0.2}	Adonijah Fork near Indore, WV
21WVINST	KE-041-B-1.5	Laurel Fork near Lizmores, WV
21WVINST	KE-041-C-1	Grassy Fork near Indore, WV
21WVINST	KE-045-B	Lick Branch at Bickmore, WV
21WVINST	KE-046-{1.2}	Leatherwood Creek near Hartland, WV
21WVINST	KE-049	Pisgah Run at Clay, WV
21WVINST	KE-050-{00.2}	Buffalo Creek at Clay, WV
21WVINST	KE-050-B-{00.1}	Lilly Fork near Clay, WV

Table 8
STORET Sampling Locations for
Elk River Watershed
Hydrologic Unit Code – 05050007
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
21WVINST	KE-050-B-1-{2}	Sinnett Branch near Clay, WV
21WVINST	KE-050-B-10	Ike Fork West of Muddlety, WV
21WVINST	KE-050-B-7-{.1}	Jim Young Fork near Enoch, WV
21WVINST	KE-050-B-8	Beech Fork West of Enoch, WV
21WVINST	KE-050-B-9	Sycamore Run near Enoch, WV
21WVINST	KE-050-F-{2.2}	Sand Fork near Swandale, WV
21WVINST	KE-050-G	The Gulf near Swandale, WV
21WVINST	KE-050-I	Rockcamp Run near Swandale, WV
21WVINST	KE-050-I-3	Hickory Fork near Widen, WV
21WVINST	KE-050-K	Adkins Branch at Swandale, WV
21WVINST	KE-050-O	Robinson Fork near Enoch, WV
21WVINST	KE-050-P	Taylor Creek near Widen, WV
21WVINST	KE-050-S	Dillie Run near Widen, WV
21WVINST	KE-050-T	Pheasant Run near Widen, WV
21WVINST	KE-056	Spread Run at Spread, WV
21WVINST	KE-059	Turkey Run near Whetstone, WV
21WVINST	KE-064	Big Otter Creek at Ivydale, WV
21WVINST	KE-064-D	Moore Fork near Big Otter, WV
21WVINST	KE-064-E	Boggs Fork at Big Otter, WV
21WVINST	KE-069-{5.6}	Groves Creek near Harrison, WV
21WVINST	KE-070-A	Road Fork at O'Brion, WV
21WVINST	KE-074-{10.4}	Strange Creek near Morris, WV
21WVINST	KE-074-F	Big Run near Morris, WV
21WVINST	KE-076-{00.9}	Birch River near Glendon, WV
21WVINST	KE-076-A	Leatherwood Run near Herold, WV
21WVINST	KE-076-C	Middle Run near Herold, WV
21WVINST	KE-076-D-1	Buckeye Fork near Canfield, WV
21WVINST	KE-076-E-{02.6}	Little Birch River near Herold, WV
21WVINST	KE-076-E-5	Windy Run near Little Birch, WV
21WVINST	KE-076-E-6-A	Seng Run near Little Birch, WV
21WVINST	KE-076-E-7.5	Fisher Run near Little Birch, WV
21WVINST	KE-076-N-{02.4}	Anthony Creek near Birch River, WV
21WVINST	KE-076-N-8	Rich Fork near Tioga, WV
21WVINST	KE-076-O	Poplar Creek near Birch River, WV
21WVINST	KE-076-S.3	Otter Hole near Cowen, WV
21WVINST	KE-076-S.8	Chuffy Run near Cowen, WV
21WVINST	KE-076-U-{0.8}	Johnson Branch near Cowen, WV
21WVINST	KE-076-W	Jacks Run near Cowen, WV
21WVINST	KE-078	Upper Mill Run near Frametown, WV
21WVINST	KE-079	Big Run near Frametown, WV

Table 8
STORET Sampling Locations for
Elk River Watershed
Hydrologic Unit Code – 05050007
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
21WVINST	KE-082	Rockcamp Run near Gassaway, WV
21WVINST	KE-084.5	Bear Run at Gassaway, WV
21WVINST	KE-085	Little Buffalo Creek near Gassaway, WV
21WVINST	KE-087-B	Laurel Fork near Sutton, WV
21WVINST	KE-087-C	Unnamed Trib. Granny Creek near Sutton, WV
21WVINST	KE-088	Old Woman Run at Sutton, WV
21WVINST	KE-091	Wolf Creek at Sutton Lake, WV
21WVINST	KE-091-A-1	Spruce Fork at Sutton Lake, WV
21WVINST	KE-094	Flatwoods Run near Sutton Lake, WV
21WVINST	KE-098-A	Kanawha Run at Sutton Lake, WV
21WVINST	KE-098-B-{13.4}	Right Fork of Holly River at Jumbo, WV
21WVINST	KE-098-B-{13.6}	Right Fork Holly River at Diana, WV
21WVINST	KE-098-B-16	Desert Fork at Jumbo, WV
21WVINST	KE-098-B-16.4	Upper Mudlick near Jumbo, WV
21WVINST	KE-098-B-16-B	Carlo Run near Skelt, WV
21WVINST	KE-098-B-3-{1}	Fall Run at Sutton Lake, WV
21WVINST	KE-098-B-8	Weese Run near Diana, WV
21WVINST	KE-098-C-{10.0}	Left Fork Holly River near Poling, WV
21WVINST	KE-098-C-{13.8}	Left Fork Holly River near Wheeler, WV
21WVINST	KE-098-C-1	Laurelpatch Run above Sutton Lake, WV
21WVINST	KE-098-C-1-0.5A	Wilson Fork at Sutton Lake, WV
21WVINST	KE-098-C-11	Laurel Fork at Hacker Valley, WV
21WVINST	KE-098-C-11-C	Right Fork at Holly River State Park, WV
21WVINST	KE-098-C-14-{1}	Fall Run at Holly River Park, WV
21WVINST	KE-098-C-15-{1}	Big Run near Holly River Park, WV
21WVINST	KE-098-C-2	Oldlick Run above Sutton Lake, WV
21WVINST	KE-098-C-2-D	Cougar Fork North of Diana, WV
21WVINST	KE-098-C-5	Long Run near Poling, WV
21WVINST	KE-098-C-6	Bear Run near Poling, WV
21WVINST	KE-102-{02.8}	Laurel Creek near Centralia, WV
21WVINST	KE-102-{14.6}	Laurel Creek near Weese, WV
21WVINST	KE-102-A	Camp Creek at Sutton Lake, WV
21WVINST	KE-102-C-1-{.4}	Unnamed Trib. Brooks Ck. near Erbacon, WV
21WVINST	KE-111-{0.2}	Back Fork in Webster Springs, WV
21WVINST	KE-111-K	Sugar Creek at Skelt, WV
21WVINST	KE-111-K-2	Little Sugar Creek near Skelt, WV
21WVINST	KE-111-Q	Big Run near Waneta, WV
21WVINST	KE-111-S	Flint Run near Monterville, WV
21WVINST	KE-115	Steps Run near Bergoo, WV
21WVINST	KE-117	Leatherwood Creek at Bergoo, WV

Table 8 STORET Sampling Locations for Elk River Watershed Hydrologic Unit Code – 05050007 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Location**
21WVINST	KE-117-B	Right Fork Leatherwood Creek near Bergoo, WV
21WVINST	KE-118	Bergoo Creek near Bergoo, WV
21WVINST	KE-124	Big Run near Bergoo, WV
21WVINST	KE-128	Hickorylick Run near Monterville, WV
21WVINST	KE-136-{0.5}	Props Run near Slatyfork, WV
21WVINST	KE-137	Laurel Run at Slatyfork, WV
21WVINST	KE-138	Big Spring Fork near Slatyfork, WV
21WVINST	KE-139	Old Field Fork at Slatyfork, WV
21WVINST	KE-139-B	Crooked Fork North of Marlinton, WV
21WVINST	KE-139-0.5A	Slaty Fork at Slatyfork, WV

in Table 9 while a use support matrix summary of all designated uses is given in Table 10.

Of the 832.41 stream miles assessed, 220.31 (26.5%) were fully supporting their overall designated uses, 492.43 (59.2%) were fully supporting but threatened, 72.14 (8.6%) were partially supporting, and 47.53 (5.7%) were non-supporting.

Of the 817.72 miles assessed for Aquatic Life Support use, 306.34 (37.5%) were fully supporting, 387.86 (47.4%) were fully supporting but threatened, 80.65 (9.9%) were partially supporting, and 42.87 (5.2%) were non-supporting. No streams in the watershed were assessed for Fish Consumption use during this reporting period.

Of the 767.00 miles assessed for Primary Contact Recreation use, 366.74 (47.8%) were fully supporting, 357.60 (46.6%) were fully supporting but threatened, and 42.66 (5.6%) were non-supporting.

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Elk River watershed is provided in Table 11.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Metals (71.80 miles), Siltation (47.08 miles), and Habitat Alteration (non-flow)

Table 9 USE SUMMARY REPORT: OVERALL USE SUPPORT ELK RIVER WATERSHED Waterbody Type: River			
Total Number of River/Streams Assessed:	153		
Total Number of River/Streams Monitored:	142		
Total Number of River/Streams Evaluated:	11		
	ASSESSMENT BASIS IN MILES		
DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	220.31	220.31
SUPPORTING BUT THREATENED	0.00	492.43	492.43
PARTIALLY SUPPORTING	0.00	72.14	72.14
NOT SUPPORTING	1.95	45.58	47.53
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	1.95	830.46	832.41

TABLE 10
USE SUPPORT MATRIX SUMMARY
ELK RIVER WATERSHED
WATERBODY TYPE: RIVER
UNITS IN MILES

USE	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting
Overall Use	220.31	492.43	72.14	47.53
Aquatic Life	306.34	387.86	80.56	42.87
Fish Consumption				
Cold Water Fishery - Trout	164.32	73.05	15.64	18.90
Shell fishing				
Warm Water Fishery	71.70	264.04	46.22	22.48
Bait Minnow Fishery	59.00	62.09	22.79	19.06
Primary Contact Recreation	366.74	357.60		42.66
Drinking Water Supply	180.35		16.77	5.00

Table 11 Complete Summary of Causes, Including User-Defined Elk River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Cause Categories Waterbody Type: River			
Code	**Cause Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0000	CAUSE UNKNOWN	4.87	23.59
0100	UNKNOWN TOXICITY	11.45	0.00
0500	METALS	40.18	31.62
0580	ZINC	21.77	0.00
1000	PH	26.28	8.14
1100	SILTATION	21.77	25.31
1600	HABITAT ALTERATION (non-flow)	0.00	34.64
1700	PATHOGENS	11.64	22.85
1710	Fecal Coliform Bacteria	11.64	21.28
2500	TURBIDITY	21.77	0.00

(34.64 miles). Additional significant causes of impairment are pH (34.42 miles) and Fecal Coliform (32.92 miles).

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Elk River watershed is provided in Table 12.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Unknown Source (55.24 miles), Petroleum Activities (47.08 miles), and Abandoned Mining (33.02 miles). Additional significant sources of impairment are Hydromodification (27.30 miles) and Silviculture (25.31 miles).

Size of Waters Affected by Toxics

For purposes of this report, toxics monitoring refers only to streams sampled for priority pollutants listed in Section 307 of the Clean Water Act.

During this reporting cycle, 460.41 stream miles in the Elk River watershed were monitored for toxics. Of these, 65.09 miles (14.1%) had elevated levels.

Table 12 **Complete Summary of Sources, Including User-Defined** **Elk River Watershed** **Sizes of Waterbodies Not Fully Supporting Uses** **Affected by Various Source Categories** **Waterbody Type: River**			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0100	INDUSTRIAL POINT SOURCES	9.50	0.00
1350	GRAZING-RELATED SOURCES	0.00	1.35
2000	SILVICULTURE	0.00	25.31
4000	URBAN RUNOFF/STORM SEWERS	21.77	0.00
4500	Highway/Road/Bridge Runoff	21.77	0.00
5000	RESOURCE EXTRACTION	36.84	34.95
5100	Surface Mining	1.58	0.00
5200	Subsurface Mining	3.17	0.00
5500	Petroleum Activities	21.77	25.31
5700	Mine Tailings	7.98	0.00
5800	Acid Mine Drainage	17.07	5.94
5900	Abandoned Mining	7.71	25.31
7000	HYDROMODIFICATION	0.00	27.30
7100	Channelization	0.00	1.99
7200	Dredging	0.00	1.99
7550	HABITAT MODIFICATION (other than hydromodification)	0.00	11.32
7600	Removal of Riparian Vegetation	0.00	11.32
7700	Streambank Modification/Destabilization	0.00	9.99
8100	ATMOSPHERIC DEPOSITION	5.70	0.00
8400	SPILLS	1.95	0.00
9000	SOURCE UNKNOWN	26.20	29.04

Public Health/Aquatic life Impacts

During this reporting period, no bathing beach or public water supply closures were documented in the watershed.

However, two fish kills were reported. A total kill occurred along 9.5 miles of Laurel Creek in Webster and Braxton counties due to an industrial discharge. Also, a total kill occurred along 1.95 miles of Gabes Creek in Kanawha County due to green cement from an oil and gas operation.

Section 303(d) Waters

Table 13 includes streams from the Elk River watershed that are on the current 303(d) list. Six streams from the watershed are on the list, including one (Elk River mainstem) on the Primary Waterbody List, four on the Mine Drainage Impaired sublist, and one on the Acid Rain Impaired sublist. Currently, no 303(d) listed streams in the Elk River watershed have had TMDL's completed.

LITERATURE CITED

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Harris, V. B. 1974. Great Kanawha: A Historic Outline. Commissioned by the Kanawha County Court, 6 December 1974.

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TABLE 13
West Virginia
1998 303(d) List
Elk River Watershed

Primary Waterbody List

Stream Name	Stream Code	Use Affected	Pollutant	Primary Source	Miles Affected	Reach Description	TMDL Priority
Elk River	K-43	AQL	Aluminum, Lead, Iron, Zinc	Undetermined	21.77	Mouth to Big Sandy	Medium
Elk River	K-43	HH	Iron	Undetermined	21.77	Mouth to Big Sandy	Medium

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Morris Ck	KE-26	0.97	Aquatic Life	pH, Metals	Mine Drainage	Medium
Left Fk / Morris Ck	KE-26-A	2.15	Aquatic Life	pH, Metals	Mine Drainage	Medium
Buffalo Ck	KE-50	23.81	Aquatic Life	Metals	Mine Drainage	Medium
Pheasant Rn	KE-50-T	1.50	Aquatic Life	pH, Metals	Mine Drainage	Medium

Waterbodies Impaired by Acid Rain

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Fall Rn / Lt Fk / Holly Rv	KE-98-C-14	5.7	Aquatic Life	pH	Acid Rain	Low

AQL = Aquatic Life
HH = Human Health
TMDL = Total Maximum Daily Load
MP = Mile Point

The Lower Kanawha River Watershed

Background

According to the U. S. Geological Survey, the Kanawha River watershed is divided into upper and lower sections, or Hydrologic Units (HUCs). The lower section, HUC # 05050008, includes the mainstem Kanawha River downstream from the Elk River and all tributaries of this section excluding the Coal River, which is addressed in a separate report. Major tributaries included in this section are Thirteenmile Creek, Eighteenmile Creek, Hurricane Creek, Pocatalico River, Davis Creek, and Twomile Creek. According to DEP records, there are 452 streams totaling 1,409 miles in the Lower Kanawha River watershed.

This watershed area lies primarily within two sub-ecoregions of the Western Allegheny Plateau ecoregion (Omernik, 1992). Permian sandstone, siltstone, shale, limestone and coal of the Dunkard Formation underlie the Permian Hills ecoregion (70a). The original vegetation of this ecoregion was primarily Appalachian oak forest. Today forests are common. Most of the acreage is too steep to be farmed or is reverting to woodland. Nevertheless, there are some farms growing corn and hay on the ridges and some pastures remain on the hill slopes. Grazing and cultivation have caused slope erosion and upland topsoil is often thin or non-existent. Some coal mining and oil and gas production occur within this ecoregion.

The Monongahela Transition Zone ecoregion (70b) is generally less rugged, less forested and warmer than the Permian Hills ecoregion. Typically interbedded limestone, shale, sandstone and coal of the Monongahela group underlie this ecoregion. The natural vegetation was mixed mesophytic forest in contrast to the Appalachian oak forest of the Permian Hills. Urban, suburban and industrial development dominates some local areas, especially the narrow River valleys that serve as transportation corridors. Bituminous coal mining and some oil and gas production occur in this ecoregion. Acid mine drainage, siltation, and industrial pollution have degraded streams in much of this ecoregion. Two sites on headwater tributaries of Davis Creek are in the Central Appalachian ecoregion.

An unusual topographic feature is the Kanawha Valley. This alluvial valley is much larger than would result from flooding of a River the size of the present day Kanawha River. In fact, much of the alluvial depth can be attributed to glacial periods, when a continental ice sheet near

Chillicothe, Ohio dammed an ancient River. This damming created a huge reservoir (called "Teays Lake" today) that resulted in alluvial material being deposited over thousands of years on the lakebed during flood events. When the ice shelf eventually retreated, and the massive reservoir drained, Kanawha River and its tributaries began to meander through the thick alluvium of the ancient lakebed (Cardwell, 1975).

Climate throughout the watershed is considered mild. Generally summers are warm and winters are moderately cold. Summer temperatures may reach the low nineties on occasion while winter lows average in the middle twenties. Precipitation occurs on an average of 152 days each year. While 1996 set the record as the wettest year for West Virginia in more than a century of keeping records (Friedlander, Jr., Blaine P., 1996), 1997 was much closer to the average.

The Lower Kanawha Valley never developed the intense salt industry as the Upper Kanawha Valley. Limited extraction of natural gas, oil and some coal still occurs in the region. Prior to the Twentieth Century the Lower Kanawha River was primarily an agricultural and timbering region.

The lower Kanawha River was first altered, beginning in 1825, by a series of sluices and wing dams to improve navigation. It was hoped that this effort would provide a channel with a guaranteed three feet of navigable water. By 1900 a system of locks and dams had been created which provided six feet of water for an average of 136 days each year (Hale, 1994). Modern locks and dams have altered the River so that the mainstem channel has nine feet of water available during the entire year. Several tributaries of the Lower Kanawha are navigable for short stretches. Only the Coal River, covered in a separate report had its channel altered to support navigation. These eight locks and dams suffered from neglect during the War Between the States and never again operated (Harris). Remnants of these locks and dams can still be seen along the Coal River.

As of January 1998, there were at least 67 NPDES discharge permits in effect within the Lower Kanawha River watershed. Of the known permitted discharges, 23 are sewage treatment plants, and 44 are industrial discharges.

The West Virginia Division of Natural Resources (WV DNR) lists the Kanawha River, the Pocatalico River, and Flat Fork Creek, as high quality streams (WV DNR, 1986). The West Virginia Division of Environmental Protection (WV DEP) has placed these same streams on the 303(d) list of water quality limited streams due to various impacts. This discrepancy may be due to the fragmented nature of the impacts on these tributaries. One segment may suffer from the impact, while another may be either upstream of the impact or far enough downstream to have recovered.

Another factor to consider is the different criteria used by the two different State agencies in listing streams. The Division of Wildlife Resources considered any stream a high quality stream if it contained a native trout population or was stocked with trout. They also included any warm water stream over five miles in length with a desirable fish population that was actively fished by the public. If a portion of a stream deserved to be listed as high quality, then the entire stream was listed.

The Office of Water Resources, on the other hand, bases their decision upon water quality data collected from sections of streams which are suspected of being impaired. If a portion of the stream deserved to be listed as water quality impaired, usually , especially if only limited data was available, the entire stream was listed.

Water Quality Summary

During this reporting period, 100 streams totaling 530.72 miles were assessed in the Lower Kanawha River watershed. Figure 5 is a map depicting sampling stations in the Lower Kanawha watershed, while Table 14 provides a list of these stations. A summary of overall designated use support is provided in Table 15 while a use support matrix summary of all designated uses is given in Table 16.

Of the 528.77 stream miles assessed, 112.48 (21.3%) were fully supporting their overall designated uses, 137.68 (26.0%) were fully supporting but threatened, 232.16 (43.9%) were partially supporting, and 46.45 (8.8%) were non-supporting.

Of the 529.81 miles assessed for Aquatic Life Support use, 159.67 (30.1%) were fully supporting, 105.20 (19.9%) were fully supporting but threatened, 179.88 (34.0%) were partially supporting, and 85.06 (16.0%) were non-supporting. For the Fish Consumption use, 140.41 miles were assessed. Of these, 85.91 miles (61.2%) were fully supporting while 54.50 miles (38.8%) were partially supporting.

Of the 528.77 miles assessed for Primary Contact Recreation use, 265.07 (50.1%) were fully supporting, 171.36 (32.4%) were fully supporting but threatened, 66.76 (12.6%) were partially supporting, and 25.58 (4.9%) were non-supporting.

Figure 5
Lower Kanawha River Watershed
Hydrologic Unit – 05050008

STORET Sampling Locations
1994-1998

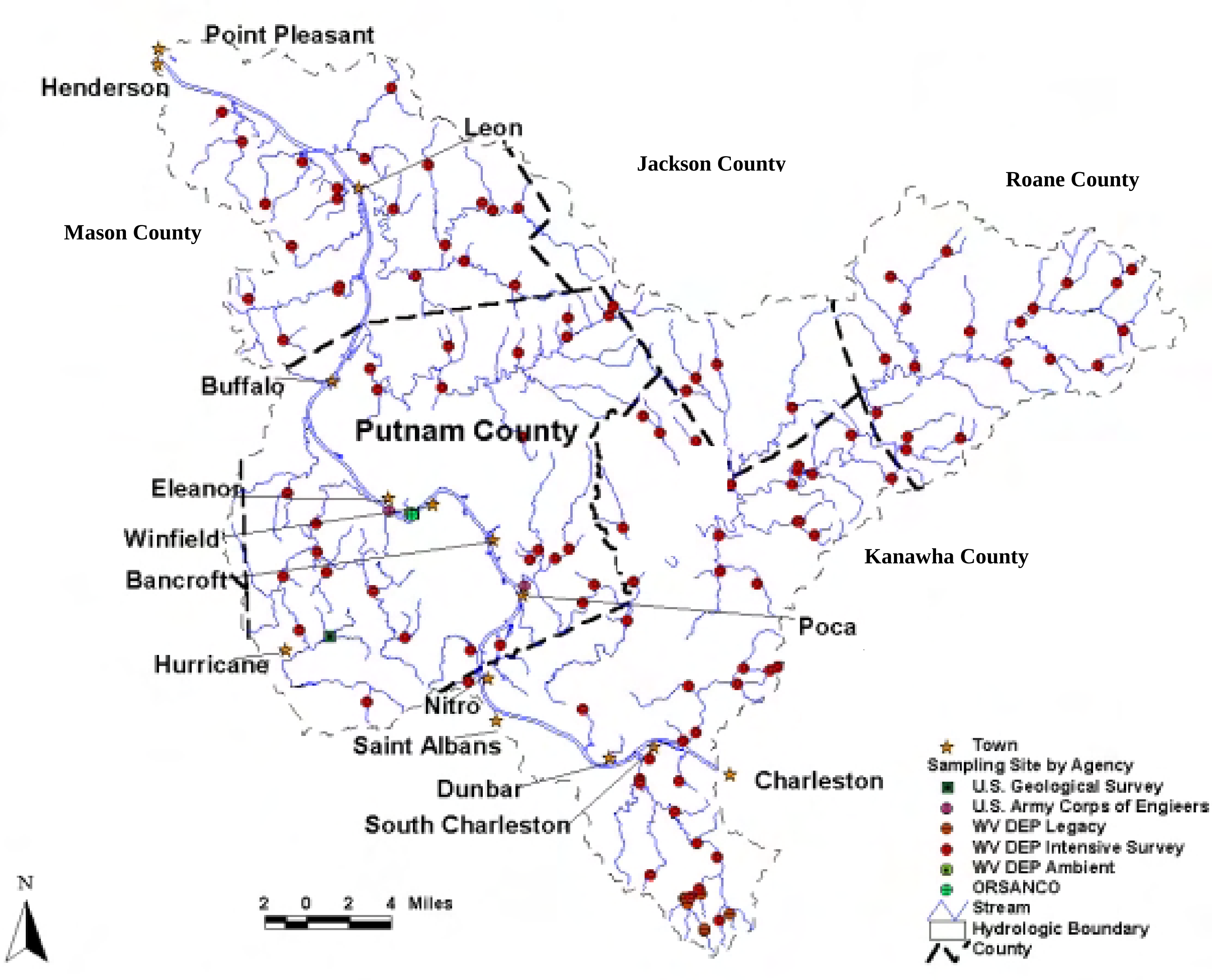

Table 14 STORET Sampling Locations for Lower Kanawha River Watershed Hydrologic Unit Code – 05050008 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Location**
11COEHUN	1KR0W0055	KANAWHA RIVER, Mile 0.5
11COEHUN	1KR0W3005	KANAWHA RIVER, Mile 30.0
11COEHUN	1PR0W0039	Pocatalico River mile 0.3
112WRD	3201300	KANAWHA RIVER AT WINFIELD, WV
112WRD	3.83E+14	MILL CREEK @ HURRICANE CITY PARK
21WVWQAS	WA96-K01	Kanawha River at Winfield Locks and Dam
21WV7IWQ	550748	Kanawha River at Winfield Locks and Dam
21WV7IWQ	551119	Wall Fork in Kanawha State Forest
21WV7IWQ	551127	Davis Ck. above Johnson Hollow
21WV7IWQ	551130	Davis Ck. below Johnson Hollow
21WV7IWQ	551131	Davis Ck. above Portercamp Branch
21WV7IWQ	551136	Davis Ck. below Portercamp Branch
21WV7IWQ	551147	Davis Ck. behind Salamander Trail Shelter
21WV7IWQ	551148	Portercamp Branch above Horse Stables
21WV7IWQ	551149	Portercamp Branch at Salamander Bridge
21WV7IWQ	551153	Shrewsbury Hollow Run at Snipes Trail Bridge
21WV7IWQ	551155	Swimming Pool Parking Discharge
31ORWUNT	KR31.1M	KANAWHA R @ WINFIELD W.VA.MP31.1
21WVINST	K-06	Five Mile Creek above Couch, WV
21WVINST	K-06-A	Little Five Mile Creek near Point Pleasant, WV
21WVINST	K-09-A	Upper Ninemile Creek at Beech Hill, WV
21WVINST	K-09-C-{05.4}	Lower Ninemile Creek at Chief Cornstalk WMA, WV
21WVINST	K-10-A	Cooper Creek near Leon, WV
21WVINST	K-10-F	Barnett Fork near Leon, WV
21WVINST	K-11	Pond Branch near Southside, WV
21WVINST	K-11-0.5-{0.6}	Un. Trib. Pond Branch near Southside, WV
21WVINST	K-12-{12.0}	Thirteenmile Creek below Nat, WV
21WVINST	K-12-{20.7}	Thirteenmile Creek at Deerlick, WV
21WVINST	K-12-A	Rocky Fork near Waterloo, WV
21WVINST	K-12-E-{02.4}	Mudlick Fork below Elmwood, WV
21WVINST	K-12-E-2.5{4.0}	Un. Trib Mudlick Fork Tribble, WV
21WVINST	K-12-F	Poplar Fork at Capehart, WV
21WVINST	K-12-F-{05.0}	Poplar Fork near Wood, WV
21WVINST	K-12-H	Baker Branch near Deerlick, WV
21WVINST	K-12-J	Bee Run near Deerlick, WV
21WVINST	K-13	Little Sixteenmile Creek above Southside, WV
21WVINST	K-14	Sixteenmile Creek near Southside, WV
21WVINST	K-14-{02.2}	Sixteenmile Creek near Southside, WV

Table 14
STORET Sampling Locations for
Lower Kanawha River Watershed
Hydrologic Unit Code – 05050008
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
21WVINST	K-14-A.5-{1.6}	Un. Trib. Sixteenmile Creek near Southside, WV
21WVINST	K-14-B-1	Unnamed Trib. Fivefork Branch near Southside, WV
21WVINST	K-16	Eighteen Mile Creek near Kenna, WV
21WVINST	K-16-{03.5}	Eighteenmile Creek near Buffalo, WV
21WVINST	K-16-{12.8}	Eighteenmile Creek below Extra, WV
21WVINST	K-16-{25.0}	Eighteenmile Creek above Extra, WV
21WVINST	K-16-{33.0}	Eighteen Mile Creek near Kenna, WV
21WVINST	K-16-B	Jakes Branch near Buffalo, WV
21WVINST	K-16-G-1-{0.4}	Left Fork Turkey Branch near Buffalo, WV
21WVINST	K-16-J-3-{1.0}	Saltlick Creek near Confidence, WV
21WVINST	K-16-L	Sulug Creek near Extra, WV
21WVINST	K-16-Q-{1.0}	Harris Branch near Extra, WV
21WVINST	K-16-S	Cottrell Run near Extra, WV
21WVINST	K-19-C	Left Fk. Five & Twentymile Ck Frazier Bottom
21WVINST	K-22-{06.0}	Hurricane Creek North of Hurricane, WV
21WVINST	K-22-{10.6}	Hurricane Creek below Hurricane, WV
21WVINST	K-22-{14.4}	Hurricane Creek at Hurricane, WV
21WVINST	K-22-B	Poplar Fork near Hurricane, WV
21WVINST	K-22-B-2	Cow Creek near Hurricane, WV
21WVINST	K-22-B-3	Long Branch near Teays Valley, WV
21WVINST	K-22-B-5-B	Unnamed Trib. Crooked Ck. near Scott Depot, WV
21WVINST	K-22-J-{1.3}	Rider Creek near Hurricane, WV
21WVINST	K-30	Armour Creek at Nitro, WV
21WVINST	K-32-A	Rockstep Run near Scary, WV
21WVINST	K-32-0.1A	Vintroux Hollow near Scary, WV
21WVINST	K-33	Gallatin Branch near St. Albans, WV
21WVINST	K-36-{2.4}	Finney Branch at Institute, WV
21WVINST	K-39-{01.4}	Davis Creek in South Charleston, WV
21WVINST	K-39-{03.6}	Davis Creek below Kanawha St. Forest
21WVINST	K-39-{12.2}	Davis Creek in Kanawha State Forest, WV
21WVINST	K-39-A	Ward Hollow in South Charleston WV
21WVINST	K-39-B-{0.1}	Trace Fork in South Charleston, WV
21WVINST	K-39-E-3-{0.4}	Site 1 of Bays Fork in Kanawha State Forest WV
21WVINST	K-39-E-3-{0.6}	Site 2 of Bays Fork in Kanawha State Forest WV
21WVINST	K-39-F	Rays Branch at Charleston WV
21WVINST	K-39-J	Coal Hollow near Loundendale, WV
21WVINST	K-39-M-1-A	Hoffman Hollow in Kanawha State Forest, WV

Table 14
STORET Sampling Locations for
Lower Kanawha River Watershed
Hydrologic Unit Code – 05050008
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
21WVINST	K-39-O	Shewsbury Hollow in Kanawha State Forest, WV
21WVINST	K-41	Twomile Creek in Charleston, WV
21WVINST	K-41-A	Woodward Branch in Charleston, WV
21WVINST	K-41-D-1	Unnamed Trib. Left Fk. Guthrie, WV
21WVINST	K-41-E-1	Edens Fork near Charleston, WV
21WVINST	K-41-E-2-{0.1}	Holmes Branch near Charleston, WV
21WVINST	K-41-E-2-{1.4}	Holmes Branch near Charleston, WV
21WVINST	K-41-E-2-{1.7}	Holmes Branch near Charleston, WV
21WVINST	K-42	Joplin Branch in South Charleston, WV
21WVINST	KP-00-{04.7}	Pocatalico River above Poca, WV
21WVINST	KP-00-{08.5}	Pocatalico River below Lanham, WV
21WVINST	KP-00-{32.5}	Pocatalico River below Hicumbottom, WV
21WVINST	KP-00-{35.0}	Pocatalico River below Hicumbottom, WV
21WVINST	KP-00-{61.0}	Pocatalico River above Walton, WV
21WVINST	KP-01-{01.9}	Heizer Creek near Poca, WV
21WVINST	KP-01-A-{01.1}	Manila Creek near Poca, WV
21WVINST	KP-01-A-0.1{.6}	Un. Trib Manila Cr. near Poca, WV
21WVINST	KP-01-B	Bigger Branch near Poca, WV
21WVINST	KP-05	Rocky Fork at Rocky Fork, WV
21WVINST	KP-08	Schoolhouse Branch near Rocky Fork, WV
21WVINST	KP-09-A	Spring Branch near Rocky Fork, WV
21WVINST	KP-13-{1.3}	Tuppers Creek near Sissonville, WV
21WVINST	KP-13-{3.0}	Tuppers Creek below Pocatalico, WV
21WVINST	KP-13-A-1-A	Turkeypen Branch near Pocatalico, WV
21WVINST	KP-16-{4.5}	Grapevine Creek near Sissonville, WV
21WVINST	KP-16-B	Broadtree Run near Sissonville, WV
21WVINST	KP-16-D	Vance Hollow near Sissonville, WV
21WVINST	KP-17-{00.3}	Pocatalico Creek near Sissonville, WV
21WVINST	KP-17-B-5	First Creek near Advent, WV
21WVINST	KP-17-C-1-A	Dan Slater Hollow near Trace Fork, WV
21WVINST	KP-17-C-4	Railroad Hollow near Trace Fork, WV
21WVINST	KP-17-C-4.5{1}	Un. Trib. Allens Fork near Trace Fk., WV
21WVINST	KP-17-E-{2.6}	Dudden Fork near Goldtown, WV
21WVINST	KP-17-F-1	Loom Tree Hollow near Goldtown, WV
21WVINST	KP-17-G	Faber Hollow near Goldtown, WV
21WVINST	KP-20	Raccoon Creek near Sissonville, WV
21WVINST	KP-21	Pernel Branch near Sissonville, WV
21WVINST	KP-26	Camp Creek near Island Branch, WV
21WVINST	KP-28	Green Creek above Kettle, WV

Table 14 STORET Sampling Locations for Lower Kanawha River Watershed Hydrologic Unit Code – 05050008 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Location**
21WVINST	KP-28-A-{0.7}	Hunt Fork near Kettle, WV
21WVINST	KP-28-B-1	Bear Branch near Kettle, WV
21WVINST	KP-28-E	Anderson Lick Run near Doddtown, WV
21WVINST	KP-29	Straight Creek near Mattie, WV
21WVINST	KP-32-.5A	Sugar Camp Hollow near Cicerone, WV
21WVINST	KP-32-{1.0}	Wolf Creek near Boyd, WV
21WVINST	KP-33-{0.1}	Flat Fork near Ryan, WV
21WVINST	KP-33-{5.8}	Flat Fork near Harmony, WV
21WVINST	KP-33-D-{0.8}	Coon Run near Harmony, WV
21WVINST	KP-33-G	Cabbage Fork near Gandeeville, WV
21WVINST	KP-36-B	Boner Hollow near Walton, WV
21WVINST	KP-37-A	Snake Hollow near Walton, WV
21WVINST	KP-38-.8A	Greathouse Hollow near Walton, WV
21WVINST	KP-38-D	Hollywood Fork near Looneyville, WV
21WVINST	KP-40	Round Knob Run near Stringtown, WV
21WVINST	KP-41-A	Slab Fork near Stringtown, WV
21WVINST	KP-43-{1.6}	Laurel Fork near Looneyville, WV
21WVINST	KP-43-A	Smith Run near Roxalana, WV
21WVINST	KP-45.5	Vineyard Run at Looneyville, WV

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Lower Kanawha River watershed is provided in Table 17.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Siltation (237.42 miles), Metals (102.79 miles), and Fecal Coliform (94.52 miles).

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Lower Kanawha River watershed is provided in Table 18.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Unknown Source (169.03 miles), Urban Runoff/Storm Sewers (111.95 miles), Petroleum Activities (66.77 miles), and Combined Sewer Overflow (58.50 miles).

Table 15 USE SUMMARY REPORT: OVERALL USE SUPPORT LOWER KANAWHA RIVER WATERSHED Waterbody Type: River	
Total Number of River/Streams Assessed:	100
Total Number of River/Streams Monitored:	99
Total Number of River/Streams Evaluated:	1

DEGREE OF USE SUPPORT	ASSESSMENT BASIS IN MILES		
	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	112.48	112.48
SUPPORTING BUT THREATENED	0.00	137.68	137.68
PARTIALLY SUPPORTING	0.00	232.16	232.16
NOT SUPPORTING	0.25	46.20	46.45
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	0.25	528.52	528.77

TABLE 16
USE SUPPORT MATRIX SUMMARY
LOWER KANAWHA RIVER WATERSHED
WATERBODY TYPE: RIVER
UNITS IN MILES

USE	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting
Overall Use	112.48	137.68	232.16	46.45
Aquatic Life	159.67	105.20	179.88	85.06
Fish Consumption	85.91		54.50	
Warm Water Fishery	71.17	52.16	161.25	36.33
Bait Minnow Fishery	109.15	65.18	18.13	48.73
Primary Contact Recreation	265.07	171.36	66.76	25.58
Drinking Water Supply	11.78			
Industrial	58.50			

Table 17 Complete Summary of Causes, Including User-Defined Lower Kanawha River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Cause Categories Waterbody Type: River			
Code	**Cause Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0000	CAUSE UNKNOWN	3.55	1.25
0100	UNKNOWN TOXICITY	1.00	2.09
0410	PCB’s	5.00	0.00
0420	DIOXINS	49.50	0.00
0500	METALS	18.64	84.15
0750	SULFATES	9.18	0.00
0900	NUTRIENTS	0.00	25.65
1000	pH	1.52	25.65
1100	SILTATION	55.85	181.57
1200	ORGANIC ENRICHMENT/LOW DO	0.25	0.00
1500	FLOW ALTERATIONS	2.87	0.00
1600	HABITAT ALTERATION (non-flow)	8.07	55.90
1700	PATHOGENS	88.11	6.41
1710	Fecal Coliform Bacteria	88.11	6.41

Size of Waters Affected by Toxics

During this reporting cycle, 202.26 stream miles in the Lower Kanawha River watershed were monitored for toxics. Of these, 54.50 miles (26.9%) contained elevated levels. The majority of these stream miles (49.50) were impaired by dioxin in fish tissue. An additional five miles was impaired by PCB’s in fish tissue. The source of dioxin contamination is unknown while the PCB’s originated from improper disposal of waste from Spencer Transformer in Harmony, WV. Efforts to determine the source of dioxin contamination are currently being undertaken by the U. S. EPA. Current fish consumption advisories appear in Table 73.

Table 18 Complete Summary of Sources, Including User-Defined Lower Kanawha River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0200	MUNICIPAL POINT SOURCES	2.00	0.00
0400	COMBINED SEWER OVERFLOW	58.50	0.00
1000	AGRICULTURE	1.25	35.29
1100	Nonirrigated Crop Production	0.00	25.65
1350	GRAZING-RELATED SOURCES	1.25	4.86
1400	Pasture Grazing-Riparian and/or Upland	1.25	30.51
1600	INTENSIVE ANIMAL FEEDING OPERATIONS	0.00	4.78
1640	Confined Animal Feeding Operations (NPS)	0.00	4.78
1800	Off-Farm Management Area	0.00	25.65
2000	SILVICULTURE	18.78	0.00
2300	Logging Road Construction/Maintenance	18.78	0.00
3000	CONSTRUCTION	41.47	0.00
3200	Land Development	6.80	0.00
4000	URBAN RUNOFF/ STORM SEWERS	93.17	18.78
5000	RESOURCE EXTRACTION	18.07	68.44
5500	Petroleum Activities	0.00	66.77
5800	Acid Mine Drainage	9.18	2.83
5900	Abandoned Mining	18.07	2.83
6000	LAND DISPOSAL	11.41	0.00
6300	Landfills	0.57	0.00
6350	Inappropriate Waste Disposal/Wildcat Dumping	5.00	0.00
6500	Onsite Wastewater Systems (Septic Tanks)	4.85	0.00
6700	Septage Disposal	0.76	0.00
6800	Raw Sewage	1.09	0.00
7000	HYDROMODIFICATION	2.87	1.63
7100	Channelization	0.00	1.63
8400	SPILLS	0.00	2.09
8700	RECREATIONAL AND TOURISM ACTIVITIES (non-boating)	0.00	5.94
9000	SOURCE UNKNOWN	106.33	62.70

Public Health/Aquatic life Impacts

Within the Lower Kanawha River watershed, four streams are under fish consumption advisories. These are the Lower Kanawha River mainstem (45.5 miles, dioxin), Pocatalico River (2.0 miles, dioxin), Armour Creek (2.0 miles, dioxin), and Flat Fork Creek (5.0 miles, PCB's). In Flat Fork Creek, species affected are suckers, carp, and channel catfish. In the three other streams, the advisory is for bottom feeders. The public is cautioned not to consume any fish listed in the above advisories.

During this reporting period, no bathing beach or public water supply closures were documented in the watershed. However, two fish kills were reported. A total kill occurred along 1.0 miles of Hurricane Creek in Putnam County due to effluent from a new water line. Also, a total kill occurred along 0.25 miles of Two and Three Quarter Mile Creek in Kanawha County due to raw sewage.

Section 303(d) Waters

Table 19 includes streams from the Lower Kanawha River watershed that are on the current 303(d) list. Nine streams and two lakes are on the list, including five streams and both lakes on the Primary Waterbody List and four streams on the Mine Drainage Impaired sublist. Both lakes have had TMDL's completed. In addition, TMDL's have been drafted for Armour Creek (lower 2 miles), Pocatalico River (lower 2 miles), and the Kanawha River (45.5 miles from Coal River confluence to mouth at Point Pleasant) for dioxin. Approval of these TMDL's is anticipated in the fall of 2000.

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TABLE 19
West Virginia
1998 303(d) List
Lower Kanawha River Watershed

Primary Waterbody List

Stream Name	Stream Code	Use Affected	Pollutant	Primary Source	Miles Affected	Reach Description	TMDL Priority
Kanawha R.(lower)	O-20	HH#	Dioxin	Undetermined	46	Mouth of Coal R. to	High
Pocatalico River	K-29	HH*	Dioxin	Undetermined	2.0	Lower 2 miles	High
Armour Creek	K-30	HH*	Dioxin	Undetermined	2	Lower 2 miles	High
Flat Fork Creek	KP-33	HH*	PCB S	Spencer Transformer, Harmony WV	5.0	Entire Length	Medium
Hurricane Lake	K(L)-21-(1)	AQL	Nutrients, Siltation, Iron	Dom. Sewage, Const., Urb. Runoff	12 Acres	N/A	Completed
Hurricane Lake	K(L)-21-(1)	HH	Iron	Construction, Urban Runoff	12 Acres	N/A	Completed
Ridenhour Lake	K(L)-30-A-(1)	AQL	Nutrients, Siltation, Iron, Alum.	Dom. Sewage, Const., Agr., Urb.Runoff	27 Acres	N/A	Completed
Ridenhour Lake	K(L)-30-A-(1)	HH	Iron	Construction, Urban Runoff	27 Acres	N/A	Completed

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Rich Fork / Two Mile Creek	K-41-D.5	1.52	Aquatic Life	pH, Metals	Mine Drainage	Medium
Heizer Ck	KP-1	9.18	Aquatic Life	pH, Metals	Mine Drainage	Medium
Manilla Ck	KP-1-A	7.37	Aquatic Life	pH, Metals	Mine Drainage	Medium
Tuppers Ck	KP-13	6.82	Aquatic Life	pH, Metals	Mine Drainage	Medium

* Contaminant found in fish tissue
# Contaminant found in fish tissue and water column
AQL = Aquatic Life
HH = Human Health

TMDL = Total Maximum Daily Load
HUC = Hydrologic Unit Code
MP = Mile Point

The North Branch of Potomac River Watershed

Background

Near one of the springs at the head of the North Branch Potomac River is the point where surveyors marked a corner of Thomas, 6th Lord Fairfax's land grant. This spring is on the eastern slope of Backbone Mountain in Tucker County, West Virginia, very near the Maryland border. From this spring, North Branch flows 97 miles to its confluence with South Branch, just downstream of Oldtown, MD. The North Branch Potomac River drains approximately 1,328 square miles in West Virginia.

Oldtown was established as a village around the year 1722 by the Shawnee, Wopeththah (pronounced "Opessah"). It was later the home of Nemacolin, a Lenape who showed colonial Virginians a trail that led from the mouth of Wills Creek over the Great Eastern Divide to the forks of Ohio River (present day Pittsburgh PA).

The Virginia-based Ohio Land Company constructed a trading storehouse at the confluence of Wills Creek and North Branch that served as a fort during the French and Indian War, Pontiac's Uprising, Dunmore's War and the Revolutionary War. Fort Cumberland (named after William, Duke of Cumberland, the second son of George II, king of England) became the town of Cumberland MD, the western terminus of the C&O Canal and later, an important location along the B&O Railroad. The North Branch Potomac River Valley became an important travel corridor because it provided a route through a gap in the Allegheny Front escarpment and continued westward deep into the heart of the rugged Allegheny Highlands.

Keyser, with a population of approximately 5,900 is the largest town in the North Branch of the Potomac Watershed. The total population of this watershed is approximately 29,940. The population density is approximately 23 people per square mile.

Prior to modern coal production in the upper reach of North Branch Potomac River, a primary economic activity was timbering for various wood products. The paper mill at Luke, Maryland was established in 1888 by the Luke family. Historically, the mill has been a major source of environmental damage to North Branch and may even have played a role in the degradation of its migratory fishery. Modern coal mining's acid and metal-laden discharges destroyed the remaining fish that survived the waste discharged into North Branch from the paper mill. By the time the North

Branch mainstem became acidic, the anadromous (those that return from the sea to spawn) fallfish and shad fisheries, and the catadromous (those that return to the sea to spawn) eel fishery were completely destroyed.

The native brook trout, once a dominant fish in the North Branch, was reduced to a few remnant populations in scattered tributaries that did not suffer the onslaught of industrialization. The Stony River subwatershed stands as a good example of the destruction that modern industries visited upon the North Branch watershed trout fishery. Stony River Reservoir was constructed by Westvaco Corporation to ensure a reliable source of water for running its pulp mill at Luke MD. This small reservoir altered the trout fishery of the Stony River headwaters, but probably only insignificantly by preventing fish movement from further down the River into the headwaters. Trout adapted to the cold impoundment and continued to utilize the small feeder tributaries as breeding zones.

Virginia Electric Power Corporation constructed the Mount Storm Power Plant about 1965. Associated with it were Mt. Storm Reservoir and several coal mines. The reservoir provided process water for the coal-fired power plant and the mines provided fuel for the boilers that drove the steam turbines. The creation of this industrial complex completed destruction of the native trout fishery in the Stony River watershed, which had been initiated by impacts from existing mines.

Except for a short segment of the mainstem upstream of Mt. Storm Reservoir and a few tributaries, most notably Mill Run, the trout fishery has been severely degraded by impoundment, channelization, warm water discharge and mine drainage. Today, improvements in treating process water at the power plant and acidic water at some of the mine sites (active and inactive) have allowed Stony River below Mill Run to support a stocked trout fishery, but there is no evidence that trout are breeding in the mainstem.

Another coal-fired power plant exists within the North Branch watershed. This small plant on Little Buffalo Creek is a rare example of a power plant that utilizes coal from reprocessed gob (coal mine waste material). A huge gob pile located near this power plant pile has degraded Little Buffalo Creek and Buffalo Creek from its confluence with Little Buffalo Creek to its mouth.

In recent decades, two activities have contributed greatly to improving the water quality of the North Branch mainstem: the construction of Jennings Randolph Reservoir and improvements in mine drainage. The reservoir provides a pollutant settling basin wherein acidic, metal-laden water is transformed into a more suitable biological medium at the discharge chutes. This improvement in water quality is coincidental to the primary purpose for the dam's construction, low-flow augmentation on the lower Potomac River to ensure enough drinking water and pollution dilution for the cities located there.

Improvements in mine drainage have come from several activities. Permitting authorities have allowed surface mining of older mines, while requiring mine operators to cover the acidic overburden. This has prevented future production of acidic water. Researchers have employed a number of neutralization schemes to treat abandoned mine discharges and streams impacted by such discharges. These improvements, while far from solving all of the watershed's environmental ills, have renewed hope that the mainstem North Branch can recover somewhat from past environmental degradation.

However, the former ecological health of the mainstem will likely never be recovered. There are trade-offs associated with the current water quality improvements. For instance, the application of neutralizing agents to acidic tributaries often have resulted in alkaline conditions and concrete like precipitates on the substrates in those tributaries. Therefore, some tributaries have remained biologically hostile environments even as the North Branch mainstem has become more biologically productive. The construction of Jennings Randolph Reservoir, while providing for the establishment of a brown trout fishery downstream in the North Branch mainstem, has dashed all hopes of ever reestablishing the native migratory fisheries.

The North Branch of the Potomac River flows through two ecoregions. Approximately 47 miles of the upper portion of the mainstem and its tributaries drain land located in the Allegheny Highlands physiographic province and the Central Appalachians ecoregion (Ecoregion 69). The lower 50 miles drain lands in the Ridge and Valley physiographic province and Central Appalachians Ridges and Valleys ecoregion (Ecoregion 67).

Ecoregion 67 is characterized by long parallel ridges and valleys underlain by alternating layers of sandstones and shales. There are no coals within this Ecoregion. The valleys, gentler slopes and rounded ridge tops of this Ecoregion support agricultural pursuits, primarily pasture and hay production, but also some orchard and row-crop production. The upper Patterson Creek subwatershed has become host to numerous poultry production facilities within the last decade. Mostly, these relatively new poultry facilities have been developed as additions to existing livestock farms rather than as new farms. Patterson Creek is home to at least three species of special concern;

the mussels *Alasmidonta varicosa* and *Alasmidonta undulata*, and the wood turtle (*Clemmys insculpta*).

Ecoregion 69 is characterized by high, rounded mountains surrounding steep, narrow valleys through which flow mostly high-gradient streams. However, many headwater streams are sluggish as they meander through wet meadows on the uplands. The ecoregion is underlain with numerous coal seams, several of which produce acid drainage when mined.

DEP records indicate there are 113 streams totaling 930 miles in the Potomac River watershed. The watershed has 2,361.0 acres of Palustrine wetlands, 10.0 acres of Riverine wetlands and 21.2 acres of Lacustrine wetlands for a total of 2,392.2 acres of wetlands. It also has 1,966.6 acres of Lacustrine waters and 711.2 acres of Riverine waters for a total of 2,677.8 acres of deepwater habitat.

Water Quality Summary

During this reporting period, 47 streams totaling 307.97 miles were assessed in the North Branch Potomac River watershed. Figure 6 is a map depicting sampling stations in the North Branch Watershed, while Table 20 provides a list of these stations. A summary of overall designated use support is provided in Table 21 while a use support matrix summary of all designated uses is given in Table 22.

Of the 307.97 stream miles assessed, 71.44 (23.2%) were fully supporting their overall designated uses, 120.76 (39.2%) were fully supporting but threatened, 68.37 (22.2%) were partially supporting, and 47.40 (15.4%) were non-supporting.

Of the 302.65 miles assessed for Aquatic Life Support use, 89.81 (29.7%) were fully supporting, 98.19 (32.4%) were fully supporting but threatened, 67.25 (22.2%) were partially supporting, and 47.40 (15.7%) were non-supporting.

The North Branch mainstem (75.75 miles) was the only stream assessed for the Fish Consumption use during this reporting period. For this use, 25.25 miles (33.3%) were fully supporting and 50.50 miles (66.7%) were partially supporting.

Of the 307.97 miles assessed for Primary Contact Recreation use, 190.66 (61.9%) were fully supporting, 84.72 (27.5%) were fully supporting but threatened, 1.13 (0.4%) were partially supporting, and 31.46 (10.2%) were non-supporting.

Figure 6
North Branch of the Potomac River Watershed
Hydrologic Unit – 02070002

STORET Sampling Locations
1994-1998

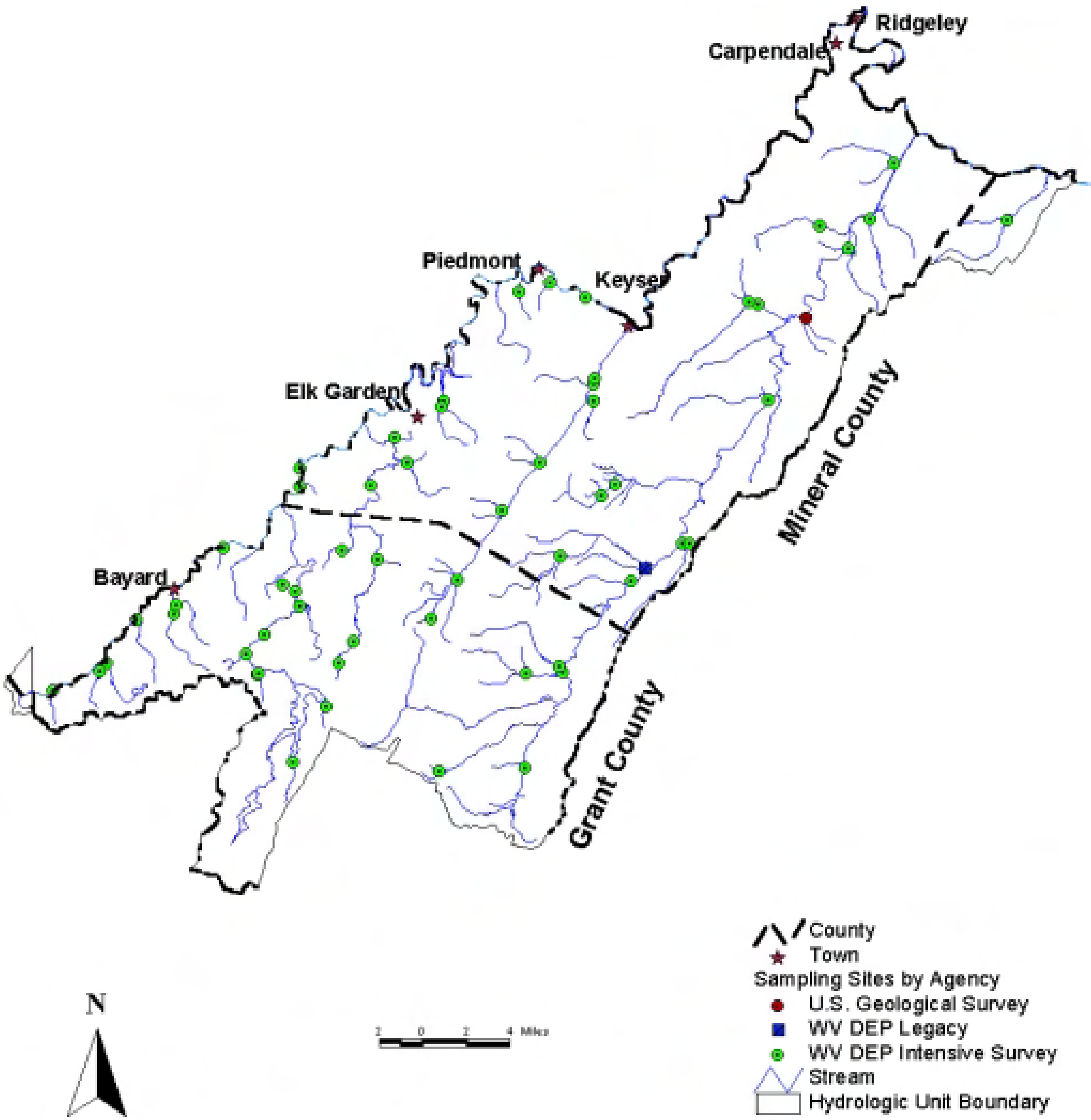

Table 20
STORET Sampling Locations for
North Branch Potomac River Watershed
Hydrologic Unit Code – 02070002
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
11NPSWRD	CHOH_BACT_02	Mill Run Below Berm Above Lock 71 - Oldtown
11NPSWRD	CHOH_BACT_05	Mill Run at Battie Mixon - Oldtown
11NPSWRD	CHOH_BACT_15	Mill Run at STP Above Confluence 7 Springs Creek
11NPSWRD	CHOH_BACT_16	7 Springs Creek at Towpath River Side
11NPSWRD	CHOH_BACT_17	7 Springs Creek at STP Above Confluence Mill Run
112WRD	1603000	NB POTOMAC R NR CUMBERLAND, MD
112WRD	1604500	PATTERSON CREEK NEAR HEADSVILLE, WV
21MDOEP	BDK0000	BRADDOCK RUN US 40 AND BRADDOCK ST. BR.
21MDOEP	GEO0009	GEORGES CREEK AT FRANK.1 M.NORTH OF WESTPRT.
21MDOEP	NBP0023	NORTH BRANCH POTOMAC TOLL BR. AT OLDTOWN
21MDOEP	NBP0103	WEST OF MOORES HOLLOW RD. AND ROUTE 51
21MDOEP	NBP0326	N.BRA.POT.GAGING STA.;W. MD. RR.AT PINTO.USGS
21MDOEP	NBP0461	NORTH BRANCH POTOMAC AT BRIDGE ON RT.220
21MDOEP	NBP0534	N.BRA.POT.R.AT BLOOM. UPST.OF CONF./SAVA. R.
21MDOEP	NBP0689	N BR. POT. DOWNSTREAM OF MD. RT. 38
21MDOEP	SAV0000	SAVAGE RIVER AT MD RT. 135
21MDOEP	WIL0013	WILLS CR. GAG. ST. DOWNST. FR. CONFL/BRAD.RUN
21PA	WQN0506	LITTLE WILLS CRK-SR0096 BR AT BARD-HARRISON
21WV7IWQ	551160	Patterson Creek below Cave Run
21WVINST	PNB-00-{052.0}	North Branch of Potomac below Piedmont, WV
21WVINST	PNB-00-{081.6}	North Branch Potomac below Schell, WV
21WVINST	PNB-00-{082.6}	North Branch Potomac above Schell, WV
21WVINST	PNB-00-{088.9}	North Branch Potomac below Gormania, WV
21WVINST	PNB-00-{101.8}	North Branch Potomac above Henry, WV
21WVINST	PNB-01-{04.2}	Green Spring Run below Donaldson, WV
21WVINST	PNB-04-{04.6}	Patterson Creek in Fort Ashby, WV
21WVINST	PNB-04-{20.2}	Patterson Creek in Headsville, WV
21WVINST	PNB-04-{29.7}	Patterson Creek at Russeldale, WV
21WVINST	PNB-04-{33.0}	Patterson Creek above Russeldale, WV
21WVINST	PNB-04-{39.4}	Patterson Creek below Williamsport, WV
21WVINST	PNB-04-{45.2}	Patterson Creek below Forman, WV
21WVINST	PNB-04-A	Plum Run near Patterson Creek, WV
21WVINST	PNB-04-C.5	Horseshoe Creek near Fort Ashby, WV
21WVINST	PNB-04-CC	Rosser Run near Williamsport, WV
21WVINST	PNB-04-D	Mill Run near Fort Ashby, WV
21WVINST	PNB-04-DD-{2.0}	Thorn Creek near Williamsport, WV
21WVINST	PNB-04-FF	Middle Fork at Medley, WV

Table 20
STORET Sampling Locations for North Branch Potomac River Watershed
Hydrologic Unit Code – 02070002
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
21WVINST	PNB-04-FF-5-A	Unnamed Trib. Middle Fk. Greenland, WV
21WVINST	PNB-04-J-{1.6}	Cabin Run near Champwood, WV
21WVINST	PNB-04-J-1	Pargut Run near Reese Mill, WV
21WVINST	PNB-04-S-{04.7}	Mill Creek near Ridgeville, WV
21WVINST	PNB-04-S-{05.6}	Mill Creek South of Ridgeville, WV
21WVINST	PNB-04-V	Elliber Run at Russeldale, WV
21WVINST	PNB-04-W-3	Whip Run South of Antioch, WV
21WVINST	PNB-07-{03.8}	New Creek below New Creek, WV
21WVINST	PNB-07-{08.4}	New Creek at Claysville, WV
21WVINST	PNB-07-{10.4}	New Creek below Laurel Dale, WV
21WVINST	PNB-07-C	Block Run South of Keyser, WV
21WVINST	PNB-07-C.4-1	Unnamed Trib. near New Creek, WV
21WVINST	PNB-07-H	Linton Creek near Mountain Valley, WV
21WVINST	PNB-07-H-2	Un. Trib. Linton Creek near Mtn. Valley, WV
21WVINST	PNB-10	Slaughterhouse Run at Piedmont, WV
21WVINST	PNB-11-{0.8}	Montgomery Run near Peidmont, WV
21WVINST	PNB-15	Deep Run near Elk Garden, WV
21WVINST	PNB-15-A	Cranberry Run near Elk Garden, WV
21WVINST	PNB-16-.5A-{.4}	Un. Trib. Abrams Ck. near Elk Garden, WV
21WVINST	PNB-16-{05.4}	Abram Creek East of Mt. Storm, WV
21WVINST	PNB-16-{16.8}	Abram Creek West of Mt. Pisgah, WV
21WVINST	PNB-16-{18.1}	Abram Creek at Bismarck, WV
21WVINST	PNB-16-A-{0.8}	Emory Creek above Emoryville, WV
21WVINST	PNB-16-B	Wyckroff Run near Mount Storm, WV
21WVINST	PNB-16-B.5	Laurel Run near Mt. Pisgah, WV
21WVINST	PNB-17-{06.9}	Stony River at Mount Storm, WV
21WVINST	PNB-17-{09.6}	Stony River near Mount Storm, WV
21WVINST	PNB-17-{15.6}	Stony River below Mount Storm Lake, WV
21WVINST	PNB-17-B	Mill Run near Mount Storm, WV
21WVINST	PNB-17-B.5	Laurel Run North of Mount Storm Lake, WV
21WVINST	PNB-17-C	Four Mile Run near Mount Storm Lake, WV
21WVINST	PNB-17-E	Hemlick Run South of Mount Storm Lake, WV
21WVINST	PNB-17-O	Laurel Run South of Mount Storm Lake, WV
21WVINST	PNB-18	Difficult Creek near Gormania, WV
21WVINST	PNB-19-{01.4}	Buffalo Creek above Bayard, WV
21WVINST	PNB-19-A	Little Buffalo above Bayard, WV
21WVINST	PNB-20	Red Oak Creek above Wilson, WV
21WVINST	PNB-21	Elk Run above Henry, WV

Table 21 USE SUMMARY REPORT: OVERALL USE SUPPORT NORTH BRANCH POTOMAC RIVER WATERSHED Waterbody Type: River			
Total Number of River/Streams Assessed:	47		
Total Number of River/Streams Monitored:	47		
Total Number of River/Streams Evaluated:	0		
	ASSESSMENT BASIS IN MILES		
DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	71.44	71.44
SUPPORTING BUT THREATENED	0.00	120.76	120.76
PARTIALLY SUPPORTING	0.00	68.37	68.37
NOT SUPPORTING	0.00	47.40	47.40
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	0.00	307.97	307.97

TABLE 22
USE SUPPORT MATRIX SUMMARY
NORTH BRANCH POTOMAC RIVER WATERSHED
WATERBODY TYPE: RIVER
UNITS IN MILES

USE	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting
Overall Use	71.44	120.76	68.37	47.40
Aquatic Life	89.81	98.19	67.25	47.40
Fish Consumption	25.25		50.50	
Cold Water Fishery - Trout	20.63	33.56	8.25	2.63
Warm Water Fishery	43.20	51.39	51.91	
Bait Minnow Fishery	25.98	13.24	7.09	32.77
Primary Contact Recreation	190.66	84.72	1.13	31.46
Industrial	17.50			

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the North Branch Potomac River watershed is provided in Table 23.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Dioxins (50.50 miles), Metals (35.07 miles), pH (32.19 miles), and Siltation (32.09 miles).

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the North Branch Potomac River watershed is provided in Table 24.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Industrial Point Sources (50.50 miles), Abandoned Mining (34.82 miles) and Acid Mine Drainage (33.01 miles).

Table 23
Complete Summary of Causes, Including User-Defined
North Branch Potomac River Watershed
Sizes of Waterbodies Not Fully Supporting Uses
Affected by Various Cause Categories
Waterbody Type: River

Code	Cause Category	Major Impact in Miles	Moderate/Minor Impact in Miles
0000	CAUSE UNKNOWN	5.60	3.42
0420	DIOXINS	50.50	0.00
0500	METALS	33.92	1.15
0580	Zinc	1.52	0.00
0750	SULFATES	3.04	23.56
0900	NUTRIENTS	0.00	5.40
0920	Nitrogen	0.00	5.40
1000	pH	32.19	0.00
1100	SILTATION	8.13	23.96
1600	HABITAT ALTERATION (non-flow)	2.81	14.78
1700	PATHOGENS	0.40	0.00
1710	Fecal Coliform Bacteria	0.40	0.00

Table 24 Complete Summary of Sources, Including User-Defined North Branch Potomac River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0100	INDUSTRIAL POINT SOURCES	50.50	0.00
1000	AGRICULTURE	0.40	6.08
1350	GRAZING-RELATED SOURCES	0.40	6.08
1410	Pasture Grazing-Riparian	0.40	0.00
4600	Erosion and Sedimentation	0.00	12.21
5000	RESOURCE EXTRACTION	36.45	2.17
5700	Mine Tailings	1.52	0.00
5800	Acid Mine Drainage	33.01	0.00
5900	Abandoned Mining	34.28	2.17
7000	HYDROMODIFICATION	0.00	12.21
7200	Dredging	0.00	12.21
7550	HABITAT MODIFICATION (other than hydromodification)	0.00	2.17
9000	SOURCE UNKNOWN	5.60	4.92

Size of Waters Affected by Toxics

During this reporting cycle, 252.20 stream miles in the North Branch Potomac River watershed were monitored for toxics. Of these, 78.22 miles (31.0%) had elevated levels.

Public Health/Aquatic life Impacts

During this reporting period, no bathing beach or public water supply closures were documented in the watershed. In addition, no fish kills were reported. A fish consumption advisory currently is in effect for the lower 50.50 miles of the North Branch mainstem due to dioxin contamination originating from the Westvaco Pulp Mill in Luke, Maryland. The advisory covers non-sport fish only (Table 73).

Section 303(d) Waters

Table 25 includes streams from the North Branch Potomac River watershed that are on the current 303(d) list. Fourteen streams from the watershed are on the list, including one (Stony River) on the Primary Waterbody List and 13 on the Mine Drainage Impaired sublist. (Note: Although the North Branch mainstem currently is under a fish consumption advisory, since the stream belongs to Maryland, it is not included on West Virginia's 303(d) list). Currently, no 303(d) listed streams in the North Branch Potomac River watershed have had TMDL's completed.

TABLE 25
West Virginia
1998 303(d) List
North Branch Potomac River Watershed

Primary Waterbody List

Stream Name	Stream Code	Use Affected	Pollutant	Primary Source	Miles Affected	Reach Description	TMDL Priority
Stony River	PNB-17	AQL	pH,Unionized Ammonia	Mine	4.69	Between Fourmile Run and Mill Run	High
Stony River	PNB-17	AQL	Metals	Mine	11.87	Between Fourmile Run and mouth	High

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Slaughterhouse Rn	PNB-10	2.17	Aquatic Life	pH, Metals	Mine Drainage	Medium
Montgomery Rn	PNB-11	2.81	Aquatic Life	pH, Metals	Mine Drainage	Medium
Piney Swamp Rn	PNB-12	5.51	Aquatic Life	pH, Metals	Mine Drainage	Medium
Abram Ck	PNB-16	18.50	Aquatic Life	pH, Metals	Mine Drainage	Medium
Emory Rn	PNB-16-A	2.25	Aquatic Life	pH, Metals	Mine Drainage	Medium
Glade Rn	PNB-16-C	3.04	Aquatic Life	pH, Metals	Mine Drainage	Medium
Little Ck	PNB-16-D	0.68	Aquatic Life	pH, Metals	Mine Drainage	Medium
Laurel Run	PNB-17-B.5	1.42	Aquatic Life	pH	Mine Drainage	Medium
Fourmile Run	PNB-17-C	1.52	Aquatic Life	pH, Metals	Mine Drainage	Medium
Laurel Run	PNB-17-D	1.37	Aquatic Life	pH, Metals	Mine Drainage	Medium
Helmick Run	PNB-17-E	0.95	Aquatic Life	pH, Metals	Mine Drainage	Medium
Elk Run	PNB-21	3.15	Aquatic Life	Iron	Mine Drainage	Medium
Deakin Rn	PNB-22	1.15	Aquatic Life	pH, Metals	Mine Drainage	Medium

AQL = Aquatic Life   TMDL = Total Maximum Daily Load
HH = Human Health   MP = Mile Point

The Tygart Valley River Watershed

Background

The mouth of the Tygart Valley River is located in Fairmont where it joins with the West Fork River to form the Monongahela River. The area around the mouth of the Tygart Valley River is much more urban than the remaining portions of the watershed. The Tygart Valley River Watershed includes parts of Marion, Preston, Taylor, Barbour, Tucker, Randolph, Pocahontas and Upshur counties.

The headwaters of the Tygart Valley River rise near Spruce in Pocahontas County. The River flows northwest for 130 miles and drains an area of 1,376 square miles. The two largest tributaries are the Buckhannon River and the Middle Fork River.

The total population of the watershed is approximately 84,000. There are approximately 62 people for every square mile in this watershed. The population is widely distributed across the watershed, primarily concentrated in small towns and rural unincorporated communities. Only part of Fairmont is in the Tygart Valley River watershed. Five other towns are located within the watershed. Grafton, in Taylor County, has an approximate population of 5,500. Philippi, in Barbour County, has an approximate population of 3,100. Buckhannon, in Upshur County, has an approximate population of 6,000. Elkins, in Randolph County, has an approximate population of 7,500. Some industrialization has occurred in and near these relatively small towns.

Three small private colleges are located within this watershed: Alderson-Broaddus College at Philippi, Davis and Elkins College at Elkins, and West Virginia Wesleyan College at Buckhannon.

DEP records indicate there are 416 streams totaling 2,154 miles in the Tygart Valley River watershed. In addition, the watershed contains 3,332.8 acres of Palustrine Wetlands and 341.3 acres of Lacustrine Wetlands. There are 3,341.1 acres of Riverine waters and 1,467.8 acres of Lacustrine waters.

The headwaters and the eastern edge of the Tygart Valley River watershed are within theRidge and Valley Ecoregion (67). This area is known for its northeast-southwest trending ridges of various heights and widths. Due to the extreme folding and faulting events the regions roughly parallel ridges and valleys have a variety of widths, heights, and geologic materials, including limestone, dolomite, shale, siltstone, sandstone, chert, mudstone and marble. This area is primarily forested but there is some pasture and agriculture in the wider valleys. Shale barrens occur on steep west and south facing slopes.

The Central Appalachians Ecoregion (69) occupies the largest central portion of the watershed. It extends from the headwaters of the Middle Fork to the mouth of the Tygart Valley River at Fairmont. This ecoregion is primarily a high, dissected, rugged plateau composed of sandstone, shale, conglomerate and coal. The rugged terrain, cool climate, and infertile soils limit agriculture in this area. It is covered by extensive forests. Bituminous coal mines are common and are a source of siltation and acidification of streams. Access roads for oil and gas wells are also important sources of silt in this watershed.

The western edge of the watershed lies in the Monongahela Transition Zone (70b) of the Western Allegheny Plateau Ecoregion (70). The hilly and wooded terrain was not glaciated and is more rugged than the areas further to the north and west but is less rugged and less forested than the ecoregions to the east and south. The rounded hills in this ecoregion are mostly forested with dairy, livestock, and general farms occurring in the valleys. Horizontally bedded sedimentary rock underlies the region. Bituminous coal mines are a source of siltation and acidification of streams in this ecoregion.

The Middle Fork River has been severely impacted by acid mine drainage from coal mines located in the Kittle Flats area. Most of this mining occurred between 1970 and 1990. Many other streams in this watershed have been and continue to be negatively impacted by acid mine drainage. However, the Middle Fork River is being restored. Starting in 1995 limestone sand and other passive abatement technologies have been installed along the Middle Fork. In 1997 trout were once again stocked on the Middle Fork River near Audra State Park, the first time trout were stocked here since 1973.

The mean annual precipitation in this watershed ranges from 42 to 53 inches per year.

Water Quality Summary

During this reporting period, 136 streams totaling 701.72 miles were assessed in the Tygart Valley River watershed. Figure 7 is a map depicting sampling stations in the Tygart watershed, while Table 26 provides a list of these stations. A summary of overall designated use

Figure 7
Tygart Valley River Watershed
Hydrologic Unit – 05020001

STORET Sampling Locations
1994-1998

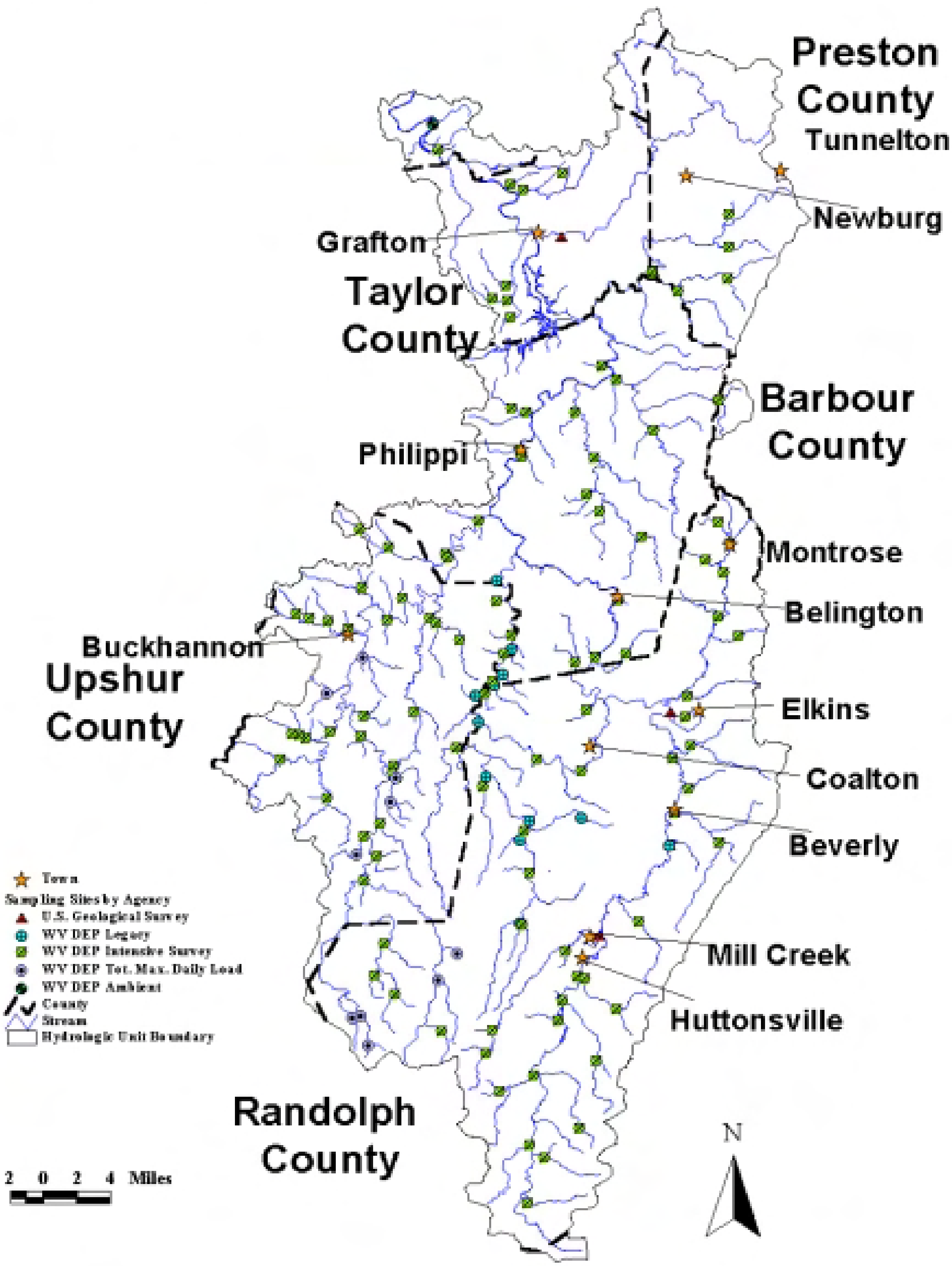

Table 26 STORET Sampling Locations for Tygart Valley River Watershed Hydrologic Unit Code – 05020001 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Location**
112WRD	3050000	TYGART VALLEY RIVER NEAR DAILEY, WV
112WRD	3050500	TYGART VALLEY RIVER NEAR ELKINS, WV
112WRD	3056250	THREE FORK CREEK NR GRAFTON, WV
112WRD	3.84E+14	TYGART VALLEY RIV NR HUTTONSVILLE
21WVTMDL	MTB-13-{00.80}	Little Sand Fork near Buckhannon, WV
21WVTMDL	MTB-17-{01.67}	Cutright Run near Hinkleville, WV
21WVTMDL	MTB-25-{00.57}	Tenmile Creek above Tenmile, WV
21WVTMDL	MTB-25-A-{01.7}	Right Fork Tenmile Creek South of Tenmile, WV
21WVTMDL	MTB-28-{01.33}	Big Run above Alton, WV
21WVTMDL	MTB-31-{59.57}	Right Fork Buckhannon River below Pickens, WV
21WVTMDL	MTB-31-{61.58}	Right Fork Buckhannon River above Pickens, WV
21WVTMDL	MTB-31-J-{02.1}	Marsh Fork near Pickens, WV
21WVTMDL	MTB-32-{10.60}	Left Fork Buckhannon River East of Pickens, WV
21WVTMDL	MTB-32-G-{01.1}	Dry Run near Adolph, WV
21WVWQAS	WA96-M03	Tygart Valley River at Colfax, W. Va.
21WV7IWQ	550452	Tygart Valley River above Beverly, W. Va.
21WV7IWQ	550574	Tygart Valley River at Colfax, W. Va.
21WV7IWQ	550844	Middle Fork River at Adolph, W. Va.
21WV7IWQ	551108	Middle Fork River at Audra State Park, WV
21WV7IWQ	551109	Middle Fork River at Finegan Ford, WV
21WV7IWQ	551110	Devil Run near Lantz, W.Va.
21WV7IWQ	551111	Hell Run near Lantz, W. Va.
21WV7IWQ	551112	White Oak Run near Midvale, W. Va.
21WV7IWQ	551113	Middle Fork River above Ellamore, W. Va.
21WV7IWQ	551114	Middle Fork River above Long Run, W. Va.
21WV7IWQ	551115	Middle Fork River below Cassity, W. Va.
21WV7IWQ	551116	Cassity Fork at Cassity, W. Va.
21WV7IWQ	551117	Cassity Fork above Cassity, W. Va.
21WV7IWQ	551118	Middle Fork River above Cassity, W. Va.
21WVINST	MT-00-{046.2}	Tygart Valley River above Philippi, WV
21WVINST	MT-00-{083.0}	Tygart Valley River in Elkins, WV
21WVINST	MT-00-{093.6}	Tygart Valley River above Elkins, WV
21WVINST	MT-00-{115.0}	Tygart Valley River above Huttonsville, WV
21WVINST	MT-04	Goose Creek at Powell, WV
21WVINST	MT-07	Plum Run North of Grafton, WV
21WVINST	MT-08	Wickwire Run North of Grafton, WV
21WVINST	MT-11-{06.63}	Berkely Run above Webster, WV

Table 26
STORET Sampling Locations for
Tygart Valley River Watershed
Hydrologic Unit Code – 05020001
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
21WVINST	MT-11-A	Shelby Run near Webster, WV
21WVINST	MT-11-B	Long Run near Webster, WV
21WVINST	MT-11-B-1	Berry Run near Webster, WV
21WVINST	MT-12-{10.20}	Three Fork Creek below Irontown, WV
21WVINST	MT-18-{09.60}	Sandy Creek near Marquess, WV
21WVINST	MT-18-E-{00.40}	Little Sandy Creek near Marquess, WV
21WVINST	MT-18-E-3-A-{1}	Un. Trib. L. Fk. Lit. Sandy C. Fellowsville, WV
21WVINST	MT-18-E-4-A	Tibbs Run near Fellowsville, WV
21WVINST	MT-18-G-2	Un. Trib. Left Fk. L. Sandy Ck Fellowsville, WV
21WVINST	MT-22	Cummingham Run near Clemtown, WV
21WVINST	MT-23	Teter Creek at Moatsville, WV
21WVINST	MT-23-B-1	Stony Run above Kasson, WV
21WVINST	MT-23-C-{05.6}	Brushy Fork near St. George, WV
21WVINST	MT-23-F	Mill Run near Nestorville, WV
21WVINST	MT-24-A	Frost Run near Meriden, WV
21WVINST	MT-24-C	Sugar Creek near Kalamazoo, WV
21WVINST	MT-24-C-1.5-A	Bear Run near Calhoun, WV
21WVINST	MT-24-C-2	Bills Creek near Calhoun, WV
21WVINST	MT-24-C-3.5	Hunter Fork near Calhoun, WV
21WVINST	MT-26-{00.4}	Hackers Creek north of Phillipi, WV
21WVINST	MT-26-B	Foxgrape Run near Philippi, WV
21WVINST	MT-26-C	Little Hackers Creek near Philippi, WV
21WVINST	MT-29	Anglins Run near Philippi, WV
21WVINST	MT-35.5	Shooks Run in Belington, WV
21WVINST	MT-36	Island Run in Junior, WV
21WVINST	MT-37-{0.0}	Beaver Creek near Junior, WV
21WVINST	MT-37-{2.9}	Beaver Creek east of Junior, WV
21WVINST	MT-38-A	Back Fork near Junior, WV
21WVINST	MT-41-{01.0}	Grassy Run near Norton, WV
21WVINST	MT-42-{07.7}	Roaring Creek near Mabie, WV
21WVINST	MT-42-B-3-{1.0}	Un. Trib. Flatbush Fk. near Mabie, WV
21WVINST	MT-43-{13.2}	Leading Creek below Montrose, WV
21WVINST	MT-43-{15.6}	Leading Creek at Montrose, WV
21WVINST	MT-43-A	Craven Run in Elkins, WV
21WVINST	MT-43-F-1	Loglick Run near Elkins, WV
21WVINST	MT-43-H	Davis Lick near Kerens, WV
21WVINST	MT-43-M	Campfield Run near Montrose, WV
21WVINST	MT-43-O	Laurel Run near Montrose, WV
21WVINST	MT-45	Chenoweth Creek at Elkins, WV

Table 26
STORET Sampling Locations for
Tygart Valley River Watershed
Hydrologic Unit Code – 05020001
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Location
21WVINST	MT-48	King Run at Hazelwood, WV
21WVINST	MT-50	Files Creek at Beverly, WV
21WVINST	MT-50-A-1	Limekiln Run near Beverly, WV
21WVINST	MT-61-{02.0}	Shavers Run near Valley Bend, WV
21WVINST	MT-64-A.5	Buck Run near Mill Creek, WV
21WVINST	MT-64-E	Meatbox Run in Kumbrabow State Forest, WV
21WVINST	MT-64-F	Potatohole Fork in Kumbrabow State Forest, WV
21WVINST	MT-66	Riffle Creek near Huttonsville, WV
21WVINST	MT-66-B	McGee Run near Huttonsville, WV
21WVINST	MT-68	Becky Creek near Huttonsville, WV
21WVINST	MT-68-D	Wamsley Run South of Huttonsville, WV
21WVINST	MT-69	Poundmill Run near Huttonsville, WV
21WVINST	MT-74	Elkwater Fork South of Huttonsville, WV
21WVINST	MT-74-B-1	Fortlick Run South of Huttonsville, WV
21WVINST	MT-75-{16.2}	Stewart Run near Valley Head, WV
21WVINST	MT-78	Ralston Run at Valley Head, WV
21WVINST	MT-79-{0.9}	Windy Run at Valley Head, WV
21WVINST	MT-81-{0.8}	Big Run above Mingo, WV
21WVINST	MTB-00-{06.6}	Buckhannon River below Hall, WV
21WVINST	MTB-03	Big Run at Carrolton, WV
21WVINST	MTB-05	Pecks Run near Hall, WV
21WVINST	MTB-05-B	Little Pecks Run near Pecks Run, WV
21WVINST	MTB-05-C	Mud Run near Hodgesville, WV
21WVINST	MTB-07-{01.0}	Sand Run at Kesling Mill, WV
21WVINST	MTB-07-A-{00.5}	Laurel Fork above Kesling Mill, WV
21WVINST	MTB-07-A-{02.9}	Laurel Fork near Kesling Mill, WV
21WVINST	MTB-07-C-{0.32}	Un. Trib Sand Run at Goodwin, WV
21WVINST	MTB-08	Big Run near Fishing Camp, WV
21WVINST	MTB-09	Childers Run near Buckhannon, WV
21WVINST	MTB-10-A	Sugar Run near Buckhannon, WV
21WVINST	MTB-11	Fink Run in Buckhannon, WV
21WVINST	MTB-11-B	Mud Lick Run near Buckhannon, WV
21WVINST	MTB-11-B.5	Wash Run near Buckhannon, WV
21WVINST	MTB-11-B.7	Bridge Run near Lorentz, WV
21WVINST	MTB-18-{11.2}	French Creek above French Creek, WV
21WVINST	MTB-18-A	Crooked Run near Adrian, WV
21WVINST	MTB-18-B	Bull Run in Adrian, WV
21WVINST	MTB-18-B-2	Blacklick Run in Adrian, WV
21WVINST	MTB-18-B-3	Mudlick Run in Adrian, WV

Table 26 STORET Sampling Locations for Tygart Valley River Watershed Hydrologic Unit Code – 05020001 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Location**
21WVINST	MTB-18-D-{03.9}	Laurel Fork at Evergreen, WV
21WVINST	MTB-19-{0.9}	Trubie Run near Sago, WV
21WVINST	MTB-20	Sawmill Run near Sago, WV
21WVINST	MTB-24	Laurel Run near Tenmile, WV
21WVINST	MTB-25	Tenmile Creek in Tenmile, WV
21WVINST	MTB-25-A	Right Fork Tenmile Creek in Tenmile, WV
21WVINST	MTB-27	Panther Fork at Beans Mill, WV
21WVINST	MTB-28	Big Run at Alton, WV
21WVINST	MTB-29	Swamp Run near Alton, WV
21WVINST	MTB-31-F-1	Trout Run at Helvetia, WV
21WVINST	MTB-31-F-2-{1}	Upper Trout Run above Helvetia, WV
21WVINST	MTB-31-F-5	Salt Block Run near Helvetia, WV
21WVINST	MTB-32-{00.40}	Left Fork Buckhannon River in Alexander, WV
21WVINST	MTB-32-I-1	Phillips Camp Run at Kumbrabow State Forest, WV
21WVINST	MTM-00.5-{0.6}	Swamp Run at Swamp Run, WV
21WVINST	MTM-02	Laurel Run near Nebo, WV
21WVINST	MTM-03	Hooppole Run near Gormley, WV
21WVINST	MTM-05	Service Run near Gormley, WV
21WVINST	MTM-07	Short Run near Ellamore, WV
21WVINST	MTM-11-{0.3}	Right Fork below Kedron, WV
21WVINST	MTM-13-{00.80}	Long Run Southeast of Cassity, WV
21WVINST	MTM-17	Three Forks Run near Cassity, WV
21WVINST	MTM-21	Pleasant Run near Cassity, WV
21WVINST	MTM-27	Mitchell Lick Fork at Adolph, WV

support is provided in Table 27 while a use support matrix summary of all designated uses is given in Table 28.

Of the 701.72 stream miles assessed, 180.67 (25.7%) were fully supporting their overall designated uses, 264.59 (37.7%) were fully supporting but threatened, 128.80 (18.4%) were partially supporting, and 127.66 (18.2%) were non-supporting.

Of the 682.14 miles assessed for Aquatic Life Support use, 231.67 (34.9%) were fully supporting, 201.21 (29.5%) were fully supporting but threatened, 131.40 (19.3%) were partially supporting, and 117.86 (17.3%) were non-supporting.

Table 27 USE SUMMARY REPORT: OVERALL USE SUPPORT TYGART RIVER WATERSHED Waterbody Type: River			
Total Number of River/Streams Assessed:	136		
Total Number of River/Streams Monitored:	136		
Total Number of River/Streams Evaluated:	0		
	ASSESSMENT BASIS IN MILES		
DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	180.67	180.67
SUPPORTING BUT THREATENED	0.00	264.59	264.59
PARTIALLY SUPPORTING	0.00	128.80	128.80
NOT SUPPORTING	0.00	127.66	127.66
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	0.00	701.72	701.72

TABLE 28
USE SUPPORT MATRIX SUMMARY
TYGART RIVER WATERSHED
WATERBODY TYPE: RIVER
UNITS IN MILES

USE	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting
Overall Use	180.67	264.59	128.80	127.66
Aquatic Life	231.67	201.21	131.40	117.86
Cold Water Fishery - Trout	121.29	101.05	30.06	18.73
Warm Water Fishery	33.08	62.99	40.42	40.60
Bait Minnow Fishery	71.50	37.17	60.92	64.30
Primary Contact Recreation	341.92	256.39	13.21	97.20
Drinking Water Supply	41.19		5.55	

During this reporting period, no streams were assessed for the Fish Consumption use. Of the 133.55 miles assessed for Primary Contact Recreation use, 341.922(48.2%) were fully supporting, 256.39 (36.2%) were fully supporting but threatened, 13.21 (1.9%) were partially supporting, and 97.20 (13.7%) were non-supporting.

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Tygart Valley River watershed is provided in Table 29.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Siltation (153.31 miles), Habitat Alteration (non-flow) (108.75 miles), Metals (106.39 miles), and pH (98.85 miles).

Table 29
Complete Summary of Causes, Including User-Defined
Tygart River Watershed
Sizes of Waterbodies Not Fully Supporting Uses
Affected by Various Cause Categories
Waterbody Type: River

Code	Cause Category	Major Impact in Miles	Moderate/Minor Impact in Miles
0000	CAUSE UNKNOWN	10.12	15.23
0500	METALS	83.36	23.03
0580	Zinc	21.84	4.60
0750	SULFATES	0.00	4.60
0800	OTHER INORGANICS	4.60	1.92
0900	NUTRIENTS	0.00	4.60
0920	Nitrogen	0.00	4.60
1000	pH	84.35	14.50
1100	SILTATION	22.17	131.14
1500	FLOW ALTERATIONS	2.60	0.00
1600	HABITAT ALTERATION (non-flow)	11.80	96.95
1700	PATHOGENS	14.40	0.00
1710	Fecal Coliform Bacteria	13.40	0.00
2400	TOTAL TOXICS	2.80	0.00
2900	ODOR	2.37	0.00

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Tygart Valley River watershed is provided in Table 30.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Abandoned Mining (120.25 miles), Acid Mine Drainage (88.33 miles), and Unknown Source (56.07 miles).

Table 30
Complete Summary of Sources, Including User-Defined
Tygart River Watershed
Sizes of Waterbodies Not Fully Supporting Uses
Affected by Various Source Categories
Waterbody Type: River

Code	Source Category	Major Impact in Miles	Moderate/Minor Impact in Miles
1000	AGRICULTURE	0.00	13.08
1350	GRAZING-RELATED SOURCES	0.00	3.40
1400	Pasture Grazing-Riparian and/or Upland	0.00	5.68
2000	SILVICULTURE	0.00	6.40
5000	RESOURCE EXTRACTION	96.69	54.01
5100	Surface Mining	2.60	2.60
5200	Subsurface Mining	0.00	4.60
5500	Petroleum Activities	0.00	6.40
5800	Acid Mine Drainage	80.58	7.75
5900	Abandoned Mining	75.64	44.61
5950	Inactive Mining	2.60	0.00
7000	HYDROMODIFICATION	4.10	17.88
7100	Channelization	1.50	17.88
7550	HABITAT MODIFICATION (other than hydromodification)	0.00	9.20
7600	Removal of Riparian Vegetation	0.00	9.20
7700	Streambank Modification/Destabilization	0.00	9.20
8100	ATMOSPHERIC DEPOSITION	14.68	14.50
8520	DEBRIS AND BOTTOM DEPOSITS	0.00	3.80
8600	NATURAL SOURCES	0.00	4.40
9000	SOURCE UNKNOWN	20.29	35.78

Size of Waters Affected by Toxics

During this reporting cycle, 268.91 stream miles in the Tygart Valley River watershed were monitored for toxics. Of these, 66.07 miles (24.6%) had elevated levels.

Public Health/Aquatic life Impacts

No fish consumption advisories are currently in effect for the Tygart Valley River watershed. During this reporting period, no bathing beach or public water supply closures were documented. In addition, no fish kills were reported.

Section 303(d) Waters

Table 31 includes streams from the Tygart Valley River watershed that are on the current 303(d) list. Seventy-one streams from the watershed are on the list, including three on the Primary Waterbody List, 50 on the Mine Drainage Impaired sublist, and 18 on the Acid Rain Impaired sublist.

Two streams in the watershed have had TMDL's completed. These are Buckhannon River and Ten Mile Creek, both impaired by metals from mine drainage. TMDL's for the Tygart River mainstem and its associated mine drainage impacted tributaries are underway and are anticipated to be completed by March of 2001.

TABLE 31
West Virginia
1998 303(d) List
Tygart River Watershed

Primary Waterbody List

Stream Name	Stream Code	Use Affected	Pollutant	Primary Source	Miles Affected	Reach Description	TMDL Priority
Buckhannon River	MT-31	AQL, HH	Iron	Mine Drainage	5.55	Forks to Beans Mill	Completed
Ten Mile Creek	MTB-25	AQL	Aluminum, Iron	Mine Drainage	3.2	Entire length	Completed
Middle Fork River	MT-33	AQL; HH	pH	Mine Drainage	5	Between Cassity Fork and Long Run	High
Middle Fork River	MT-33	AQL	Aluminum	Mine Drainage	5	Between Cassity Fork and Long Run	High

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Goose Ck	MT-4	2.60	Aquatic Life	pH, Metals	Mine Drainage	High
Lost Rn	MT-5	8.60	Aquatic Life	pH, Metals	Mine Drainage	High
Berkely Rn	MT-11	7.20	Aquatic Life	pH, Metals	Mine Drainage	High
Shelby Rn	MT-11-A	3.60	Aquatic Life	pH, Metals	Mine Drainage	High
Long Rn / Berkeley Rn	MT-11-B	3.60	Aquatic Life	pH, Metals	Mine Drainage	High
Berry Rn	MT-11-B-1	1.50	Aquatic Life	pH, Metals	Mine Drainage	High
Threefork Ck	MT-12	19.00	Aquatic Life	pH, Metals	Mine Drainage	High
Raccoon Ck / Threefork Ck	MT-12-C	8.80	Aquatic Life	pH, Metals	Mine Drainage	High
Little Racoon Rn	MT-12-C-2	2.60	Aquatic Life	Metals	Mine Drainage	High
Brains Ck / Fields Ck	MT-12-G-2	4.90	Aquatic Life	pH, Metals	Mine Drainage	High
Birds Ck	MT-12-H	5.50	Aquatic Life	pH, Metals	Mine Drainage	High
Squires Ck	MT-12-I	4.50	Aquatic Life	pH, Metals	Mine Drainage	High
Sandy Ck	MT-18	16.40	Aquatic Life	pH, Metals	Mine Drainage	High
Glade Rn / Sandy Ck	MT-18-C	2.90	Aquatic Life	pH, Metals	Mine Drainage	High
Little Sandy Ck	MT-18-E	10.60	Aquatic Life	pH, Metals	Mine Drainage	High

TABLE 31 Continued
Tygart River Watershed

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Maple Rn	MT-18-E-1	4.80	Aquatic Life	pH, Metals	Mine Drainage	High
Left Fk / Ll Sandy Ck	MT-18-E-3	5.40	Aquatic Life	pH, Metals	Mine Drainage	High
Left Fork / Sandy Ck	MT-18-G	8.00	Aquatic Life	Metals	Mine Drainage	High
Frost Rn	MT-24-A	2.20	Aquatic Life	pH, Metals	Mine Drainage	High
Foxgrape Rn	MT-26-B	3.40	Aquatic Life	Aluminum	Mine Drainage	High
Little Hackers Ck	MT-26-C	1.60	Aquatic Life	Aluminum	Mine Drainage	High
Ford Rn	MT-27	2.70	Aquatic Life	pH, Metals	Mine Drainage	High
Anglins Rn	MT-29	2.60	Aquatic Life	pH, Metals	Mine Drainage	High
Island Rn	MT-36	1.20	Aquatic Life	pH, Metals	Mine Drainage	High
Beaver Ck	MT-37	4.60	Aquatic Life	pH, Metals	Mine Drainage	High
Laurel Rn	MT-39	3.40	Aquatic Life	pH, Metals	Mine Drainage	High
U.t./Tygart Valley Rv at Harding	MT-40.?	0.00	Aquatic Life	pH, Metals	Mine Drainage	High
Grassy Rn	MT-41	2.80	Aquatic Life	pH, Metals	Mine Drainage	High
Roaring Ck	MT-42	15.00	Aquatic Life	pH, Metals	Mine Drainage	High
Pecks Rn	MTB-5	8.20	Aquatic Life	pH/Metals	Mine Drainage	High
U.t. / Pecks Rn	MTB-5-.8A	0.69	Aquatic Life	pH/Metals	Mine Drainage	High
Little Pecks Rn	MTB-5-B	2.49	Aquatic Life	Mn, Fe	Mine Drainage	High
Mud Rn/pecks Rn	MTB-5-C	1.18	Aquatic Life	Metals	Mine Drainage	High
Turkey Rn	MTB-10	7.04	Aquatic Life	pH/Metals	Mine Drainage	High
Sugar Rn	MTB-10-A	1.73	Aquatic Life	Metals	Mine Drainage	High
Fink Rn	MTB-11	8.17	Aquatic Life	pH/Metals	Mine Drainage	High
Mud Lick of Fink Rn	MTB-11-B	1.90	Aquatic Life	Iron,	Mine Drainage	High
Bridge Rn / Fink Rn	MTB-11-B.7	2.47	Aquatic Life	pH, Metals	Mine Drainage	High

TABLE 31 Continued
Tygart River Watershed

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Bull Rn	MTB-18-B	3.90	Aquatic Life	Iron	Mine Drainage	High
Blacklick Rn	MTB-18-B-2	2.09	Aquatic Life	Iron	Mine Drainage	High
Mudlick Rn	MTB-18-B-3	1.14	Aquatic Life	Iron	Mine Drainage	High
Panther Fk	MTB-27	6.40	Aquatic Life	pH	Mine Drainage	High
Swamp Rn	MTB-29	1.68	Aquatic Life	pH, Metals	Mine Drainage	High
Herods Rn	MTB-30	2.62	Aquatic Life	pH	Mine Drainage	High
Left Fk / Buckhannon Rv	MTB-32	17.90	Aquatic Life	pH, Iron	Mine Drainage	High
Devil Rn	MTM-4	2.33	Aquatic Life	pH, Metals	Mine Drainage	High
Hell Rn	MTM-6	3.23	Aquatic Life	pH, Metals	Mine Drainage	High
Whiteoak Rn	MTM-8	1.92	Aquatic Life	pH, Metals	Mine Drainage	High
Cassity Ck	MTM-16	6.40	Aquatic Life	pH, Metals	Mine Drainage	High
Panther Rn	MTM-16-A	5.80	Aquatic Life	pH, Metals	Mine Drainage	High

Waterbodies Impaired by Acid Rain

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Little Laurel Run / Big Run	MT-40-A	3.8	Aquatic Life	pH	Acid Rain	Low
U.t. / Roaring Creek	MT-42-F	1.2	Aquatic Life	pH	Acid Rain	Low
Glade Run	MT-64-C	1.8	Aquatic Life	pH	Acid Rain	Low
Meatbox Run	MT-64-E	1.3	Aquatic Life	pH	Acid Rain	Low
Potatohole Fork	MT-64-F	2	Aquatic Life	pH	Acid Rain	Low
Right Fk / Tenmile Creek	MTB-25-A	4.03	Aquatic Life	pH	Acid Rain	Low
Right Fk / Buckhannon Rv	MTB-31	16.8	Aquatic Life	pH	Acid Rain	Low
Marsh Fork	MTB-31-J	5.48	Aquatic Life	pH	Acid Rain	Low
Left Fk / Buckhannon Rv	MTB-32	17.9	Aquatic Life	pH	Acid Rain	Low

TABLE 31 Continued Tygart River Watershed						
Waterbodies Impaired by Acid Rain						
Stream Name	**Stream Code**	**Miles Affected**	**Use Affected**	**Pollutant**	**Source**	**TMDL Priority**
Smooth Rocklick Rn (Dons Run)	MTB-32-A	1.96	Aquatic Life	pH	Acid Rain	Low
Bearcamp Run	MTB-32-D	5.48	Aquatic Life	pH	Acid Rain	Low
Beech Rn/Lt Fk/Buckhannon Rv	MTB-32-H	5.2	Aquatic Life	pH	Acid Rain	Low
Laurel Rn / Middle Fork	MTM-2	2	Aquatic Life	pH	Acid Rain	Low
Service Run / Middle Fk	MTM-5	0.95	Aquatic Life	pH	Acid Rain	Low
Short Run / Middle Fk	MTM-7	1.74	Aquatic Life	pH	Acid Rain	Low
Cassity Fk	MTM-16	4.3	Aquatic Life	pH	Acid Rain	Low
Birch Fk	MTM-26	6.6	Aquatic Life	pH	Acid Rain	Low
Kittle Ck	MTM-28	6.2	Aquatic Life	pH	Acid Rain	Low

* Contaminant found in fish tissue
# Contaminant found in fish tissue and water column
AQL = Aquatic Life
HH = Human Health

TMDL = Total Maximum Daily Load
HUC = Hydrologic Unit Code
MP = Mile Point

The Gauley River Watershed

Background

The Gauley River watershed is tributary to Great Kanawha River. Indeed, the confluence of Gauley River and New River is the head of Great Kanawha River. Gauley River was named after a French trapper, Gauloise, who operated within this watershed (McWhorter, 1974). According to John P. Hale in his book, *Trans-Allegheny Pioneers* (1971), the Delaware Indians called the River "To-ke-bel-lo-ke" signifying "Falling Creek." This may have been a reference to the fact that the River's mouth is immediately upstream of the falls of Great Kanawha River. However, it also aptly describes the character of the River upstream of the village of Swiss, where world-class whitewater rafting action today is supported by the falling water of Gauley River.

The watershed is subject to the effects of both continental polar air masses and maritime tropical air masses. The worst floods are generally those brought on by tropical storms, including hurricanes, that penetrate across the Allegheny Mountains and move in a westerly direction. Such storms dump rain upon the headwaters first and continue pouring as they move in the same direction that the mainstem Gauley River flows. Winters in this watershed are often very snowy, especially in the high eastern portion where the orographic effect causes westerly air masses to dump significant quantities of snow in winter and rain in other seasons. Consequently, the watershed rarely suffers from drought.

Encompassing 1,481 square miles, the watershed area includes some of the most remote mountain terrain in West Virginia's Allegheny Highlands. Cranberry Wilderness Area and Cranberry Backcountry are managed for wildland recreation experiences by the United States Forest Service. A significant portion of the watershed is located in these remote areas and others managed by the Monongahela National Forest. Red Spruce forests cloak the highest ridges that drain into the Gauley watershed. Poorly buffered soils and acidic deposition combine to make many of the headwater streams slightly acidic. Several decades ago, Cranberry River was one of West Virginia's best trout streams. The advent of the era of acid rain nearly sounded the death knell for this River. Today, the only thing preventing its demise is an artificial liming effort on some of its tributaries by the WV Division of Natural Resources. Other significant public lands within the watershed area include Summersville Reservoir (the State's largest impoundment), Gauley River National Recreation Area, Meadow River Wildlife Management Area and Carnifex Ferry Battlefield State

Park.

Rocks with relatively low amounts of calcium and carbonate predominate in the Cherry River, Cranberry River and Upper Gauley River subwatersheds. These siltstones, shales, coals and coarse-grained sandstones of the Pennsylvanian System parent poorly-buffered soils. The organic acids from decaying spruce, hemlock and great laurel, combined with mineral acids from the sky, tax the low acid neutralizing capacity of these soils. Consequently, many streams in these subwatersheds are acidic. Other tributaries, such as Williams River and Meadow River are more buffered because their headwaters are underlain with calcareous strata of the Mississippian System, such as the shales, sandstones and limestones of the Hinton and Bluefield Formations.

Gauley River Watershed is located within the Central Appalachians Ecoregion, with the watershed area being about equally divided between the Cumberland Mountains and Forested Hills & Mountains Subecoregions. The ecoregion boundaries closely approximate geological boundaries, but other considerations that distinguish one ecoregion from another are climate, dominant plant communities and topography. Both subecoregions are marked by massive surface sandstones giving rise to rock-bottomed high-gradient streams or sand-bottomed low gradient streams. Surface waters tend to be alkaline but those of the Cumberland Mountains are generally better buffered. Many streams in the Forested Hills & Mountains are highly susceptible to acid deposition.

The Gauley River watershed lies within Kanawha, Clay, Fayette, Nicholas, Summers, Greenbrier, Webster, Pocahontas and Randolph Counties. DEP records indicate there are 524 streams totaling 1,969 miles in the watershed. The watershed is mostly forested, but a few areas are not. Perhaps the largest contiguous, non-forested tract is that covered by Summersville Reservoir. Other significant non-forested areas include the city of Summersville and its surrounding environs, and the upper Muddlety Creek, Big Beaver Creek and Meadow River subwatersheds where pastures, hay fields and surface mines support primarily grasses and forbs.

Before mountaintop mining became an environmental buzz phrase, this mining practice was being carried out within the Gauley River watershed. Huge multi-seam surface coal mines were established in the vicinities of Muddlety Creek and Peters Creek. The Twentymile Creek subwatershed resisted this type of mineral exploitation until twenty years ago or so. It did suffer significant sedimentation from timbering in recent decades, although stricter enforcement of best management practices for sediment control may be alleviating some of the strain. Now, vast contour and mountaintop mines have encroached upon the watershed area of this high quality stream.

Water Quality Summary

During this reporting period, 139 streams totaling 855.65 miles were assessed in the Gauley River watershed. Figure 8 is a map depicting sampling stations in the Gauley watershed, while Table 32 provides a list of these stations. A summary of overall designated use support is provided in Table 33 while a use support matrix summary of all designated uses is given in Table 34.

Of the 855.65 stream miles assessed, 307.80 (36.0%) were fully supporting their overall designated uses, 288.68 (33.7%) were fully supporting but threatened, 161.16 (18.8%) were partially supporting, and 98.01 (11.5%) were non-supporting.

Of the 855.63 miles assessed for Aquatic Life Support use, 310.48 (36.3%) were fully supporting, 285.98 (33.4%) were fully supporting but threatened, 155.94 (18.2%) were partially supporting, and 103.23 (12.1%) were non-supporting.

During this reporting cycle, no streams in the Gauley River watershed were assessed for Fish Consumption use.

Of the 855.54 miles assessed for Primary Contact Recreation use, 714.03 (83.5%) were fully supporting, 120.79 (14.1%) were fully supporting but threatened, 4.35 (0.5%) were partially supporting, and 16.37 (1.9%) were non-supporting.

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Gauley River watershed is provided in Table 35.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are pH (108.63 miles), Siltation (86.95 miles), and Metals (72.28 miles).

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Gauley River watershed is provided in Table 36.

Figure 8
Gauley River Watershed
Hydrologic Unit – 05050005

STORET Sampling Locations
1994-1998

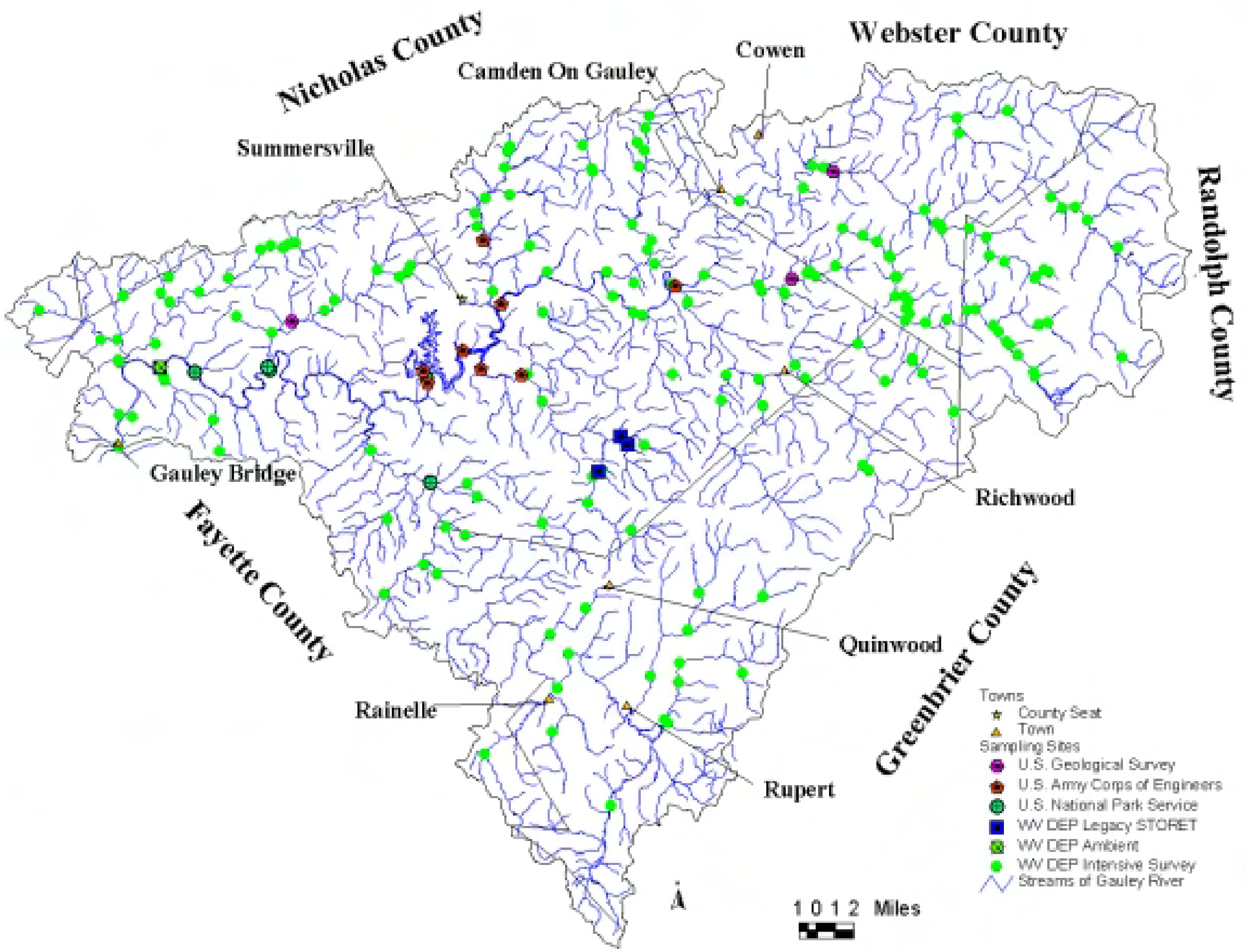

Table 32
STORET Sampling Locations for
Gauley River Watershed
Hydrologic Unit Code – 05050005
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Stream Name	Location
21WVINST	K-82-{0.0}	GAULEY RIVER at mouth	Behind the Go-Mart in Gauley Bridge
21WVINST	K-82-{18.6}	GAULEY RIVER mile 18.6	About 7 miles north and east of Ansted
21WVINST	K-82-{35.6}	GAULEY RIVER mile 35.6	Just south of the Summersville dam
21WVINST	K-82-{55.2}	GAULEY RIVER mile 55.2	About 4 miles south and west of Craigsville
21WVINST	K-82-{61.6}	GAULEY RIVER mile 61.6	About 3 miles south of Craigsville
21WVINST	K-82-{80.2}	GAULEY RIVER mile 80.2	About 5 miles due east of Camden on Gauley
21WVINST	KG-1	SCRABBLE CREEK	At Gauley Bridge
21WVINST	KG-13-{0.0}	PETERS CREEK	About 7 miles north and east of Ansted
21WVINST	KG-13-{15.6}	PETERS CREEK	Less than a mile west of Enon
21WVINST	KG-13-{7.9}	PETERS CREEK	About 1/2 mile east of Drennen on Hwy 39
21WVINST	KG-13-{7.9}	PETERS CREEK	Just east of Drennen
21WVINST	KG-13-B	OTTER CREEK	Just west of Lockwood
21WVINST	KG-13-F	JERRY FORK	About 3 miles west and south of Gilboa - much longer by vehicle
21WVINST	KG-13-K	BUCK GARDEN CREEK	In Gilboa
21WVINST	KG-13-L	ROCKCAMP BRANCH	East and south of Gilboa
21WVINST	KG-13-M	MCCLUNG BRANCH	About 2 miles east of Gilboa
21WVINST	KG-19-{14.4}	MEADOW RIVER	About a mile south and east of Russelville
21WVINST	KG-19-{18.0}	MEADOW RIVER	At Charmco
21WVINST	KG-19-{3.2}	MEADOW RIVER	About 3 miles south of Carnifex Ferry State Park - longer by road
21WVINST	KG-19-{40.4}	MEADOW RIVER	About 3 miles west of Smoot
21WVINST	KG-19-E-{2.0}	GLADE CREEK	North and west of Russellville
21WVINST	KG-19-G-{2.8}	ANGLINS CREEK	About 5 miles south of Mt. Nebo
21WVINST	KG-19-G-{9.6}	ANGLINS CREEK	About 2 miles east of Sugargrove Knob - longer by road
21WVINST	KG-19-G-3-{1.0}	SUGARGROVE CREEK	South of Runa
21WVINST	KG-19-G-{7.5}	U.T. OF ANGLINS CREEK	East of Sugargrove Knob
21WVINST	KG-19-H-{0.8}	YOUNGS CREEK	Just east of Nallen

Table 32 STORET Sampling Locations for Gauley River Watershed Hydrologic Unit Code – 05050005 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	KG-19-H-1-A-{1.2}	NORTH PRONG CREEK	About 2.5 miles east of Nallen
21WVINST	KG-19-J-1	HAYNES BRANCH	In Russellville
21WVINST	KG-19-J-2	ROAD FORK	Hwy 60 southeast from Ansted.
21WVINST	KG-19-P	MEADOW CREEK	West and just north of Charmco
21WVINST	KG-19-P-{5.4}	MEADOW CREEK	In Bellburn
21WVINST	KG-19-Q	SEWELL CREEK	In Rainelle
21WVINST	KG-19-Q-1-A-{1.4}	BOGGS CREEK	South of Rainelle about 1.5 miles
21WVINST	KG-19-Q-5	GOULD HOLLOW	Just north of Bellwood.
21WVINST	KG-19-U-{3.8}	BIG CLEAR CREEK	North of Rupert at Kessler
21WVINST	KG-19-U-{7.8}	BIG CLEAR CREEK	In Anjean
21WVINST	KG-19-U-2-C	OLD FIELD BRANCH	Approx 5 miles from Anjean
21WVINST	KG-19-U-2-D	JOB KNOB BRANCH	About 5 miles from Anjean
21WVINST	KG-19-U-4	ELIJAH BRANCH	Approx 5.5 miles from Anjean
21WVINST	KG-19-V-{1.0}	LITTLE CLEAR CREEK	About 2 miles east of Rupert
21WVINST	KG-19-V-{4.4}	LITTLE CLEAR CREEK	About 4 miles north and east of Rupert (as the crow flies)
21WVINST	KG-19-V-{6.0}	LITTLE CLEAR CREEK	About 5 miles north and east of Rupert (as the crow flies)
21WVINST	KG-19-V-1	BEAVER CREEK	About 2 miles east of Rupert
21WVINST	KG-19-V-3	RADER RUN	About 4 miles north and east of Rupert (as the crow flies)
21WVINST	KG-19-V-5	LAUREL CREEK/LITTLE CLEAR CREEK	North and west of Cornstalk between Buffalo Mtn and Cross Mtn.
21WVINST	KG-19-V-5	LAUREL CREEK/LITTLE CLEAR CREEK	North and west of Cornstalk between Buffalo Mtn and Cross Mtn
21WVINST	KG-24-{12.4}	HOMINY CREEK	About 2 miles south of Hominy Falls (longer by road)
21WVINST	KG-24-{4.0}	HOMINY CREEK	Locational data unavailable
21WVINST	KG-24-{6.2}	HOMINY CREEK	“ “
21WVINST	KG-24-E-{1.0}	GRASSY CREEK	“ “
21WVINST	KG-24-E-2	BRUSHY MEADOW CREEK	“ “
21WVINST	KG-24-G	ROARING CREEK	“ “
21WVINST	KG-24-I	COLT BRANCH	“ “

Table 32 STORET Sampling Locations for Gauley River Watershed Hydrologic Unit Code – 05050005 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	KG-26-{1.6}	MUDDLETY CREEK	“ “
21WVINST	KG-26-{8.8}	MUDDLETY CREEK	“ “
21WVINST	KG-26-B-2	JONES RUN	“ “
21WVINST	KG-26-E	FOCKLER BRANCH	“ “
21WVINST	KG-26-F	TROUT RUN	“ “
21WVINST	KG-26-I	MCMILLION CREEK	“ “
21WVINST	KG-26-K-1	LOWER SPRUCE RUN	“ “
21WVINST	KG-26-K-1-A	SPRUCE RUN	“ “
21WVINST	KG-26-O	CLEAR FORK	“ “
21WVINST	KG-26-O-2	FALLS RUN	“ “
21WVINST	KG-26-P	LAUREL FORK	“ “
21WVINST	KG-27	PERSINGER CREEK	“ “
21WVINST	KG-3	BIG CREEK	“ “
21WVINST	KG-30-{0.4}	BIG BEAVER CREEK	“ “
21WVINST	KG-30-{3.8}	BIG BEAVER CREEK	Locational data unavailable
21WVINST	KG-30-{4.3}	BIG BEAVER CREEK	“ “
21WVINST	KG-30-D-{0.8}	WYATT RUN	“ “
21WVINST	KG-30-E	LITTLE BEAVER CREEK	“ “
21WVINST	KG-30-H	LEFT FORK/BEAVER CREEK	“ “
21WVINST	KG-30-K	PADDY RUN	“ “
21WVINST	KG-30-L	BEARPEN FORK/BEAVER CREEK	“ “
21WVINST	KG-30-N	LOWER LAUREL RUN	“ “
21WVINST	KG-30-P	UPPER LAUREL RUN	“ “
21WVINST	KG-31	LITTLE LAUREL CREEK	“ “
21WVINST	KG-32	PANTHER CREEK	“ “
21WVINST	KG-34-{0.0}	CHERRY RIVER	“ “
21WVINST	KG-34-{8.8}	CHERRY RIVER	“ “

Table 32 **STORET Sampling Locations for Gauley River Watershed** Hydrologic Unit Code – 05050005 **for 1995 - 1999**			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	KG-34-B	COAL SIDING RUN	" "
21WVINST	KG-34-E	LAUREL CREEK	
21WVINST	KG-34-E-3	SPRING RUN	" "
21WVINST	KG-34-F-{1.8}	LITTLE LAUREL CREEK	" "
21WVINST	KG-34-G-{1.0}	SOUTH FORK/ CHERRY RIVER	" "
21WVINST	KG-34-G-{9.6}	SOUTH FORK/CHERRY RIVER	Locational data unavailable
21WVINST	KG-34-G-8	BECKY RUN	" "
21WVINST	KG-34-H-{0.3}	NORTH FORK/CHERRY RIVER	
21WVINST	KG-34-H-{9.5}	NORTH FORK/CHERRY RIVER	" "
21WVINST	KG-34-H-11.5	CARPENTER RUN	" "
21WVINST	KG-34-H-14	BEAR RUN	" "
21WVINST	KG-34-H-4	HUNTERS RUN	" "
21WVINST	KG-34-H-8	WINDY RUN	" "
21WVINST	KG-34-H-9	ARMSTRONG RUN	" "
21WVINST	KG-35-{0.0}	CRANBERRY RIVER	" "
21WVINST	KG-35-{17.5}	CRANBERRY RIVER	" "
21WVINST	KG-35-{19.7}	CRANBERRY RIVER	" "
21WVINST	KG-35-{23.7}	CRANBERRY RIVER	" "
21WVINST	KG-5-{0.0}	TWENTYMILE CREEK	" "
21WVINST	KG-5-{15.6}	TWENTYMILE CREEK	" "
21WVINST	KG-51-{0.2}	WILLIAMS RIVER	Locational data unavailable
21WVINST	KG-51-{1.2}	WILLIAMS RIVER	" "
21WVINST	KG-51-{10.0}	WILLIAMS RIVER	" "
21WVINST	KG-51-{20.0}	WILLIAMS RIVER	" "
21WVINST	KG-5-A	BUCKLES BRANCH	" "
21WVINST	KG-5-B-{1.3}	BELLS CREEK	" "

Table 32 **STORET Sampling Locations for** **Gauley River Watershed** Hydrologic Unit Code – 05050005 **for 1995 - 1999**			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	KG-5-B-1	OPEN FORK	“ “
21WVINST	KG-5-B-1-C	SANGAMORE FORK	“ “
21WVINST	KG-5-B-2	SMITH BRANCH	“ “
21WVINST	KG-5-B-7	CAMPBELL FORK	“ “
21WVINST	KG-5-C	DORSEY BRANCH	“ “
21WVINST	KG-5-F	ROCKCAMP FORK	“ “
21WVINST	KG-5-F-1	SPRING BRANCH	“ “
21WVINST	KG-5-F-3	BEARPEN FORK	“ “
21WVINST	KG-5-H	ASH FORK	
21WVINST	KG-5-J	NEIL BRANCH	“ “
21WVINST	KG-5-L	PEACH ORCHARD BRANCH	“ “
21WVINST	KG-5-M	BOARDTREE BRANCH	“ “
21WVINST	KG-5-O	STILLHOUSE BRANCH	Locational data unavailable
21WVINST	KG-5-P	ROBINSON FORK	“ “
21WVINST	KG-6-{0.6}	RICH CREEK	
21WVINST	KG-6-{4.8}	RICH CREEK	“ “
21WVINST	KG-60	TURKEY CREEK	“ “
21WVINST	KG-60-A	RIGHT FORK/TURKEY CREEK	“ “
21WVINST	KG-65	WILLIAMS CAMP RUN	“ “
21WVINST	KG-6-A	LICK BRANCH	“ “
21WVINST	KG-6-B-{1.6}	BRIDGE FORK	“ “
21WVINST	KG-6-D-{1.8}	KELLY FORK	“ “
21WVINST	KGC-10	LAUREL BRANCH	“ “
21WVINST	KGC-11	MILL BRANCH	“ “
21WVINST	KGC-12.5	UPPER TWIN BRANCH	“ “
21WVINST	KGC-12.5-A	LOWER TWIN BRANCH	“ “
21WVINST	KGC-13	QUEER BRANCH	“ “
21WVINST	KGC-14	LICK BRANCH	“ “
21WVINST	KGC-15	HANGING ROCK BRANCH	“ “

Table 32 **STORET Sampling Locations for Gauley River Watershed** Hydrologic Unit Code – 05050005 **for 1995 - 1999**			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	KGC-16	BALDWIN BRANCH	" "
21WVINST	KGC-17	ROUGH RUN	Locational data unavailable
21WVINST	KGC-17.3	LITTLE ROUGH RUN	" "
21WVINST	KGC-17.6	PHEASANT HOLLOW	" "
21WVINST	KGC-18	COLD RUN	" "
21WVINST	KGC-2	HINKLE RUN	" "
21WVINST	KGC-21	BIRCHLOG RUN	" "
21WVINST	KGC-22	TUMBLING ROCK RUN	" "
21WVINST	KGC-23-{2.3}	SOUTH FORK CRANBERRY RIVER	" "
21WVINST	KGC-24-{3.6}	NORTH FORK / CRANBERRY RIVER	" "
21WVINST	KGC-24-C	LEFT FORK/NORTH FORK/CRANBERRY RIVER	" "
21WVINST	KGC-24.4	STEEP RUN	" "
21WVINST	KGC-24.7	LITTLE RUN	" "
21WVINST	KGC-25	LOST RUN	" "
21WVINST	KGC-26	RED RUN	" "
21WVINST	KGC-27	LITTLE BRANCH	Locational data unavailable
21WVINST	KGC-3	JAKEMAN RUN	" "
21WVINST	KGC-4-{0.4}	BARRENSHE RUN	" "
21WVINST	KGC-4-A	LITTLE BARRENSHE RUN	" "
21WVINST	KGC-6	BEAR RUN	" "
21WVINST	KGC-7	BEE RUN	" "
21WVINST	KGC-8	FOXTREE RUN	
21WVINST	KGC-9	ALDRICH BRANCH	" "
21WVINST	KGW-10	MIDDLE FORK WILLIAMS RIVER	" "
21WVINST	KGW-10-{7.5}	MIDDLE FORK WILLIAMS RIVER	" "
21WVINST	KGW-10-A	LITTLE FORK	" "
21WVINST	KGW-10-B	LITTLE BEECHY RN	" "

Table 32 STORET Sampling Locations for Gauley River Watershed Hydrologic Unit Code – 05050005 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	KGW-10-C	BEECHY RUN	“ “
21WVINST	KGW-10-D	LAURELLY BRANCH	“ “
21WVINST	KGW-10-E	HELL-FOR-CERTAIN BRANCH	“ “
21WVINST	KGW-10-G	MCCLINTOCK RUN	“ “
21WVINST	KGW-10-G.5	SALMOND BRANCH	“ “
21WVINST	KGW-10-H	NORTH BRANCH	“ “
21WVINST	KGW-16.5	BRIDGE CREEK	Locational data unavailable
21WVINST	KGW-19	UPPER BANNOCK SHOALS RUN	“ “
21WVINST	KGW-20	TEA CREEK	“ “
21WVINST	KGW-20	TEA CREEK	“ “
21WVINST	KGW-22-{0.4}	LITTLE LAUREL CREEK	“ “
21WVINST	KGW-27	MOUNTAINLICK RUN	“ “
21WVINST	KGW-8	WHITE OAK FORK	“ “
21WVINST	KGW-27	MOUNTAINLICK RUN	“ “

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Atmospheric Deposition (89.95 miles), Abandoned Mining (65.81 miles), and Unknown Source (56.87 miles).

Size of Waters Affected by Toxics

During this reporting cycle, 586.44 stream miles in the Gauley River watershed were monitored for toxics. Of these, 47.38 miles (8.1%) had elevated levels.

Public Health/Aquatic life Impacts

No streams in the Gauley River watershed are currently under fish consumption advisory. In addition, no bathing beach or public water supply closures or fish kills were documented during the reporting period.

Table 33 USE SUMMARY REPORT: OVERALL USE SUPPORT GAULEY RIVER WATERSHED Waterbody Type: River			
Total Number of River/Streams Assessed:	139		
Total Number of River/Streams Monitored:	119		
Total Number of River/Streams Evaluated:	20		
DEGREE OF USE SUPPORT	ASSESSMENT BASIS IN MILES		
	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	4.01	303.79	307.80
SUPPORTING BUT THREATENED	6.00	282.68	288.68
PARTIALLY SUPPORTING	8.30	152.86	161.16
NOT SUPPORTING	21.67	76.34	98.01
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	39.98	815.67	855.65

TABLE 34
USE SUPPORT MATRIX SUMMARY
GAULEY RIVER WATERSHED
WATERBODY TYPE: RIVER
UNITS IN MILES

USE	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting
Overall Use	307.80	288.68	161.16	98.01
Aquatic Life	310.48	285.98	155.94	103.23
Cold Water Fishery - Trout	124.91	136.16	39.74	45.65
Warm Water Fishery	124.00	80.20	71.02	
Bait Minnow Fishery	61.59	69.62	45.18	63.96
Primary Contact Recreation	714.03	120.79	4.35	16.37
Drinking Water Supply	241.26			

Section 303(d) Waters

Table 37 includes streams from the Gauley River watershed that are on the current 303(d) list. Thirty-eight streams are on the list, including one (Gauley River mainstem) on the Primary Waterbody List, seventeen on the Mine Drainage Impaired sublist, and 20 on the Acid Rain Impaired sublist.

Currently, no 303(d) listed streams in the Gauley River watershed have had TMDL's completed.

Table 35
Complete Summary of Causes, Including User-Defined
Gauley River Watershed
Sizes of Waterbodies Not Fully Supporting Uses
Affected by Various Cause Categories
Waterbody Type: River

Code	Cause Category	Major Impact in Miles	Moderate/Minor Impact in Miles
0000	CAUSE UNKNOWN	3.40	13.65
0500	METALS	28.21	44.07
0550	Lead	0.00	35.52
0580	Zinc	11.86	35.52
0600	AMMONIA (UNIONIZED)	10.26	0.00
0750	SULFATES	0.00	3.10
0900	NUTRIENTS	0.00	11.86
0920	Nitrogen	0.00	11.86
1000	pH	91.52	17.11
1100	SILTATION	52.62	34.33
1600	HABITAT ALTERATION (non-flow)	9.45	29.83

Table 36 Complete Summary of Sources, Including User-Defined Gauley River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
2000	SILVICULTURE	27.43	3.62
4000	URBAN RUNOFF/STORM SEWERS	0.00	14.07
5000	RESOURCE EXTRACTION	74.49	42.87
5100	Surface Mining	28.71	9.61
5200	Subsurface Mining	0.00	6.38
5700	Mine Tailings	6.08	8.55
5800	Acid Mine Drainage	6.85	0.00
5900	Abandoned Mining	38.93	26.88
6000	LAND DISPOSAL	0.00	7.80
6500	Onsite Wastewater Systems (Septic Tanks)	0.00	7.80
7000	HYDROMODIFICATION	1.28	0.00
7100	Channelization	1.28	0.00
8100	ATMOSPHERIC DEPOSITION	71.37	18.58
9000	SOURCE UNKNOWN	5.00	87.39

LITERATURE CITED

Hale, J. P. 1971 third edition. *Trans-Allegheny Pioneers*. Raleigh NC. First printing 1886 Cincinnati OH.

McWhorter, L. V. 1974 second printing. *The Border Settlers of Northwestern Virginia*. First printing 1915.

TABLE 37
West Virginia
1998 303(d) List
Gauley River Watershed

Primary Waterbody List

Stream Name	Stream Code	Use Affected	Pollutant	Primary Source	Miles Affected	Reach Description	TMDL Priority
Gauley River	K-82	AQL	Zinc, Lead	Undetermined	35.52	Mouth to Summersville Dam	Medium

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Scrabble Ck	KG-1	3.10	Aquatic Life	Metals	Mine Drainage	Medium
Peters Ck	KG-13	17.65	Aquatic Life	Metals	Mine Drainage	Medium
Jerry Fk / Peters Ck	KG-13-F	2.35	Aquatic Life	Metals	Mine Drainage	Medium
Buck Garden Ck	KG-13-K	5.13	Aquatic Life	Metals	Mine Drainage	Medium
Sewell Ck	KG-19-Q	14.07	Aquatic Life	Metals	Mine Drainage	Medium
Little Clear Ck	KG-19-V	16.26	Aquatic Life	Metals	Mine Drainage	Medium
Brushy Meadow Ck	KG-24-E-2	5.95	Aquatic Life	Metals	Mine Drainage	Medium
Colt Br	KG-24-I	2.15	Aquatic Life	Metals	Mine Drainage	Medium
Muddlety Ck	KG-26	27.02	Aquatic Life	Metals	Mine Drainage	Medium
Fockler Br	KG-26-E	2.69	Aquatic Life	Metals	Mine Drainage	Medium
Mcmillion Ck / Muddlety Ck	KG-26-I	6.99	Aquatic Life	Metals	Mine Drainage	Medium
Lower Spruce Rn	KG-26-K-1	1.57	Aquatic Life	Metals	Mine Drainage	Medium
Spruce Rn / Lower Spruce	KG-26-K-1-A	1.50	Aquatic Life	Metals	Mine Drainage	Medium
Clear Fk	KG-26-O	4.01	Aquatic Life	Metals	Mine Drainage	Medium
Big Beaver Ck	KG-30	16.42	Aquatic Life	Metals	Mine Drainage	Medium
Bearpen Fk / Beaver Ck	KG-30-L	2.53	Aquatic Life	Metals	Mine Drainage	Medium
Panther Ck	KG-32	8.55	Aquatic Life	Metals	Mine Drainage	Medium
Carpenter Run	KG-34-H-11	1.38	Aquatic Life	Metals	Mine Drainage	Medium

TABLE 37 Continued
Gauley River Watershed

Waterbodies Impaired by Acid Rain

Stream Name	Stream Code	Miles	Use Affected	Pollutant	Source	TMDL Priority
Windy Run	KG-34-H-8	1.97	Aquatic Life	pH	Acid Rain	Low
Armstrong Run	KG-34-H-9	1.34	Aquatic Life	pH	Acid Rain	Low
Turkey Creek	KG-60	5.09	Aquatic Life	pH	Acid Rain	Low
Right Fk / Turkey Creek	KG-60-A	2.35	Aquatic Life	pH	Acid Rain	Low
Big Run / Gauley Rv	KG-70	4.37	Aquatic Life	pH	Acid Rain	Low
Lick Branch	KGC-14	2.08	Aquatic Life	pH	Acid Rain	Low
Barrenshe Run	KGC-4	3	Aquatic Life	pH	Acid Rain	Low
Aldrich Branch	KGC-9	2.52	Aquatic Life	pH	Acid Rain	Low
Little Rough	KGC-17	2.7	Aquatic Life	pH	Acid Rain	Low
Cold Run	KGC-18	1.52	Aquatic Life	pH	Acid Rain	Low
Dogway Fk	KGC-19	6.8	Aquatic Life	pH	Acid Rain	Low
Birch Log	KGC-21	2.28	Aquatic Life	pH	Acid Rain	Low
Tumbling Rock	KGC-22	2.4	Aquatic Life	pH	Acid Rain	Low
North Fork / Cranberry	KGC-23	3.76	Aquatic Life	pH	Acid Rain	Low
Left Fork / North Fork / Cranberry	KGC-23-C	1.48	Aquatic Life	pH	Acid Rain	Low
Craig Rn	KGW-1	3	Aquatic Life	pH	Acid Rain	Low
Middle Fk / Williams Rv	KGW-10	12.85	Aquatic Life	pH	Acid Rain	Low
Tea Creek	KGW-20	5.7	Aquatic Life	pH	Acid Rain	Low
Sugar Creek	KGW-21	3.84	Aquatic Life	pH	Acid Rain	Low

AQL = Aquatic Life TMDL = Total Maximum Daily Load
HH = Human Health MP = Mile Point

The Lower Guyandotte River Watershed

Background

"Guyandotte" is an English language corruption of a Huron name ("Wendat," later spelled "Wyandotte") for the Huron people. The name was applied to those Wendat living south of Lake Erie in the 17th and 18th centuries. These Wendat also were called "Huron of the Lake." The word translated means "islanders" reflecting their belief that they inhabited the center of the great island, earth (National Park Service, date unknown). War parties and hunting/gathering groups of these people frequented areas now encompassed by West Virginia, including the valley of the River of ilka name. Another name for this River is the Lenape "Se-co-nee," translated as "Narrow Bottom River" (Hale 1974). This aptly describes the River valley over most of its length, especially upstream of the village of Salt Rock.

The Lower Guyandotte River watershed includes that portion of the Guyandotte River watershed area from the River's mouth upstream to the mouth of Island Creek at the city of Logan. The subwatershed of Island Creek is not included in this watershed area. The largest tributary watershed is that of Mud River. The lower Guyandotte River watershed area is 739 square miles. The mainstem River flows in a northwesterly direction from Logan to Huntington. Watershed streams drain the Allegheny Plateau Physiographic Province in a dendritic pattern (tree-like branching). DEP records indicate there are 432 streams totaling 988 miles in the watershed.

The watershed area is located within two Ecoregions; the Western Allegheny Plateau and the Central Appalachians. The northernmost portion of the watershed is located in a subecoregion of the Western Allegheny Plateau called the Monongahela Transition Zone. Streams originating in this ecoregion are usually well-buffered against acid inputs and they have low to moderate gradients. The southernmost portion of the watershed is located in the Cumberland Mountains Subecoregion of the Central Appalachians Ecoregion. Streams generally have higher gradients than in the Monongahela Transition Zone. Substrates have significant quantities of sand eroded from the coarse-grained sandstones that predominate in the subecoregion. The Lower Guyandotte Watershed is located within Logan, Lincoln, Putnam, Cabell and Mason Counties. The only significantly-sized public lands within the watershed are Upper Mud River Wildlife Management Area/Flood Control Project, Big Ugly Wildlife Management Area and Chief Logan State Park.

The watershed is subject to the effects of both continental polar air masses and maritime tropical air masses. The worst floods are those brought on by tropical storms, including hurricanes, that penetrate across the Allegheny and Cumberland Mountains and move in a northerly direction. Such storms dump rain upon the headwaters first and continue pouring as they move in the same direction that the mainstem Guyandotte River drains. The R.D. Bailey Reservoir in the Upper Guyandotte River watershed has alleviated much of the flooding associated with major storm systems. The watershed experiences relatively mild winters (compared to northeastern West Virginia), generally receiving more rain than snow. Prevailing wind in summer is from the southwest.

Pennsylvanian Age sedimentary rocks of the Monongahela Group, Conemaugh Group, Allegheny Formation and Kanawha Formation are exposed within the watershed. The rocks dip to the northwest. Much of the northernmost third of this watershed is composed of relatively soft gray and red shales of the Monongahela and Conemaugh Groups. Consequently, soils have a high clay component and do not drain well. Erosion is a significant problem in this portion of the watershed. This is particularly noticeable in the Mud River subwatershed where farming is a predominant land use.

In the early part of this century, railroads opened up this watershed and the Upper Guyandotte River watershed for extensive coal mining. A large increase in human population occurred as immigrants from southern States and other countries poured into the region to find work in the mines. This was a double whammy to the water quality of the watersheds' streams. Metal-laden mine water and untreated or improperly treated sewage from coal camps and towns degraded some streams severely. In the 1950s and 1960s, strip mining was instituted in the watersheds as coal companies attempted to cost effectively increase coal production. West Virginia passed some of the most stringent regulations in the nation governing surface mining, but the environmental damage wrought by this technique was still overwhelming. Today, multi-seam mining in the form of mountain top removal and valley fill is prominent in this watershed.

Natural gas extraction is a major industry in the Lower Guyandotte River watershed area. Numerous gas wells, pipelines and the roads that serve them contribute sediment to streams already burdened with too much sediment from urbanization, coal mining, road maintenance and farming. Timbering roads and skid trails also increase sediment loads in the watershed's streams. Best management practices utilized by both the gas and timbering industries minimize erosion at some sites, but renegade loggers and gas well developers continue to cause major sediment problems. Even the best-managed sites contribute some sediment to local streams, so that areas of extensive logging or gas extraction have sediment-choked streams.

Some communities are treating sewage at new or upgraded treatment plants, thanks in large part to federally funded programs instituted in the 1970s. Consequently, water quality has improved in a few areas, but many of the watersheds' communities remain inadequately sewered. Other water-related problems associated with urbanization, such as stormwater runoff and increased flooding, are increasing in some portions of the Lower Guyandotte River watershed as flat floodplain land is developed for housing and industry. This is especially true in the Teays Valley portion of the watershed. Teays Valley is the remnant of ancient Teays Lake, a reservoir dammed by the last continental ice sheet. The floor of the old lake was covered deeply with sediments, so when the lake finally drained, stream valley floors were wider than they might have been if the lake had never existed. These valleys are now attractive to the rapidly growing human populations of Huntington, Barboursville, Milton and Culloden, all of which lie, at least partly, within the Lower Guyandotte River watershed. Much of the watershed is still forested, but the forests are rapidly being replaced by residential developments.

Mud River and Guyandotte River once supported diverse freshwater mussel assemblages. The coal industry's pollution wiped out the Guyandotte mussels. The Mud River mussel assemblage was diverse and abundantly populated until extensive agriculture introduced vast quantities of sediment into the River mainstem. In recent decades, housing construction between the River's mouth and Milton has bled more sediment into the River. The mussel population in Mud River is a mere "shell" of its former self. The warmwater fishery of Mud River has suffered from the severe sedimentation also. The construction of R. D. Bailey Reservoir on upper Guyandotte River, improved sewage treatment and stricter enforcement of mining regulations in the last 30 years have contributed to an improvement in that River's recreation fishery, but it may never recover to its pre-mining condition.

<u>Water Quality Summary</u>

During this reporting period, 114 streams totaling 476.99 miles were assessed in the Lower

Guyandotte River watershed. Figure 9 is a map depicting sampling stations in the Lower Guyandotte watershed, while Table 38 provides a list of these stations. A summary of overall designated use support is provided in Table 39 while a use support matrix summary of all designated uses is given in Table 40.

Of the 476.99 stream miles assessed, 61.59 (12.9%) were fully supporting their overall designated uses, 209.10 (43.8%) were fully supporting but threatened, 83.34 (17.5%) were partially supporting, and 122.96 (25.8%) were non-supporting.

Of the 473.35 miles assessed for Aquatic Life Support use, 153.88 (32.5%) were fully supporting, 131.24 (27.7%) were fully supporting but threatened, 74.15 (15.7%) were partially supporting, and 114.08 (24.1%) were non-supporting.

During this reporting period, no streams were assessed in the Lower Guyandotte River watershed for Fish Consumption use.

Of the 476.62 miles assessed for Primary Contact Recreation use, 158.07 (33.2%) were fully supporting, 216.89 (45.5%) were fully supporting but threatened, and 101.66 (21.3%) were non-supporting.

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Lower Guyandotte River watershed is provided in Table 41.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Fecal Coliform (95.93 miles), Siltation (90.23 miles), Habitat Alteration (non-flow) (87.08 miles), and Metals (80.57 miles).

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Lower Guyandotte River watershed is provided in Table 42.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Unknown Source (218.20 miles), Raw Sewage (74.14 miles), and Urban Runoff/Storm Sewers (73.00 miles).

Figure 9
Lower Guyandotte River Watershed
Hydrologic Unit – 05070102

STORET Sampling Locations
1994-199

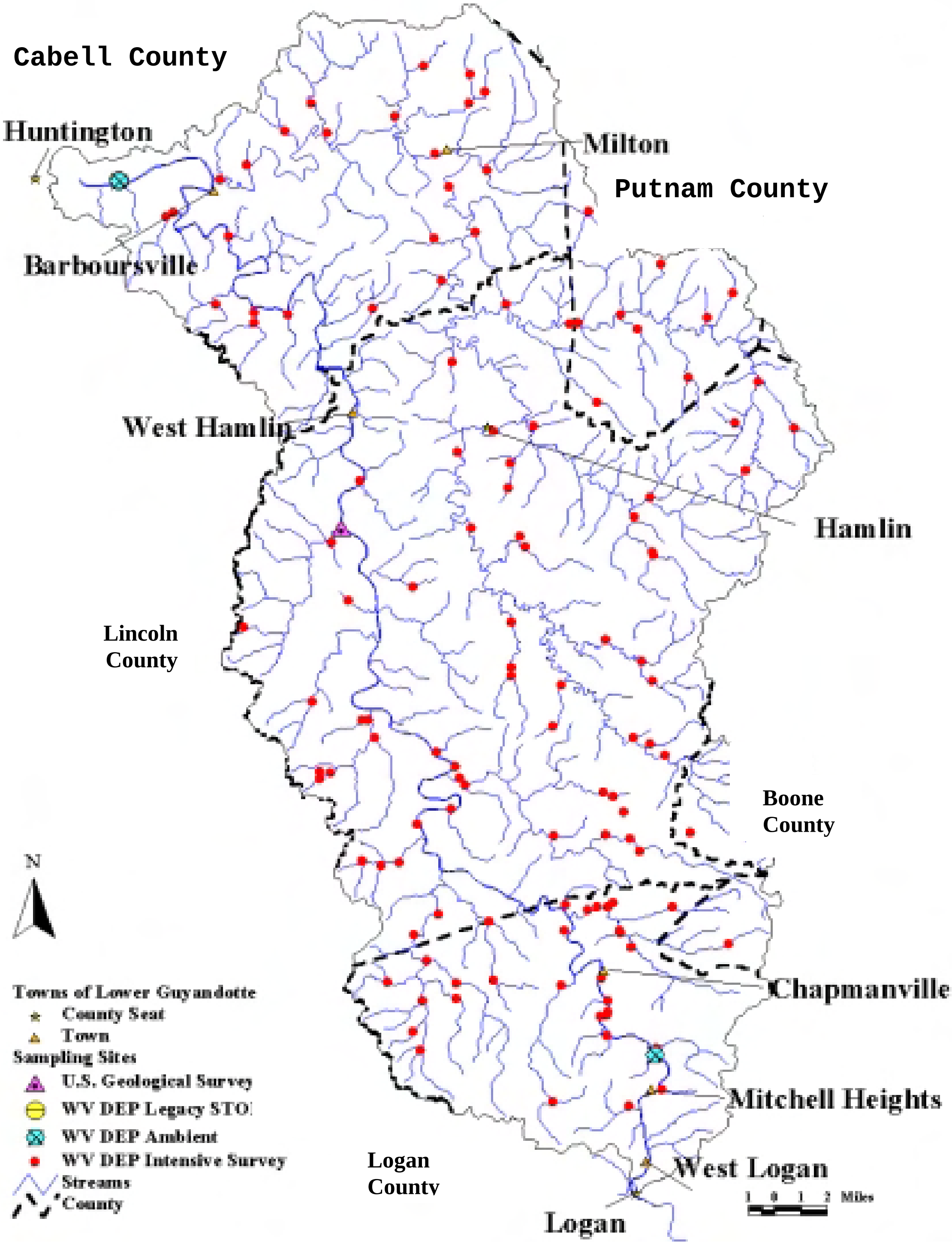

Table 38 STORET Sampling Locations for Lower Guyandotte River Watershed Hydrologic Unit Code – 05070102 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Stream Name**
21WVINST	O-4-{76.3}	GUYANDOTTE RIVER
21WVINST	OG-10	MERRITT CREEK
21WVINST	OG-10-A	RIGHT FORK OF MERRITT CREEK
21WVINST	OG-11	SMITH CREEK
21WVINST	OG-14-D-{0.4}	UNT OF TRACE CREEK
21WVINST	OG-2-{18.8}	MUD RIVER
21WVINST	OG-2-{25.5}	MUD RIVER
21WVINST	OG-2-{3.6}	MUD RIVER
21WVINST	OG-2-{47.0}	MUD RIVER
21WVINST	OG-2-{48.7}	MUD RIVER
21WVINST	OG-2-{77.2}	MUD RIVER
21WVINST	OG-23.5	STALEY BRANCH
21WVINST	OG-27	FOURMILE CREEK
21WVINST	OG-27-A	LOWGAP BRANCH
21WVINST	OG-27-H-{1.8}	FALLS BRANCH
21WVINST	OG-29-C	HORSESHOE BRANCH
21WVINST	OG-3	DAVIS CREEK
21WVINST	OG-3-0.5A	EDENS BRANCH
21WVINST	OG-30-{1.2}	STOUT CREEK
21WVINST	OG-32-F	PLUM BRANCH
21WVINST	OG-34	FOURTEENMILE CREEK
21WVINST	OG-34-A	LICK BRANCH
21WVINST	OG-34-B	EAST FORK / FOURTEENMILE CREEK
21WVINST	OG-34-E-1	NELSON FORK
21WVINST	OG-34-E-1-{0.8}	NELSON FORK
21WVINST	OG-35	AARONS CREEK
21WVINST	OG-36	HAMILTON CREEK
21WVINST	OG-37	LITTLE UGLY CREEK
21WVINST	OG-38-{0.8}	BIG UGLY CREEK
21WVINST	OG-38-{11.6}	BIG UGLY CREEK
21WVINST	OG-38-A	PIGEONROOST CREEK
21WVINST	OG-38-D-{3.9}	LAUREL CREEK
21WVINST	OG-38-D-{4.5}	LAUREL CREEK
21WVINST	OG-38-G	SULPHUR CREEK
21WVINST	OG-38-K	LEFTHAND CREEK
21WVINST	OG-38-K.7	LITTLE DEADENING CREEK
21WVINST	OG-38-K-5	PIGEONROOST FORK
21WVINST	OG-40	SAND CREEK
21WVINST	OG-41	DRY BRANCH

Table 38 STORET Sampling Locations for Lower Guyandotte River Watershed Hydrologic Unit Code – 05070102 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Stream Name**
21WVINST	OG-42-A	SHORT BEND
21WVINST	OG-42-C-{0.2}	LAUREL FORK
21WVINST	OG-42-D	MUDLICK BRANCH
21WVINST	OG-42-E	GARTIN FORK
21WVINST	OG-44-A.5	WORKMAN FORK
21WVINST	OG-44-A-2-{2.8}	MARSH FORK
21WVINST	OG-44-C.3	CANEY BRANCH
21WVINST	OG-44-C.7	THOMPSON BRANCH
21WVINST	OG-44-E	SMOKEHOUSE FORK
21WVINST	OG-44-E-.5	WOLFPEN BRANCH
21WVINST	OG-44-F-1	ADAMS BRANCH
21WVINST	OG-44-G-{1.9}	BUCK FORK
21WVINST	OG-44-H	HOOVER FORK
21WVINST	OG-44-I	HENDERSON BRANCH
21WVINST	OG-44-K	BULWORK BRANCH
21WVINST	OG-48	LIMESTONE BRANCH
21WVINST	OG-49-.1A	SQUIRREL BRANCH
21WVINST	OG-49-.3A	THOMAS HOLLOW
21WVINST	OG-49-{3.3}	BIG CREEK
21WVINST	OG-49-A	ED STONE BRANCH
21WVINST	OG-49-A-1	NORTH BRANCH / ED STONE BRANCH
21WVINST	OG-49-B-1	CHAPMAN BRANCH
21WVINST	OG-49-C	VICKERS BRANCH
21WVINST	OG-49-C.1	UNT OF BIG CREEK
21WVINST	OG-49-D-2	DOG FORK
21WVINST	OG-49-E-1	PERRYS BRANCH
21WVINST	OG-50	LILY BRANCH
21WVINST	OG-51.5	FOWLER BRANCH
21WVINST	OG-51-B	CANOE FORK
21WVINST	OG-51-G.5	SOUTH FORK / CRAWLEY CREEK
21WVINST	OG-53	GODBY BRANCH
21WVINST	OG-53.4	CHAFIN BRANCH
21WVINST	OG-53.5	BENTLEY BRANCH
21WVINST	OG-59	MILL CREEK
21WVINST	OG-6-{0.1}	MILL CREEK
21WVINST	OG-60	BIG BRANCH
21WVINST	OG-61	BUFFALO CREEK
21WVINST	OG-9-A-{0.3}	UPPER HEATH CREEK
21WVINST	OGM-1.5	TANYARD BRANCH

Table 38 STORET Sampling Locations for Lower Guyandotte River Watershed Hydrologic Unit Code – 05070102 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Stream Name**
21WVINST	OGM-12	INDIAN FORK
21WVINST	OGM-13	BRUSH CREEK
21WVINST	OGM-14-{7.2}	CHARLEY CREEK
21WVINST	OGM-16-A	FALLEN FORK
21WVINST	OGM-19	TRACE CREEK
21WVINST	OGM-20-{21.2}	TRACE FORK
21WVINST	OGM-20-{6.4}	TRACE FORK
21WVINST	OGM-20-A	COON CREEK
21WVINST	OGM-20-D-{4.6}	BIG CREEK
21WVINST	OGM-20-F	SYCAMORE CREEK
21WVINST	OGM-20-H	CLYMER CREEK
21WVINST	OGM-20-I-1-{1.5}	KELLYS CREEK
21WVINST	OGM-20-L	MARTIN RUN
21WVINST	OGM-20-K-{0.1}	NELSON HOLLOW
21WVINST	OGM-20-K-1	LEFTHAND FORK
21WVINST	OGM-20-M-{1.8}	BRIDGE CREEK
21WVINST	OGM-20-M-1	FLINT HOLLOW
21WVINST	OGM-20-R-2	DONLEY FORK / HAYZLETT FORK
21WVINST	OGM-20-T-{3.5}	JOES CREEK
21WVINST	OGM-20-V	ROCKHOUSE BRANCH
21WVINST	OGM-22-A-{0.7}	STRAIGHT FORK
21WVINST	OGM-25-A	MEADOW BRANCH
21WVINST	OGM-25-B-{2.3}	TRACE CREEK
21WVINST	OGM-25-B-1	TINCTURE FORK
21WVINST	OGM-25-H-1	VALLEY FORK
21WVINST	OGM-25-I	SUGARTREE FORK
21WVINST	OGM-25-I-{3.0}	SUGARTREE FORK
21WVINST	OGM-25-I-4	SAND FORK
21WVINST	OGM-3-{0.9}	LITTLE CABELL CREEK
21WVINST	OGM-31	SANDLICK BRANCH
21WVINST	OGM-33-B	DRY FORK
21WVINST	OGM-33-C	BIG BRANCH
21WVINST	OGM-35-{1.8}	BIG CREEK
21WVINST	OGM-35-{4.1}	BIG CREEK
21WVINST	OGM-35-E	LAUREL FORK
21WVINST	OGM-39	LEFT FORK/MUD RIVER
21WVINST	OGM-39-{10.2}	LEFT FORK/MUD RIVER
21WVINST	OGM-39-G	FLAT CREEK
21WVINST	OGM-4-{0.2}	BIG CABELL CREEK

Table 38 STORET Sampling Locations for Lower Guyandotte River Watershed Hydrologic Unit Code – 05070102 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Stream Name**
21WVINST	OGM-4-{2.0}	BIG CABELL CREEK
21WVINST	OGM-40.3-{0.0}	UPTON BRANCH
21WVINST	OGM-40.3-{2.2}	UPTON BRANCH
21WVINST	OGM-43	STONECOAL BRANCH
21WVINST	OGM-44-{0.2}	BERRY BRANCH
21WVINST	OGM-50	LUKEY FORK
21WVINST	OGM-7-{0.4}	LOWER CREEK
21WVINST	OGM-7-B-1	TONY BRANCH
21WVINST	OGM-8-{4.0}	MILL CREEK
21WVINST	OGM-8-B	LEFT FORK/MILL CREEK
21WVINST	OGM-8-C	RIGHT FORK/MILL CREEK

Table 39 USE SUMMARY REPORT: OVERALL USE SUPPORT LOWER GUYANDOTTE RIVER WATERSHED Waterbody Type: River			
Total Number of River/Streams Assessed:	114		
Total Number of River/Streams Monitored:	114		
Total Number of River/Streams Evaluated:	0		
	ASSESSMENT BASIS IN MILES		
DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	61.59	61.59
SUPPORTING BUT THREATENED	0.00	209.10	209.10
PARTIALLY SUPPORTING	0.00	83.34	83.34
NOT SUPPORTING	0.00	122.96	122.96
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	0.00	476.99	476.99

TABLE 40 USE SUPPORT MATRIX SUMMARY LOWER GUYANDOTTE RIVER WATERSHED WATERBODY TYPE: RIVER UNITS IN MILES				
USE	**Supporting**	**Supporting but Threatened**	**Partially Supporting**	**Not Supporting**
Overall Use	61.59	209.10	83.34	122.96
Aquatic Life	153.88	131.24	74.15	114.08
Cold Water Fishery - Trout		3.54		
Warm Water Fishery	65.18	66.59	63.15	91.30
Bait Minnow Fishery	88.70	61.11	11.00	22.78
Primary Contact Recreation	158.07	216.89		101.66
Drinking Water Supply	6.50			73.00

Table 41 Complete Summary of Causes, Including User-Defined Lower Guyandotte River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Cause Categories Waterbody Type: River			
Code	**Cause Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0000	CAUSE UNKNOWN	13.21	5.96
0500	METALS	80.57	0.00
0750	SULFATES	2.88	0.00
1000	pH	4.81	2.35
1100	SILTATION	17.77	72.46
1600	HABITAT ALTERATION (non-flow)	14.04	73.04
1700	PATHOGENS	95.93	0.00
1710	Fecal Coliform Bacteria	95.93	0.00
3200	DIESEL FUEL/GASOLINE	1.00	0.00

Table 42 Complete Summary of Sources, Including User-Defined Lower Guyandotte River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0200	MUNICIPAL POINT SOURCES	8.67	0.00
0230	Package Plants (Small Flow)	8.67	0.00
4000	URBAN RUNOFF/STORM SEWERS	73.00	0.00
5000	RESOURCE EXTRACTION	12.00	0.00
5800	Acid Mine Drainage	12.00	0.00
5900	Abandoned Mining	12.00	0.00
6000	LAND DISPOSAL	74.14	0.00
6800	Raw Sewage	74.14	0.00
7000	HYDROMODIFICATION	0.00	3.12
7100	Channelization	0.00	3.12
8400	SPILLS	1.00	0.00
9000	SOURCE UNKNOWN	105.65	112.55

Size of Waters Affected by Toxics

During this reporting cycle, 281.31 stream miles in the Lower Guyandotte River watershed were monitored for toxics. None of the streams monitored for toxics had elevated levels.

Public Health/Aquatic life Impacts

No streams within the Lower Guyandotte River watershed are currently under fish consumption advisory. In addition, no bathing beach or water supply closures were documented during this reporting cycle.

One fish kill was reported during the period. It occurred on Big Cabell Creek in Cabell County and resulted in a moderate kill along 1.0 miles of stream. The cause was diesel fuel and oil from a vehicle maintenance operation.

Section 303(d) Waters

Table 43 includes streams from the Lower Guyandotte River watershed that are on the current 303(d) list. Seven streams from the watershed are on the list, including two on the Primary Waterbody List and five on the Mine Drainage Impaired sublist.

Currently, no 303(d) listed streams in the Lower Guyandotte River watershed have had TMDL's completed. However, a TMDL for Pat's Branch is anticipated by the fall of 2000.

LITERATURE CITED

Hale, J. P. 1971 third edition. *Trans-Allegheny Pioneers*. Raleigh NC. First printing 1886 Cincinnati OH.

National Park Service. Date unknown. *Hopewell Culture. Wyandotte.* A brochure distributed at the Hopewell Culture National Historical Park near Chillicothe OH.

TABLE 43
West Virginia
1998 303(d) List
Lower Guyandotte River Watershed

Primary Waterbody List

Stream Name	Stream Code	Use Affected	Pollutant	Primary Source	Miles Affected	Reach Description	TMDL Priority
Guyandotte River	O-4	AQL	Iron, Aluminum	Undetermined	72	Pecks Mill to mouth	Medium
Guyandotte River	O-4	HH	Iron	Undetermined	72	Pecks Mill to mouth	Medium
Pats Branch	OG-0.5	AQL	Copper	Undetermined	2	Entire length	Low
Pats Branch	OG-0.5	HH	Fluoride	Undetermined	1.7	Entire length	Low

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Limestone Br	OG-48	1.78	Aquatic Life	pH, Metals	Mine Drainage	Medium
Ed Stone Br / Big Ck	OG-49-A	2.35	Aquatic Life	pH, Metals	Mine Drainage	Medium
North Br/big Ck	OG-49-A-1	0.75	Aquatic Life	pH, Metals	Mine Drainage	Medium
Godby	OG-53	1.52	Aquatic Life	pH, Metals	Mine Drainage	Medium
Buffalo Ck	OG-61	3.14	Aquatic Life	pH, Metals	Mine Drainage	Medium

AQL = Aquatic Life
HH = Human Health
TMDL = Total Maximum Daily Load
MP = Mile Point

The Middle Ohio River North Watershed

Background

This watershed area of 955 square miles includes the subwatersheds draining into Ohio River downstream of Fish Creek to, but excluding Little Kanawha River. The largest subwatershed here is that of Middle Island Creek (565 square miles). The watershed is located within the Allegheny Plateau Physiographic Province. The drainage pattern in this province is dendritic, that is, much-branched with few exceptional topographic features, such as sinkholes or long parallel ridges. that is, much-branched with few exceptional topographic features, such as sinkholes or long parallel ridges. The largest tributary subwatershed is that of Middle Island Creek. Another large subwatershed is Fishing Creek. Many of the larger streams are slow-moving and prone to chemical and temperature stratification. Stream segments behind old mill dams, low-water bridge crossings and protruding rock shelves, and those located within the backwater influence of Ohio River are especially susceptible to stratification. This is problematical in late summer when high stream temperature and algal respiration can lead to oxygen depletion.

Located within the Permian Hills Subecoregion of the Western Allegheny Plateau Ecoregion, the Mid-Ohio River North Watershed is typified by well-buffered streams with moderate to low gradients. Forests are composed of oak-hickory-pine and cove hardwood types. Stream substrates have significant quantities of sand and silt.

The rock strata exposed in this watershed are primarily those classified in the Dunkard Group of both the Pennsylvanian and Permian Systems. They are cyclic sequences of sandstone, siltstone, shale, limestone and coal. Some of the strata give rise to poorly-buffered soils, others parent calcareous soils of high acid neutralizing capacity. The only significant exceptions to the strata being classified in the Dunkard Group are those rock layers exposed in the Burning Springs Anticline that are considered part of the Monongahela Group, Conemaugh Group, Allegheny Formation and Pottsville Group. The strata in the Pottsville Group are primarily sandstones and they make up only an insignificant proportion of the rocks exposed in the anticline. The other strata are cyclic sequences of sandstone, siltstone, shale, limestone and coal as in the Dunkard Group.

All or parts of Marshall, Wetzel, Wood , Tyler, Pleasants, and Doddridge Counties are drained in this watershed. DEP records indicate that the watershed contains 338 streams totaling

1,195 miles. The largest communities located within (at least partially) the watershed area are Parkersburg, Vienna, Williamstown, Sistersville, Paden City and St. Marys, all of which are located along the Ohio River bank. Publicly-managed lands within the watershed include Lewis Wetzel, The Jug and Conway Run Lake Wildlife Management Areas.

The most long-term human-induced negative impacts on water quality within the watershed are probably those from agriculture. Agricultural pursuits here began before Europeans explored the Ohio River region in the 17th century. Indian agriculture, primarily slash-and-burn, was practiced here for centuries before French, Dutch and British explorers and traders plied their trades here. However, it was only after the area southeast of Ohio River had been wrested from natives by Virginians in the mid 18th century that vast acreages began to be cleared for pasture, hay and crop production. These acreages included steep hillsides as well as rich bottomlands.

From World War I until now, many farms became abandoned and those remaining have, for the most part, experienced increases in their forested acreages. This has helped to decrease the total amount of sedimentation, but some farms, in order to offset losses of cropped acreage on steep hillsides, have increased bottomland acres in production, resulting in the loss of forested riparian zones. Historically, programs of the U. S. Department of Agriculture, aimed at increasing productive acreage, resulted in the conversion of vast acreages from wetlands to pasture and cropland. Subsequent development of residential areas on these converted floodplain lands has exacerbated flooding problems. Sediment-choked stream channels tend to flood more often than deeper channels, so that the increased erosion brought about by cropping has also contributed to the increase in flood damages experienced within the watershed.

Other water quality problems are caused by permanent channel blockage, streambank stabilization projects, inadequate sewage disposal, timbering, oil and gas well development, road construction and maintenance, and building construction, especially housing developments.

Water Quality Summary

During this reporting period, 54 streams totaling 418.83 miles were assessed in the Middle Ohio River North watershed. Figure 10 is a map depicting sampling stations in the Middle Ohio North watershed, while Table 44 provides a list of these stations. A summary of overall designated use support is provided in Table 45 while a use support matrix summary of all designated uses is

Figure 10
Middle Ohio River – North Watershed
Hydrologic Unit 05030201
STORET Sampling Locations
1994-1998

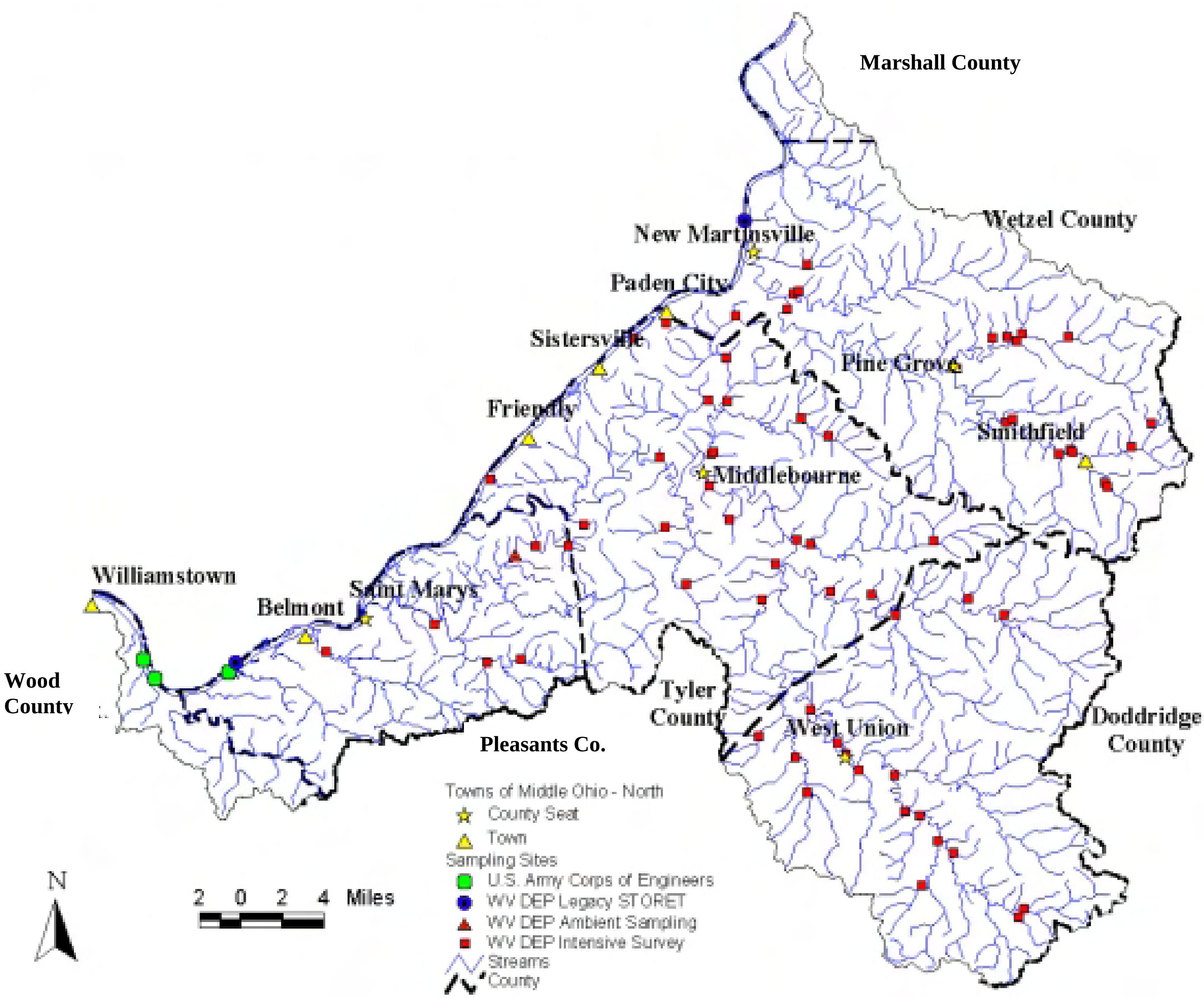

Table 44
STORET Sampling Locations for
Mid Ohio River North Watershed
Hydrologic Unit Code – 05030201
for 1995 – 1999

Agency Code Identifier	STORET Station Number	Stream Name
21WVINST	O-57-{1.8}	FRENCH CREEK
21WVINST	O-58-{22.4}	MIDDLE ISLAND CREEK
21WVINST	O-58-{4.5}	MIDDLE ISLAND CREEK
21WVINST	O-58-{42.8}	MIDDLE ISLAND CREEK
21WVINST	O-63	SUGARCAMP RUN
21WVINST	O-68	OWL RUN
21WVINST	O-68.2-{1.2}	UNT OF OHIO RIVER
21WVINST	O-69-C-{0.4}	LITTLE FISHING CREEK
21WVINST	O-69-N	SOUTH FORK FISHING CREEK
21WVINST	O-69-N-11	STOUT RUN
21WVINST	O-69-N-7	ARCHERS FORK
21WVINST	O-69-N-8	FALLEN TIMBER RUN
21WVINST	O-69-N-9-B	BUCK RUN
21WVINST	O-69-N-9-C-1-{0.3}	UNT OF PICKENPAW RUN
21WVINST	O-69-N-{13.2}	SOUTH FORK FISHING CREEK
21WVINST	O-69-N-{16.8}	SOUTH FORK FISHING CREEK
21WVINST	O-69-N-{6.6}	SOUTH FORK FISHING CREEK
21WVINST	O-69-N-{7.0}	SOUTH FORK FISHING CREEK
21WVINST	O-69-O-2-{0.4}	BETSY RUN
21WVINST	O-69-O-3-{0.4}	MAUD RUN
21WVINST	O-69-O-5-A	GARRISON FORK
21WVINST	O-69-O-6-A	BIG RUN
21WVINST	O-69-O-{8.2}	NORTH FORK FISHING CREEK
21WVINST	O-69-{6.6}	FISHING CREEK
21WVINST	OMI-12	CEDAR RUN
21WVINST	OMI-13	ALLEN RUN
21WVINST	OMI-19	ALLEN RUN
21WVINST	OMI-21-A-{1.6}	LITTLE SANCHO CREEK
21WVINST	OMI-21-D	GRIMMS RUN
21WVINST	OMI-23	POINT PLEASANT CREEK
21WVINST	OMI-23-.1A	FIRST RUN
21WVINST	OMI-23-A-1	DRY RUN
21WVINST	OMI-23-B-3	MUDLICK RUN
21WVINST	OMI-23-B-{7.8}	ELK FORK
21WVINST	OMI-23-C	COALLICK RUN
21WVINST	OMI-23-G	PEACH FORK
21WVINST	OMI-25	JUG RUN
21WVINST	OMI-29-{0.0}	INDIAN CREEK
21WVINST	OMI-29-{1.0}	INDIAN CREEK

Table 44
STORET Sampling Locations for
Mid Ohio River North Watershed
Hydrologic Unit Code – 05030201
for 1995 – 1999

Agency Code Identifier	STORET Station Number	Stream Name
21WVINST	OMI-30-{4.8}	MCELROY CREEK
21WVINST	OMI-4-{4.8}	MCKIM CREEK
21WVINST	OMI-4-{7.6}	MCKIM CREEK
21WVINST	OMI-40-E	WILHELM RUN
21WVINST	OMI-46	MEATHOUSE FORK
21WVINST	OMI-46-E	TOMS FORK
21WVINST	OMI-46-E-1	LITTTLE TOMS FORK
21WVINST	OMI-46-L	BEECH LICK
21WVINST	O-57-{1.8}	FRENCH CREEK
21WVINST	O-68.2-{1.2}	U. T. OF OHIO RIVER
21WVINST	O-69-C-{0.4}	LITTLE FISHING CREEK
21WVINST	O-69-C-{5.6}	LITTLE FISHING CREEK
21WVINST	O-69-K-{5.0}	PINEY FORK
21WVINST	O-69-N-{6.6}	SOUTH FORK FISHING CREEK
21WVINST	O-69-N-{7.0}	SOUTH FORK FISHING CREEK
21WVINST	O-69-N-{13.2}	SOUTH FORK FISHING CREEK
21WVINST	O-69-N-9-C-1-{0.3}	UNT OF PICKENPAW RUN
21WVINST	O-69-N-{16.8}	SOUTH FORK OF FISHING CREEK
21WVINST	O-69-0-{8.2}	NORTH FORK FISHING CREEK
21WVINST	O-70-{0.2}	WILLIAMS RUN
21WVINST	O-72-A-3-{0.6}	U. T. OF LEFT FORK OF PROCTOR CREEK
21WVINST	O-72-A.11-{2.6}	U. T. OF PROCTOR CREEK
21WVINST	OMI-4-{4.8}	MCKIM CREEK
21WVINST	OMI-4-{7.4}	MCKIM CREEK
21WVINST	OMI-4-{14.9}	MCKIM CREEK
21WVINST	OMI-21-A-{1.6}	LITTLE SANCHO CREEK
21WVINST	OMI-23-B-{7.8}	ELK FORK
21WVINST	O-58-{42.8}	MIDDLE ISLAND CREEK
21WVINST	OMI-29-A-{1.4}	BIG RUN
21WVINST	OMI-29-{3.8}	INDIAN CREEK
21WVINST	OMI-29-{8.8}	INDIAN CREEK
21WVINST	OMI-29-H-{0.8}	STACKPOLE RUN
21WVINST	OMI-30-{0.4}	MCELROY CREEK
21WVINST	OMI-30-{8.8}	MCELROY CREEK
21WVINST	OMI-30-H-1-D-{1.6}	UNT OF LITTLE FLINT RUN
21WVINST	OMI-30-H-{2.0}	FLINT RUN
21WVINST	OMI-30-N-{1.6}	TALKINGTON FORK
21WVINST	OMI-30-O-2-{1.5}	BIG BATTLE RUN
21WVINST	OMI-32-{0.8}	CONAWAY RUN

Table 44 STORET Sampling Locations for Mid Ohio River North Watershed Hydrologic Unit Code – 05030201 for 1995 – 1999		
Agency Code Identifier	**STORET Station Number**	**Stream Name**
21WVINST	OMI-41.5-{0.0}	U. T. OF MIDDLE ISLAND CREEK
21WVINST	OMI-46-H-{3.0}	BRUSHY FORK
21WVINST	OMI-46-I-1-{0.4}	U. T. OF SNAKE RUN
21WVINST	OMI-46-{15.4}	MEATHOUSE FORK

Table 45 USE SUMMARY REPORT: OVERALL USE SUPPORT MID-OHIO RIVER NORTH WATERSHED Waterbody Type: River			
Total Number of River/Streams Assessed:	54		
Total Number of River/Streams Monitored:	53		
Total Number of River/Streams Evaluated:	1		
	ASSESSMENT BASIS IN MILES		
DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	60.61	60.61
SUPPORTING BUT THREATENED	0.00	260.15	260.15
PARTIALLY SUPPORTING	0.00	97.67	97.67
NOT SUPPORTING	0.20	0.00	0.20
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	0.20	418.63	418.83

given in Table 46.

Of the 418.83 stream miles assessed, 60.61 (14.5%) were fully supporting their overall designated uses, 260.15 (62.0%) were fully supporting but threatened, 97.67 (23.4%) were partially supporting, and 0.20 (0.1%) were non-supporting.

Of the 455.54 miles assessed for Aquatic Life Support use, 110.03 (24.2%) were fully supporting, 250.27 (54.9%) were fully supporting but threatened, 94.48 (20.8%) were partially supporting, and 0.26 (0.1%) were non-supporting.

TABLE 46 USE SUPPORT MATRIX SUMMARY MID-OHIO RIVER NORTH WATERSHED WATERBODY TYPE: RIVER UNITS IN MILES				
USE	**Supporting**	**Supporting but Threatened**	**Partially Supporting**	**Not Supporting**
Overall Use	60.61	260.15	97.67	0.20
Aquatic Life	110.03	250.27	94.48	0.26
Fish Consumption			58.40	
Warm Water Fishery	45.24	224.89	80.31	
Bait Minnow Fishery	71.71	25.38	14.17	1.74
Primary Contact Recreation	348.12	77.32	13.17	0.26
Drinking Water Supply	154.40			
Industrial	58.40			

During this reporting period, the Ohio River mainstem (58.40 miles) was the only stream assessed in the watershed for Fish Consumption use. The entire reach was partially supporting due to chlordane and PCB's contamination.

Of the 438.87 miles assessed for Primary Contact Recreation use, 348.12 (79.3%) were fully supporting, 77.32 (17.6%) were fully supporting but threatened, 13.17 (3.0%) were partially supporting, and 0.26 (0.1%) were non-supporting.

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Middle Ohio River North watershed is provided in Table 47.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Siltation (155.69 miles), Metals (101.60 miles), Pesticides (58.40 miles) and PCB's (58.40 miles). A large portion of the stream mileage contributing to these causes is the Ohio River mainstem.

Table 47 Complete Summary of Causes, Including User-Defined Mid-Ohio River North Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Cause Categories Waterbody Type: River			
Code	**Cause Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0000	CAUSE UNKNOWN	0.00	9.89
0200	PESTICIDES	58.40	0.00
0410	PCB's	58.40	0.00
0500	METALS	0.00	101.60
0530	Copper	0.00	12.60
1100	SILTATION	0.00	155.69
1500	FLOW ALTERATIONS	0.00	3.03
1600	HABITAT ALTERATION (non-flow)	0.00	33.97
1700	PATHOGENS	0.00	16.77
1710	Fecal Coliform Bacteria	0.00	16.77
3300	CAUSTIC CHEMICALS	0.20	0.00

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Middle Ohio River North watershed is provided in Table 48.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Unknown Source (208.44 miles), and Agriculture (25.30 miles).

Size of Waters Affected by Toxics

During this reporting cycle, 174.79 stream miles in the Middle Ohio River North watershed were monitored for toxics. Of these, only the Ohio River mainstem (58.40 miles) had elevated levels.

Public Health/Aquatic life Impacts

Within the Middle Ohio River North watershed, only the Ohio River mainstem segment is

Table 48 Complete Summary of Sources, Including User-Defined Mid-Ohio River North Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
1000	AGRICULTURE	0.00	25.30
1350	GRAZING-RELATED SOURCES	0.00	3.19
1400	Pasture Grazing-Riparian and/or Upland	0.00	11.99
1420	Pasture Grazing-Upland	0.00	8.80
7000	HYDROMODIFICATION	0.00	3.03
7200	Dredging	0.00	3.03
8400	SPILLS	0.20	0.00
9000	SOURCE UNKNOWN	58.40	150.04

under a fish consumption advisory. This risk based advisory was issued in May, 1996 and is due to contamination by PCB's (Table 73). Although PCB's, chlordane, and dioxin were all present at detectable levels in tissue samples, consumption advisories are based on the most stringent criteria, which during this reporting period, turned out to be the risk based criteria for PCB's. A commercial fishing ban on the Ohio River mainstem coincides with the fish consumption advisory.

During this reporting period, no bathing beach or public water supply closures were documented in the watershed. However, one fish kill was reported. It occurred along 0.20 miles of Bull Run in Wood County due to asphalt emulsion from a parking lot surfacing job and resulted in a total kill in the affected reach.

Section 303(d) Waters

The only watershed stream included in the current 303(d) list is the Ohio River mainstem (Table 49). It is listed for PCB's and chlordane in fish tissue and copper and aluminum in the water column. The source of these pollutants is undetermined. A TMDL has not yet been completed on the stream, although one currently is in progress.

TABLE 49
West Virginia
1998 303(d) List
Middle Ohio River North Watershed

Primary Waterbody List							
Stream Name	**Stream Code**	**Use Affected**	**Pollutant**	**Primary Source**	**Miles Affected**	**Reach Description**	**TMDL Priority**
Ohio River	O	HH*	PCB's	Undetermined	51.00	Entire segment	High
Ohio River	O	HH*	Chlordane	Undetermined	51.00	Entire segment	High
Ohio River	O	AQL	Copper**	Undetermined	12.70	mp 113.7 to mp 126.4	Low
Ohio River	O	AQL	Aluminum	Undetermined	51.00	Entire segment	Low

* Contaminant found in fish tissue
\# Contaminant found in fish tissue and water column
AQL = Aquatic Life
HH = Human Health

TMDL = Total Maximum Daily Load
HUC = Hydrologic Unit Code
MP = Mile Point

** The water quality criteria for copper changed from total to dissolved in July of 1999. Dissolved copper data collected in 1998 and 1999 revealed no violations of the new criteria. If the trend continues, copper likely will be removed from the 303(d) list as a pollutant of concern in the Ohio River.

The Middle Ohio River South Watershed

Background

The streams draining the 706 square mile area downstream of the mouth of Little Kanawha River to and including Oldtown Creek are included in this watershed. The Allegheny Plateau Physiographic Province encompasses this watershed. The drainage pattern is dendritic, that is, much-branched with few exceptional topographic features, such as sinkholes or long parallel ridges. The largest tributary subwatersheds include those of Mill, Sandy and Oldtown Creeks. Many of the larger streams are slow-moving and prone to chemical and temperature stratification. This is especially true of stream segments behind old mill dams, low-water bridge crossings and protruding rock shelves, and those located within the backwater influence of Ohio River. This is often problematical in summer when algal respiration and high stream temperature can lead to oxygen depletion just below stream surfaces.

The Mid-Ohio River South Watershed is located primarily within the Permian Hills Subecoregion of the Western Allegheny Plateau Ecoregion, although the Oldtown Creek subwatershed and a few smaller tributary watersheds are located in the Monongahela Transition Zone Subecoregion. Streams in both of these subecoregions are typified by having moderate to low gradients and sand/silt substrates. DEP records indicate there are 318 streams in the watershed totaling 1,147 miles. The water is usually well-buffered against acid inputs. Forest types that predominate are oak-hickory-pine and cove hardwoods.

This watershed is underlain primarily by surface rock strata classified in the Dunkard Group of the Permian and Pennsylvanian Systems. These are cyclic sequences of sandstone, siltstone, shale, limestone and coal. Most of the soils borne of these rocks are well-buffered against acid inputs. Consequently, most of the surface waters are naturally alkaline. Because of the abundance of shale as parent material, many of the soils have a high clay content and drain poorly. Consequently, erosion is problematical in the watershed and resulting water quality problems associated with sedimentation are great. Any surface disturbance to these soils usually results in erosion.

Parts of Wood, Jackson, Mason and Roane Counties are located within this watershed. The largest communities located therein are Ripley and Ravenswood. McClintic, Frozencamp and

O'Brien Lake Wildlife Management Areas are the largest publicly-owned lands within the watershed, but they are relatively small.

The most long-term human-induced negative impacts on water quality within the watershed are probably those from agriculture. Agricultural pursuits here began before Europeans explored the Ohio River region in the 17th century. Indian agriculture, primarily slash-and-burn, was practiced here for centuries before French, Dutch and British explorers and traders plied their trades here. However, it was only after the area southeast of Ohio River had been wrested from natives by Virginians in the mid 18th century that vast acreages began to be cleared for pasture, hay and crop production. These acreages included steep hillsides as well as rich bottomlands.

From World War I until now, many farms became abandoned and those remaining have, for the most part, experienced increases in their forested acreages. This has helped to decrease the total amount of sedimentation, but some farms, in order to offset losses of cropped acreage on steep hillsides, have increased bottomland acres in production, resulting in the loss of forested riparian zones. Historically, programs of the U. S. Department of Agriculture, aimed at increasing productive acreage, resulted in the conversion of vast acreages from wetlands to pasture and cropland. Subsequent development of residential areas on these converted floodplain lands has exacerbated flooding problems. Sediment-choked stream channels tend to flood more often than deeper channels, so that the increased erosion brought about by cropping has also contributed to the increase in flood damages experienced within the watershed.

Other water quality problems are caused by permanent channel blockage, streambank stabilization projects, inadequate sewage disposal, timbering, oil and gas well development, road construction and maintenance, and building construction (especially housing developments). Interstate highway 77 contributes a significant amount of sediment to the streams near which it runs. Steep road cuts, inadequately vegetated, frequently bleed clay from the exposed shales that predominate the geologic base of this watershed.

Water Quality Summary

During this reporting period, 37 streams totaling 396.13 miles were assessed in the Middle Ohio River South watershed. Figure 11 is a map depicting sampling stations in the Middle Ohio South watershed while Table 50 provides a list of these stations. A summary of overall designated

Figure 11
Middle Ohio River – South Watershed
Hydrologic Unit – 05030202

STORET Sampling Locations
1994-1998

Table 50 STORET Sampling Locations for Mid Ohio River South Watershed Hydrologic Unit Code – 05070202 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Stream Name**
21WVINST	O-21-{6.7}	OLDTOWN CREEK
21WVINST	O-24	SLIDING HILL CREEK
21WVINST	O-31	LITTLE MILL CREEK
21WVINST	O-32-H-{2.4}	PARCHMENT CREEK
21WVINST	O-32-L-7-F	PLEASANT VALLEY RUN
21WVINST	O-32-L-7-{3.0}	GRASSLICK CREEK
21WVINST	O-32-M-{6.8}	ELK FORK AT SPRUCE RUN
21WVINST	O-32-N	LITTLE MILL CREEK
21WVINST	O-32-{18.7}	MILL CREEK
21WVINST	O-33	SPRING CREEK
21WVINST	O-36-J-{1.0}	LEFT FORK/SANDY CREEK
21WVINST	O-36-{4.6}	SANDY CREEK AT SILVERTON
21WVINST	O-36-{7.2}	SANDY CREEK
21WVINST	O-32-L-7-B	STONELICK RUN
21WVINST	O-44-A	SOUTH FORK/LEE CREEK
21WVINST	O-44-B	NORTH FORK/LEE CREEK
21WVINST	O-20.5-{2.6}	CROOKED CREEK
21WVINST	O-21-A-{0.0}	POTTER CREEK
21WVINST	O-21-C-{2.4}	TRACE FORK
21WVINST	O-30-A-{1.6}	CLAYLICK RUN
21WVINST	O-31-A-{0.6}	RIGHT FORK OF LITTLE MILL CREEK
21WVINST	O-32-{19.6}	MILL CREEK
21WVINST	O-32-H-{2.2}	PARCHMENT CREEK
21WVINST	O-32-H-{4.8}	PARCHMENT CREEK
21WVINST	O-32-H-{7.4}	PARCHMENT CREEK
21WVINST	O-32-L-4.5-{0.4}	BEAR FORK
21WVINST	O-32-L-7-{11.6}	GRASSLICK CREEK
21WVINST	O-32-L-8-B-{0.8}	LAUREL RUN
21WVINST	O-32-L-8-{2.4}	BEAR FORK
21WVINST	O-32-N-3-{2.0}	FROZENCAMP CREEK
21WVINST	O-32-N-5-{0.8}	LITTLE CREEK
21WVINST	O-32-N-5-B-2-{0.5}	U.T. OF POPLAR FORK
21WVINST	O-36-{8.6}	SANDY CREEK
21WVINST	O-36-G-{2.6}	TRACE FORK
21WVINST	O-36-I-{4.2}	RIGHT FORK SANDY CREEK
21WVINST	O-36-I-10-{0.6}	FALLENTIMBER RUN
21WVINST	O-36-J-{1.2}	LEFT FORK SANDY CREEK
21WVINST	O-36-J-{10.8}	LEFT FORK SANDY CREEK
21WVINST	O-36-J-3-{3.6}	TURKEY FORK

Table 50 STORET Sampling Locations for Mid Ohio River South Watershed Hydrologic Unit Code – 05070202 for 1995 - 1999		
Agency Code Identifier	**STORET Station Number**	**Stream Name**
21WVINST	O-36-J-5-{1.4}	NESSELROAD RUN
21WVINST	O-36-J-10-A-{0.3}	U.T. OF NICHOLAS HOLLOW
21WVINST	O-38-{2.1}	LITTLE SANDY CREEK
21WVINST	O-43-{3.6}	POND CREEK
21WVINST	O-43-{5.8}	POND CREEK
21WVINST	O-44-A-{3.0}	LEE CREEK SOUTH FORK
21WVINST	O-44-B-{3.0}	LEE CREEK, NORTH FORK
21WVINST	O-50-{9.0}	BIG RUN

use support is provided in Table 51 while a use support matrix summary of all designated uses is given in Table 52.

Of the 396.13 stream miles assessed, 91.89 (23.2%) were fully supporting their overall designated uses, 37.09 (9.4%) were fully supporting but threatened, and 267.15 (67.4%) were partially supporting.

Of the 396.10 miles assessed for Aquatic Life Support use, 109.64 (27.7%) were fully supporting, 19.31 (4.9%) were fully supporting but threatened, 255.94 (64.6%) were partially supporting, and 11.21 (2.8%) were non-supporting.

During this reporting period, the Ohio River mainstem (93.50 miles) was the only stream assessed in the watershed for Fish Consumption use. The entire reach was partially supporting due to chlordane and PCB's contamination.

Of the 396.10 miles assessed for Primary Contact Recreation use, 285.67 (72.1%) were fully supporting, 83.88 (21.2%) were fully supporting but threatened, and 26.55 (6.7%) were non-supporting.

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Middle Ohio River South watershed is provided in Table 53.

Considering both major and moderate/minor impacts, the principal causes of impairment in

Table 51 USE SUMMARY REPORT: OVERALL USE SUPPORT MID-OHIO RIVER SOUTH WATERSHED Waterbody Type: River	
Total Number of River/Streams Assessed:	37
Total Number of River/Streams Monitored:	37
Total Number of River/Streams Evaluated:	0

DEGREE OF USE SUPPORT	ASSESSMENT BASIS IN MILES		
	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	91.89	91.89
SUPPORTING BUT THREATENED	0.00	37.09	37.09
PARTIALLY SUPPORTING	0.00	267.15	267.15
NOT SUPPORTING	0.00	0.00	0.00
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	0.00	396.13	396.13

TABLE 52
USE SUPPORT MATRIX SUMMARY
MID-OHIO RIVER SOUTH WATERSHED
WATERBODY TYPE: RIVER
UNITS IN MILES

USE	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting
Overall Use	91.89	37.09	267.15	
Aquatic Life	109.64	19.31	255.94	11.21
Fish Consumption			93.50	
Warm Water Fishery	35.58	11.21	215.43	13.68
Bait Minnow Fishery	74.09	8.10	40.51	7.61
Primary Contact Recreation	285.67	83.88		26.55
Drinking Water Supply	61.16		61.70	
Industrial	93.50			

the watershed are Siltation (163.39 miles), Pesticides, PCB’s and Metals (each 93.50 miles), and Habitat Alteration (non-flow) (90.93 miles).

Table 53
Complete Summary of Causes, Including User-Defined
Mid-Ohio River South Watershed
Sizes of Waterbodies Not Fully Supporting Uses
Affected by Various Cause Categories
Waterbody Type: River

Code	Cause Category	Major Impact in Miles	Moderate/Minor Impact in Miles
0100	UNKNOWN TOXICITY	0.05	0.00
0200	PESTICIDES	93.50	0.00
0410	PCB’s	93.50	0.00
0420	DIOXINS	28.20	0.00
0500	METALS	0.00	93.50
1100	SILTATION	29.53	133.86
1600	HABITAT ALTERATION (non-flow)	11.21	79.72
1700	PATHOGENS	26.55	0.00
1710	Fecal Coliform Bacteria	26.55	0.00

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Middle Ohio River South watershed is provided in Table 54.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Agriculture (81.77 miles), Unknown Source (80.03 miles), and Construction (29.36 miles).

Size of Waters Affected by Toxics

During this reporting cycle, 322.82 stream miles in the Middle Ohio River South watershed were monitored for toxics. Of these, only the Ohio River mainstem (93.50 miles) had elevated levels.

Table 54 Complete Summary of Sources, Including User-Defined Mid-Ohio River South Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0100	INDUSTRIAL POINT SOURCES	0.05	0.00
1000	AGRICULTURE	27.50	54.27
1050	CROP-RELATED SOURCES	0.00	4.80
1350	GRAZING-RELATED SOURCES	27.50	34.88
1400	Pasture Grazing-Riparian and/or Upland	0.00	19.39
3000	CONSTRUCTION	0.00	29.36
3200	Land Development	0.00	29.36
5000	RESOURCE EXTRACTION	0.00	4.81
5900	Abandoned Mining	0.00	4.81
9000	SOURCE UNKNOWN	24.32	55.71

Public Health/Aquatic life Impacts

Within the Middle Ohio River South watershed, only the Ohio River mainstem segment is under a fish consumption advisory. This risk based advisory was issued in May, 1996 and is due to contamination by PCB's (Table 73). Although PCB's, chlordane, and dioxin were all present at detectable levels in tissue samples, consumption advisories are based on the most stringent criteria, which during this reporting period, turned out to be the risk based criteria for PCB's. A commercial fishing ban on the Ohio River mainstem segment coincides with the fish consumption advisory.

During this reporting period, no bathing beach or public water supply closures were documented in the watershed. However, one fish kill was reported. It occurred along 0.05 miles of the Ohio River mainstem in Wood County due to an unknown industrial discharge and resulted in a light kill.

Section 303(d) Waters

The only watershed stream included in the current 303(d) list is the Ohio River mainstem (Table 55). It is listed for PCB's, chlordane, and dioxin in fish tissue and dioxin, aluminum, and iron in the water column. The source of these pollutants is undetermined. A TMDL has not yet been completed on the stream, although one currently is in progress.

TABLE 55 West Virginia 1998 303(d) List Middle Ohio River South Watershed							
Primary Waterbody List							
Stream Name	**Stream Code**	**Use Affected**	**Pollutant**	**Primary Source**	**Miles Affected**	**Reach Description**	**TMDL Priority**
Ohio River	O	HH*	PCB's	Undetermined	101.00	Entire segment	High
Ohio River	O	HH*	Chlordane	Undetermined	101.00	Entire segment	High
Ohio River	O	HH#	Dioxin	Undetermined	28.20	mp 237.5 to mp 265.7	High
Ohio River	O	AQL	Aluminum	Undetermined	101.00	Entire segment	Low
Ohio River	O	AQL; HH	Iron	Undetermined	61.70	mp 113.7 to mp 126.4	Low

* Contaminant found in fish tissue
# Contaminant found in fish tissue and water column
AQL = Aquatic Life
HH = Human Health

TMDL = Total Maximum Daily Load
HUC = Hydrologic Unit Code
MP = Mile Point

The Potomac River Direct Drains Watershed

Background

"Patomeck" was the name of an Indian town located on this River in 1608 when the Chesapeake Bay region was explored by Captain John Smith of England. The town was part of the powerful Powhatan confederacy and as such was a place to which other communities brought tribute. The name is thought to be derived from "Patomek," a Lenape language word meaning "where something is brought" (Donehoo, 1998).

This watershed area of 641 square miles includes the areas of several Potomac River tributary watersheds within West Virginia except for Shenandoah River, South Branch Potomac River, North Branch Potomac River and Cacapon River. Opequon, Back and Sleepy Creeks are the largest subwatersheds within the watershed, however, all three have their headwaters located in Virginia. DEP records indicate there are 113 streams in the watershed totaling 927 miles.

Two distinct physiographic provinces make up this watershed; Ridge and Valley, and Great Valley. The Great Valley province is underlain primarily by limestones, dolomites and shales of the Cambrian and Ordovician Systems. The drainage pattern is primarily karst type, with some trellised drainage in the vicinity of the thickest shales. The Ridge and Valley Province is composed of long parallel ridges and valleys with a trellised (tree-like) drainage pattern. The rocks are arranged in cyclical sequences of sandstones, shales, dolomites and limestones of Ordovician, Silurian and Devonian age.

The Potomac Direct Drains Watershed is located in three subecoregions of the Ridge & Valley Ecoregion: Northern Limestone/Dolomite Valleys, Northern Shale Valleys and Northern Sandstone Ridges. Streams are quite different from one another across these three subecoregions. For instance, headwater streams originating in the Sandstone Ridges are usually poorly-buffered against acid inputs and they have steep gradients. Those in the karst areas typical of the Limestone/Dolomite Valleys are very well buffered and have moderate to low gradients. The ridges are typically forested with oaks, hickories and pines, while the karst areas are usually covered with agricultural crops, pastures or human structures. The shale valleys have a mixture of these land covers.

The watershed is subject to both polar air masses and tropical storm systems. However, temperatures in winter tend to be warmer than in most other regions of the State except the southwest. Tropical storm systems moving from south to north tend to cause the greatest flooding with the valley of Potomac River subject to more flooding than any other part of the watershed. Although Jennings Randolph Reservoir on North Branch Potomac River (upstream of the watershed) was constructed primarily for low flow augmentation, it has been used as a flood moderating structure during periods of heavy runoff. This has helped alleviate some of the damages from floods within the Potomac River valley.

The largest publicly-owned lands within the watershed are Sleepy Creek Wildlife Management Area and Cacapon State Park. The wildlife management area includes an impoundment of Meadow Creek, the largest within the watershed. Most perennial streams have few, if any obstructions to fish passage. Spring spawning runs of American shad were once a sight to behold in the larger tributaries, but now obstructions on the mainstem Potomac have decreased the numbers of spawning shad significantly. American eels also migrate through the watershed, although their spawning direction is downstream. Elvers (larval eels returning from their nursery in the Sargasso Sea) and adults are a bit more adept at wriggling up the low dams, but removal of these dams would assist their recovery greatly. The States of Maryland and Virginia, as well as many other interested parties have been planning for the removal of several of these dams. Indeed, a few have been broken up already.

Jefferson and Berkeley Counties, and part of Morgan County are located within the watershed. Perhaps the fastest growing county population in West Virginia is that of Berkeley County in the vicinity of Martinsburg. The livestock farms and fruit orchards of Jefferson County are rapidly being developed as well. All three counties have experienced incredible population increases in the past 20 years, due to the expansion outward from the metropoli of Washington D.C., Baltimore MD and northern VA. Indeed, many of the old communities within this watershed are now considered by demographers to be “bedroom” communities for these metropoli. Some residential developments are populated primarily by “second-home vacationers” and retirees. Golf communities and other resort communities have sprung up within just a few years. Once-forested mountainsides are now subdivided into numerous house lots and apartment complexes. Currently, the largest communities within this watershed are Martinsburg and Berkeley Springs, both of which are subjected to the environmental and political strains of urban sprawl.

A predominance of orchard horticulture and other agricultural pursuits on the karst lands of this watershed for more than a century have, undoubtedly, affected the water quality of the streams located therein. Chemical pesticides and fertilizers have been applied for many decades so that it is not unusual for researchers to find relatively high concentrations of these chemicals and their breakdown compounds in groundwater, streams and sediments. Karst geology lends itself to rapid distribution of pollutants into groundwater and subsequently into surface streams fed by springs and seeps. Consequently, streams draining the Great Valley have the highest average concentrations of nutrients than in any other Physiographic Region of West Virginia.

Rapid urbanization of the countryside poses serious threats to aquatic ecosystems as sediment from construction sites runs into small streams. Significantly large areas of forest and agricultural land have been converted to suburban areas, thus decreasing the amount of readily permeable soil surface available to absorb precipitation. Zoning regulations, where they exist, are minimal and do not adequately protect natural flood storage and flood prevention areas, such as intermittent wetlands and riparian buffer zones. Nonetheless, the high calcium content of the streams makes them extremely productive biologically. Consequently, water quality problems are apt to be reflected by low diversity, not by low abundance.

Water Quality Summary

During this reporting period, 41 streams totaling 276.36 miles were assessed in the Potomac River Direct Drains watershed. Figure 12 is a map depicting sampling stations in the Potomac Direct Drains watershed, while Table 56 provides a list of these stations. A summary of overall designated use support is provided in Table 57 while a use support matrix summary of all designated uses is given in Table 58.

Of the 276.36 stream miles assessed, 124.14 (44.9%) were fully supporting their overall designated uses, 86.03 (31.1%) were fully supporting but threatened, 58.98 (21.4%) were partially supporting, and 7.21 (2.6%) were non-supporting.

Of the 276.36 miles assessed for Aquatic Life Support use, 134.41 (48.6%) were fully supporting, 81.00 (29.3%) were fully supporting but threatened, 38.87 (14.1%) were partially supporting, and 22.08 (8.0%) were non-supporting.

Figure 12

Potomac River Direct Drains Watershed

Hydrologic Unit - 02070004

STORET Sampling Locations
1994-1998

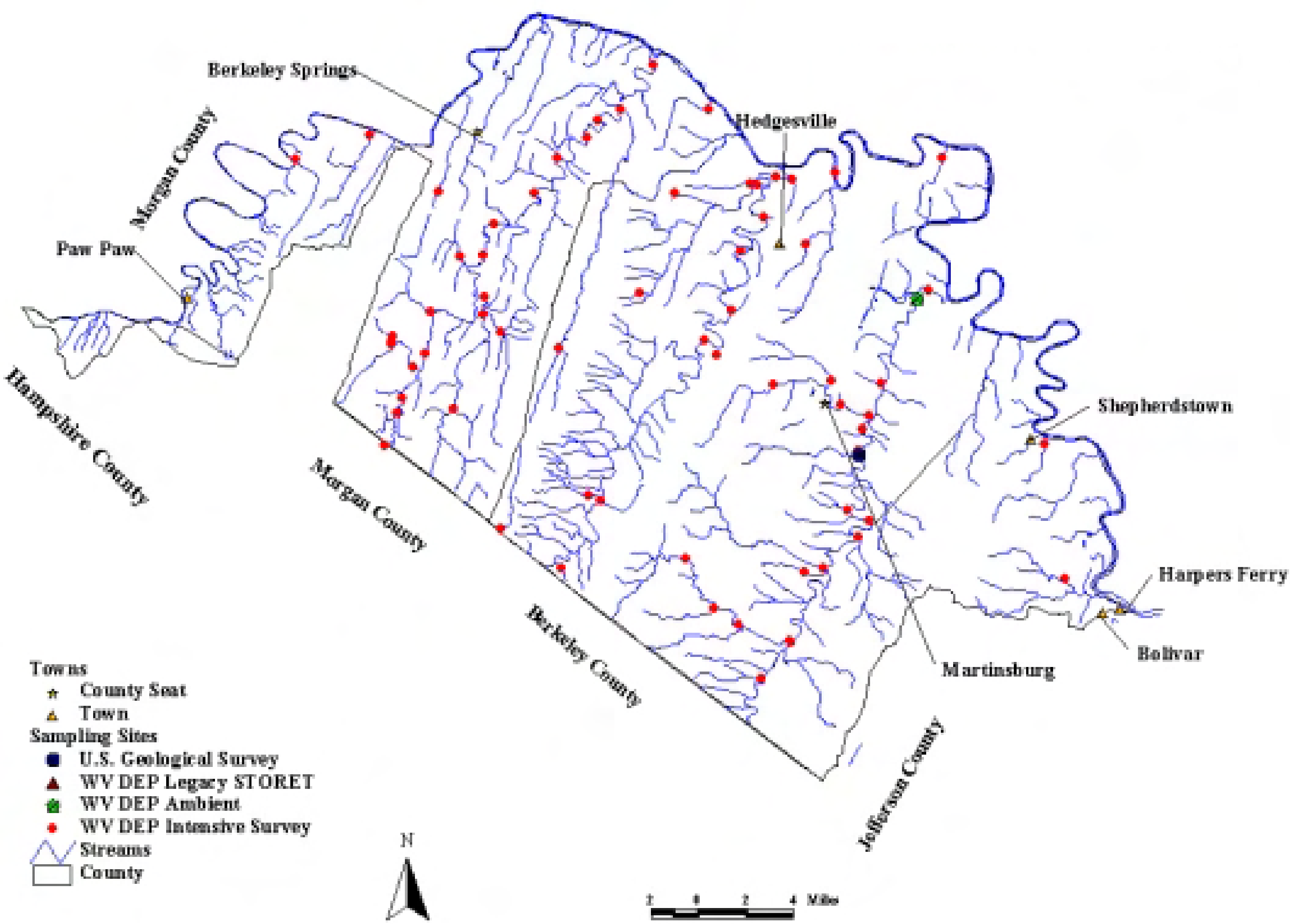

Table 56 STORET Sampling Locations for Potomac River Direct Drains Watershed Hydrologic Unit Code – 02070004 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	P-12-{5.2}	SIR JOHNS RUN	Approx 3 miles south and west of Berkeley Springs, South and east of Great Cacapon
21WVINST	P-15-{0.4}	WILLET RUN	Just south of WV/MD state line and about 1.5 miles west of Great Cacapon
21WVINST	P-16-{0.1}	ROCKWELL RUN	Just east of WV/MD state line and west of Great Cacapon
21WVINST	P-1-A-{0.8}	ELK BRANCH	About 3 miles north and east of Halltown, I mile west of Potomac River
21WVINST	P-2.2-{0.3}	UT POTOMAC RV (TEAGUE'S RUN)	Just east of Shepherdstown
21WVINST	P-4.5	JORDAN RUN	West of Williamsport
21WVINST	P-4-{1.3}	OPEQUON CREEK	East and north of Bedington
21WVINST	P-4-{17.8}	OPEQUON CREEK	South and west of Kearneysville
21WVINST	P-4-{18.8}	OPEQUON CREEK	West of Kearneysville
21WVINST	P-4-{29.2}	OPEQUON CREEK	
21WVINST	P-4-{9.8}	OPEQUON CREEK	East of Martinsburg about 2 miles and on the Stonebridge Golf Course
21WVINST	P-4-B	EAGLE RUN	East of Martinsburg
21WVINST	P-4-C-{0.2}	TUSCARORA CREEK	East of Martinsburg
21WVINST	P-4-C-{1.5}	TUSCARORA CREEK	In Martinsburg
21WVINST	P-4-C-{6.0}	TUSCARORA CREEK	In Martinsburg area
21WVINST	P-4-C-1	DRY RUN	In the northern part of Martinsburg
21WVINST	P-4-D	EVANS RUN	East of Martinsburg 2 to 3 miles
21WVINST	P-4-I	HOPEWELL RUN	South and west of Leetown
21WVINST	P-4-I	HOPEWELL RUN	South and west of Leetown
21WVINST	P-4-J	MIDDLE CREEK	South and west of Leetown
21WVINST	P-4-K-{1.2}	GOOSE CREEK	North and east of Inwood
21WVINST	P-4-M	MILL CREEK	South and east of Inwood
21WVINST	P-4-M-{7.8}	MILL CREEK	West of Inwood about 2 miles
21WVINST	P-4-M-{7.8}	MILL CREEK	West of Inwood about 2 miles
21WVINST	P-4-M-1	SYLVAN RUN	South and east of Bunker Hill
21WVINST	P-4-M-2	TORYTOWN RUN	Just west of Bunker Hill
21WVINST	P-4-M-2	TORYTOWN RUN	Just west of Bunker Hill
21WVINST	P-4-P	SILVER SPRING RUN	East of Ridgeway approx 3 miles (as the crow flies)
21WVINST	P-4-P	SILVER SPRING RUN	East of Ridgeway approx 3 miles (as the crow flies)
21WVINST	P-5	HARLAN RUN	
21WVINST	P-5-A-{1.4}	TULLIS BRANCH	East of Hedgesville

Table 56
STORET Sampling Locations for
Potomac River Direct Drains Watershed
Hydrologic Unit Code – 02070004
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Stream Name	Location
21WVINST	P-6-{1.2}	BACK CREEK	North and west of North Mountain and south of the Potomac River.
21WVINST	P-6-{17.3}	BACK CREEK	In Camp Tomahawk, north and east of Jones Springs
21WVINST	P-6-{18.4}	BACK CREEK	About 2 miles east of Jones Springs
21WVINST	P-6-{33.8}	BACK CREEK	Just north of WV/VA state line and south of Glengary about 1 mile
21WVINST	P-6-{9.1}	BACK CREEK	About 2 miles north of Tomahawk
21WVINST	P-6-A.1	UT OF BACK CREEK #2	North and east of Hedgesville and west of Georgetown
21WVINST	P-6-A.2	KATES RUN	East and a little south of Johnsontown
21WVINST	P-6-A.5-{0.2}	U.T. OF BACK CREEK	South and east of Tomahawk
21WVINST	P-6-A-{0.5}	TILHANCE CREEK	South of WV/MD state line and north and east of Johnstontown
21WVINST	P-6-A-{1.3}	TILHANCE CREEK	East of Johnstontown
21WVINST	P-6-A-{9.4}	TILHANCE CREEK	About 3 miles west of Tomahawk - as the crow flies
21WVINST	P-6-A-1-{1.6}	HIGGINS RUN	West of Johnsontown
21WVINST	P-6-C.8-{0.6}	U.T. OF BACK CREEK @ GANOTOWN	At Ganotown
21WVINST	P-6-D	SAWMILL RUN	East of Ganotown
21WVINST	P-6-D	SAWMILL RUN	East of Ganotown
21WVINST	P-22	LITTLE BRUSH CREEK	Just north of WV/VA state line
21WVINST	P-8	BIG RUN	About a mile north of Cherry Run
21WVINST	P-9-{1.0}	SLEEPY CREEK	Just south and west of Sleepy Creek
21WVINST	P-9-{10.0}	SLEEPY CREEK	About 5 miles east of Berkley Springs (as the crow flies)
21WVINST	P-9-{12.2}	SLEEPY CREEK	About 4.5 miles east of Berkely Springs (as the crow flies)
21WVINST	P-9-{15.2}	SLEEPY CREEK	East and a little south of Berkley Springs
21WVINST	P-9-{18.2}	SLEEPY CREEK	South and west of New Hope - east and south of Berkley Springs
21WVINST	P-9-{21.6}	SLEEPY CREEK	East of Smith Crossroads - south and a little east of Berkley Springs
21WVINST	P-9-{23.6}	SLEEPY CREEK	South and east of Smith Crossroads
21WVINST	P-9-{33.2}	SLEEPY CREEK	North and east of Ridge - east of Cacapon State Park
21WVINST	P-9-{35.6}	SLEEPY CREEK	North and east of Ridge
21WVINST	P-9-{36.8}	SLEEPY CREEK	About a mile east of Ridge
21WVINST	P-9-B-{0.0}	MEADOW BRANCH	South of Potomac River and about 7.5 miles east

Table 56 STORET Sampling Locations for Potomac River Direct Drains Watershed Hydrologic Unit Code – 02070004 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
			of Berkley Springs
21WVINST	P-9-B-{12.8}	MEADOW BRANCH	In Sleepy Creek WMA
21WVINST	P-9-B-1-A-{0.1}	ROARING RUN	In Sleepy Creek WMA
21WVINST	P-9-D.8-{0.5}	LICK RUN	South and west of Smith Crossroads
21WVINST	P-9-E-{1.5}	MIDDLE FORK/SLEEPY CREEK	Just west of Stotlers Crossroads
21WVINST	P-9-E-{7.0}	MIDDLE FORK/SLEEPY CREEK	About 4 miles east of Ridge (as the crow flies)
21WVINST	P-9-E-1	SOUTH FORK/SLEEPY CREEK	Just north of Stotlers Crossroads
21WVINST	P-9-F	ROCK GAP RUN	In Cacapon State Park area
21WVINST	P-9-G-{0.25}	INDIAN RUN	East of Cacapon State Park and west of Oakland
21WVINST	P-9-G-1	NORTH FORK RUN	In Cacapon State Park
21WVINST	P-9-G-1	NORTH FORK RUN	In Cacapon State Park
21WVINST	P-9-G-2-{0.0}	SOUTH FORK/INDIAN CREEK	In Cacapon State Park
21WVINST	P-9-G-3	MIDDLE FORK / INDIAN RUN	In Cacapon State Park
21WVINST	P-9-I	HANDS RUN	First bridge just south of state line on Rt 522.

During this reporting cycle, no streams in the watershed were assessed for Fish Consumption use. Of the 274.86 miles assessed for Primary Contact Recreation use, 219.38 (79.8%) were fully supporting, 40.29 (14.7%) were fully supporting but threatened, and 15.19 (5.5%) were non-supporting.

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Potomac River Direct Drains watershed is provided in Table 59.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Siltation (39.10 miles) and Fecal Coliform (24.36 miles).

Table 57 USE SUMMARY REPORT: OVERALL USE SUPPORT POTOMAC DIRECT DRAINS WATERSHED Waterbody Type: River			
Total Number of River/Streams Assessed:	42		
Total Number of River/Streams Monitored:	42		
Total Number of River/Streams Evaluated:	0		
	ASSESSMENT BASIS IN MILES		
DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	124.14	124.14
SUPPORTING BUT THREATENED	0.00	86.03	86.03
PARTIALLY SUPPORTING	0.00	58.98	58.98
NOT SUPPORTING	0.00	7.21	7.21
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	0.00	276.36	276.36

TABLE 58

USE SUPPORT MATRIX SUMMARY
POTOMAC DIRECT DRAINS WATERSHED
WATERBODY TYPE: RIVER
UNITS IN MILES

USE	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting
Overall Use	124.14	86.03	58.98	7.21
Aquatic Life	134.41	81.00	38.87	22.08
Cold Water Fishery - Trout	34.28	28.72	20.19	9.64
Warm Water Fishery	61.56	29.24	6.84	
Bait Minnow Fishery	31.73	23.04	18.68	12.44
Primary Contact Recreation	219.38	41.79		15.19

Table 59 Complete Summary of Causes, Including User-Defined Potomac River Direct Drainage Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Cause Categories Waterbody Type: River			
Code	**Cause Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0000	CAUSE UNKNOWN	3.18	0.00
0800	OTHER INORGANICS	1.50	0.00
0900	NUTRIENTS	4.57	9.17
0910	Phosphorus	1.21	9.17
0920	Nitrogen	4.57	9.17
1100	SILTATION	9.26	29.84
1200	ORGANIC ENRICHMENT/LOW DO	4.60	0.00
1500	FLOW ALTERATIONS	0.00	4.53
1600	HABITAT ALTERATION (non-flow)	4.60	6.03
1700	PATHOGENS	15.19	9.17
1710	Fecal Coliform Bacteria	15.19	9.17
1720	E. Coli	4.18	0.00

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Potomac River Direct Drains watershed is provided in Table 60.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Agriculture (43.85 miles), Unknown Source (33.18 miles), and Urban Runoff/Storm Sewers (30.72 miles).

Size of Waters Affected by Toxics

During this reporting cycle, 175.28 stream miles in the Potomac River Direct Drains watershed were monitored for toxics. Of these, 1.50 miles (0.9%) had elevated levels.

Table 60 Complete Summary of Sources, Including User-Defined Potomac River Direct Drainage Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0200	MUNICIPAL POINT SOURCES	2.71	0.00
1000	AGRICULTURE	34.90	8.95
1050	CROP-RELATED SOURCES	30.72	0.00
1350	GRAZING-RELATED SOURCES	34.90	8.95
1400	Pasture Grazing-Riparian and/or Upland	0.00	5.78
1640	Confined Animal Feeding Operations (NPS)	4.18	0.00
4000	URBAN RUNOFF/STORM SEWERS	0.00	30.72
7000	HYDROMODIFICATION	0.00	4.53
7100	Channelization	0.00	4.53
9000	SOURCE UNKNOWN	19.09	14.09

<u>Public Health/Aquatic life Impacts</u>

A fish consumption advisory currently is in effect for the Potomac River mainstem from Piedmont to the Cacapon River confluence (38 miles). The advisory covers non-sport fish only (Table 73).

During this reporting period, no bathing beach or public water supply closures were documented in the watershed. In addition, no fish kills were reported.

<u>Section 303(d) Waters</u>

No streams in the Potomac River Direct Drains watershed are currently on the 303(d) list. (Note: Although the Potomac River mainstem currently is under a fish consumption advisory, since the stream belongs to the State of Maryland, it is not included on West Virginia's 303(d) list.

LITERATURE CITED

Donehoo, Dr. George P. 1998 second printing, Lewisburg PA. *A History of the Indian Villages and Place Names in Pennsylvania*. Originally published 1928, Harrisburg PA.

Tug Fork River Watershed

Background

Tug Fork of Big Sandy River was called by the Lenape (Delaware) Indians “Si-ke-a-ce-pe,” translated as “Salt Stream” (Hale, 1971). According to Hale, this name referred to the numerous animal salt licks located along its valley. The English name was given it by members of the Sandy Creek expedition of Virginia militia men and Cherokee warriors against the Shawnee. This failed expedition in the winter of 1755-56, during the French & Indian War, nearly ended in complete disaster for the Virginians involved. Under the co-leadership of Captain Andrew Lewis (a Virginian) and Outacite (a Cherokee War Captain), the expedition faced starvation short of the intended goal. Captain Lewis suggested eating dead horses, but the men could not stomach this, so they took to boiling their leathern strings used to tie items to their packs. These strings were called “tugs,” hence the name “Tug Fork.” Nearly mutinous, the men were finally given permission to make their way back home the best way they could. It is interesting to note that some of the men found their way eastward to the headwaters of Coal River. One of the men in this party was Samuel Cole and it was his name that was given to that River by the Virginians, although today it is spelled like the mineral. Another possible source of the name “Tug” is from the Cherokee work “tugulu,” meaning a confluence of streams.

The entire Tug Fork watershed is an interstate watershed located in the States of West Virginia, Virginia and Kentucky. However, only the West Virginia portion is considered in this report. This portion will be referred to as the Tug Fork watershed herein. This watershed lies within McDowell, Mingo and Wayne Counties and encompasses a 932 square mile area. DEP records indicate that the watershed contains 520 streams totaling 1,317 miles. The largest population center in the watershed is the city of Williamson. Numerous other towns and villages crowd the narrow valleys of watershed streams. The mainstem Tug Fork flows northwesterly from its headwaters draining Big Stone Ridge to its confluence with Levisa Fork at the village of Fort Gay where Big Sandy River begins. The watershed lies within the transition zone between the Allegheny Plateau Physiographic Province and the Cumberland Plateau Province. Steep-sided hills and mountains with numerous rock cliffs make this watershed one of the most rugged in West Virginia.

The rock strata exposed in the watershed are primarily of Pennsylvanian Age with a tiny percentage in the stream valleys of McDowell County from the Mississipian Period. The rocks dip downward from the headwaters toward the mouth steeper than the mainstem falls. Consequently, as one travels upstream, he encounters older rock formations. Ascending, the strata encountered are classified by Geologists as Conemaugh Group, Allegheny Formation, Kanawha Formation, New River Formation, Pocahontas Formation and Bluestone Formation. Most of the strata are alkaline, therefore most of the soils and streams are well-buffered against acid deposition.

Ecologists consider the entire Tug Fork watershed to be located within the Cumberland Mountains Subecoregion of the Central Appalachians Ecoregion. Streams of this subecoregion generally have moderate to high gradients and they are usually well-buffered against acid inputs. Their substrates are composed of significant amounts of sand eroded from coarse-grained, poorly cemented sandstones that predominate in the surface geologic structure.

The watershed is subject to the effects of both continental polar air masses and maritime tropical air masses. The worst floods are those brought on by tropical storms, including hurricanes, that penetrate across the Allegheny and Cumberland Mountains and move in a northerly direction. Such storms dump rain upon the headwaters first and continue pouring as they move in the same direction that the mainstem Tug Fork drains. The watershed experiences relatively mild winters (compared to northeastern West Virginia), generally receiving more rain than snow. Prevailing wind in summer is from the southwest.

In the early part of this century, railroads opened up this watershed for extensive coal mining. A large increase in human population occurred as immigrants from southern States and other countries poured into the region to find work in the mines. This was a double whammy to the water quality of the watershed's streams. Metal-laden mine water and untreated or improperly treated sewage from coal camps and towns degraded some streams severely. In the 1950s and 1960s, strip mining was instituted in the watershed as coal companies attempted to cost effectively increase coal production. West Virginia passed some of the most stringent regulations in the nation governing surface mining, but the environmental damage wrought by this technique was still overwhelming. Today, multi-seam mining in the form of mountaintop removal and valley fill is prominent in this watershed

Water Quality Summary

During this reporting period, 108 streams totaling 528.09 miles were assessed in the Tug Fork River watershed. Figure 13 is a map depicting sampling stations in the Tug Fork watershed, while Table 62 provides a list of these stations. A summary of overall designated use support is provided in Table 63 while a use support matrix summary of all designated uses is given in Table 64.

Of the 528.09 stream miles assessed, 51.23 (9.7%) were fully supporting their overall designated uses, 201.09 (38.1%) were fully supporting but threatened, 115.93 (21.9%) were partially supporting, and 159.81 (30.3%) were non-supporting.

Of the 522.96 miles assessed for Aquatic Life Support use, 80.94 (15.5%) were fully supporting, 169.32 (32.4%) were fully supporting but threatened, 134.60 (25.7%) were partially supporting, and 138.10 (26.4%) were non-supporting.

Of the 532.08 miles assessed for Primary Contact Recreation use, 119.99 (22.6%) were fully supporting, 174.01 (32.7%) were fully supporting but threatened, and 238.08 (44.7%) were non-supporting.

Relative Assessment of Causes

A detailed summary of the major causes of pollution in the Tug Fork River watershed is provided in Table 65.

Considering both major and moderate/minor impacts, the principal causes of impairment in the watershed are Fecal Coliform (223.38 miles), Siltation (209.13 miles), Turbidity (155.00 miles), and Unknown Cause (138.56 miles). A large portion of the stream mileage contributing to these causes is the Tug Fork River mainstem.

Relative Assessment of Sources

A detailed summary of the major sources of pollution in the Tug Fork River watershed is provided in Table 66.

Considering both major and moderate/minor impacts, the principal sources of pollution in the watershed are Abandoned Mining (188.88 miles), Unknown Source (176.07 miles), and Raw Sewage (165.09 miles).

Figure 13

Tug Fork Watershed
Hydrologic Unit – 05070201

STORET Sampling Locations
1994-1998

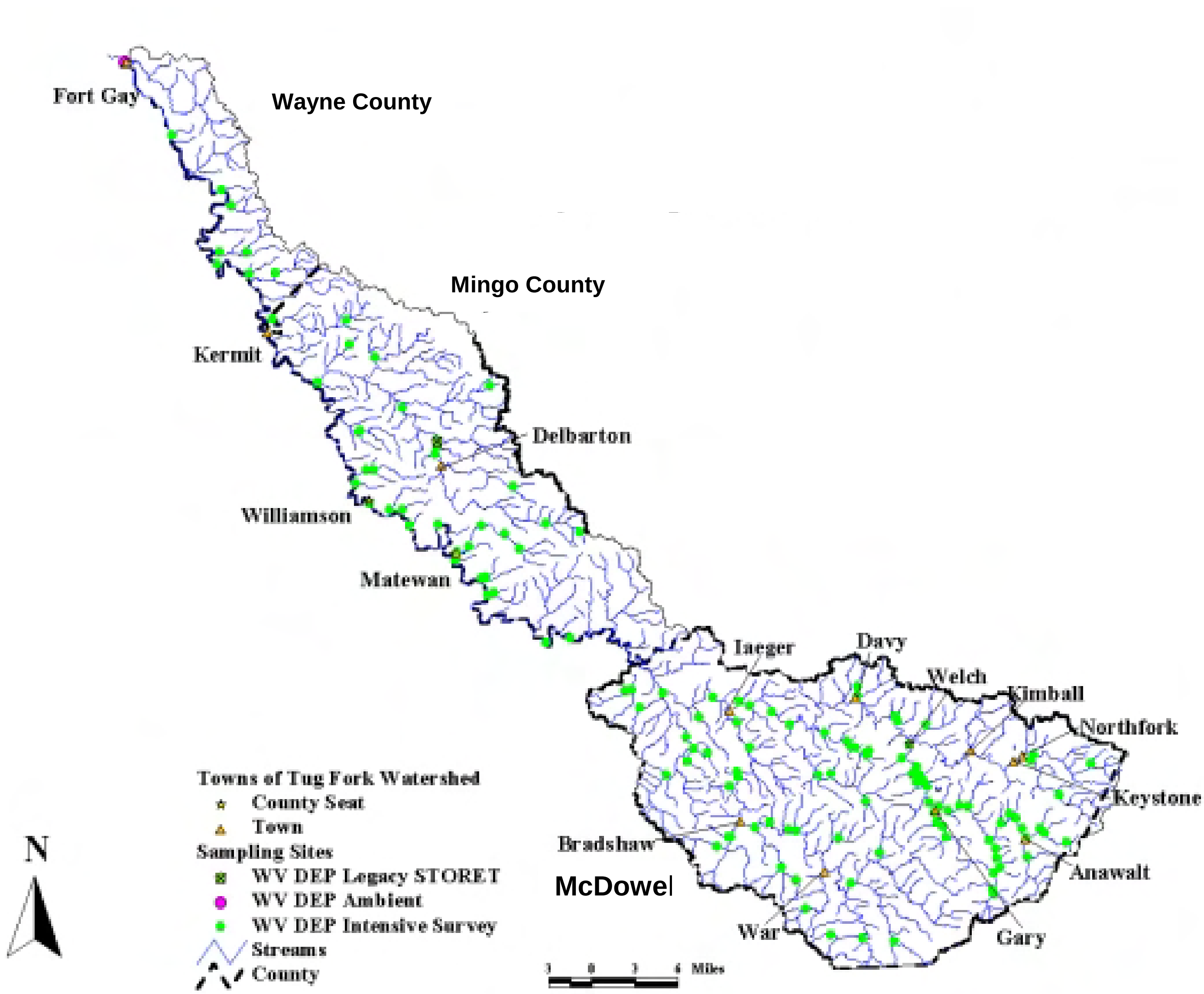

Table 61 STORET Sampling Locations for Tug Fork River Watershed Hydrologic Unit Code – 05070201 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	BS-{101.2}	TUG FORK RIVER Mile 101.2	Between Jed and Wilcoe, south of Welch
21WVINST	BS-{104.2}	TUG FORK RIVER Mile 104.2	Just west of Gary on Coal Company Property
21WVINST	BS-{14.5}	TUG FORK RIVER Mile 14.5	On the WV/KY border just north of Webb
21WVINST	BS-{24.9}	TUG FORK RIVER Mile 24.9	On the WV/KY state line between Tripp and Crum
21WVINST	BS-{47.4}	TUG FORK RIVER Mile 47.4	On WV/Ky state line east of Vulcan
21WVINST	BS-{51.6}	TUG FORK RIVER Mile 51.6	On WV/KY state line east of Vulcan
21WVINST	BS-{70.6}	TUG FORK RIVER Mile 70.6	Just west of Iaeger
21WVINST	BS-{76.4}	TUG FORK RIVER Mile 76.4	East of Iaeger
21WVINST	BST-10	DRAG CREEK	Just north of Webb
21WVINST	BST-100	LITTLE INDIAN CREEK	In Welch
21WVINST	BST-103	ROCK NARROWS BRANCH	Just south of Havaco
21WVINST	BST-104	HARRIS BRANCH	South of Havaco and Jed across from DOH facility
21WVINST	BST-105	MITCHELL BRANCH	From Gary - 2.7 miles NE of Filbert Road
21WVINST	BST-106	SUGARCAMP BRANCH	South of Jed
21WVINST	BST-107	GRAPEVINE BRANCH	On Route 103 between Welch and Gary
21WVINST	BST-109-{0.0}	SANDLICK CREEK	In the Gary area.
21WVINST	BST-109-{1.7}	SANDLICK CREEK	About a mile south of Gary
21WVINST	BST-109-A	RIGHT FORK/SANDLICK CREEK	About 1/2 mile south of Gary
21WVINST	BST-109-B	LEFT FORK/SANDLICK CREEK	About 2.5 miles south of Gary in Elbert
21WVINST	BST-110	ADKIN BRANCH	In Gary
21WVINST	BST-111	BELCHER BRANCH	About a mile east of Gary at Venus
21WVINST	BST-112	TURNHOLE BRANCH	In Thorpe.
21WVINST	BST-113	HARMON BRANCH	East of Gary and just east of Thorpe
21WVINST	BST-113	HARMON BRANCH	East of Gary and just east of Thorpe
21WVINST	BST-115	SOUTH FORK	West of Anawalt and north of Skygusty
21WVINST	BST-115-A	TEA BRANCH	At Skygusty

Table 61 STORET Sampling Locations for Tug Fork River Watershed Hydrologic Unit Code – 05070201 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	BST-115-B	MCCLURE BRANCH	Just south of Skygusty
21WVINST	BST-115-D	JUMP BRANCH	Southwest of Anawalt, about 2 miles south of Skygusty
21WVINST	BST-115-E	SPICE CREEK	About 2.5 miles south of Skygusty
21WVINST	BST-115-F	LAUREL BRANCH	Approx. 5 miles south of Skygusty
21WVINST	BST-115-G	ROAD FORK	South of Skygusty approx. 6 miles.
21WVINST	BST-116	BELCHER BRANCH	At Pageton
21WVINST	BST-117	LOOP BRANCH	Just north of Pageton
21WVINST	BST-118	MILL BRANCH	Approx 1.5 miles east of Pageton
21WVINST	BST-119	DRY BRANCH	
21WVINST	BST-120-{0.0}	LITTLE CREEK	In downtown Anawalt
21WVINST	BST-120-{2.0}	LITTLE CREEK	East of Anawalt approx 4 miles
21WVINST	BST-120-A	INDIAN GRAVE BRANCH	In Leckie
21WVINST	BST-120-B	PUNCHEON CAMP BRANCH	Just east of Leckie
21WVINST	BST-121	MILLSEAT BRANCH	About a mile south of Anawalt
21WVINST	BST-14	BULL CREEK	Just east of Tripp
21WVINST	BST-14-B	RIGHT FORK/BULL CREEK	North of Crum about 2 miles.
21WVINST	BST-16	SILVER CREEK	Just south of Crum
21WVINST	BST-17-{2.7}	JENNIE CREEK	About 5 miles east of Crum
21WVINST	BST-19-{0.0}	MARROWBONE CREEK	Just north of Greyeagle and Kermit
21WVINST	BST-19-{8.0}	MARROWBONE CREEK	Approx. 8 miles east of Greyeagle.
21WVINST	BST-24	PIGEON CREEK	In Naugatuck
21WVINST	BST-24-{29.3}	PIGEON CREEK	About 2 miles east of Musick
21WVINST	BST-24-{31.8}	PIGEON CREEK	About 6 miles east of Musick
21WVINST	BST-24-{9.0}	PIGEON CREEK	Just south of Belo
21WVINST	BST-24-E-2-{0.1}	SPRUCE FORK	About 2.5 miles north of Lenore
21WVINST	BST-24-K-8	SIMMONS FORK	About 5 miles south and west of Holden
21WVINST	BST-24-N	ELK CREEK	About 2 miles north of Delbarton
21WVINST	BST-24-O	MILLSTONE BRANCH	About 2 miles north of Delbarton
21WVINST	BST-24-P	PIGEONROOST CREEK	About a mile north of Delbarton
21WVINST	BST-24-Q-7	SPRING BRANCH	About 3 miles east of Ragland.
21WVINST	BST-27-{2.5}	MILLER CREEK	About 5 miles east of Nolan
21WVINST	BST-27-C	MILL FORK	About 5 miles east of Nolan
21WVINST	BST-3	POWDERMILL BRANCH	About half way between Saltpeter and Glenhayes off Rt 52

Table 61
STORET Sampling Locations for
Tug Fork River Watershed
Hydrologic Unit Code – 05070201
for 1995 - 1999

Agency Code Identifier	STORET Station Number	Stream Name	Location
21WVINST	BST-31-{1.0}	BUFFALO CREEK	At Chattaroy
21WVINST	BST-31-B	SOUTH FORK/BUFFALO CREEK	In Chattaroy
21WVINST	BST-32	SUGARTREE CREEK	At Goodman
21WVINST	BST-33	WILLIAMSON CREEK	In Williamson
21WVINST	BST-34	SYCAMORE CREEK	In East Williamson
21WVINST	BST-35	LICK CREEK	Between Williamson and Rawl
21WVINST	BST-36	DICK WILLIAMSON BRANCH	At Rawl.
21WVINST	BST-38	SPROUSE CREEK	In Lobata
21WVINST	BST-40	MATE CREEK	In Matewan
21WVINST	BST-40-B	RUTHERFORD BRANCH	In North Matewan
21WVINST	BST-40-C	MITCHELL BRANCH	North of Matewan at Red Jacket
21WVINST	BST-40-D	CHAFIN BRANCH	Between Red Jacket and Newtown at a coal mine entrance.
21WVINST	BST-40-H	DOUBLE CAMP FORK	Just south of Newton
21WVINST	BST-41	SULPHUR CREEK	At Blackberry City south of Matewan
21WVINST	BST-42	THACKER CREEK	At Thacker
21WVINST	BST-42-A	SCISSORSVILLE BRANCH	Just north of Thacker
21WVINST	BST-42-B	MAUCHINVILLE BRANCH	Just north and east of Thacker
21WVINST	BST-43	GRAPEVINE CREEK	About a mile south of Thacker
21WVINST	BST-43-A	LICK FORK/GRAPEVINE	About a mile and a half south of Thacker
21WVINST	BST-57-{0.6}	BULL CREEK	About 3 miles west of Panther
21WVINST	BST-57-B	LEFT FORK BULL CREEK	About 2.5 miles west of Panther
21WVINST	BST-60	PANTHER CREEK	Just south of Panther and across the river
21WVINST	BST-60	PANTHER CREEK	Just south of Panther and across the river
21WVINST	BST-60-A-{2.0}	GREENBRIER FORK	About 2 miles south and west of Panther and across the river
21WVINST	BST-60-D	CUB BRANCH	South and east of Panther
21WVINST	BST-60-E	GEORGE BRANCH	South and west of Iaeger. Near Panther State Forest
21WVINST	BST-60-F	CRANE CREEK	South and west of Iaeger in Panther State Forest
21WVINST	BST-60-G-{0.9}	HURRICANE BRANCH	South and west of Iaeger in Panther

Table 61 STORET Sampling Locations for Tug Fork River Watershed Hydrologic Unit Code – 05070201 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
			State Forest
21WVINST	BST-60-I-2	WHITE OAK BRANCH	In Panther State Forest
21WVINST	BST-63-{1.2}	HORSE CREEK	South and west of Iaeger
21WVINST	BST-70-{1.3}	DRY FORK	About a mile south of Iaeger
21WVINST	BST-70-{18.4}	DRY FORK	Between the towns of Bartley and English
21WVINST	BST-70-{7.4}	DRY FORK	At Carlos between Beartown and Garland
21WVINST	BST-70-C	MILE BRANCH	Just south of Union City
21WVINST	BST-70-F	GRAPEVINE BRANCH	About 1 mile west of Garland
21WVINST	BST-70-I	BEARTOWN BRANCH	At Beartown
21WVINST	BST-70-M-{1.8}	BRADSHAW CREEK	About 1.5 miles south of Bradshaw
21WVINST	BST-70-M-1	GROUNDHOG BRANCH	
21WVINST	BST-70-M-3	WOLFPEN BRANCH	South and west of Jolo
21WVINST	BST-70-N-{4.5}	LITTLE SLATE CREEK	South and west of War
21WVINST	BST-70-N-{0.0}	LITTLE SLATE CREEK	At Raysal
21WVINST	BST-70-N-{2.7}	LITTLE SLATE CREEK	About 4 mile west of War (as the crow flies)
21WVINST	BST-70-O	ATWELL BRANCH	At Atwell
21WVINST	BST-70-Q	BARTLEY CREEK	In Bartley area
21WVINST	BST-70-T-2	CLEAR FORK	At Caretta
21WVINST	BST-70-U-1	BIG BRANCH OF WAR CREEK	South of War and west of Berwind and west of Berwind Lake
21WVINST	BST-70-W-{0.8}	JACOB FORK	South and east of War.
21WVINST	BST-70-W-{7.8}	JACOB FORK	At Johnstown
21WVINST	BST-70-W-1-A-{0.8}	MOUNTAIN FORK	About 5 miles east of War (as the crow flies)
21WVINST	BST-70-Z-{0.0}	VALL CREEK	At Vallscreek
21WVINST	BST-70-Z-{2.3}	VALL CREEK	About 4 miles west of Vallscreek
21WVINST	BST-71	LICK BRANCH	About a mile east of Iaeger
21WVINST	BST-72	HARMAN BRANCH	About 2 miles east of Iaeger
21WVINST	BST-76-{0.0}	CLEAR FORK	Approx 2 miles west of Roderfield
21WVINST	BST-76-{0.0}	CLEAR FORK	About 2 miles west of Roderfield on Fire Tower Conservancy property
21WVINST	BST-76-{10.2}	CLEAR FORK	Just north of Six and 9 miles south of Welch
21WVINST	BST-76-{5.6}	CLEAR FORK	About 3 miles west of Coalwood
21WVINST	BST-76-E	DAYCAMP BRANCH	About 3 miles west of Coalwood
21WVINST	BST-78-B	SHABBYROOM BRANCH	Just east of Roderfield at Erin

Table 61 STORET Sampling Locations for Tug Fork River Watershed Hydrologic Unit Code – 05070201 for 1995 - 1999			
Agency Code Identifier	**STORET Station Number**	**Stream Name**	**Location**
21WVINST	BST-78-D	HONEYCAMP BRANCH	East of Roderfield and west of Premier
21WVINST	BST-78-E	COONTREE BRANCH	About a mile west of Premier
21WVINST	BST-78-F	STONECOAL BRANCH	Just west of Premier
21WVINST	BST-78-G	BADWAY BRANCH	Just west of Premier
21WVINST	BST-78-H	NEWSON BRANCH	Just east of Premier
21WVINST	BST-78-I	MOORECAMP BRANCH	Just east of Premier
21WVINST	BST-85-A	LEFT FORK/DAVY BRANCH	Just north of Davy
21WVINST	BST-85-A-{0.8}	LEFT FORK DAVY BRANCH	About a mile north of Davy
21WVINST	BST-94	SHANNON BRANCH	North and west of Welch at Capels
21WVINST	BST-95	UPPER SHANNON BRANCH	Just north and west of Welch
21WVINST	BST-98-A	PUNCHEONCAMP BRANCH	2 miles north and east of Welch
21WVINST	BST-99-{0.0}	ELKHORN CREEK	In Welch
21WVINST	BST-99-{16.4}	ELKHORN CREEK	About 8.5 miles north of Bramwell and 10 miles south of Keystone
21WVINST	BST-99-L-{0.0}	NORTH FORK/ELKHORN CREEK	At Northfork
21WVINST	BST-99-L-{6.2}	NORTH FORK/ELKHORN CREEK	Just north of Ashland
21WVINST	BST-99-L-1	BUZZARD BRANCH	At Algoma just north of Northfork

Size of Waters Affected by Toxics

During this reporting cycle, 472.45 stream miles in the Tug Fork River watershed were monitored for toxics. Of these, 70.59 miles (14.9%) had elevated levels.

Public Health/Aquatic life Impacts

No streams in the Tug Fork River watershed are currently under a fish consumption advisory. In addition, no bathing beach or public water supply closures were documented during this reporting period.

During this reporting cycle, three fish kills were documented. The first occurred along 2.08 miles of Johns Branch in Cabell County due to the chemical permethrin from a pesticide application

And resulted in a total kill on the affected reach. The second occurred along 4.4 miles of Jennie Creek in Wayne county due to caustic soda from mine drainage treatment and resulted in a total kill on the affected reach. The third occurred along 0.9 miles of Mudlick Fork in Wayne county and also was due to caustic soda from mine drainage treatment. A heavy kill occurred on the affected reach.

Section 303(d) Waters

Table 67 includes streams from the Tug Fork River watershed that are on the current 303(d) list. Sixty-four streams from the watershed are on the list, including one (Tug Fork River mainstem) on the primary Waterbody list and 63 on the Mine Drainage Impaired sublist. Currently, no 303(d) listed streams in the Tug Fork River watershed have had TMDL's completed.

LITERATURE CITED

Hale, J. P. 1971 third edition. *Trans-Allegheny Pioneers*. Raleigh NC. First printing 1886 Cincinnati OH.

Table 62
USE SUMMARY REPORT: OVERALL USE SUPPORT
TUG FORK RIVER WATERSHED
Waterbody Type: River

Total Number of River/Streams Assessed:	108
Total Number of River/Streams Monitored:	104
Total Number of River/Streams Evaluated:	4

DEGREE OF USE SUPPORT	ASSESSMENT BASIS IN MILES		
	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	51.23	51.23
SUPPORTING BUT THREATENED	0.00	201.09	201.09
PARTIALLY SUPPORTING	0.00	115.93	115.93
NOT SUPPORTING	3.20	97.81	101.01
NOT ATTAINABLE	0.00	0.00	0.00
TOTAL SIZE ASSESSED	0.00	466.06	469.26

TABLE 63 USE SUPPORT MATRIX SUMMARY TUG FORK RIVER WATERSHED WATERBODY TYPE: RIVER UNITS IN MILES				
USE	**Supporting**	**Supporting but Threatened**	**Partially Supporting**	**Not Supporting**
Overall Use	51.23	201.09	115.93	101.01
Aquatic Life	80.94	169.32	134.60	138.10
Cold Water Fishery - Trout		32.20	10.92	7.95
Warm Water Fishery	22.87	95.67	84.10	85.15
Bait Minnow Fishery	58.07	69.67	44.18	45.00
Primary Contact Recreation	119.99	174.01		238.08
Drinking Water Supply	96.20			58.80

Table 64 Complete Summary of Causes, Including User-Defined Tug Fork River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Cause Categories Waterbody Type: River			
Code	**Cause Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0000	CAUSE UNKNOWN	66.80	71.67
0500	METALS	64.02	4.30
0750	SULFATES	3.40	0.87
1000	PH	7.83	0.00
1100	SILTATION	22.05	187.08
1600	HABITAT ALTERATION (non-flow)	17.92	36.55
1700	PATHOGENS	223.38	0.00
1710	Fecal Coliform Bacteria	223.38	0.00
2500	TURBIDITY	0.00	155.00
2900	ODOR	0.00	0.10
3300	CAUSTIC CHEMICALS	5.30	0.00

Table 65 Complete Summary of Sources, Including User-Defined Tug Fork River Watershed Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: River			
Code	**Source Category**	**Major Impact in Miles**	**Moderate/Minor Impact in Miles**
0200	MUNICIPAL POINT SOURCES	32.00	0.00
0230	Package Plants (Small Flows)	32.00	0.00
3000	CONSTRUCTION	0.00	2.46
3100	Highway/Road/Bridge Construction	0.00	2.46
4000	URBAN RUNOFF/STORM SEWERS	1.52	0.00
5000	RESOURCE EXTRACTION	210.55	18.52
5100	Surface Mining	1.75	2.77
5200	Subsurface Mining	0.00	2.57
5700	Mine Tailings	0.00	2.20
5900	Abandoned Mining	188.78	0.10
5950	Inactive Mining	0.00	1.90
6000	LAND DISPOSAL	165.09	0.00
6500	Onsite Wastewater Systems (Septic Tanks)	1.57	0.00
6800	Raw Sewage	165.09	0.00
7000	HYDROMODIFICATION	1.75	36.93
7100	Channelization	0.00	36.93
7200	Dredging	1.75	2.95
7550	HABITAT MODIFICATION (other than hydromodification)	1.75	34.38
7600	Removal of Riparian Vegetation	1.75	34.38
7700	Streambank Modification/Destabilization	1.75	33.05
7800	Drainage/Filling of Wetlands	0.00	12.95
8400	SPILLS	5.30	0.00
8520	DEBRIS AND BOTTOM DEPOSITS	0.00	0.10
9000	SOURCE UNKNOWN	88.95	87.12

TABLE 66
West Virginia
1998 303(d) List
Tug Fork River Watershed

Primary Waterbody List

Stream Name	Stream Code	Use Affected	Pollutant	Primary Source	Miles Affected	Reach Description	TMDL Priority
Tug Fork River	BST	AQL	Aluminum, Iron, Zinc	Undetermined	59	Kermit to mouth	High
Tug Fork River	BST	HH	Iron	Undetermined	59	Kermit to mouth	High

Waterbodies Impaired by Mine Drainage

Stream Name	Stream Code	Miles Affected	Use Affected	Pollutant	Source	TMDL Priority
Powdermill Br	BST-3	2.27	Aquatic Life	Metals	Mine Drainage	Medium
Pigeon Ck	BST-24	30.76	Aquatic Life	pH, Metals	Mine Drainage	Medium
Millstone Br / Pigeon Ck	BST-24-O	1.78	Aquatic Life	Metals	Mine Drainage	Medium
Sugartree Ck	BST-32	2.42	Aquatic Life	Metals	Mine Drainage	Medium
Williamson Ck	BST-33	1.52	Aquatic Life	Metals	Mine Drainage	Medium
Sprouse Ck	BST-38	1.60	Aquatic Life	Metals	Mine Drainage	Medium
Mate Ck	BST-40	9.90	Aquatic Life	Metals	Mine Drainage	Medium
Rutherford Br	BST-40-B	2.00	Aquatic Life	pH, Metals	Mine Drainage	Medium
Mitchell Br / Mate Ck	BST-40-C	2.82	Aquatic Life	Metals	Mine Drainage	Medium
Chafin Br	BST-40-D	0.87	Aquatic Life	Metals	Mine Drainage	Medium
Thacker Ck	BST-42	2.95	Aquatic Life	pH, Metals	Mine Drainage	Medium
Scissorsville Br	BST-42-A	1.90	Aquatic Life	pH, Metals	Mine Drainage	Medium
Mauchlinville Br	BST-42-B	1.78	Aquatic Life	pH, Metals	Mine Drainage	Medium
Grapevine Ck	BST-43	2.56	Aquatic Life	Metals	Mine Drainage	Medium
Lick Fk / Grapevine Ck	BST-43-A	1.10	Aquatic Life	Metals	Mine Drainage	Medium
Panther Ck	BST-60	9.40	Aquatic Life	Metals	Mine Drainage	Medium
Cub Br / Panther Ck	BST-60-D	0.70	Aquatic Life	Metals	Mine Drainage	Medium

TABLE 66 Continued Tug Fork River Watershed						
Waterbodies Impaired by Mine Drainage						
Stream Name	**Stream Code**	**Miles Affected**	**Use Affected**	**Pollutant**	**Source**	**TMDL Priority**
Grapevine Br/dry Fk	BST-70-F	1.75	Aquatic Life	Metals	Mine Drainage	Medium
Beartown Br	BST-70-I	1.70	Aquatic Life	Metals	Mine Drainage	Medium
Atwell Br	BST-70-O	1.93	Aquatic Life	Metals	Mine Drainage	Medium
Clear Fk / Tug Fk	BST-76	11.00	Aquatic Life	Metals	Mine Drainage	Medium
Shabbyroom Br	BST-78-B	2.10	Aquatic Life	Metals	Mine Drainage	Medium
Honeycamp Br	BST-78-D	1.67	Aquatic Life	Metals	Mine Drainage	Medium
Coontree Br / Spice Ck	BST-78-E	0.95	Aquatic Life	Metals	Mine Drainage	Medium
Stonecoal Br / Spice Ck	BST-78-F	1.33	Aquatic Life	Metals	Mine Drainage	Medium
Badway Br	BST-78-G	1.33	Aquatic Life	Metals	Mine Drainage	Medium
Newson Br	BST-78-H	1.05	Aquatic Life	Metals	Mine Drainage	Medium
Moorecamp Br	BST-78-I	0.91	Aquatic Life	Metals	Mine Drainage	Medium
Left Fk / Davy Br	BST-85-A	2.46	Aquatic Life	Metals	Mine Drainage	Medium
Shannon Br	BST-94	3.10	Aquatic Life	Metals	Mine Drainage	Medium
Upper Shannon Br	BST-95	2.45	Aquatic Life	Metals	Mine Drainage	Medium
Puncheoncamp Br / Browns	BST-98-A	3.00	Aquatic Life	Metals	Mine Drainage	Medium
Little Indian Ck	BST-100	2.12	Aquatic Life	Metals	Mine Drainage	Medium
Jed Br	BST-102	0.95	Aquatic Life	Metals	Mine Drainage	Medium
Rock Narrows Br	BST-103	1.70	Aquatic Life	Metals	Mine Drainage	Medium
Harris Br	BST-104	1.15	Aquatic Life	Metals	Mine Drainage	Medium
Mitchell Br	BST-105	2.10	Aquatic Life	Metals	Mine Drainage	Medium
Sugarcamp Br	BST-106	2.58	Aquatic Life	Metals	Mine Drainage	Medium
Grapevine Br	BST-107	0.51	Aquatic Life	Metals	Mine Drainage	Medium
Sandlick Ck	BST-109	5.25	Aquatic Life	Metals	Mine Drainage	Medium
Right Fk / Sandlick Ck	BST-109-A	2.95	Aquatic Life	Metals	Mine Drainage	Medium

TABLE 66 Continued Tug Fork River Watershed						
Waterbodies Impaired by Mine Drainage						
Stream Name	**Stream Code**	**Miles Affected**	**Use Affected**	**Pollutant**	**Source**	**TMDL Priority**
Left Fk / Sandlick Ck	BST-109-B	2.18	Aquatic Life	Metals	Mine Drainage	Medium
Adkin Br	BST-11O	2.15	Aquatic Life	Metals	Mine Drainage	Medium
Belcher Br	BST-111	1.45	Aquatic Life	Metals	Mine Drainage	Medium
Turnhole Br	BST-112	2.20	Aquatic Life	Metals	Mine Drainage	Medium
Harmon Br	BST-113	3.10	Aquatic Life	Metals	Mine Drainage	Medium
South Fk / Tug Fk	BST-115	5.72	Aquatic Life	Metals	Mine Drainage	Medium
Tea Br	BST-115-A	1.14	Aquatic Life	Metals	Mine Drainage	Medium
Mcclure Br	BST-115-B	1.25	Aquatic Life	Metals	Mine Drainage	Medium
Jump Br	BST-115-D	1.67	Aquatic Life	Metals	Mine Drainage	Medium
S pice Ck / South Fk	BST-115-E	3.18	Aquatic Life	Metals	Mine Drainage	Medium
Laurel Br / South Br	BST-115-F	2.42	Aquatic Life	Metals	Mine Drainage	Medium
Road Fk / South Fk	BST-115-G	1.25	Aquatic Life	Metals	Mine Drainage	Medium
Belcher Br	BST-116	1.75	Aquatic Life	Metals	Mine Drainage	Medium
Loop Br	BST-117	1.38	Aquatic Life	Metals	Mine Drainage	Medium
Mill Br	BST-118	2.00	Aquatic Life	Metals	Mine Drainage	Medium
Dry Br / Tug Fk	BST-119	0.95	Aquatic Life	Metals	Mine Drainage	Medium
Little Ck	BST-120	4.20	Aquatic Life	Metals	Mine Drainage	Medium
Indian Grave Br	BST-120-A	2.08	Aquatic Life	Metals	Mine Drainage	Medium
Puncheoncamp Br / Little	BST-120-B	2.05	Aquatic Life	Metals	Mine Drainage	Medium
Millseat Br	BST-121	1.40	Aquatic Life	Metals	Mine Drainage	Medium
Ballard Harmon Br	BST-122	2.03	Aquatic Life	Metals	Mine Drainage	Medium
Sams Br	BST-123	1.85	Aquatic Life	Metals	Mine Drainage	Medium

AQL = Aquatic Life TMDL = Total Maximum Daily Load
HH = Human Health MP = Mile Point

PART III: LAKE WATER QUALITY ASSESSMENT

Background

Data for this reporting period was derived primarily from DEP's 1996 lake water quality assessment (LWQA). Although stream data contained in this report was broken down by individual watersheds, lake data will be reported as an aggregate due to the fact that only 15 lakes were assessed during this reporting period.

Since the phase out of the federal Clean Lakes Program in 1995, DEP has performed limited monitoring of lakes. The 1996 lakes assessment represents the final assessment of its type under the old Clean Lakes Program. Without a federal funding source for lake monitoring, DEP will no longer be able to perform ambient water quality monitoring of the State's public lakes. However, DEP is committed to completing TMDL's on those water quality limited lakes that appear on the 303(d) list.

By State definition, a significant publicly owned lake is any lake, reservoir, or pond that meets the definition of waters of the State, is owned by a government agency or public utility, and is managed as a recreational resource for the general public. Presently, there are 108 publicly owned lakes in West Virginia, totaling 22,373 surface acres.

The 15 public lakes assessed during this reporting period were each sampled twice in 1996, once in spring and once in summer. The 15 lakes sampled included ten of the State's original 13 priority lakes along with five non-priority lakes with potential impairment.

A variety of chemical and physical parameters were evaluated in order to determine general water quality, use support status, and trophic condition (i.e., fertility) of each waterbody. Parameters were selected to help determine the impacts from sedimentation, nutrient enrichment, acid mine drainage, natural acidity, atmospheric deposition, and toxics.

Trophic Status

Trophic State indices for public lakes assessed during this reporting period are given in Table 67. Of the 15 lakes assessed for trophic status, one was classified as oligotrophic (infertile), three were mesotrophic (moderately fertile), and the remaining 11 were eutrophic (fertile). The trophic State indices devised by Carlson (1977) were utilized to determine trophic status. This method was selected due to its relative ease of use and widespread acceptability.

Carlson's indices can be calculated from any of several parameters, including secchi depth, chlorophyll A, and total phosphorus. The calculated index values range on a scale of 0 to 100, with higher numbers indicating a degree of eutrophy (enrichment) and lower numbers indicating a degree of oligotrophy (sterility). For this assessment, the following delineation was used: 0-39 = oligotrophic, 40-50 = mesotrophic, and 51-100 = eutrophic.

For lakes sampled during this reporting period, trophic State indices were determined utilizing summer chlorophyll A, total phosphorus, and secchi depth. The index values computed for these three parameters were then averaged to provide a final value, which was compared against the scale in the previous paragraph.

Control Methods

Pollution control methods for State lakes were previously summarized in the 1996 305(b) report. That report may be referenced for details. No additional controls have been implemented since that time.

Restoration Methods

Lake restoration methods were previously summarized in the 1998 305(b) report, which may be referenced for details. During this reporting period, Tomlinson Run Lake and Kanawha State Forest Pond were both drained and dredged.

Impaired and Threatened Lakes

The overall designated use support status for public lakes assessed during this reporting period is presented in Table 68. Of the 2,462 lake acres assessed, 144 (5.8 percent) fully supported their designated uses, 1,845 (74.9 percent) were fully supporting but threatened, and 473 (19.2 percent) were partially supporting.

A summary of specific designated uses is provided in Table 69 . The fishable goal of the Clean Water Act (CWA) is typically reported in two parts (i.e., designated uses): aquatic life support and fish consumption. The swimmable goal of the CWA also is reported in two parts: swimming and secondary contact recreation. During this reporting period, the fish consumption use was not

TABLE 67 TROPHIC STATE INDICES (TSI) OF PRIORITY LAKES SUMMER 1996								
	SECCHI DISK		CHLOROPHYLL A		TOTAL PHOSPHOROUS			
LAKE	DEPTH (M)	TSI	CONC (MG/M3)	TSI	CONC (MG/M3)	TSI	MEAN TSI	TROPHIC STATE
Tomlinson Run	0.61	67	164	81	50	61	70	Eutrophic
Turkey Run	0.46	71	73.7	73	40	57	67	Eutrophic
Saltlick Pond #9	1.89	51	58.6	70	20	47	56	Eutrophic
Ridenour	0.36	75	32.2	65	50	61	67	Eutrophic
Laurel	0.85	62	41.4	67	20	47	59	Eutrophic
Moncove	1.68	53	4.76	46	11	39	46	Mesotrophic
Cheat	0.33	76	9.5	53	30	53	61	Eutrophic
Castleman Run	0.88	62	67	72	40	57	64	Eutrophic
Bear	1.22	57	67.4	72	50	61	63	Eutrophic
Burches Run	0.85	62	79.9	74	50	61	66	Eutrophic
Kanawha State Forest	1.22	57	8.63	52	23	49	53	Eutrophic
O'Brien	2.29	48	2.48	39	21	48	45	Mesotrophic
Summit	2.19	49	6.6	49	20	47	48	Mesotrophic
Boley	2.67	46	0.99	30	10	37	38	Oligotrophic
Spruce Knob	1.83	51	23.71	62	24	50	54	Eutrophic

Table 68 USE SUMMARY REPORT: OVERALL USE SUPPORT Waterbody Type: Lake			
Total Number of Lake/Reservoir Assessed:	15		
Total Number of Lake/Reservoir Monitored:	15		
Total Number of Lake/Reservoir Evaluated:	0		
	ASSESSMENT BASIS IN ACRES		
DEGREE OF USE SUPPORT	EVALUATED	MONITORED	TOTAL
FULLY SUPPORTING	0.00	144	144
SUPPORTING BUT THREATENED	0.00	1845	1845
PARTIALLY SUPPORTING	0.00	473	473
NOT SUPPORTING	0.00	0	0
NOT ATTAINABLE	0.00	0	0
TOTAL SIZE ASSESSED	0.00	2462	2462

TABLE 69
USE SUPPORT MATRIX SUMMARY
WATERBODY TYPE: LAKES
UNITS IN ACRES

USE	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting	Not Attainable
Overall Use	144.00	1845.00	473.00		
Aquatic Life	144.00	1845.00	473.00		
Cold Water Fishery - Trout		68.00			
Warm Water Fishery	144.00	1777.00	473.00		
Primary Contact Recreation	732.00	1730.00			
Drinking Water Supply		1730.00			
Industrial		1730.00			

assessed. In addition, secondary contact recreation, because it is not a recognized use in West Virginia's water quality standards, was not assessed. Thus, in this report, the fishable goal of the CWA is equated to the aquatic life support use while the swimmable goal is equated to the primary contact recreation use.

For the aquatic life support use, 144 (5.8 percent) of the lake acres assessed were fully supporting, 1,845 (75 percent) were fully supporting but threatened, and 473 (19.2 percent) were partially supporting.

For the primary contact recreation use, 732 acres (29.7 percent) were fully supporting while 1,730 acres (70.3 percent) were fully supporting but threatened. (Cheat Lake, threatened by acid mine drainage, comprised the entire 1,730 acres of threatened waters). Pollution cause categories for lakes classified as less than fully supporting are listed in Table 70. Considering both major and moderate/minor impacts, siltation was found to have the greatest impact on lakes, followed by metals, turbidity, and nutrients.

Pollution source categories for lakes classified as less than fully supporting are provided in Table 71. Overall, petroleum activities, agriculture, silviculture, and construction affected the most lake acreage.

Table 70
Complete Summary of Causes, Including User-Defined
Sizes of Waterbodies Not Fully Supporting Uses
Affected by Various Cause Categories
Waterbody Type: Lake

Code	Cause Category	Major Impact in Acres	Moderate/Minor Impact in Acres
0500	METALS	27.00	232.00
0900	NUTRIENTS	8.00	80.00
1100	SILTATION	256.00	217.00
1200	ORGANIC ENRICHMENT/LOW DO	8.00	0.00
2200	NOXIOUS AQUATIC PLANTS (Native)	8.00	0.00
2500	TURBIDITY	0.00	217.00

Table 71 Complete Summary of Sources, Including User-Defined Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories Waterbody Type: Lake			
Code	**Source Category**	**Major Impact in Acres**	**Moderate/Minor Impact in Acres**
0230	Package Plants (Small Flows)	0.00	16.00
1000	AGRICULTURE	46.00	274.00
2000	SILVICULTURE	137.00	0.00
3000	CONSTRUCTION	65.00	0.00
4000	URBAN RUNOFF/STORM SEWERS	27.00	0.00
5000	RESOURCE EXTRACTION	153.00	217.00
5500	Petroleum Activities	153.00	217.00
6000	LAND DISPOSAL	0.00	16.00
6800	Raw Sewage	0.00	27.00

Water quality standards promulgated by the State Environmental Quality Board for streams also are applicable to lakes (WV EQB, 1999). Impaired or threatened status of lakes is determined by evaluating several factors, including violations of water quality criteria, physical alteration of habitat, and impairment of biological productivity.

Most violations of State water quality criteria noted during this assessment were for iron, manganese, and aluminum. These metals tend to accumulate in reservoirs and are frequently found in high concentrations, particularly in the hypolimnion (i.e., bottom waters). Accumulation of metals and other pollutants in reservoirs is not an unusual phenomenon, since reservoirs by their very nature act as sinks for pollution originating in the watershed. A few metals violations were noted in surface water samples, and these were primarily in lakes with a high level of turbidity.

Many of the lakes sampled during this assessment experienced hypolimnetic (bottom water) oxygen depletion in the summertime, with several also experiencing low hypolimnetic dissolved oxygen in the spring. However, no violations of dissolved oxygen occurred in any lake surface waters. It is important to realize that low bottom dissolved oxygen is a common phenomenon in many reservoirs due to thermal stratification. Although violations of State dissolved oxygen criteria were noted, special consideration must be given to lakes due to the phenomenon of stratification.

Section 303(d) Waters

Table 72 is a list of public lakes currently on the 303(d) list. Nine lakes totaling 193 acres appear on the list. Pollutants common to these lakes are nutrients, siltation, metals, and low dissolved oxygen. Common sources of pollution include domestic sewage, construction, urban runoff, agriculture, and petroleum activities.

TMDL Status

To date, eight TMDL's have been completed on lakes in West Virginia. Four were completed in 1998 (Hurricane, Mountwood Park, Burches Run, and Tomlinson Run). An additional four were finalized in 1999 (Turkey Run, Ridenhour, Castleman Run, and Bear). Saltlick Pond #9, the only lake on the 303(d) list without a completed TMDL, will be addressed in 2000.

Copies of the completed lake TMDL's are available from DEP's Office of Water Resources, 1201 Greenbrier Street, Charleston, WV 25311, telephone (304) 558-2108.

Acid Effects on Lakes

All 15 lakes monitored during this reporting period were assessed for high acidity. None were found to be impaired by high acidity. However, four lakes (Summit, Spruce Knob, Boley, and Cheat) are considered threatened. Summit, Spruce Knob, and Boley are threatened by acid precipitation while Cheat is threatened by acid mine drainage. Many methods are being employed to mitigate the harmful effects of high acidity. In the Cheat Lake watershed, AMD effects are being reduced through reclamation of abandoned and inactive coal mines. Summit and Boley Lakes are routinely limed to neutralize a low pH condition. The soils of the Spruce Knob Lake watershed are limed periodically to help maintain a neutral pH.

Toxic Effects on Lakes

None of the 15 lakes sampled during this reporting period were monitored for toxics.

Table 72
West Virginia Lakes
1998 303(d) List

Primary Waterbody List

Lake Name	Steam Code	Use Affected	Pollutant	Primary Source	Size Affected in Acres	TMDL Priority	HUC
Hurricane Creek	K(L)-22-(1)	Aquatic Life	Nutrients, Siltation, Iron	Domestic Sewage, Construction, Urban Runoff	12	High	05050008
Hurricane Creek	K(L)-22-(1)	Human Health	Iron	Construction, Urban Runoff	12	High	05050008
Ridenour Lake	K(L)-30-A-(1)	Aquatic Life	Nutrients, Siltation, Iron, Aluminum	Domestic Sewage, Construction, Agriculture, Urban Runoff	27	High	05050008
Ridenour Lake	K(L)-30-A-(1)	Human Health	Iron	Construction, Urban Runoff	27	High	05050008
Mountwood Park Lake	LK(L)-10-(1)	Aquatic Life	Siltation	Construction, Streambank modification, highway maintenance	48	High	05030303
Saltlick Pond #9	LK(L)-95-(1)	Aquatic Life	Siltation	Undetermined	15	High	05030303
Tomlinson Run Lake	O(L)-102-(1)	Aquatic Life	Siltation	Agriculture, Construction	30	High	05030101
Turkey Run Lake	O(L)-37-(1)	Aquatic Life	Siltation, Iron, Aluminum, Nutrients	Petroleum Activities	15	High	05030202
Turkey Run Lake	O(L)-37-(1)	Human Health	Iron	Petroleum Activities	15	High	05030202
Burches Run Lake	O(L)-83-C-(1)	Aquatic Life	Nutrients, Siltation	Agriculture, Domestic Sewage	16	High	05030106
Bear Rocks Lake	O(L)-88-D-2-F-(1)	Aquatic Life	Nutrients, Siltation, Low Dissolved Oxygen	Agriculture, Construction	8	High	05030106
Castleman Run Lake	O(L)-92-L-(1)	Aquatic Life	Siltation, Nutrients	Agriculture	22	High	05030106

Trends in Lake Water Quality

Although no formal trend analysis has been conducted on lakes in West Virginia, a general comparison of historical water quality data and trophic status indicates that the majority of the 15 lakes monitored during this reporting cycle were stable (i.e., no apparent trend). The only lake that appears to be showing a trend is Cheat Lake, which is improving from the effects of acid mine drainage.

LITERATURE CITED

Carlson, River E. 1977. *A Trophic State Index for Lakes*. Limnol. Oceanogr. 22:362-369.

West Virginia State Environmental Quality Board. 1999. Title 46, Requirements Governing Water Quality Standards, Series 1. West Virginia State Environmental Quality Board, Charleston, WV.

PART IV: GROUNDWATER QUALITY

Under the Groundwater Protection Act, West Virginia code Chapter 22, Article 12, Section 6.a.3, the DEP is required to provide a biennial report to the State Legislature on the status of the State=s groundwater and groundwater management program, including detailed reports from each agency which holds groundwater regulatory responsibility. The fourth Biennial Report to the legislature covering the period from 1 July 1997 through 30 June 1999 was submitted in the fall of 1999.

The Office of Water Resources (OWR), within the West Virginia Division of Environmental Protection (DEP), is responsible for compiling and editing information submitted for the biennial report. The DEP, the West Virginia Department of Agriculture (DOA), and the West Virginia Bureau for Public Health (BPH) all have groundwater regulatory responsibility and have contributed to this report. Additionally, several boards and standing committees which currently share the responsibility of developing and implementing rules, policies, and procedures for the Ground Water Protection Act (1991) are: The Environmental Quality Board, The Groundwater Coordinating Committee, The Ground Water Protection Act Committee, The Groundwater Monitoring Well Drillers Advisory Board, The Well Head Protection Committee, and The Non-Point Source Coordinating Committee.

There is one recurring theme expressed by most, if not all, of the programs and offices of the reporting agencies. Most common is the need for an accessible central and Statewide electronic data system. Currently all groundwater data, and other water data, are collected by individual programs and offices. There are some avenues of electronic data storage currently in place, but these are not available Statewide. The DEP Office of Water Resources, Technical and Geographic Information System (TAGIS), and Information Technology Office (ITO) are currently working on the implementation of a Statewide electronic data storage system through the Environmental Resources Information System (ERIS). Once this system is operational there will be a need for a technical committee of senior scientists to address the methods and needs for entering the State=s data in the system to ensure consistency. Until this mechanism is in place it will be a monumental undertaking to assess and evaluate the status of the State's groundwater quality.

Another theme expressed is the need for a systematic approach to groundwater complaint investigations to involve all agencies with groundwater protection responsibilities. There also is the need for groundwater sampling guidelines to be developed by the Groundwater Program in cooperation with other programs to ensure consistency to all groundwater sampling efforts. Some effort in this regard has begun.

Programs and agencies have also identified the need for specific hydro geologic information on the State's groundwater such as regional and local water levels, groundwater flow studies, and access to Statewide dedicated groundwater monitoring data. Additional themes include greater outreach to the citizens of West Virginia on issues such as non-point source pollution, protecting individual groundwater and drinking water sources, toll free help lines, and the advantages and disadvantages of a consolidated groundwater protection program, at both the federal and the State levels, to enhance Statewide consistency and unified implementation of groundwater rules.

While much remains to be done to provide protection and continued viability of the State's groundwater, great strides have been taken in that direction. The DEP, DOA, and BPH continue to work closely at many levels to protect the groundwater of West Virginia and the health and safety of the citizens and visitors to the State.

Copies of the report AGroundwater Programs and Activities: Biennial Report to the West Virginia 2000 Legislature may be obtained by contacting the Groundwater Program at the Office of Water Resources, 1201 Greenbrier Street, Charleston, WV 25311, telephone (304) 558-2108.

LITERATURE CITED

West Virginia Division of Environmental Protection. 1991. West Virginia Groundwater Protection Act, Chapter 22, Article 12, West Virginia Code.

PART V: WETLANDS

While West Virginia's wetlands (102,000 acres) comprise less than 1 percent of the State’s total acreage, the State still takes great interest in the management of these areas. Management efforts are mainly geared toward protection of wetlands by regulatory proceedings or acquisition. Permitting authority for activities impacting wetlands (Section 404) lies with the U. S. Army Corps of Engineers. West Virginia insures protection through an active Section 401 certification program.

No significant changes have occurred in the status of West Virginia's wetlands since submission of the 305(b) report for 1998. This publication is available from the Watershed Assessment Program, Office of Water Resources, 1201 Greenbrier Street, Charleston, WV 25311, or it may be accessed via the internet at www.dep..State.wv.us.

The Wildlife Resources Section of the Division of Natural Resources updated its wetlands inventory in 1996. Current wetland information is described in a booklet entitled AWest Virginia's Wetlands...Uncommon, Valuable Wildlands (Tiner, 1996). This publication is available from the West Virginia Wildlife Resources Section, Technical Support Unit, P. O. Box 67, Elkins, WV 26241.

LITERATURE CITED

Tiner, R. W. 1996. West Virginia’s Wetlands, Uncommon Valuable Wildlands. U. S. Fish and Wildlife Service, Ecological Services, Northeast Region, Hadley, MA. 20 pp.

PART VI: WATER POLLUTION CONTROL PROGRAM

Chapter One: Point Source Control Program

The objectives of the point source control program are the control and reduction of water pollution. These objectives are met by ensuring that discharges from facilities meet the applicable Clean Water Act effluent limitations and, further, that they do not violate water quality standards.

The Office of Water Resources (OWR) primary mechanism for carrying out this program is the WV NPDES permit. The permit includes effluent limits and requirements for facility operation and maintenance, discharge monitoring and reporting.

Due to these requirements and emphasis on issuing major industrial permits, the best available technology (BAT) approach to point source control has resulted in substantial pollution reduction in all State waters, particularly in the area of conventional pollutants. Also, it has provided States greater latitude in requiring additional reductions in effluent loadings of these pollutants. BAT limits are generally adequate to protect water quality since the majority of major dischargers are located on large Rivers, which have the capacity to assimilate wastewater. Water quality on the State's large Rivers has shown a gradual improvement over the past few decades.

On smaller streams, the combination of BAT and water quality-based permit limits has generally provided the greatest degree of pollutant control, particularly in relation to toxic substances.

In addition to enabling OWR to correct problems, State regulations contain approval procedures for proposed industrial wastewater connections to publicly owned treatment works (POTWs). This allows OWR to evaluate proposals and require the installation of pretreatment facilities where necessary, or otherwise approve with conditions.

Each permitted facility is required to monitor its discharges and submit regular reports. These reports are reviewed and, where noncompliance exists, administrative actions are generally required. These may include warning letters, notices to comply, enforcement orders, or referrals for civil action.

OWR maintains a quality assurance/quality control (QA/QC) laboratory inspection program. This program provides a mechanism for reviewing the analytical testing procedures used by various laboratories serving WV/NPDES permittees across the State. The maintenance of acceptable QA/QC procedures is imperative to insure the analytical information submitted to OWR is accurate.

To address the discharge of toxic pollutants, the State Environmental Quality Board has adopted several additional numeric water quality criteria for organic constituents. These criteria supplement existing criteria for a variety of other organics and heavy metals.

Another important mechanism to address toxic discharges is the toxicity testing program. This program, formerly run by DEP, was turned over to the Wheeling Field Office of U. S. EPA in 1998. This effort serves to provide toxics information as it relates to a particular discharge. The results give the permitting engineer an indication of the presence or absence of toxicity in a discharge. The permit reissuance process and an increased use of toxicity testing has led to the reduction of toxic pollutants in discharges to West Virginia streams.

To date, the point source permitting program has been effective in controlling the amount of toxic pollutants discharged into State waters. Section 304(l) of the Clean Water Act requires States to list all waters that do not meet standards due to point source toxics. Currently, no streams or lakes in the State qualify for listing under Section 304(l).

OWR supports a field inspection staff as part of the agency's Environmental Enforcement (EE) unit. This unit is responsible for a variety of pollution control tasks. The inspectors maintain close contact with permitted facilities and conduct activities that have an immediate and long-term effect on the State’s water quality.

One of the inspectors' highest priorities is the investigation of fish kills and spills. Investigations must be thorough to determine the cause and, if necessary, to carry out enforcement procedures. Typical investigation procedures include location of a source, sampling, and contacting the responsible official or company. A quick assessment of downstream drinking water intakes is made by the inspector and steps are taken to notify and protect the users. Types of spill investigations include vehicle wrecks, chemical plant accidents, and train derailments.

Routine facility inspections occupy the largest portion of the inspector's time. Inspections of permitted facilities are conducted and include solid waste, municipal and industrial facilities. Most of these are reconnaissance inspections and are performed on a regular basis. The field staff also conducts more detailed compliance evaluation inspections (CEI) where facilities' sampling and reporting procedures are checked. Activities also include inspection of open dumps (solid waste) and the initiation of enforcement actions necessary in the removal of such dumps.

When needed, enforcement action is initiated to correct problems. This may consist of a notice of violation, an administrative action, a notice to comply, or a criminal complaint. Inspectors may recommend the initiation of civil action for some pollution problems. In such cases, a recommendation is forwarded to DEPs Office of Legal Services. This type of enforcement action is very time consuming and is usually taken as a last resort.

Inspection of activities covered under the nonpoint source program is another important function of the field inspector. Activities related to construction and timbering sites and agricultural activities can potentially cause much soil disturbance. Unless proper erosion control measures are instituted on a site-by-site basis, soil erosion will occur causing excess sedimentation in streams and violation of water quality standards.

Screening of complaints is conducted at the local level to determine if immediate response is needed. Complaints originate primarily from private citizens or emergency personnel such as fire departments, sheriff's departments, and State police. Serious complaints are investigated immediately and procedures are much the same as for spills.

Chapter Two: Nonpoint Source Control Program

OWR, as the lead agency for the State's nonpoint source program, works with other cooperating State agencies to assess nonpoint source impacts, then develops and implements projects designed to reduce pollutant loads for agricultural, silvicultural, resource extraction, urban runoff, hydro modification, and construction activities. Program initiatives are based upon education, technical assistance, financial incentives, demonstration projects, and enforcement, as necessary.

OWR's NPS program supports the overall administration and coordination of the nonpoint source activities through participating State agencies: Office of Mines and Minerals, Soil Conservation Agency, Office of Oil and Gas, and Division of Forestry. Each year, there are specific activities funded under the nonpoint source program. Following is a description of the current program components:

Nonpoint Source Program Coordinator for Agriculture and Construction

The NPS Program Coordinator is located at the West Virginia State Soil Conservation Agency headquarters. This individual has broad responsibilities for coordination of the Statewide NPS water quality activities for agriculture and construction. This individual integrates the water quality components, geographic locations, cooperating agency activities, and resources into the total program objectives. The Coordinator also is responsible for compiling Quarterly Status Reports, organizing training, developing relationships among cooperating agencies, making public presentations, attending NPS Conferences and workshops, and managing day to day functions of the program.

State Revolving Fund (SRF) Coordinator for Agriculture

Loan funds are made available at low interest to landowners for installation of best management practices on farms through OWR's Revolving Loan Fund. The SRF Program

Coordinator is located at the West Virginia State Soil Conservation Agency (WVSCA) headquarters. This individual has responsibility for development of the program, which includes implementing and evaluating the State revolving loan fund for the installation of agriculture best management practices. The SRF Coordinator works with the local Soil Conservation Districts, WVSCA, WVDEP, Natural Resources Conservation Service (NRCS), and the Farm Service Agency (FSA) to effectively manage the use of the SRF.

State Nonpoint Source Silviculture Program

Managed through the Division of Forestry, the goal of this program is to maintain and strengthen the cooperative effort and involvement of State and federal agencies, environmental groups, forest industries, woodland owners, and the general public toward preventing and correcting water quality problems associated with the harvesting and processing of forest products. In addition, the program deals with problems created by forest fires and repeat fires and enforces the use of BMP's under the West Virginia Logging Sediment Control Act.

Nonpoint Source Resource Management Training Center (RMTC) at Cedar Lakes

The Nonpoint Source Resource Management Training Center is a cooperative partnership project conducted by the WV Soil Conservation Agency, WV Department of Education, WV Division of Environmental Protection, and the U. S. Environmental Protection Agency. The main objective of this partnership is to combat NPS pollution in West Virginia and reduce NPS impacts through public education. The NPS RMTC provides information and training on the control of NPS impacts to all individuals and groups that disturb soil. Land users utilizing this facility include urban developers, loggers, farmers, watershed associations, homeowners, earth moving contractors, consulting engineers, people in the resource extraction industry, students, and teachers.

Southern Construction Demonstration Project (Piney Creek Comprehensive Watershed Project)

This project focuses on the Piney Creek watershed located in Raleigh County. The water quality of Piney Creek has been monitored by the U. S. Park Service and SOS volunteers and has been identified as having the poorest water quality of all watersheds draining into the New River Gorge National Park. Piney Creek is impacted by sediment from construction and silviculture, urban runoff from the City of Beckley, heavy metals from coal mining, and untreated sewage.

A NPS Technician is responsible for educating local residents, contractors, and engineers, as well as local planning commissions and the City of Beckley, about storm water management and sediment and erosion control requirements and BMP'S. The NPS Technician coordinates with the local citizens and government agencies to determine where NPS expertise and educational assistance are needed.

Kanawha River Direct Drainage Watershed Project

Agricultural producers and sediment sources in the demonstration watersheds are the primary target groups of this NPS project. The ultimate goal is to reduce NPS impacts upon water quality from agricultural operations. The parameters of concern are sediment, nutrients, and a variety of pesticides. Runoff reduction will be accomplished with regulatory and voluntary compliance from informed producers. The primary objective, developed on a farm by farm basis, will be development of a Best Management System that incorporates the BMP's necessary to reduce NPS impacts on water quality. A NPS Technician assists in preparing, reviewing and approving sediment control plans for two Soil Conservation Districts covering six counties.

Big Sandy Creek Comprehensive Watershed Project

This project focuses the efforts of a NPS technician on the nutrient management issues related to dairy farming within the watershed. The primary activities involve educational workshop training and nutrient management planning. Secondary activities include working with AMD issues as well as erosion and sediment control problems.

Wheeling Creek and Mountwood Park Lake

A NPS technician conducts workshops for contractors, developers, engineers, and landowners on the topic of erosion control. Presentations by the technician on volunteer stream monitoring have resulted in many streams being adopted by local citizens.

Teays Valley/Hurricane Creek Watershed Project

A NPS technician conducts workshops for contractors, developers, engineers, and landowners on the topic of erosion control. The technician also reviews erosion and sediment control plans for a nine county area to determine their potential to protect of water quality. In addition, many local citizens have adopted and are monitoring streams as a result of training conducted by the technician.

South Branch of Potomac Watershed Project

This project implements an information and education program for water quality issues associated with nutrient, pesticide, and grazing management, erosion control, and market development for raw and composted poultry litter usage, with particular emphasis on potential impacts to agriculture and water quality. An environmental scientist is assisting in proper management of the vast amount of animal waste generated by the local agricultural community. The scientist educates the public and provides technical assistance for erosion abatement throughout the watershed.

Evaluation of Reclamation Technologies

The Purpose of this project is to revisit several sites where innovative land reclamation practices and water quality projects were installed a number of years ago. Data is collected to ascertain impacts of the applied technology on the environment. Historical information and data also is collected.

Selection of sites for evaluation are made with the help of personnel from the Division of Environmental Protection (Offices of Water Resources, Abandoned Mine Lands and Reclamation, and Mining and Reclamation). With guidance and suggestions from the above agencies, these sites will be revisited and samples will be collected and analyzed. Articles and reports concerning the findings will be prepared.

Alkaline Leakage Field Demonstration: Lime Injection into Surface-Mine Spoil Aquifer

The purpose of this project is to investigate, at demonstration scale, the effectiveness and operational/design requirements for introducing alkaline leakage into surface mine spoil. The proposal is to introduce quick lime (CaO) into the aquifer from the surface via recharge ponds and ditches. An attempt will be made to prove feasibility and, if successful, to design and estimate costs for an "intermittently-continuous" lime-treatment pilot facility. The study has two phases: (1) a "slug" injection of a large instantaneous dose of lime, and (2) long-term monitoring of the Phase I project and design and installation of an "intermittently-continuous" lime-leakage pilot facility. Response time for the slug injection is expected to be on the order of one month.

Statewide Biosolids Management Program

The disposal of biosolids generated from wastewater treatment plants remains a problem in many West Virginia communities. The potential for nonpoint source (NPS) impacts to surface and ground waters of the State from improper management and land application of biosolids must continue to be addressed. Through the cooperative efforts of the West Virginia Division of Environmental Protection (WVDEP) and the West Virginia University Cooperative Extension Service (WVU CES), much progress has been made in developing an environmentally safe land application program for suitable biosolids. This has led to a doubling of the amount of biosolids that were land applied safely during 1989-1992. Still, about half of the biosolids produced in West Virginia are land filled.

This proposal is a cooperative program among the West Virginia Division of Environmental Protection (WVDEP), the West Virginia State Soil Conservation Agency (WVSCA), WVU Cooperative Extension Service (WVU CES) and the WV Department of Education (WVDE) to better implement a coordinated Statewide Biosolids Management Program.

This program will include: 1) regulation and oversight of wastewater treatment plants by WVDEP, 2) soil suitability analysis and long term evaluation, nutrient management planning, best management practice implementation, and education of landowners by WVSCA through NPS field personnel, 3) operation of the NPS Resource Management Training Center, 4) operation of the WVU CES, and 5) education of wastewater treatment plant operators by the WVDE, WVDEP and WVU CES. Many of the existing resources and ongoing programs within each cooperating agency will be used to enhance the State's biosolids program. This proposal will provide funding for NPS education and information for land application technical assistance for WVSCA and WVU CES.

Total Maximum Daily Load Modeling - Statewide Watershed Project

The Office of Water Resources has been engaged with EPA in the development of Total Maximum Daily Loads (TMDL's) for streams listed on the State's 303(d) list of impaired waters. During the FY-97 round of TMDL development, EPA used contractual assistance for model development from funds available within the Region, primarily excess West Virginia grant funds. This work plan continued that effort for FY-98 by making unspent funds from the FY-97 319 grant available for a TMDL modeling contract.

The predominant sources of impairment to streams in the first round of TMDL development were nonpoint in nature. That also is the case for streams and lakes addressed by FY-98 TMDL's.

Chapter Three: Cost/Benefit Assessment

The improvement in water quality due to the installation of new and upgraded municipal wastewater systems has been significant since 1972 when the Water Pollution Control Act Amendment was passed by Congress. Between 1972 and 1999, 304 wastewater systems received funding provided by the DEP's Construction Assistance Program. From 1972 to 1990 the major funding provided was from the US EPA Construction Grants Program and this totaled $ 668 million in grant funds to 200 projects. From 1990 to 1999 the major funding provided was from the new State Revolving Fund (SRF) low interest loan program and this totaled $ 166 million in loan funds to 104 projects. During the specific reporting period of July 1997 to July 1999, 39 wastewater projects were funded by the SRF program totaling $73 million in loan agreements.

In addition to the traditional municipal wastewater projects that have always been funded by the DEP, in FY98 a new nonpoint source pollution control program was created under the SRF program called the West Virginia Agriculture Water Quality Loan Program. This pilot program has provided $ 1.6 million in FY98 and FY99 for the installation of agriculture best management practices in Grant, Hampshire, Hardy, Pendleton and Mineral Counties. The program is expanding Statewide during FY2000.

The above funding provided for municipal systems has resulted in a number of them coming into compliance with administrative orders and consent decrees. Some of the utilities have extended sewer service to areas where customers used malfunctioning septic tank systems or had direct discharges to streams. All of these projects have environmental benefits affecting the quality of surface and groundwater. These projects have also corrected a number of health hazards in localized areas. These environmental benefits or results are obvious in some project areas while other projects were completed to prevent a pollution problem from occurring in the future.

In West Virginia, the majority of water pollution control activities (permitting) are administered through various State agencies. DEP's Office of Water Resources oversees the administration and enforcement of water pollution control (NPDES) permits not related to coal mining. In addition, the office administers Section 401 water quality certifications, with comments provided by DNR's Wildlife Resources Section. The Office of Mining and Reclamation handles coal related NPDES permits. The Office of Waste Management issues NPDES permits associated with solid waste facilities. The State Health Department has input on municipal facilities and oversees all activities associated with home septic systems in cooperation with county sanitarians. The State Environmental Quality Board (EQB) (formerly the Water Resources Board) establishes water quality standards and acts as an appellate board on some water pollution control activities. The Office of Water Resources also contributes to two interstate commissions dealing with water pollution: The Ohio River Valley Water Sanitation Commission (ORSANCO) and The Interstate Commission on the Potomac River Basin (ICPRB). Following is a breakdown of various State agency expenditures for FY-96-97: (see following page)

Division of Environmental Protection	
Office of Administration	$ 3,609,789
Office of Information Services	1,525,794
Office of Water Resources (includes Revolving Loan Fund)	35,095,612
Office of Waste Management	14,191,559
Office of Mining and Reclamation	13,726,914
Office of Abandoned Mine Lands & Reclamation	34,707,012
Office of Oil & Gas	2,023,783
Division of Natural Resources	
Fish Kill Reimbursement	24,727
Acid Impacted Streams	75,959
Stream Restoration	13,050
Bureau of Public Health (includes County Sanitarians)	3,000,000
Environmental Quality Board	164,344
TOTAL	**$ 108,158,543**

Improvement in the water quality of State rivers and streams has had numerous benefits, particularly for the larger Rivers such as the Ohio, Kanawha, and Monongahela. In these waterbodies, a recovery of the sport fishery has coincided with an increase in other water-based recreational activities such as boating, skiing, and swimming.

The Division of Natural Resources, Wildlife Resources Section maintains figures on the economic impact of hunting and fishing in West Virginia. According to a survey conducted by the U. S. Fish and Wildlife Service and the U. S. Bureau of the Census, State anglers spent $204,922,711 for fishing in 1996. According to a report released by the American Sportfishing Association, the total economic impact of these expenditures amounted to $308,804,127. The same report indicated that this impact maintained 4,450 jobs and generated wages amounting to $71,238,378. In addition, expenditures generated $12,295,363 in State sales taxes and $2,048,445 in income taxes. The DNR Annual Report revealed that fishing (and related) licenses generated $5,953,610 in 1996. Excise tax apportionment was approximately $1,971,369. In summary:

WV Tax Income	$14,343,808
DNR Income	7,924,979
Impact on WV Government	$22,268,787

Obviously, these revenues are greatly dependent upon water quality supportive of the sport fishery.

Chapter Four: Surface Water Monitoring Program

General activities of the State's surface water monitoring program include conducting compliance inspections, performing intensive site-specific surveys, collecting ambient water quality data, monitoring contaminant levels in aquatic organisms, utilizing benthic and toxicity data to assess perturbations, and conducting special surveys and investigations.

The primary function of the monitoring program is to determine whether or not State waters support their designated uses. A secondary function of the program is to determine the degree of impairment of waters that do not fully support their uses. Monitoring data are used to support the agency's permitting, enforcement, TMDL, and planning activities.

General monitoring activities (ambient and watershed assessments, fish tissue sampling, groundwater characterization, lake assessment, and intensive surveys) are coordinated by individual programs within the Office of Water Resources. DEP's Environmental Enforcement (EE) unit oversees enforcement related water pollution control activities, including complaint investigation, spill response, and compliance monitoring of NPDES dischargers.

Following is a summary of monitoring activities conducted by the Office of Water Resources:

Watershed Assessment Program

Located within the OWR, the Watershed Assessment Program's scientists are charged with evaluating the health of West Virginia's watersheds. The Program is guided, in part, by the Interagency Watershed Management Steering Committee consisting of representatives from each agency which participate in the Watershed Management Framework. Its function is to coordinate the operations of the existing water quality programs and activities within West Virginia to better achieve shared water resource management goals and objectives. The Watershed Basin Coordinator serves as the day to day contact for the committee. The responsibilities of this position are to organize and facilitate the Steering Committee meetings, maintain the watershed management schedule, assist with public outreach, and to be the primary contact for watershed management related issues.

WAP uses the U. S. Geological Survey's (USGS) scheme of hydrologic units to divide the State into 32 watersheds (see map, Figure 1).

WAP assesses the health of a watershed by evaluating as many of its streams as possible, as close to their mouths as possible. In addition WAP began evaluating random sites in each watershed beginning with group B watersheds in 1997. WAP's general sampling strategy can be broken into several steps:

! The names of streams within the watershed are retrieved from the U. S. Environmental Protection Agency's (EPA) Water Body System database.

! A list of streams is developed that includes several sub-lists. These sub-lists include:
   1. Severely impaired streams,
   2. Slightly or Moderately impaired streams,
   3. Unimpaired streams,
   4. Unassessed streams, and
   5. Streams of particular concern to citizens, public officials, and permit writers.

! Assessment teams visit as many streams listed as possible and sample as close to the streams' mouths as allowed by road access and sample site suitability. Longer streams may also be sampled at additional sites further upstream. If inaccessible or unsuitable sites are dropped from the list, they are replaced with previously determined alternate sites.

The Program has scheduled the study of each watershed for a specific year of a 5-year cycle. Advantages of this pre-set timetable include: a) synchronizing study dates with permit cycles, b) facilitating the addition of stakeholders to the information gathering process, c) insuring assessment of all watersheds, d) improving the OWR's ability to plan and e) buffering the assessment process against domination by special interests.

In broad terms, OWR evaluates the streams and the Interagency Watershed Management Steering Committee sets priorities in each watershed in 5 phases:

Phase 1 - For an initial cursory view assessment teams measure or estimate about 50 indicator parameters in as many of each watershed's streams as possible.

Phase 2 - Combining pre-existing information, new Phase 1 data and stakeholders' reports, the Program produces a list of streams of concern.

Phase 3 - From the list of streams of concern, the Interagency Watershed Management Steering Committee develops a smaller list of priority streams for more detailed study.

Phase 4 - Depending on the situation, Program teams or outside teams (e. g., USGS or consultants) intensively study the priority streams.

Phase 5 - The Office of Water Resources issues recommendations for improvement; develops total maximum daily loads and makes data available to any interested party such as local watershed associations, educators, consultants, and citizen monitoring teams.

The general sampling strategy is useful for comparing watersheds, but it was designed with other purposes in mind and will not pass the rigors of statistical tests that must be applied in a scientifically-sound, comparative study.

After the 1996 sampling season WAP developed a special sampling strategy for comparing watersheds. It can be highlighted in a few steps:

- X 30-45 stream locations are selected randomly from an EPA database.
- X Personnel from WAP, Environmental Enforcement and other groups reconnoiter the locations to secure landowner approval and suitability for sampling.
- X Sampling teams visit the sites and sample in WAP's general assessment strategy.
- X Special statistical analyses allow comparisons between watersheds. This special watershed assessment strategy will be applied to the Group A watersheds when they are revisited in 2001.

Fish Tissue Sampling

The fish tissue sampling program is used to measure substances not readily detected in the water column, to monitor spatial and temporal trends, determine the biological fate of specific chemicals, and when appropriate, to provide information to support human health risk assessment evaluations. This program underwent a short hiatus during this reporting period. An effort is being made to redefine advisory criteria in a cooperative effort with West Virginia University, the Division of Natural Resources, and the Bureau of Public Health. This cooperative effort will allow the program to move from the Federal Food and Drug Administration (FDA) guidelines to the increasingly popular risk based approach (i. e., Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory). Fish Consumption Advisories can be found in Table 73.

Ambient Water Quality Monitoring

Ambient water quality monitoring is conducted quarterly by OWR at 26 selected stations. These stations are generally located at the downstream terminus of the State's major hydrologic regions. The information gathered is useful in assessing long-term trends and measuring differences between upstream and downstream stations on several Rivers. The data also is of major importance in determining 303(d) listings for the States major Rivers. Chemical constituents that are indicative of problems associated with sewage, mining, oil and gas drilling, agriculture, and several classes of industries are evaluated at each site.

A list of current sites monitored by representatives of the Office of Water resources and the Ohio River Valley Water Sanitation Commission (ORSANCO) can be found in Table 74. Eight Ohio River stations are contracted to ORSANCO. These are CORE stations and are spread throughout the West Virginia portion of this major waterway. These stations effectively bracket several target areas influenced by major industrial complexes, municipalities, and tributaries. All mile points on the Ohio River are measured from the confluence of the Allegheny River and the Monongalia River at Pittsburgh.

Table 73
WEST VIRGINIA FISH CONSUMPTION ADVISORIES

				Species Affected Under Current Advisories and Consumption Categories			
Name of Waterbody	Pollutant(s) of Concern	Source(s) of Pollutant	Affected Area (Miles)	One meal/week[1]	One meal/month[1]	Six meals/year[1]	Do not eat
Kanawha River (O-20)	Dioxin	Unknown	From mouth of Coal River to Point. Pleasant (46.0)				Bottom Feeders
Pocatalico River (K-29)	Dioxin	Unknown	Lower two miles (2.0)				Bottom Feeders
Armour Creek (K-30)	Dioxin	Unknown	Lower two miles (2.0)				Bottom Feeders
Ohio River (O)	PCBs, Chlordane, Dioxin	Unknown	Entire length bordering West Virginia (227)	Largemouth & Smallmouth Bass, Sauger	White Bass, Hybrid Striped Bass, Fresh water Drum	Flathead & Channel Catfish less than 17" long	Carp, Channel Catfish more than 17" long
Shenandoah River (S)	PCBs	Avtex, Front Royal, VA	Entire length in WV (20)				Carp, Suckers, Channel Catfish
North Branch of Potomac River (P-20)	Dioxin	Westvaco Pulp Mill, Luke, MD	Lower 50 miles (50.0)				Non-Sport fish species
Potomac River (P)	Dioxin	Westvaco Pulp Mill, Luke, MD	From Piedmont to Cacapon R. (38)				Non-Sport fish species
Flat Fork Creek (KP-33)	PCBs	Spencer Transformer, Harmony, WV	Entire Length (5)				Carp, Suckers, Channel Catfish

[1] Advisories are based on a meal size of 2 pound of fish.

TABLE 74 1996-1999 Watershed Assessment Ambient Water Quality Stations			
STORET STATION	**STATE CODE NUMBER**	**LOCATION OF SAMPLING STATION**	**COUNTY**
WA-96-B01	BST-001	Tug Fork at Fort Gay, WV	Wayne, WV
WA-96-G01	OG-003	Guyandotte River at Huntington, WV	Cabell, WV
WA-96-G02	0G-073	Guyandotte River at Pecks Mill, WV	Logan, WV
WA-96-K01	K-31	Kanawha River at Winfield Locks and Dam,	Putnam, WV
WA-96-K02	K-73	Kanawha River at Cheylan, WV	Kanawha, WV
WA-96-K03	KC-11	Coal River at Tornado, WV	Kanawha, WV
WA-96-K04	KE-004	Elk River at Coonskin Park, above CharlestonWV	Kanawha, WV
WA-96-K05	KG-008	Gauley River at Beech Glen, WV	Nicholas, WV
WA-96-K06	KN-001	New River above Gauley Bridge, WV	Fayette, WV
WA-96-K07	KN-064	New River at Hinton, WV	Summers, WV
WA-96-K08	KN-095	New River at Glen Lyn, VA	Giles, VA
WA-96-K09	KNG-006	Greenbrier River near Hinton, WV	Summers, WV
WA-96-L01	LK-028	Little Kanawha River at Elizabeth, WV	Wirt, WV
WA-96-L02	LKH-001	Hughes River below Freeport, WV	Wirt, WV
WA-96-MO1	M-07	Monongahela River below Morgantown, WV	Monongalia, WV
WA-96-M02	M-01-20	Dunkard Creek below Prentress, WV	Monongalia, WV
WA-96-M03	MT-006	Tygart Valley River at Colfax, WV	Marion, WV
WA-96-M05	MC-01	Cheat River below Lake Lynn Dam, PA	Fayette, PA
WA-96-O01	OMI-010	Middle Island Creek at Arvilla, WV	Pleasants, WV
WA-96-M04	MW-012	West Fork River at Enterprise, WV	Harrison, WV

TABLE 74 Continued 1996-1999 Watershed Assessment Ambient Water Quality Stations			
STORET STATION	**STATE CODE NUMBER**	**LOCATION OF SAMPLING STATION**	**COUNTY**
WA-96-M06	MC-31	Cheat River at Albright, WV	Preston, WV
WA-96-O02	O-004-09	Twelvepole Creek below Shoals, WV	Wayne, WV
WA-96-P01	P-030-02	Opequon Creek near Bedington, WV	Berkeley, WV
WA-96-P02	PC-06	Cacapon River above Great Cacapon, WV	Morgan, WV
WA-96-P03	PSB-013	South Branch Potomac River near Springfield	Hampshire, WV
WA-96-S01	S-001	Shenandoah River at Harpers Ferry, WV	Jefferson, WV
Ohio River Sanitation Commission Water Quality Sampling Stations All mile points on the Ohio River are measured from the confluence of the Allegheny River and the Monongalia River at Pittsburgh.			
OR-1	OR9408M	Ohio River at East Liverpool, OH, MP 40.2	Columbiana, OH
OR-2	OR896. 8M	Ohio River at Pike Island Lock, WV	Ohio, WV
OR-3	OR8546M	Ohio River at Hanibal Lock, OH, MP 126.4	Monroe, OH
OR-4	OR8192M	Ohio River at Willow Island Lock, WV MP 161.8	Washington, OH
OR-5	OR7771M	Ohio River at Belleville Lock, OH, MP 203.9	Meigs, OH
OR-6	OR7210M	Ohio River near Addison, OH, MP 260.0	Gallia, OH
OR-7	OR7018M	Ohio River at Gallipolis Lock and Dam, MP 279.2	Mason, WV
OR-8	OR6741M	Ohio River near Huntington, WV, MP 306.9	Cabell, WV

Total Maximum Daily Load (TMDL) Program

The 303(d) list is used to determine which waters within the State will enter the Total Maximum Daily Load program. Federal law requires the State to develop (TMDL's) for waterbodies which meet the definition of "water quality limited." A TMDL can be defined as a plan of action that is used to clean up polluted waters. The current definition requires the TMDL process to accomplish certain minimum requirements. The TMDL development process, as recommended by EPA, involves the following 5 steps:

1. Selecting a pollutant
2. Estimating the assimilative capacity of the waterbody
3. Estimating pollutant loadings from all sources
4. Using predictive analyses to determine total allowable pollution load (computer modeling)
5. Allocating allowable pollution so that water quality standards are achieved.

The TMDL efforts in West Virginia to date have been shaped by the lawsuit "Ohio Valley Environmental Coalition, Inc., et al. v Carol Browner, et al., No. 2:95-0529" (S.D.W.VA.) In this case (filed July 1995), the plaintiffs and EPA signed a consent decree, which the federal district court entered on July 9, 1997. The consent decree sets out a ten-year schedule for establishment of TMDLs for (1) certain portions of the Ohio River, including a TMDL for dioxin; (2) 44 other "priority" water quality limited segments (WQLSs); and (3) almost 500 WQLSs impaired by abandoned mine drainage. The decree provides that EPA will ensure the TMDLs are established if West Virginia does not establish the TMDLs. The decree also includes provisions related to EPA's review of West Virginia's subsequent 303(d) lists and development of an annual report on the status of West Virginia's TMDL program. The parties also signed a settlement agreement that includes additional commitments regarding EPA Region III guidance on listing, EPA technical assistance for the State, and EPA training to support State development of a watershed approach.

The current status of TMDLs in West Virginia is as follows:

TMDLs developed in 1997

Upper Blackwater River	South Branch of Potomac River including:
Lunice Creek	Mill Creek
North Fk. South Branch/Potomac River	Anderson Run
South Fk. South Branch/Potomac River	

TMDLs developed in 1998

Tomlinson Run Lake	Buckhannon River
Hurricane Lake	Ten Mile Creek of Buckhannon River
Mountwood Park Lake	Lost River
Burches Run Lake	

TMDLs developed in 1999

Bear Lake	Tygart River (extended to 3/2001)
Castleman Lake	Lower Kanawha River (extended)
Ridenour Lake	Armour Creek (extended)
Turkey Run Lake	Pocatalico River (extended)
Cheat River (extended to 3/2001)	

TMDLs proposed for 2000

Little Kanawha River (mainstem from Burnsville Dam to Mouth)	Spring Creek of Little Kanawha
Reedy Creek of Little Kanawha	Sand Fork of Little Kanawha
Saltlick Creek of Little Kanawha	Saltlick Pond #9 of Little Kanawha
Pats Branch of Guyandotte River	Oil Creek of Little Kanawha
	Ohio River (Dioxin)

West Virginia Stakeholder Advisory Committee

At present, EPA still has primacy for the TMDL program, but the Office of Water Resources currently is working with a diverse group of individuals appointed by the director of DEP. The initial meeting was held in January of 1999 to develop guidelines for a West Virginia TMDL section. The purpose of the group is to develop the structure for a West Virginia lead TMDL program. The group has already dealt with several important issues involving the guidelines for meshing of federal requirements with current State law and policies.

Citizens Stream Monitoring Program

One of the most severe droughts in decades occurred in 1999 and it had an impact for volunteer stream monitors. The majority of surveys submitted ranked water levels as "Low" and many surveys made special mention of the extreme low water. Yet the area of coverage by volunteers increased and several groups progressed into chemical monitoring. The use of pH and conductivity tests became common in areas affected by acid mine drainage (AMD). Two workshops sponsored by the West Virginia Watershed Network trained 34 volunteers in a newly devised physical monitoring system called The Easy Assessment Method (TEAM). The West Virginia Save Our Streams (WVSOS) coordinator was a part of the committee that devised this system. The summary of activities involving WVSOS in 1999 included: eight training workshops, five Quality Assurance/ Quality Control (QA/QC) workshops, nine demonstrations to the public and five public events with a display. Besides routine monitoring and general public events, 334 people participated in WVSOS activities. There were 48 new monitors trained and 25 monitors passed their QA/QC tests. There were 150 surveys submitted, 19 of them were of workshop or educational quality and 131 of them were of monitored quality. The ratings included 75 excellent, 40 good, 29 fair and 21 poor.

One accomplishment in 1999 was the publication of *Volunteer Stream Monitors of West Virginia.* This directory of volunteer stream monitoring groups included 45 groups registered with West Virginia Division of Environmental Protection or U. S. Environmental Protection Agency or who answered a survey sent out to groups whose status was unknown. Another accomplishment was a revision of the WVSOS QA/QC Plan. The plan was brought up to date with procedures and new participants in the program. The Watershed Assessment Program (WAP) has developed a web page and WVSOS publications should be posted on it.

Educational and outreach efforts included participation in the West Virginia Envirothon, Future Stewards program and the Hooked on Fishing Not on Drugs program. Workshops and demonstrations were made to 4-H clubs and one project included volunteers from a Boy Scout troop and a local high school. One project that had an effect on volunteer monitoring in some watersheds was an intern program sponsored by the Office of Surface Mining (OSM). This project focused on four watersheds with acid mine drainage (AMD) problems. Volunteers from across the State documented 24 streams (some with multiple stations) that exhibited AMD symptoms. Volunteers also documented 42 streams with symptoms of possible nutrient enrichment.

There was a focus on AMD impacted areas and volunteers showed the effectiveness of using pH and conductivity meters for locating these streams. A few pH meters and a conductivity meter have been acquired by WVSOS and will be offered for loan to groups that may need these to document AMD. Also, there will be a continuation of technical support offered for groups who wish to conduct some type of non-biological sampling.

There were several cooperative projects between watershed associations and government agencies. The Paint Creek Sweep, which started in 1998, was completed in 1999 and involved the watershed volunteers and the DEP. On Davis Creek the watershed association and a local college joined with members of the Division of Natural Resources (DNR) and DEP to conduct a fish survey and WVSOS sweep. There were projects involving a WVSOS trained member of the Conservation and Education Section of DNR in Pigeon and Manila Creeks. Members of the WV Soil Conservation Agency and the National Resources Conservation Service conducted monitoring projects across the southern part of the State. There have been talks with the Friends of the Cacapon River for some cooperative monitoring of that watershed in the year 2000.

During this reporting period, monitoring activity occurred in 20 of the State’s 32 watersheds. Training workshops were held in seven watersheds. There was a focus on two watersheds in 1999, the Greenbrier and the Little Kanawha. The event in the Greenbrier was an excellent educational event that included students from several schools in Greenbrier County. A workshop that was organized for the Little Kanawha watershed had no attendees and there has been little expressed public interest in WVSOS there. For 2000, plans have been started for workshops in Kanawha

County and the Mid-Ohio North watershed. Of course, trainers in the program are ready to assist any group requesting training. Again, QA/QC certification of active monitors will be a focus of efforts in the year 2000.

Chapter Five: Special State Concerns and Recommendations

SPECIAL STATE CONCERNS

In previous Section 305(b) reports the State has identified issues of concern to the effective management and protection of State waters. While the State has made some progress in developing programs and/or is taking advantage of special State and federal initiatives, which will facilitate a more proactive approach to dealing with specific problems, those concerns are still valid. Briefly, the continuing issues are as follows:

Abandoned Mine Drainage

This is the most serious water quality problem facing the State affecting at least 484 streams totaling 2,852 miles.

Lack of Domestic Sewage Treatment

In many rural areas of the state, collection and treatment of sewage from domestic sources is limited or nonexistent. The disposal of domestic sewage to state waters either through direct pipes or inadequate or failing septic tanks results in bacterial problems in many state streams. Beginning in FY-2000, the agency initiated a demonstration project on the use of State Revolving Loan Funds for repair and replacement of failing septic tanks. The one county demonstration, Raleigh County, will provide low interest funding to homeowners through local banking institutions. If successful, the program will be expanded to other counties and eventually statewide.

Fecal Coliform

Traditionally West Virginia has been reluctant to list waters impaired by fecal coliform from human sources on the states' 303(d) list. A 22 member TMDL Stakeholder Advisory Group has grappled with this and many other 303(d) listing issues during the reporting period. The group has recommended that the DEP should no longer make this exception and list waters in violation of the state's fecal coliform criteria, including those from human sources (CSO's, straight pipes, failing systems, etc).

As evidenced by information in this report, many stream miles in West Virginia are impaired by fecal coliform. Many more streams have been sampled for fecal coliform, although at a frequency insufficient for use in 303(d) listing. It is believed that if many of these streams were revisited and monitored with sufficient frequency appropriate for 303(d) listing, over 1000 streams could be added in the upcoming years to West Virginia's 303(d) list. Water Quality Impacts from Nonpoint Sources

Water Quality Impacts from Nonpoint Sources

In West Virginia, nonpoint source water quality impacts continue to be a source of impairment. Runoff from a variety of land disturbing activities, such as agriculture, timbering, and construction projects carries pollutants into adjacent waterways. Siltation associated with the runoff also adversely impacts beneficial uses of the state's streams. Many of the streams being listed on the state's list of impaired waters (303(d)), are affected by nonpoint sources. Existing non-regulatory programs promoting voluntary installation of best management practices need to be more focused on identified priority watersheds. Enforcement of water quality violations from nonpoint source activities should be increased as necessary to encourage compliance. Continuation and expansion of the agency's use of State Revolving Loan Funding for nonpoint source problems would also be beneficial.

An issue that remains is the ability to characterize when a stream is impaired by sediment, as no specific "sediment standard" is written in the state's water quality standards. In absence of this "sediment standard", assessment personnel have used surrogate indicators (e.g. total iron, total aluminum, and biologic impairment) as a means to indirectly relate water quality impairments to the excessive sediment loads a stream may be carrying. While this surrogate mechanism has withstood the challenges to date, assessment personnel and regulators both believe enhanced criteria would make sediment control more understandable, enforceable and effective.

Agricultural Development in Karst Regions

The proliferation of the poultry industry and the concerns related to animal wastes in the eastern counties of the State (Potomac and Greenbrier River drainages) have resulted in greater focus by State and federal agricultural agencies in recent years. Continued financial and technical assistance to landowners should result in improvements in the future.

Total Maximum Daily Loads (TMDL'S)

As a result of the resolution of an environmental suit in 1997, the State and the U. S. Environmental Protection Agency are tasked with the development of TMDLs on over 500 streams included on the State's 1996 303(d) list. By a court ordered consent decree, a schedule was established which included required completion dates of 2002 for the priority waters listed and 2006 (extended to 2008) for over 450 acid mine drainage affected streams. From 1997- 1999, eighteen TMDLS were developed by EPA contractors with participation by OWR staff.

While the State recognizes its responsibility for development of TMDLs, OWR is hesitant to assume complete responsibility due to limited resources. Attempts are underway to solicit support for increased funding and to establish a stakeholder process that will result in broad-based representation in the development of TMDL implementation strategies at the watershed level.

Anti-degradation

While the State has language in its water quality standards establishing an antidegradation policy, procedures for implementing that policy have been debated for many years. The West Virginia Environmental Quality Board (EQB) had initiated a development process, which originally included representatives from several Division of Environmental Protection offices to create implementation procedures for the anti-degradation policy. Currently, the EQB is leading an expanded Stakeholder Group with individuals representing nonpoint source concerns, the environmental community, agriculture, citizens action concerns, public utilities, the U. S. Fish and Wildlife Service, point source industry concerns, and point source regulatory agency concerns.

Concentrated Animal Feeding Operations

Increasing emphasis on addressing bacterial water quality problems from animal feeding operations has resulted in statewide discussions concerning the merits of permitting those operations through the National Pollutant Discharge Elimination System (NPDES) program. The agency has conducted surveys of various regions of the state (Potomac and Greenbrier drainages) and identified problem sites, which could potentially be permitted. Both the water quality agency and the agriculture community should work together to address water quality concerns related to these operations.

Fish Tissue Monitoring

The state has made considerable progress during the reporting period in development of risk-based consumption advisory levels for fish. Adoption and application of these new consumption advisory guidelines by the DEP, Division of Natural Resources and Bureau for Public Health is anticipated in late 2000. The state is concerned that a structured monitoring program does not exist, nor is funding currently available, for complete and widespread application of the new protocols.

Currently it is anticipated that the new guidelines will only be applied to the existing limited, and somewhat aging, tissue information. Many fishable waters are unmonitored and could be in need of an advisory (even if non-risked based guidelines are followed). Further, enhanced and expanded information gathering from creel surveys would help the agencies' focus efforts to inform and advise higher risk populations of the benefits and potential harm from the fish in their diets.

Biological Monitoring and Associated 303(d) Listings

Since inception of the Watershed Assessment Program in 1995, much emphasis has been placed on measuring streams health using Rapid Bioassessment Protocols. Indeed, the primary mechanism employed today in West Virginia for assessing the degree of use support for wadeable streams is through benthic information. Great progress in determining reference conditions, index periods, and sampling precision have allowed West Virginia to develop and apply the West Virginia

Stream Condition Index (WVSCI). The WVSCI score is a tool by which decisions on a streams degree of aquatic life use support can be made.

Recently this new tool has been used for listing streams on the states' 303(d) list. In 1998, at the completion of just one year of biological monitoring, (Watershed Management - Group A) 99 streams were added to the state's 1998 303(d) list via application of this new assessment tool. It is estimated that nearly 400 additional streams will be added to the state's 2002 303(d) list as a result of continued biologic monitoring

This expanded TMDL workload rivals the existing TMDL workload associated with mine drainage impacted streams, and is cause for serious concern among West Virginia regulators. West Virginia implores both EPA and Congress to seek resources and technologies to assist state's (many other eastern states have or will face similar scenarios as biological monitoring progresses) in addressing this emerging need.

Should the above scenario play out, West Virginia will face yet another significant challenge in TMDL development and implementation in the not too distant future. Again the state urges EPA and Congress to assist with financial and technical tools necessary for West Virginia to meet this challenge.

Data Management

For many years EPA's STORET mainframe data system was used by numerous agencies, both state and federal, as an outstanding repository for stream related information. Beginning in 1998 (timing coinciding with the discontinuation of the legacy STORET System, and initiation of the STORET X system) many agencies began to abandon their faithfulness to this system. This abandonment has taken a very effective tool away from state assessment personnel. No longer can information from ORSANCO, USGS, U.S. Army Corps of Engineers, etc. be found on the STORET system. It is believed that many agencies have elected to build their own data systems as EPA budget cuts caused delay after delay in implementing the new STORET system. The new system is still far from being fully implemented, meanwhile state personnel search out information which was once centralized, piecemeal from the individual agencies and programs.

West Virginia strongly urges EPA to make the STORET system as credible and effective as it once was. The state urges EPA to seek commitments from all former STORET participants to again contribute information to the STORET system.

Another concern with respect to data management is the need for a common accessible central and statewide electronic data system. Currently, all water quality data are collected and managed by individual programs and offices. DEP is in the process of implementing an agency wide environmental data management system called EQuIS (Environmental Quality Information System). This project will ultimately enable programs within all DEP offices to share environmental monitoring data with one another. Given the positive implications of this type of database system, it is important that DEP makes this effort one of it's top priorities.

RECOMMENDATIONS FOR THE IMPROVEMENT OF WATER RESOURCES MANAGEMENT:

In 1997, the Division of Environmental Protection along with 9 other State and federal agencies and the Governor of the State of West Virginia signed a Resolution of Mutual Intent for the development and implementation of a Statewide Watershed Management Initiative. Designated as the Watershed Management Framework (WMF), the initiative is intended to provide a watershed focus for all participating agencies and to establish mutual priorities for remediation and protection projects. A copy of the document AWest Virginia Watershed Management Framework is available from the Office of Water Resources, 1201 Greenbrier Street, Charleston, West Virginia 25311.

Recognizing that the resolution of water quality and other environmental issues often requires the application of multi-agency authorities and resources, the WMF partners have committed to identifying watershed projects in which positive benefits can be achieved by the redirection of resources to common priorities. The basis for establishing priorities is the water quality and land use information generated by the Watershed Assessment Program (WAP) of the Office of Water Resources (OWR) and other information provided by the partner agencies. Watershed management strategies and implementation plans are to be developed through a stakeholder process involving local input from potentially affected parties.

The WMF relationships and the continuing water quality assessments being conducted by WAP provide a logical vehicle for multi-agency involvement in water resource management for the State of West Virginia. Identification of water quality and other environmental problems and development of management strategies to address not only remediation but protection of the resource mesh well with the issues confronting the State in the next several years. TMDLs, anti-degradation, nutrient criteria development, endangered species and implementation of nonpoint strategies under the newly inaugurated Clean Water Action initiative must be coordinated at the State level through interaction by agencies with the authorities and responsibilities to achieve positive results.

The partnerships established through the WMF have already proven invaluable during the development of the States Clean Water Action Plan. In response to this national initiative, the State chose to use the WMF as the forum for preparing the necessary documentation and reports which will ultimately result in access to significant federal funding support for nonpoint source remediation projects. Copies of the State's Clean Water Action Plan are available from the Office of Water Resources, 1201 Greenbrier Street, Charleston, West Virginia 25311.

In summary, the State has recognized that effective water resource (environmental) management cannot be achieved by a single entity. It requires the participation and cooperation of multiple interests and local input. The WMF provides the mechanism to address the challenges facing the State in the future.

Office Of Water Resources

Mission Statement

To enhance and preserve the physical, chemical, and biological integrity of surface and ground waters, considering nature and health, safety, recreational and economic needs of humanity.

Vision Statement

The Office of Water Resources provides leadership on all water issues through effective programs that improve water quality and public safety statewide.

Statement of Policy Regarding the Equal Opportunity to Use and Participate in Programs

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WV Division of Environmental Protection
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